

West Virginia

2020 State Forest Action Plan



SPECIAL DEDICATION



IN MEMORY OF

Barry L. Cook

May 10, 1949 — May 9, 2020

West Virginia State Forester/Director

May 1, 2017 — May 9, 2020

Barry L. Cook was a seasoned forester with more than 45 years of experience before being appointed by Governor Jim Justice to serve as West Virginia State Forester/Director in 2017. He was a native of southern West Virginia and a graduate of both West Virginia University and Duke University.

Barry started his forestry career as a logging superintendent for Weyerhaeuser Company in Plymouth, North Carolina. In 1975, he accepted a position with J. P. Hamer Company as a procurement forester, a position he held until 1978 when he became the procurement manager for Coastal Lumber Company. Director Cook spent the following 26 years advancing through the leadership ranks until he resigned in 2002 as Vice-President of Operations. He then became President of Forest Products Group, an arm of Kimball International. Barry and his wife Donna then purchased and successfully operated Indiana Hardwoods. In 2008, the Cook family relocated to Beckley, West Virginia, so that Barry could personally oversee the acquisition of Indiana Hardwoods by Cranberry Lumber Company.

As West Virginia State Forester/Director, Barry was committed to the advancement of the Division's employees. Not only did he listen to their concerns and suggestions, but he took the time to reassure them that they were an invaluable part of the Division. For the first time in years, employees saw their leader more like they were—wearing a uniform and work boots instead of a suit and tie. It was a refreshing change that did not go unnoticed or unappreciated by the employees. During his three years with the Division, Barry did everything he could to promote employees, increase pay, purchase much needed equipment, and improve the lives of everyone that worked for the Division. He was not a leader who just touted having an open-door policy. He was a leader who actually had one.

During his life Director Cook was many things. He was a veteran who loved his country. A native West Virginian who loved his state. A brother, husband and father who loved his family. A forester who loved the land. A great leader who loved his employees.

Barry's presence in West Virginia's forestry family is greatly missed but to all who had the pleasure of knowing him, he will always be a pleasant memory. May he rest in peace.

WEST VIRGINIA 2020 STATE FOREST ACTION PLAN

A comprehensive analysis of the state's forests and related natural resources

December 2020

Produced by:

West Virginia Division of Forestry (WVDOF)
7 Players Club Drive
Charleston, WV 25305
(304)558-2788

Acknowledgements:

This document was produced with contributions from WVDOF employees, other state and federal agencies, a variety of organizations, and various other stakeholders, who are identified in Section VI as an update to the 2010 State forest resource Assessment and Strategy.

The following WVDOF employees, along with Kristen Carrington of the West Virginia Department of Agriculture (WVDA) and Joe McNeel, Director WVU Appalachian Hardwood Center (WVU AHC) had primary responsibility for taking stakeholder and WVDOF input, gathering best available data and information, and identifying issues and sub-issues for this 2020 State Forest Action Plan Update:

John Rowe* Forest Legacy Coordinator (Issue 1)	Linda Carnell* Assistant State Forester (Issue 2)
Chuck CopelandAssistant State Forester (Issue 3)	Travis Miller Assistant State Forester (Issue 3.6)
Jeremy McGill*Assistant State Forester (Issue 4)	Walt JacksonAssistant State Forester (Issue 5)
Bob Hannah*Urban Forestry Coordinator (Issue 6)	Joe McNeelDirector WVU AHC (Issue 8)
Kristen Carrington ...CFHP Coordinator, WVDA (Issue 7)	*Authored the 2010 Assessment and Strategy Section

The Geographic Information System (GIS) analysis for this document was completed by **Steve Harouff**, WVDOF GIS Manager, except for the Forest Health GIS analysis, which was done by WVDA GIS Specialist, **Lakin Castillo**.

Editing responsibilities were completed by WVDOF employees **Jeremy Jones** and **Steve Harouff**.

Coordination responsibilities for completion of this document were handled by **Steve Harouff**.

Oversight of this Assessment project was accomplished by State Foresters **Barry Cook** and **Tom Cover**.

Many thanks to **Randall Morin**, Research Forester and lead analyst for West Virginia in the Northern Research Station's Forest Inventory and Analysis (NRS-FIA) group for providing the latest estimates, data, and statistics for West Virginia's forests.

A great deal of gratitude is owed to **Kirk Piehler**, Natural Resources Staff Officer, along with several staff members of the Monongahela National Forest for contributions and review of this plan.

Cover photo: Fall Trees WV Forest Country Road – Forest Wander, <http://www.forestwander.com/2009/10/fall-trees-wv-forest-country-road/>

This project was funded in part through grants from the USDA Forest Service and the National Association of State Foresters. The USDA and the WVDOF both prohibit discrimination in all programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status.



Table of Contents

I. Introduction / Executive Summary	6
II. Considerations for Updates to Issues, Priority Areas and Strategies.....	9
III. Issues, Sub-Issues, Priority Area Identification and Long-Term Strategies	13
State Issue 1: Competing Land Uses	13
State Issue 2: Communications and Education	53
State Issue 3: Sustainability of Forest Resources in West Virginia	87
State Issue 4: Water Quality	161
State Issue 5: Wildfire	175
State Issue 6: Sustainability of Urban Forests	189
State Issue 7: Forest Health	207
State Issue 8: Utilization, Marketing and Economic Development	231
IV. Existing and Potential Multi-State Projects	274
V. Collaboration with Others	281
VI. Appendix	285
1. Strategy Matrix	285
2. Coordinating Committees Member Lists	315
3. Acronyms	321
4. Documentation of the Public Involvement Process, Issues Identified by WV Forest Stewardship Committee and in the Public Involvement Process, Analysis of the Issues Raised, and Explanation of How the Issues were Addressed.....	324



I. Introduction / Executive Summary

This West Virginia Statewide Forest Action Plan (SFAP), formerly known as the 2010 State Forest Assessment and Strategy (FRAS), provides an update of forestry, forests, and related natural resources in the state since the 2010 FRAS. The [Cooperative Forestry Assistance Act SEC. 2A. \[16 U.S.C 2101a\]](#) (amended by the 2008, 2014, and 2018 Farm Bills) requires that all states which receive federal forestry funding complete an SFAP update at least every 10 years. This update includes statewide forestry related issues, threats and benefits and the general strategies to be undertaken over the next 10 years in addressing the issues identified in this SFAP update.

Although each state forestry agency has considerable latitude in how its SFAP is prepared, a certain amount of guidance has been provided by: the language in the 2008, 2014 and 2018 amended Farm Bills; the National Association of State Foresters (NASF); the Northeast Midwest State Foresters Alliance (NMSFA) and the United States Department of Agriculture, Forest Service, Eastern Region State and Private Forestry.

It is important to note that this document is very much an overview. While there is considerable information provided in this SFAP, it does not provide in-depth information to the point of specifying on-the-ground projects. That level of guidance will be provided in annual work plans based upon annual budgets. The SFAP will provide a framework within which to do more specific planning on an annual basis.

This document was compiled by gathering as much existing data and information as possible from a variety of sources. Those sources are cited whenever possible. This SFAP is neither a research publication nor an original literary work. It is a compilation and synthesis of relevant information combined with the knowledge of the West Virginia Division of Forestry's (WVDOF) State Forester, Assistant State Foresters, Program Managers, and various partners.

The information that has been gathered for this document is intended to capture a "moment in time," so as to assess the current status of various forestry-related issues that were determined to be the most pressing in 2020. The WVDOF understands that information is never fully complete or fully current because conditions change daily, weekly, and monthly. New and better knowledge is gained over time and emphasis areas shift due to changing scientific, economic, and social priorities. This action plan is very fluid and can be amended as necessary to reflect new conditions. At a minimum, the Farm Bill requires that SFAP be revised once every 10 years. New items and better information have been incorporated into this action plan as an update of the 2010 plan.

The guidance provided by the Farm Bill, NMWSA, and NASF includes:



- **National priorities** will be addressed. These include:
 1. **Conserving and managing working forest landscapes for multiple values and uses.**
 2. **Protecting forests from threats.**
 3. **Enhancing public benefits from trees and forests.**
- Geographic Information System (GIS) analyses for help with identifying priority areas and there is considerable narrative accompaniment.
- Threats and opportunities will be identified. These are the major issues identified and addressed in the SFAP.
- Priority areas for work in the state will be identified, using where possible a geospatial analysis of data and information. Although priority areas may be in the form of program areas especially where state-wide legislative mandates exist.
- Potential and existing multi-state projects will be identified.
- The State Forester will coordinate, communicate, and collaborate with:
 - The State Forest Stewardship Committee.
 - The State wildlife agency, West Virginia Division of Natural Resources - Wildlife Resources Section
 - The State Technical Committee for the Natural Resources Conservation Service (NRCS).
 - Applicable federal land management agencies and military installations (as appropriate and feasible).
 - The Forest Legacy program.
 - The State Urban & Community Forestry (UCF) Council.
 - Other groups, organizations, and agencies as deemed necessary.
- Other existing plans will be incorporated into the SFAP or consulted during its compilation. Among these are:
 - Statewide Comprehensive Outdoor Recreation Plan 2015-2020 (SCORP).
 - State Wildlife Action Plan 2015 (SWAP).
 - Community Wildfire Protection Plans (CWPP).
 - Forest Legacy Program, Assessment of Need 2003
 - WV Invasive Species Strategic Plan 2014
- This SFAP will be revised by 2030.
- And, finally, Strategies in this SFAP will:
 - Address the issues that have been identified and address national priorities for S&PF.
 - Describe the resources needed to carry out the strategies.

Within this SFAP, various threats and opportunities were assessed in determining the following eight primary issues to address in West Virginia. There are numerous sub-issues discussed within the eight broad issues:

- **State Issue 1: Competing Land Uses (Forest Legacy)**
- **State Issue 2: Communications and Education**
- **State Issue 3: Sustainability of Forest Resources**
- **State Issue 4: Water Quality**
- **State Issue 5: Wildfire**
- **State Issue 6: Sustainability of Urban Forests**
- **State Issue 7: Forest Health**
- **State Issue 8: Utilization, Marketing, and Economic Development**

West Virginia is a geographically diverse state, including the Ohio River Valley counties along the western border with Ohio; the southern coalfield counties bordering Kentucky and Virginia; the northern panhandle, which lies in close proximity to Pittsburgh; the eastern mountain counties with elevations over 4,000 feet; and the eastern panhandle counties which lie in the Potomac River and Chesapeake Bay watershed. This creates many diverse opportunities and issues for forestry in West Virginia.

West Virginia ranks second in the nation in the percentage of its total land area covered by forests (78.50%). The state has a considerable amount of public lands and many large private landowners, including Timber Investment Management Organizations (TIMOs), Real Estate Investment Trusts (REITs), coal companies, and forest products companies. Over 6 million acres of forest land are held by family forest owners. Certain parts of the state have experienced continued reduction in parcel sizes, sometimes in conjunction with fragmentation of the forest, as well as related development and urbanization issues. Meanwhile, other parts of the state have actually seen some combining of ownerships and a trend toward more consolidation into larger private ownerships.

The intent of this long-range plan is to provide focus on the most pressing forestry-related issues and to help direct resources toward areas where there may be the greatest impact. Multi-program projects will be considered, as well as projects that can impact a greater landscape area, and opportunities for partnering with various other agencies, organizations, and states. The WVDOP will strive to reduce environmental threats to the state's forests; make positive impacts on local and state economies; protect sensitive and important habitats and ecosystems; and improve the quality and condition of West Virginia's forests.

Please feel free to contact WVDOP with any comments regarding these documents or with suggestions on how the forest resources of the state might be better managed. See the acknowledgements page at the beginning of this document for contact information.



II. Considerations for Updates to Issues, Priority Areas and Strategies

This 2020 SFAP is meant to be an update to the 2010 FRAS and takes into account both the 2015 and recently developed 2020 National Priorities addendums, which cumulatively include strategic accomplishments over the last 10 years for addressing the National Priorities and Objectives listed below. Evaluation of the past 10 years strategic accomplishments and the Collaboration Process detailed in Section (V) were considered for identifying updates to threats and opportunities within the eight primary issues and sub-issues identified in 2010 which were mostly carried over in the 2020 SFAP. Subsequently, GIS analyses were done to establish priority areas for issues, and goals and strategies identified to contend with these issues. Details about the issues, priority areas and strategies are discussed in Section III.

Identification of strategic accomplishments and consideration for developing future strategies for addressing issues is broadly guided by the following National Priorities and Objectives outlined by the USDA Forest Service:

The National Priorities and Objectives are:

- **Conserve and Manage Working Forest Landscapes for Multiple Values and Uses**
 - Identify and conserve high priority forest ecosystems and landscapes
 - Actively and sustainably manage forests
- **Protect Forests from Threats**
 - Restore fire-adapted lands and/or reduce the risk of wildfire impacts
 - Identify, manage, and reduce threats to forest and ecosystem health
- **Enhance Public Benefits from Trees and Forests**
 - Protect and enhance water quality and quantity
 - Improve air quality and conserve energy
 - Assist communities in planning for and reducing forest health risks
 - Maintain and enhance the economic benefits and values of trees and forests
 - Protect, conserve, and enhance wildlife and fish habitat
 - Connect people to trees and forests, and engage them in environmental stewardship activities
 - Manage trees and forests to mitigate and adapt to global climate change

Issues, Threats, Opportunities and Priority Areas

Eight primary issues were identified in the initial 2010 strategic plan that encompass the major forestry threats and opportunities in West Virginia. These eight broad issues are dealt with in considerable detail in Section III. They are:

- State Issue 1: Competing Land Uses
- State Issue 2: Communications and Education
- State Issue 3: Sustainability of Forest Resources in West Virginia
- State Issue 4: Water Quality
- State Issue 5: Wildfire
- State Issue 6: Sustainability of Urban Forests
- State Issue 7: Forest Health
- State Issue 8: Utilization, Marketing and Economic Development

These eight state issues are brought forth by the individual Assistant State Foresters, Program Managers the Department of Agriculture, and coordination between WVDOF staff and the Director of the WVU Appalachian Hardwood Center. Nearly half of these individuals were involved in the initial 2010 plan while others are new to this process. Each author was free to update their individual state issues sections based off the work that was done in 2010. Some of the sections are just updates from 2010 while others are completely new and have changed the focus based on sub-issues identified.

There was a total of 48 sub-issues identified and addressed in 2010 within the eight primary issues listed above. The 2020 SFAP update has reduced the number of sub-issues to 39 as a more focused plan was the approach for 2020. These cover the major forest threats and opportunities that were addressed during this first assessment/strategy. Also identified, through spatial analysis in most instances, are numerous priority areas where substantial resources and efforts will be focused for the next 10-year period.

State Strategies

The 2010 State Strategy was previously a companion document, which covered broad, long-term strategies for addressing issues and priority areas. For the 2020 SFAP broad strategies are provided after each identified sub-issue within this one document. **There is also a strategy matrix in the appendix (Item 1), which contains in table format all state strategies listed by broad issue and sub-issues.**

While the 2020 State Forest Action Plan does serve as a planning document for the S&PF programs, it can also serve as a broader strategic planning document to guide all state forestry activities. The strategies outlined in this document are long-term, broad, and flexible. They will function as guidelines, and not be operational or prescriptive. For successful implementation of the strategies, and to aid in developing the S&PF annual grant proposals and narratives, it will be necessary to develop specific annual actions from these State Strategies.



WVDOF Meetings to Decide on Plan Update Process

The WVDOF planner position has been vacant for several years, so in early 2018 the GIS Manager was charged with the responsibility for coordinating and ensuring completion of the update FRAS by newly appointed State Forester Barry Cook. Mapping, GIS analysis, data gathering, compilation and editing of the final documents would also be the GIS Manager's responsibility.

Assessment and strategy development of the broad issues sections would be carried out in same manner as was done in 2010 through the WVDOF Core programs administered by Assistant State Foresters for: Communications and Education, Forest Management, Wildfire, State Lands and Logging Inspections/Water Quality; Program Managers for Forest Legacy and Urban Forestry and the WV Department of Agriculture's Plant Industries staff, which handles Forest Health issues in the state. The Fire Staff Assistant/FEPP Coordinator was also included to assist with plan completion. The WVU Appalachian Hardwood Center was consulted to handle the Utilization, Marketing and Economic Development Issue working with the WVDOF's GIS Manager. This would form the 2020 State Forest Action Plan Committee work group and each member would handle a broad state issue.

In October 2018 an initial WVDOF conference call was held to begin discussions of how best to update the 2010 plan as states have great leeway on how plans are developed considering the guidance provided by the FS, NMWSFA, and NASF. It was suggested by Director Cook, and almost immediately decided upon, that the updated plan would be based off the extensive work that was done in 2010 and just provide updates for the existing 8 broad issues from 2010. It was also agreed upon by the workgroup that the plan would be consolidated into one document to cut down on the redundancy found with the two previous complex documents that had to reference one another. Lastly members were asked to be more focused and try and simplify the individual sections to further reduce complexity.

The members of the SFAP committee were free to update the individuals issue sections based on the Forest Service guidance provided and could either update the section or rewrite it entirely. Fortunately, nearly half the previous Program Managers and Assistant State Foresters from the 2010 plan were still in the same roles, which also fostered the plan update rather than a complete rewrite.

An in-person meeting in July 2019 provided an opportunity for additional guidance provided to Program Managers and Assistant State Foresters in the following outlines of the WVDOF's update process to:

- Review 2015 National Priorities addendums for strategic accomplishments and to assess what had been accomplished in the last 5 years for the 2020 update.
- Focus on Core Programs and the issues to be addressed this go around - pull from 2010 broad plan and think about any new issues that may have arisen.
- Review and consult other statewide plans and stakeholders for help in priority area establishment as required by SFAP guidance, to help with 2020 focus (SWAP, SCORP, MNF, etc.).
- Use narrowed list of issues to select data and GIS analysis for any new priority areas determination.



- Develop strategies to address issues in priority areas - Pull from 2010 plan broad list of strategies - Tie strategies to the National Priorities.
- Focus on what can be accomplished over the next 10 years - use past accomplishments (2015 update and current) to help determine what can really be done with core funding.
- Continue to share and include stakeholders and the various committees your program participates in to get input on the 2020 focus
- Using your list of accomplishments, and issues you want to present use data and GIS to develop priority areas and strategies.

Continued emails, individual calls and occasional entire workgroup conference calls were carried out for continued sharing information and the process of reviewing guidance documents, reviewing plan requirements, compiling accomplishments, collecting data, assessing issues and sub-issues, establishing priority areas, developing strategies and how best to combine all pieces into one document.

Assistant State Foresters and Program Managers were asked to coordinate with the various committees they were involved with to gather data, seek input, and gather feedback to help develop plan updates. Some broad issues updates were required to coordinate with specific state committees. Details for coordination efforts will in the individual issue narratives in the following section or in Section (V) *Collaboration with others*.

Existing and Emerging Benefits and Services

Recently, there has been increasing discussion about the various “ecosystem services” provided by trees and forests, and by proper forest management and natural resource activities. Some of the discussion items that will be addressed to the extent practical in this document, and in the strategy, include:

- Byproducts
- Carbon sequestration and carbon credits
- Other ecosystem services, including wildlife and fish habitat, clean water, outdoor recreation, biodiversity, clean air, and other benefits.
- Climate change
- Forest certification

For the most part, these above items will be addressed in Section III, Issue 8 – Utilization, Marketing, and Economic Development, but there are also some discussions of these items in Issue 1, Issue 3, Issue 4, and Issue 6.

As knowledge of how to handle some of the emerging topics increases and the role of forest management becomes better understood, the West Virginia Division of Forestry will be fully engaged to play its proper role. Since nearly 78.50% of this state is forested, whatever recommendations arise in the future, West Virginia will be well positioned to adequately deal with these emerging issues.



III. Issues, Sub-Issues, Priority Area Identification and Long-Term Strategies

This section includes identifying and discussing issues, threats, and opportunities, determining priority areas within each issue, and developing long term strategies to address these issues. The same broad issues identified in 2010 have been brought forward for this 2020 update.

State Issue 1: Competing Land Uses

The WVDOF's Forest Legacy Program Assessment of Need (AON) is incorporated into the 2020 State Forest Action Plan. A copy of the State Lead Agency designation letter (dated April 23rd, 2001) is on file at the office of the Director / State Forester. The original Assessment of Need was approved in December 2003. "Issues Identified by the State Forest Stewardship Coordinating Committee and through the public Involvement process" and "Documentation of the public involvement process and analysis of the issues raised" as found on pages 19 and 20 of the Forest Legacy Program Implementation Guidelines, Dated May 2017, were combined with an explanation of how each issue was addressed and included in Appendix item 4.

Competing Land Uses has been identified as a State Forest Action Plan Issue because there are threats to West Virginia's forest resources associated with it. Seven sub-issues are discussed within the Competing Land Uses issue. These sub-issues include 1) Fragmentation, Parcelization, and Loss of Forest Land; 2) Development; 3) Population and Housing Density; 4) Conversion to Non-Forestry Use; 5) Mineral extraction; 6) Agriculture; and 7) Property taxes. A detailed discussion of each sub-issue is included below. This AON also includes conditions and trends of forest resources in West Virginia. In 2003, four Forest Legacy Areas (FLAs) were established for the Forest Legacy Program (FLP) to address the Competing Land Uses issue and sub-issues. A description of these FLAs and strategies is included in this section. In 2020 it was determined that an additional FLA was needed in the Southern Coalfields of West Virginia.

Sub-Issue 1.1: Fragmentation and Parcelization

Fragmentation refers to the pattern of forest cover when it is broken up and portions of it are converted to nonforest uses (Riitters et al., 2002). Fragmentation can be delineated, measured, and analyzed using satellite imagery or rasterized GIS maps. Parcelization refers to the process of dividing land into smaller ownership parcels. The area may remain in forest, but because of smaller ownerships, the management objectives may vary significantly, and overall forest management activities become much more difficult to complete. Loss of forest land is when is deforestation occurs.

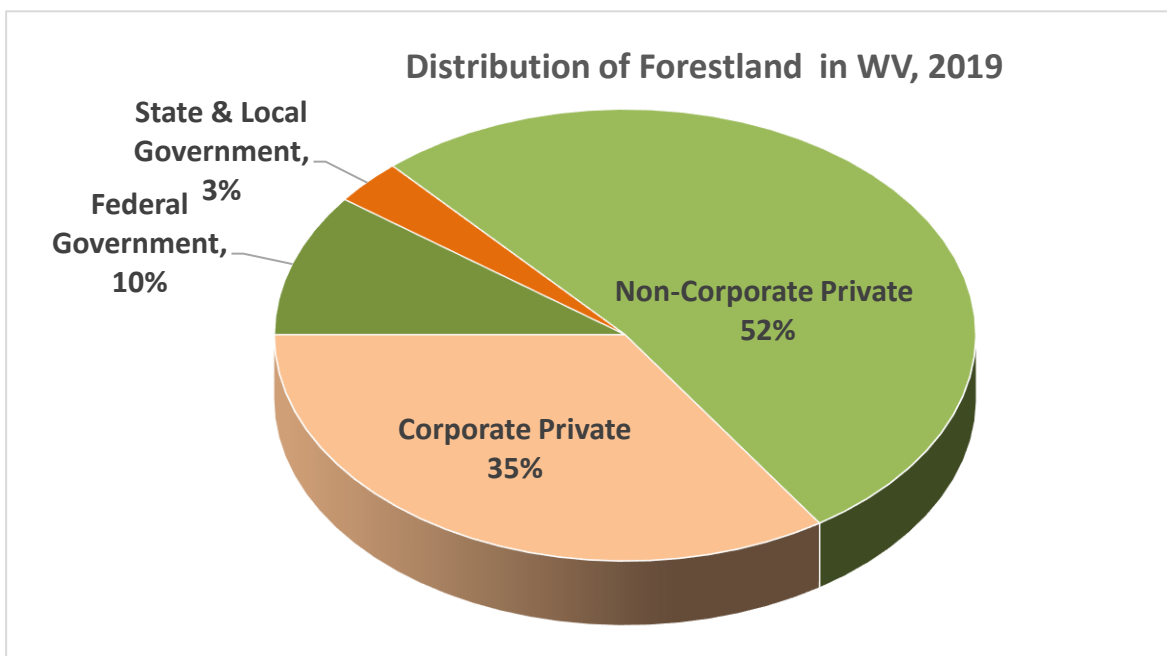
Between 2001 and 2016 there was 4% reduction in Riitters core (unfragmented) forest on corporate Properties (Table 1.1). It is important to understand that in 2019, corporate forest land accounted for

approximately 35% the forest land in West Virginia (Figure 1.1). Currently surface mining along with reduced amounts of reforestation appears to explain the loss of core forest on corporate lands. Natural gas pipeline rights-of-way may also explain the loss of core forest.

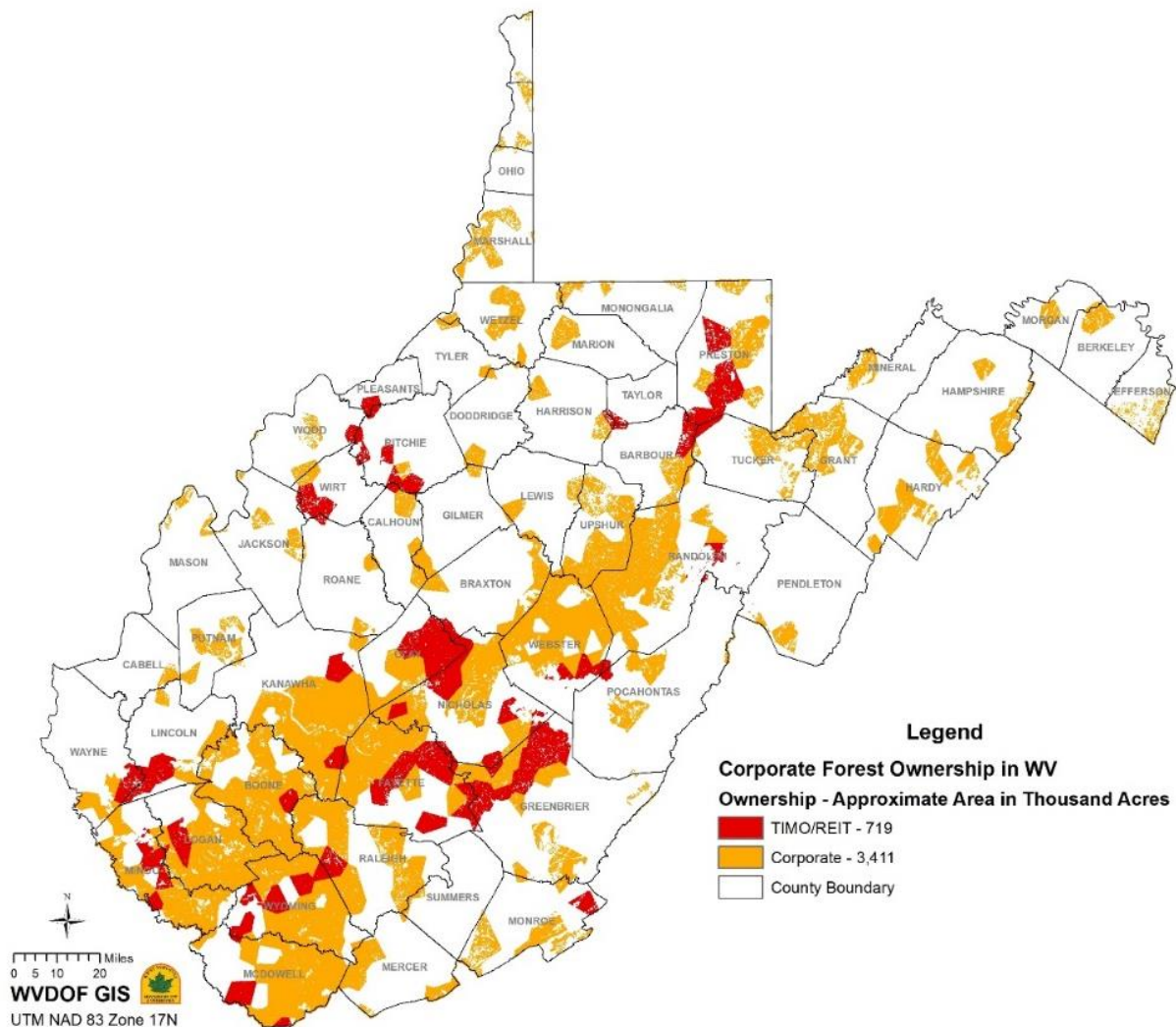
Table 1.1: FIA Change in Riitters Core (Unfragmented) Forest by Owner 2001-2016 (Morin, USDA Forest Service FIA 2019).

Owner Group	Total FIA Forestland in 2016 (1,000 Acres)	Percent Core Forest 2001	Percent Core Forest 2016	Percent Change in Core Forest 2001-2016
Federal Government	1,232.859	71%	74%	3
State & local Government	374.240	65%	70%	5
Corporate Private	4,101.402	68%	64%	-4
Non-Corporate Private	6,337.372	56%	58%	2
Total	12,045.874	62%	62%	0

Figure 1.2: Distribution of forest land area (Morin, USDA Forest Service FIA 2019).



Map 1.1 provides a perspective of where these corporate lands are located. Clearly, the majority of corporate lands are located in the Southern Coalfields.



Map 1.1: Location of Corporate Forest Lands in West Virginia, (WVDOF GIS 2018, FIA 2020).

A major concern is that there was a much smaller acreage of parcels 1,000 acres and larger in 2018 than there was in 1975 (Figure 1.2).

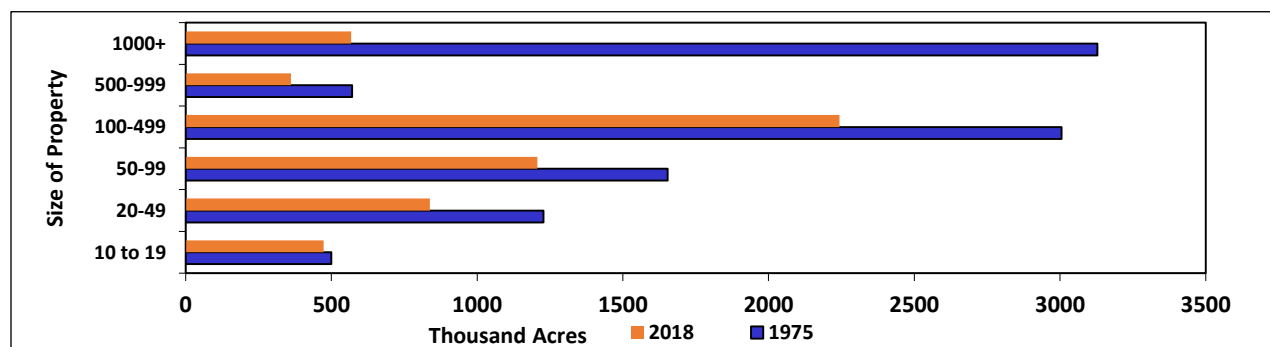
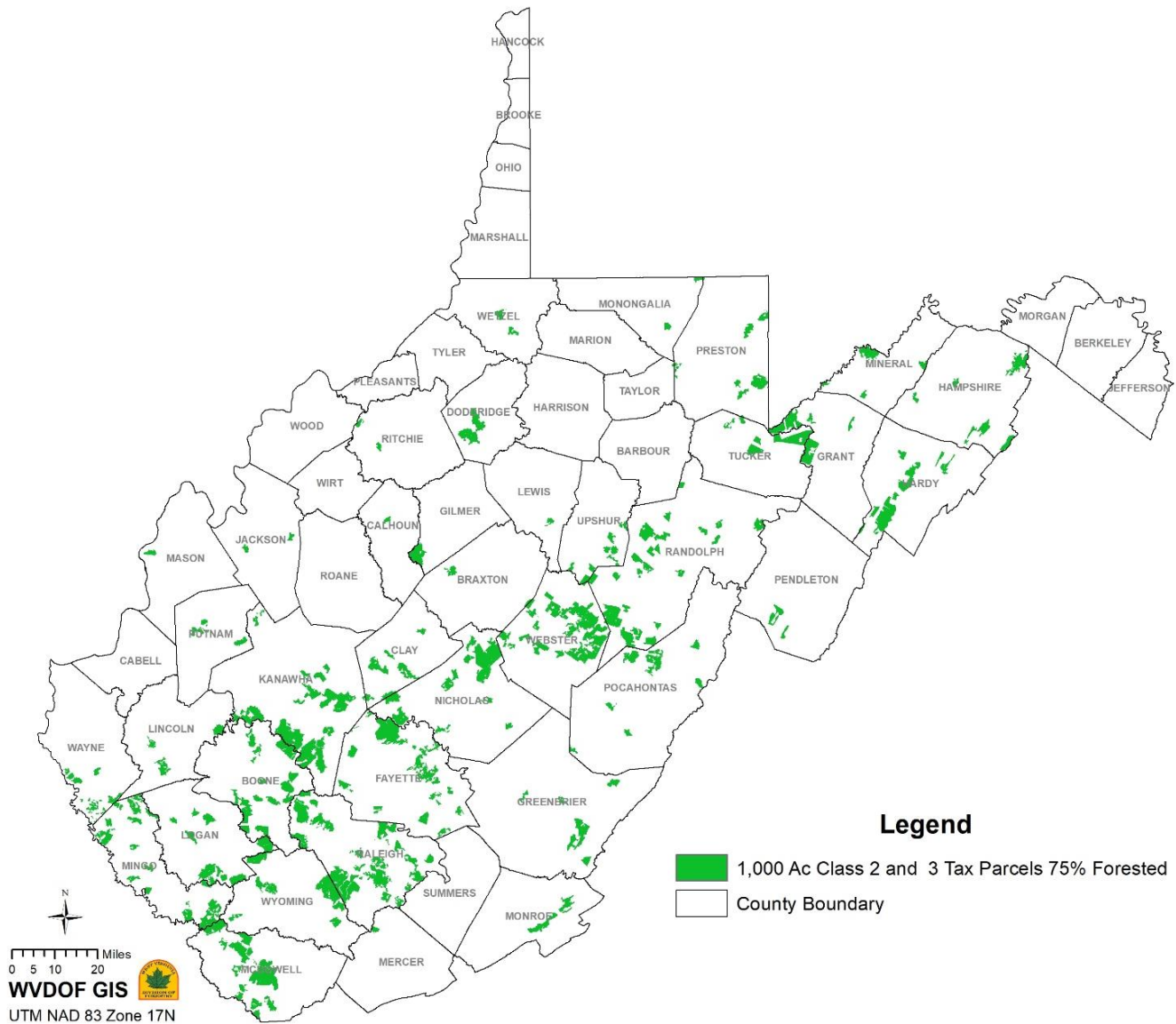


Figure 1.2: Acreage in private forest holding by size of ownership in acres, from 1975 to 2018 in West Virginia. Sources: 1975 – Birch and Kingsley (1978); National Woodland Owner Survey (2018).

Map 1.2 depicts the West Virginia Tax Class 2 and 3 Properties that are at least 1,000 acres in size and that are at least 75% forested. It is important to understand that there are only a limited number of these size properties left in West Virginia. Currently 39% of these parcels are concentrated in the southern coalfields of West Virginia.



Map 1.2: Class 2 and 3 tax parcels $\geq 1,000$ acres that are at least 75% forested, (WVDOF GIS 2020).

There has been a slight reduction in total forestland between 1989 and 2019 (Table 1.2).

Table 1.2: Forest and land statistics, West Virginia, 1989, 2000 and 2019. Source: 2000 and 2019 FIA.

Land Class	2019		2000		1989	
	Acres	Percent*	Acres	Percent*	Acres	Percent*
Timberland**	11,708,830	76.22%	11,791,700	76.49%	12,010,000	77.91%
Productive reserved	301,637	1.96%	174,000	1.13%	66,100	0.43%
Other forest land	7,356	0.05%	35,900	0.23%	17,600	0.11%
Total forest land	12,017,823	78.23%	12,001,600	77.85%	12,093,700	78.45%

*Percentages were calculated based on total land area in West Virginia.

**Timberland is defined as forest land that can produce over 20 cubic feet of commercial wood per acre per year and is not dedicated to another use.

If there has only been a small amount of deforestation that has occurred, why then is there concern about parcelization? Row (1978) concluded that as tract size decreases, the cash flow profitability of timber growing investments decreases. As tract size decreases, it can also be difficult to get the best price for the size and quality of the trees simply because of relatively high overhead cost associated with moving equipment, building skid trails and roads to harvest small tracts. Further, administrative costs are higher when wood is purchased from many smaller tracts rather than from a few large ones. Average fixed costs also drop as tract size increases. Moreover, owners of smaller tracts benefit less financially than bigger tracts. Increasing numbers of small tracts may change the location forest industry and markets. In addition, financial loss from forest fires on small areas can be spread over a larger asset bases when tract size is large.

As ownership size decreases, forestry can be seen as less relevant. Therefore, professional assistance or approaches to forest management may be less often utilized. New landowners sometimes bring a more urban-developed ownership strategy than the people from whom they purchased the land. Smaller, parcelized forests are more likely to become personal green spaces maintained for their amenities, rather than being managed as working forests dedicated to forest management and forest harvesting. While there are exceptions, the size of the forest holding is an important factor in whether or not the landowner seeks professional forestry assistance and feels “connected” to the forestry community. It is often possible to generate land values that are significantly higher than timber values by breaking the land into smaller units for sale. This is particularly true around natural outdoor recreational features such as streams, rivers, lakes, or exceptional scenery. In these places, the financial pressure to divide and sell blocks of forest land may be too great for owners to resist. Conservation easements can provide some financial assistance in these situations for landowners who are interested in continuing forest management and forest harvesting.

Sub-Issue 1.2: Development

A significant land use change has been the near doubling of developed lands in West Virginia between 1982 and 2017 (Table 1.3, Figure 1.3).

Table 1.3: Developed Lands in West Virginia, 1982, 1997 and 2017. Source: Source: U.S. Department of Agriculture, 2017. 2017 National Resources Inventory. Natural Resources Conservation Service, Washington, DC. September 2020. http://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_wv.html

Land Class	2017		1997		1982	
	Acres	Percent*	Acres	Percent*	Acres	Percent*
Developed lands**	1,167,600	7.5%	969,400	6.3%	638,100	4.1%

*Percentages were calculated using total nonfederal land and water acreages.

** Developed land was calculated as a combination of land cover/use categories, large urban and built up areas, small built up areas, and rural transportation land.

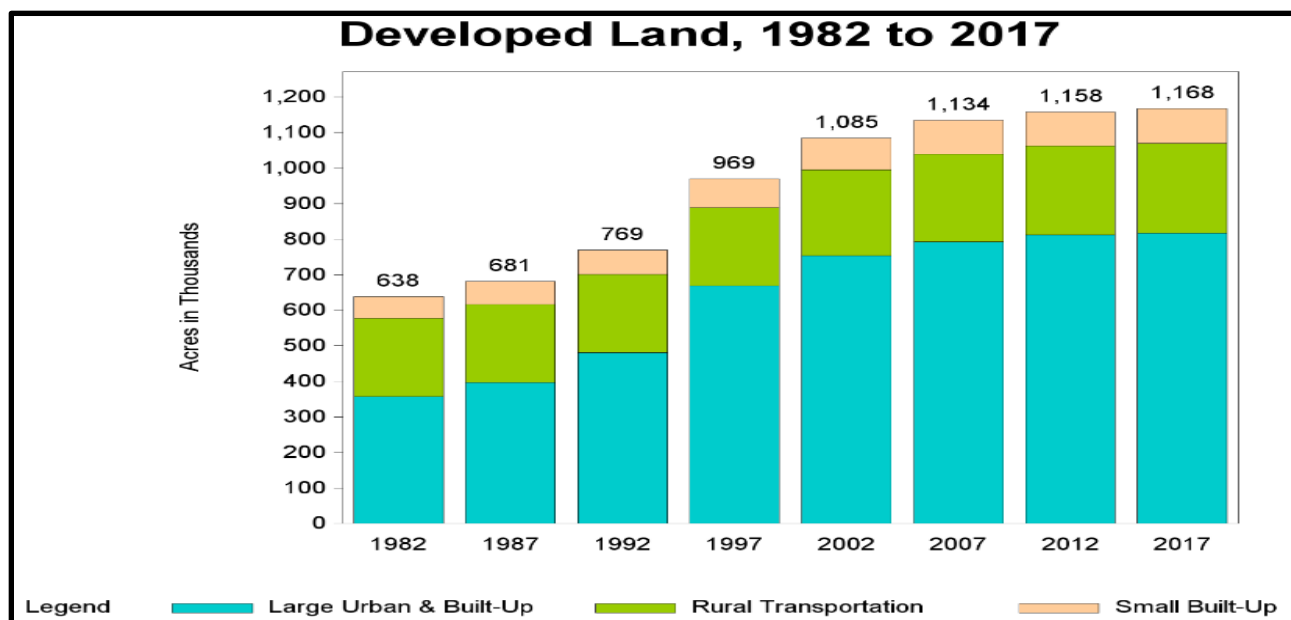


Figure 1.3: Urban land development trends in West Virginia 1982-2017, as measured by the National Research Institute (NRI). Source: U.S. Department of Agriculture, 2017. 2017 National Resources Inventory. Natural Resources Conservation Service, Washington, DC., September 2020.

http://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_dev_wv.html

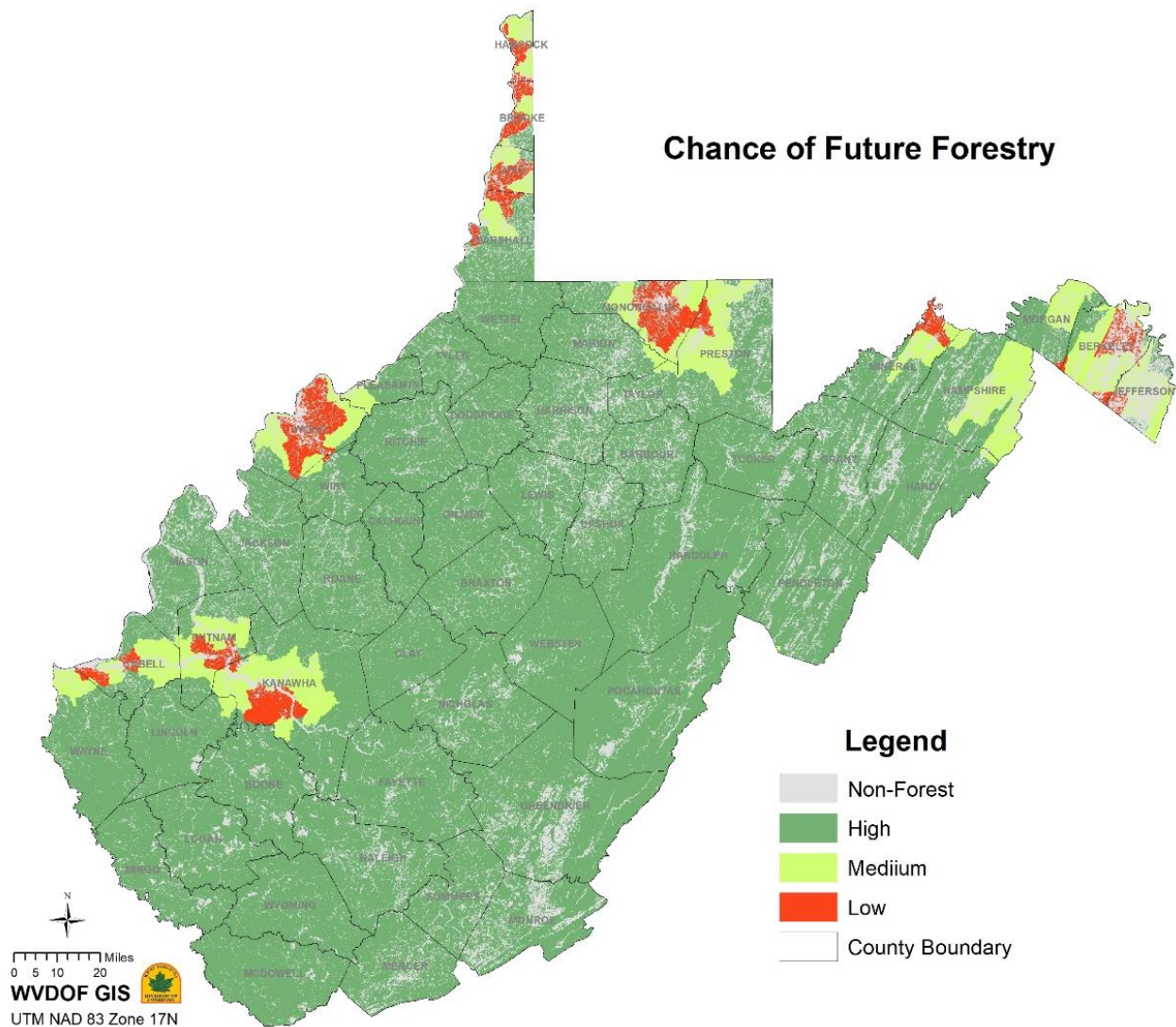
As urbanization encroaches onto rural land, and smaller forest parcels drop out of forest management, businesses such as farming, logging, tree farming, and sawmilling, are lost, and their workforce relocates. Unfortunately, in the case of forestry, what is also lost is the knowledge and services that once maintained the forests.

Sub-Issue 1.3: Population and Housing Density

Population and housing density need to be evaluated for their effect on forests and forestry in West Virginia. Increase or decreases in population need to be evaluated concurrently with housing density.

A Virginia Department of Forestry study found that the probability of sustainable forest management in an area approaches zero when population density reaches levels above 150 people per square mile. Probabilities of sustaining active forestry were 25% at densities of 70, 50% at 45, and 75% at 20 persons per square mile (Wear et al., 1996).

The study concluded that as much as half of the forest land on the workable slopes in Virginia may not be used as working forest in the future because nearby population density has pushed out the needed forestry infrastructure. The problem has not reached this magnitude in West Virginia, but it may be possible in some areas (Map 1.3).

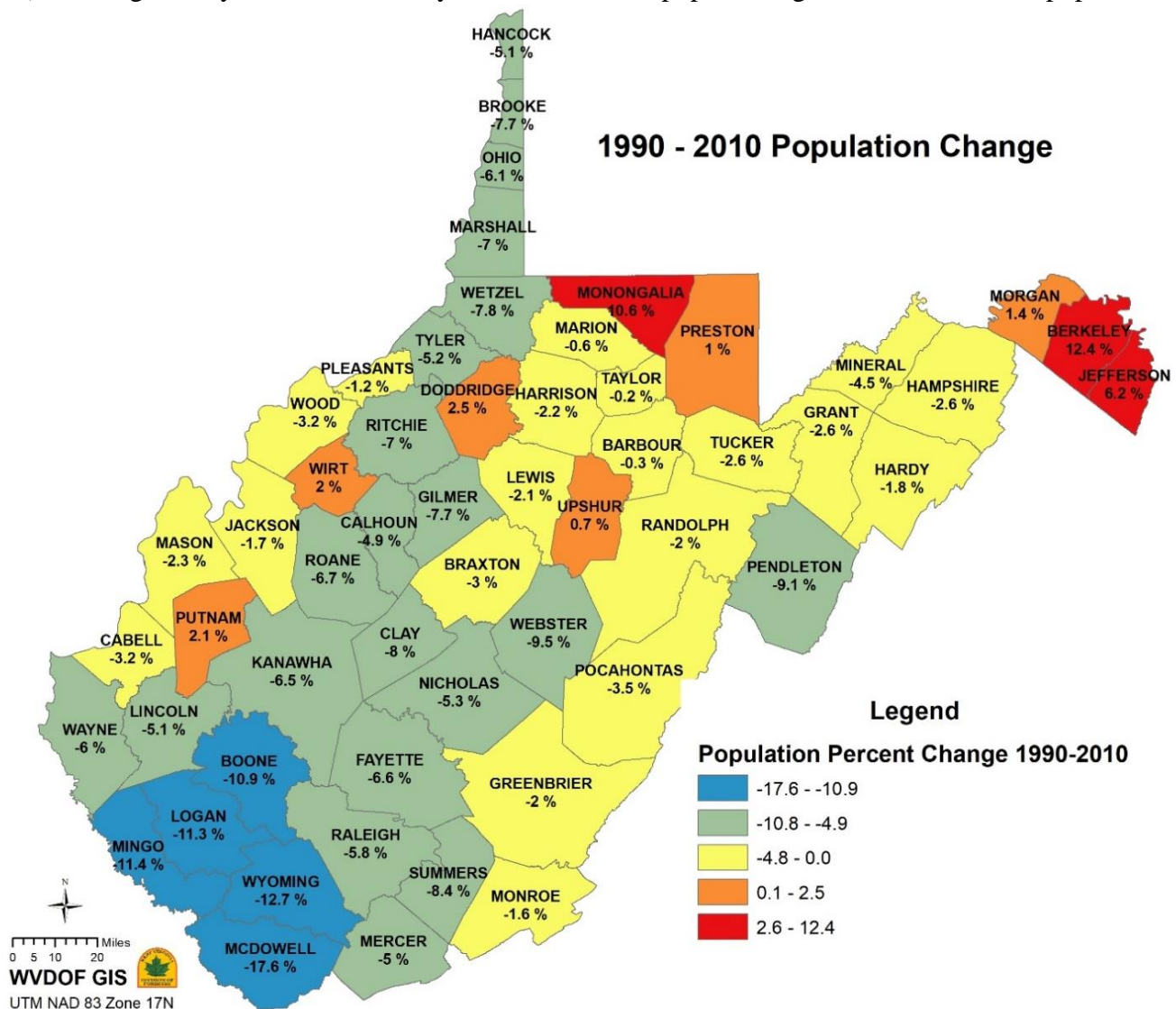


Map 1.3: Chance of future forestry based on population density, (Forest to Faucets 2.0 watersheds with predicted development increase – 2010-2040 under 4.5 high prediction model).

For the analysis of future forestry potential based on population estimates, non-forest areas were removed. The analysis reflects the implications of population density on the potential for forestry. One of the goals of the FLP in West Virginia is to protect forest land in areas that forest management is likely to continue.

Forest economies may be compromised if forest managers encounter increased opposition to forest harvesting, aerial application of chemicals, or prescribed fire, which may create noise, smoke, dust, road traffic, or altered visual conditions. With development and subsequent fragmentation, the “wildland urban interface” (WUI) grows more and more complex, bringing added costs, limitations, and social pressures on forest landowners.

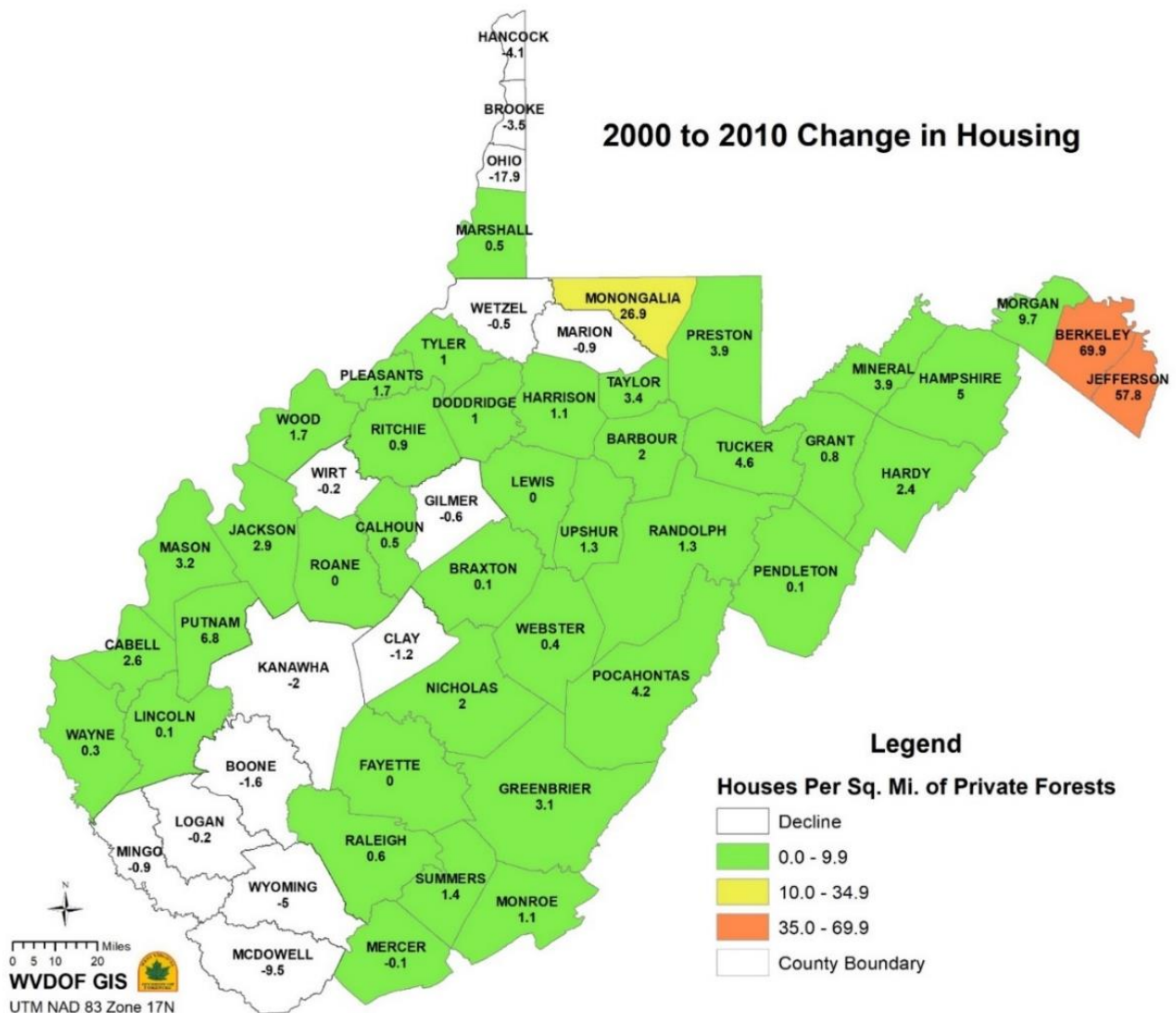
Even though population decreased in many counties in West Virginia between 2000 and 2010 (Map 1.4), housing density increased in many counties. While population growth and increased population



Map 1.4: Population change in West Virginia between 1990 and 2010, (US Census).

density are pressures that can increase the trend toward fragmented and parcelized forest land, the trend itself appears to be caused by more than simple population change. Clearly, housing density has increased in many West Virginia Counties. One possibility for the increase of this trend is the impact of second homes and recreational housing. What may still be missing from these indicators are the indirect effects of the population growth and fragmentation issues on forest management. For example, as populations grow, not only do air pollution emissions increase, but also the potential loss and damage to West Virginia's forests increases.

Using U.S. Census data, it is possible to determine the change in the number of housing units per square mile of private forest land in each county (Map 1.5). Note that of the 27 counties with population declines and, 22 show housing density increases (Map 1.4). One possibility for this trend in some areas is the impact of second homes and recreational housing. This indicates that the trend toward fragmented and parcelized forest land is caused by more than simple population change.



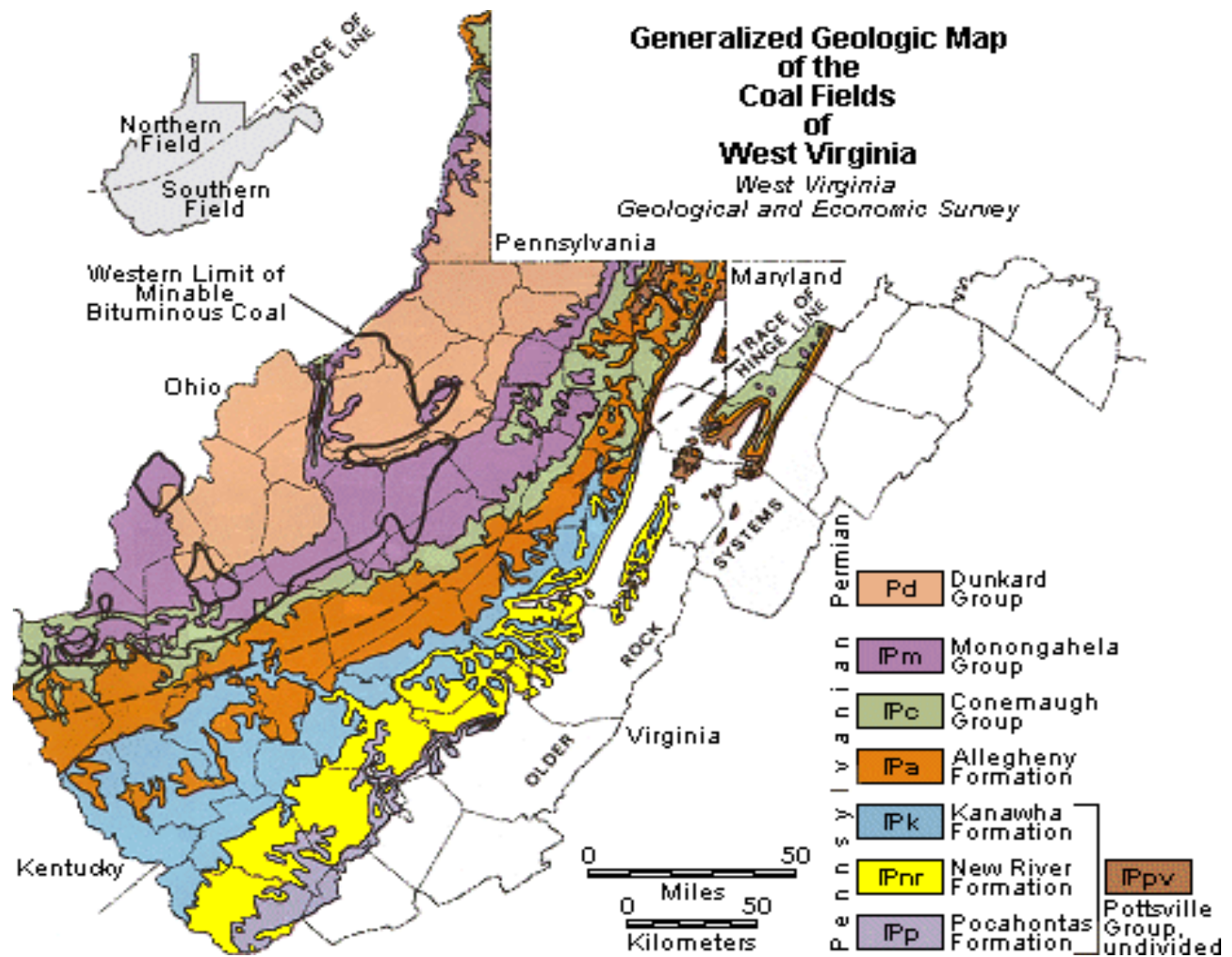
Map 1.5: Change in housing density in West Virginia between 2000 and 2010. (US Census/WVDOF).

Sub-Issue 1.4: Conversion to Non-forestry Use

Forests can only be managed as long as they remain in forest cover. As discussed above, the history of West Virginia includes a period when significant amounts of forest were converted to other uses, primarily agriculture. To the extent that such conversions continue today, they are likely to come from land development, mineral extraction, and wind or solar farms. Agriculture, which was once a competitor with forest land, is now threatened by similar competition. When and where agriculture as an industry and working land use is threatened, forestry will likely be impacted too. To the extent that such conversions continue today, they are likely to come from land development, mineral extraction, and wind or solar farms. Timber Investment Management Organizations and Real Estate Investment Trusts may have 8-12-year investment horizons to obtain returns on their investment capital. If timber and other land leases are not providing adequate yields, sometimes portfolio managers sell off parcels with lower site productivity or that may be difficult to harvest to commercial, residential, or second home buyers, where conversion to non-forestry use may occur. Developing and finding diverse revenue streams from such things as outdoor recreation, renewable energy, forest carbon, ATV / UTV / overlanding trails, watershed protection, mitigation and Forest Legacy may help keep properties from being converted to non-forestry uses. Forest Legacy is one part of the equation for keeping properties forested. Abandoned mined land which is not forested appears to be very well suited for renewable energy.

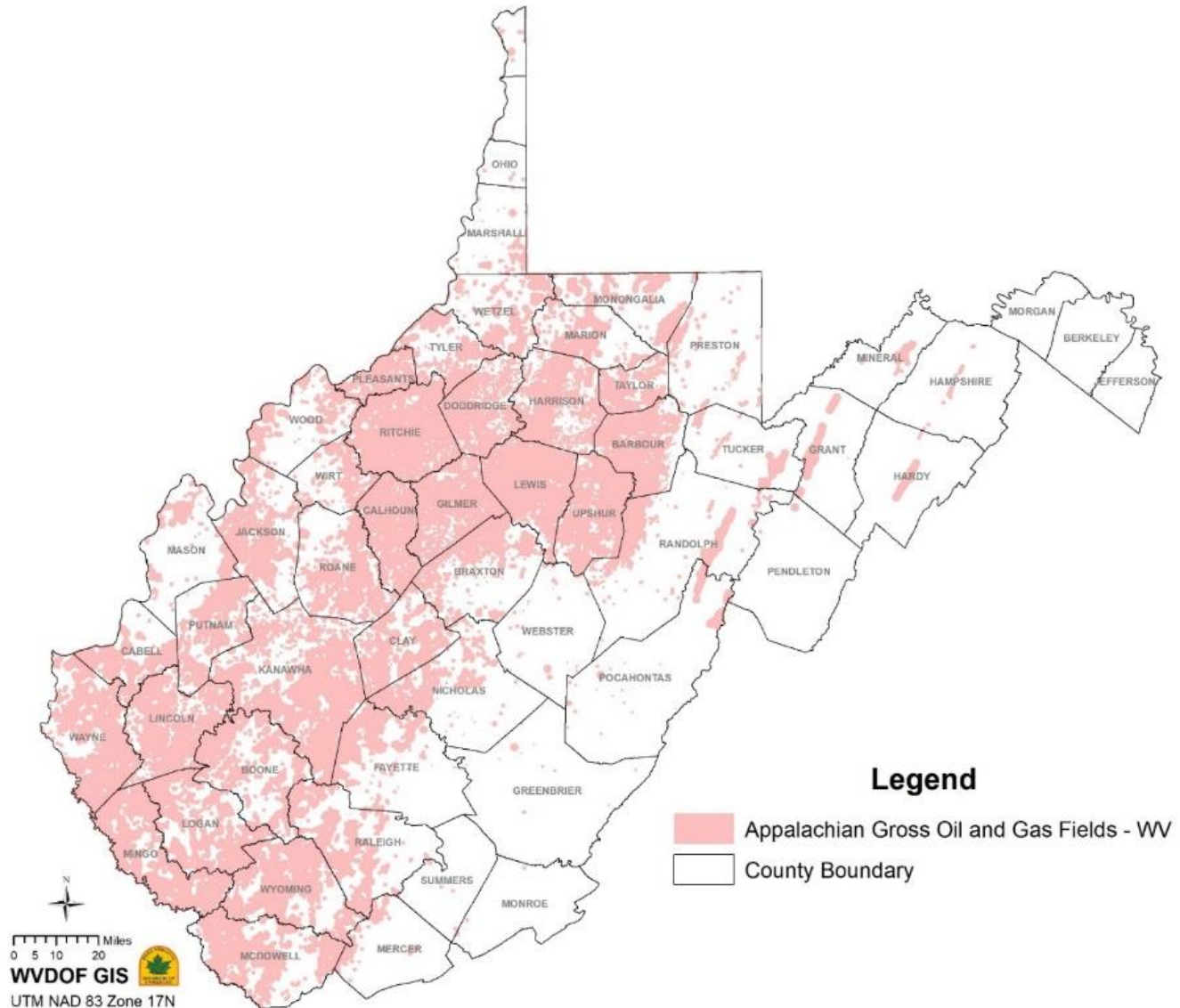
Sub-Issue 1.5: Mineral Extraction

Coal has been an important economic resource in West Virginia since the late 1800's. As the coal industry grew, mining methods changed rapidly. Large-scale surface mining started in the 1940's and became a major method of mining coal in West Virginia. Obviously, land that is to be surface mined is removed of its vegetation and topsoil to expose the coal. However, post-mining reclamation methods have improved to allow for reforestation and are allowed under the Surface Mining Control and Reclamation Act (SMCRA). These reforestation methods that break up the soil, shale, and rock significantly increase soil productivity. However, these reforestation methods are not mandatory under SMCRA. If surface mining occurs, the opportunities for sustainable forest management shrink accordingly, if reforestation does not occur. Currently, coal mining in West Virginia appears to be decreasing. Geographically, the forested areas in Eastern WV have the lowest potential for coal extraction (Map 1.6).



Map 1.6: General geologic map of West Virginia. (WV Geologic and Economic Survey).

Eastern, WV also has the lowest potential for impacts from oil and gas extraction. However, it is very important to understand that there are also many other areas in West Virginia that do not contain oil and gas fields (Map 1.7).



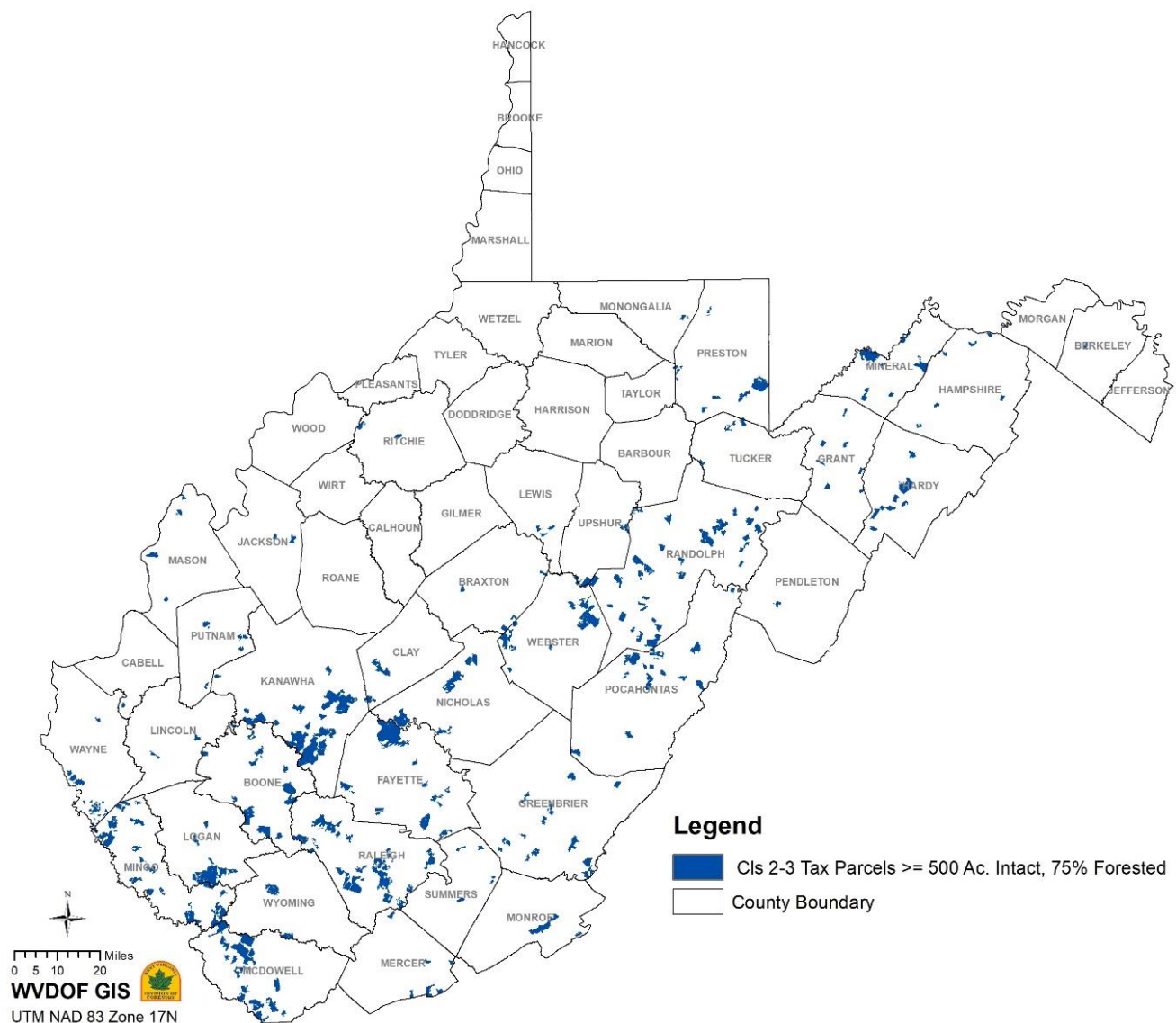
Map 1.7. Appalachian oil and gas fields in WV (U.S. Energy Information Administration, March, 2019 https://www.eia.gov/maps/layer_info-m.php).

Moreover, there are a significant number of properties where the mineral rights have not been severed from the surface (Map1.8). It is very significant to note that 44% of the properties without severed mineral rights are located in the Southern Coalfields. Because there are areas in West Virginia that do not contain oil and gas fields as well as properties with intact surface and mineral rights, we can only conclude that it is possible to meet FLP mineral extraction requirements on properties outside of eastern, WV and even in the southern coalfields.

While deep wells have potentially larger drill sites (10 acres +/-) compared to shallow gas wells and there is the possibility of greater surface disturbance. In addition, there are potential impacts from well roads and pipeline construction. With proper planning and supervision, well sites, roads, and pipelines

can be constructed to minimize surface disturbance. We must also understand that the oil and gas extraction does not cause complete deforestation of properties and that the size of disturbance is normally small relative to tract size.

For the Forest Legacy Program, one important aspect is the ownership of subsurface mineral rights. In situations where the forest landowner does not control subsurface rights, and significant surface disturbance is a possibility, the forest land may be precluded from participation in the Forest Legacy Program.



Map 1.8. Class 2 and 3 tax parcels \geq 500 acres with intact mineral ownership (WVDOF GIS 2020).

Sub-Issue 1.6: Agriculture

There is concern about losing prime farmland to development. In a state where much of the best farmland lies in valley bottoms, the conflicts between working lands and developed land uses are severe. The development of prime farmland (and all working farmlands) represents a threat to forest management as well. This may not be a result of forests being cleared for farming to replace the lost farmland. The threat is most likely from the “urbanization” of formerly rural areas, speeding a shift from a rural-oriented culture toward one that is more urban-oriented. In areas where working lands are being lost to development, pressures against other working lands increase.

Natural Resource Conservation Service data indicates that the amount of pastureland, non-cultivated cropland and cultivated cropland has significantly decreased between 1982 and 2017 (Table 1.4).

Table 1.4: Agricultural land use patterns, West Virginia, 1982, 1997 and 2017. Source: U.S. Department of Agriculture, 2017. 2017 National Resources Inventory. Natural Resources Conservation Service, Washington, DC. September 2020. http://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_wv.html

Land Cover/Use Class*	2017		1997		1982	
	Acres	Percent*	Acres	Percent*	Acres	Percent*
Pastureland	1,438,600.0	10.1%	1,519,900	10.7%	1,881,300	13.1%
Non-Cultivated Cropland	527,300.0	3.7%	689,700	4.8%	784,500	5.5%
Cultivated Cropland	114,800.0	0.8%	159,000	1.1%	293,600	2.0%

*Percentages were calculated using total nonfederal land and water acreages.

Figure 1.4 shows cultivated cropland and non-cultivated cropland being reduced from 1,078,000 acres in 1982 to 642,000 acres in 2017.

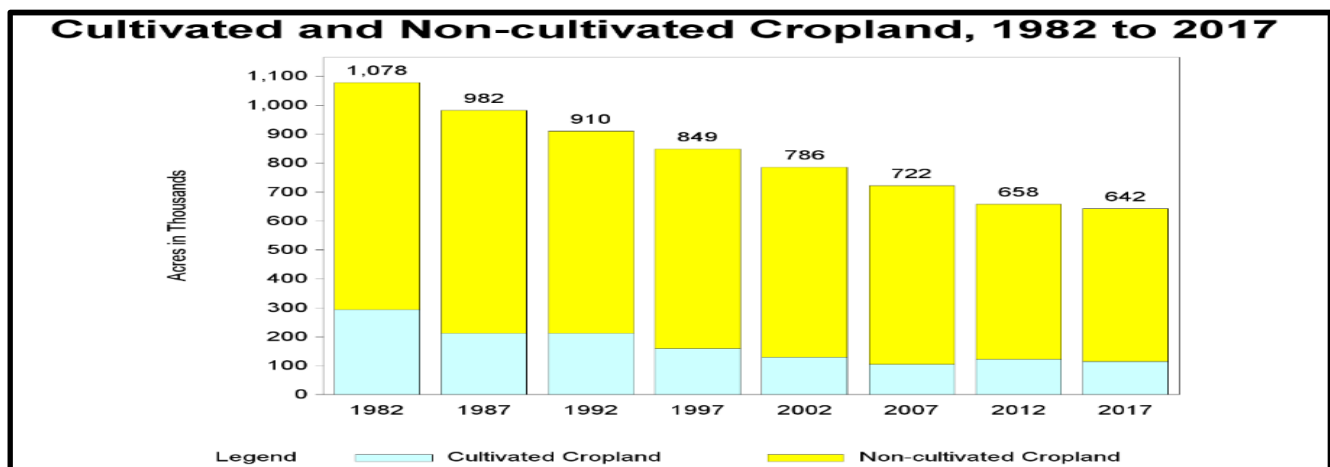
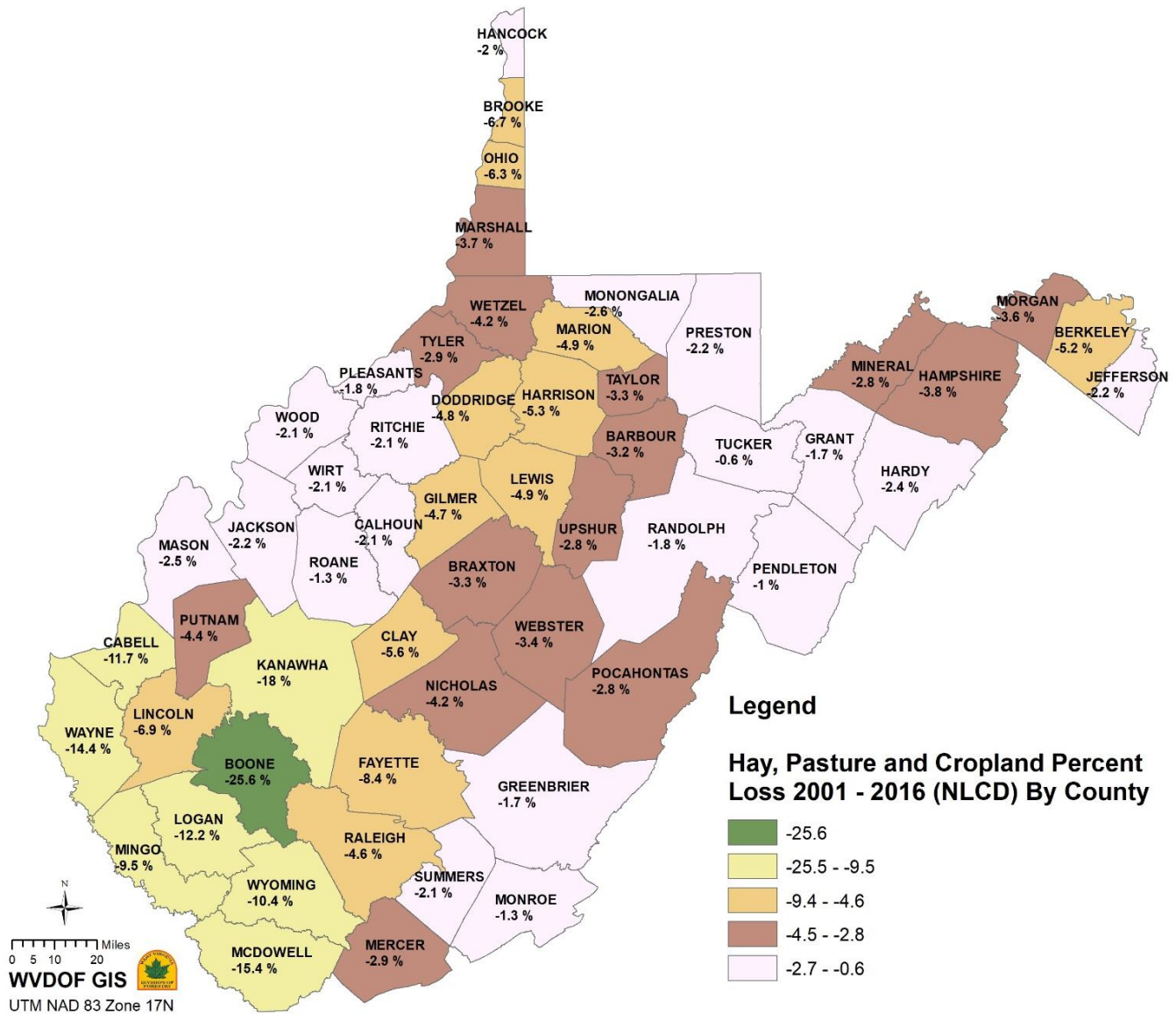


Figure 1.4: Cultivated and Non-cultivated Cropland, 1982-2017. Source: U.S. Department of Agriculture, 2017. 2017 National Resources Inventory. Natural Resources Conservation Service, Washington, DC. September 2020. http://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_wv.html

Map 1.9 shows loss of hay, pasture, and cropland in every county in West Virginia from 2001-2016.



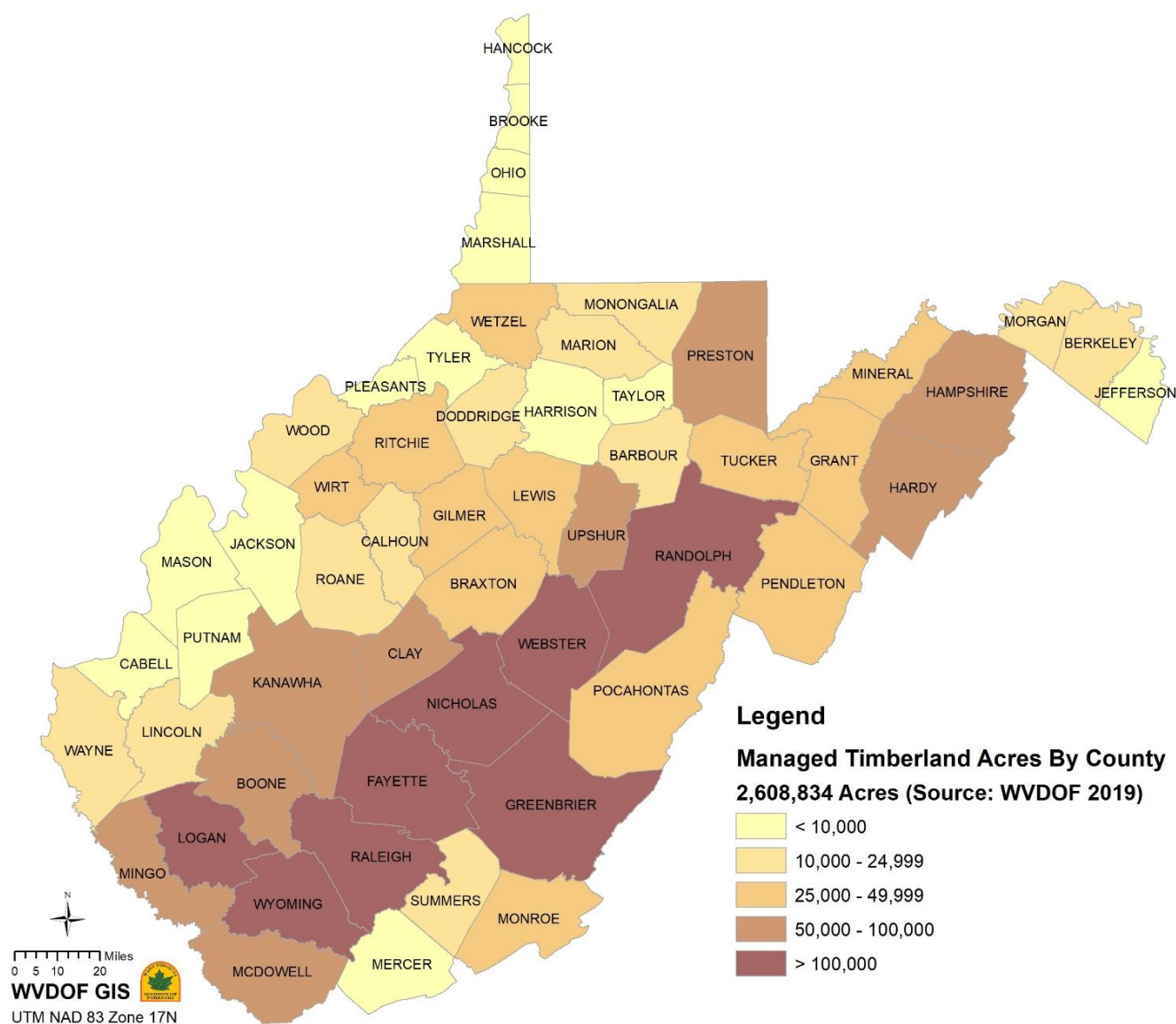
Map 1.9: Loss of Hay, Pasture and Cropland by County 2001-2016 (WVDOF GIS/NLCD).

Sub-Issue 1.7: Property Taxes

Property taxes are imposed on ownership or possession of property and are measured by the market value of the property. State law requires county assessors to list properties and assess them at their true and actual dollar value, according to the highest and best use of the property. Fair market value or true value is the amount an unobligated buyer is willing to pay an unobligated seller. Therefore, if development is the highest and best use of a property and the owner wants the property primarily for

forest management, the property taxes could make it unfeasible for the owner to employ forest management activities.

However, the State of West Virginia recognizes the value of managing the forest resource. The Managed Timberland Tax Incentive Program lowers the appraised value of forested properties so that forest management can continue. Over 2.6 million acres of forest land are currently under the Managed Timberland Program in West Virginia (Map 1.10). The Managed Timberland Tax Incentive Program can be used in conjunction with the Forest Legacy Program Conservation Easements for an even more effective method keeping forest management activities feasible and keeping properties from being converted to non-forest uses.

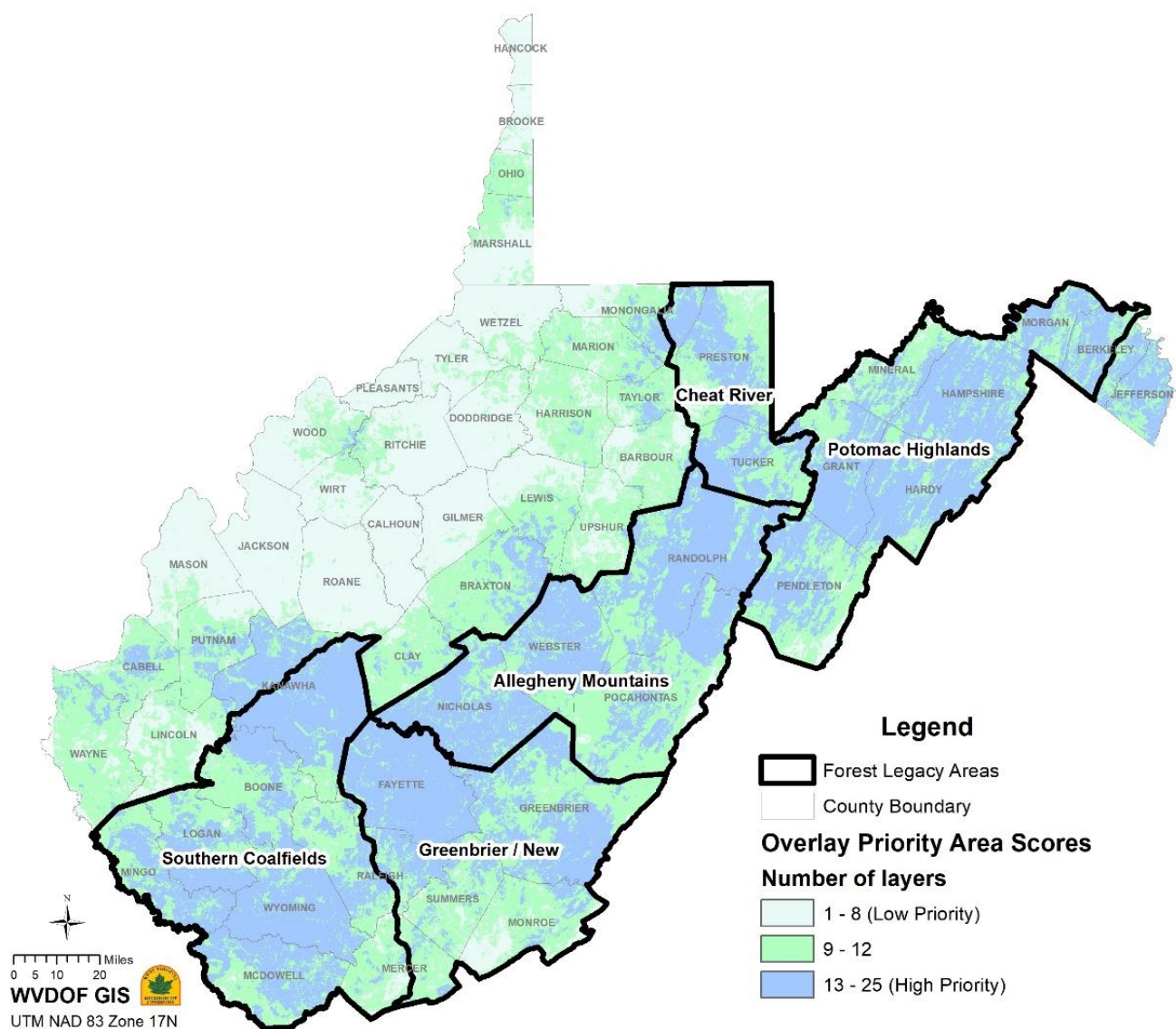


Map 1.10: Managed timberland account acreage by county 2019. Source: WVDOF GIS, 2019.

State Issue 1: Overlay Analysis Used to Identify Forest Legacy Priority Areas

An overlay analysis was conducted in 2020 to determine if the four Forest Legacy Areas identified in 2003 are still valid by using current data. Thirty-nine (39) input data layers were evaluated to address the requirements listed on Page 19 of the Forest Legacy Program Guidelines, as they relate to the Purpose of the FLP (see List of Data Layers below). A Boolean (1/0) classification was performed for each layer. The Boolean classification was used to delineate portions of the data layers used in the analysis as favorable to the FLP. Equal weights were established for each layer.

Once the data input layers were established and classified, a composite map was produced to show the results of the overlay analysis (Map 1.11).



Map 1.11: Competing land use issue overlay results showing majority of highest scores within the Forest Legacy Areas (WVDOF GIS, 2020).

On Map 1.11 pixels that represent the presence of the most data input layers (13-25) considered high priority areas, are shown in blue. This highest concentration of pixels is within the original Forest Legacy Areas as well as within the Southern Coalfields of West Virginia. Therefore, the four original FLAs and the addition of the Southern Coalfields FLA are incorporated into this assessment. A list of the data layers and the Forest Legacy Program Requirements is included below.

List of Data Layers and Requirements from page 19 of the Forest Legacy Program Guidelines

Forest Resources and Benefits

Layer 1 - Public land recreation areas – Areas within one mile of public recreation areas that are $\geq 50\%$ forested = 1.

Layer 2 - Points of interest density - High peaks, beaches, cliffs, caves, boat launches and campgrounds areas ≥ 0.012 points of interest per square mile = 1.

Layer 3 - National Hydrography Dataset waterbodies = 1

Layer 4 - WVU Natural Resources Analysis Center (NRAC) landcover 2016 core forest areas ≥ 500 -acres = 1.

Layer 5 – WVU NRAC landcover 2016 forest edge = 1.

Layer 6 - Soil productivity – Site index top quartile by county = 1.

Layer 7 - Watershed values – ability to produce clean water by watershed – from Forests to Faucets 2.0, ≥ 71 = 1.

Present and Future Threat

Layer 8 - Microsoft building density areas ≥ 46 buildings per square mile = 1

Layer 9- Census blocks with increase in population from 1990 -2010 = 1

Layer 10 -Forest to Faucets 2.0 watersheds with predicted development increase – 2010-2040 under 4.5 high prediction model watershed $\geq 13.42\%$ predicted increase = 1.

Layer 11 – Forest health areas with predicted total basal area loss $\geq 15\%$ = 1.

Layer 12 – Wildfire risk areas of annual probability of wildfire areas $\geq 0.02\%$ = 1.

Layer 13- NLCD Forest loss areas between 2001 and 2016 where counties with percent area loss $\geq 2.3\%$ = 1.



Layer 14 – NLCD Agricultural land loss areas between 2001 and 2016 where counties with percent area loss $\geq -9.5\%$ = 1.

Layer 15 – NLCD Counties with percent area development increase 2001-2016 areas $\geq 5.5\%$ = 1.

Historic or Traditional Uses of Forest Areas, and Trends and Projected Future Uses of Forest Resources

Layer 16 – Recreation trail density areas $\geq .3$ trails per square mile = 1.

Layer 17- Notification harvest density 2005-2020 – areas with ≥ 84 acres per square mile = 1.

Layer 18 – 2020 forest products industry density of certified loggers by zip code areas ≥ 0.015 per square mile = 1.

Layer 19 – 2020 Forest products industry density timber licenses by zip code areas ≥ 0.024 per square mile = 1.

Layer 20 – 2015 Forest products industry location density areas ≥ 0.003 per square mile = 1.

Current Ownership Patterns and Size of Tracts, and Trends and Projected Future Uses of Forest Resources

Layer 21 - NWOS Geospatial data set–Private landowners (Corporate, Family, and other) from 2019 = 1.

Layer 22 – Managed Timberland Tax Incentive Program Parcels 2019 = 1.

Layer 23 – Company lands 2018 = 1.

Layer 24 – Historical Forest Stewardship Program density areas ≥ 28.64 planned acres per square mile = 1.

Layer 25 – Class 2 and 3 tax parcels ≥ 500 acres with intact mineral ownership = 1

Layer 26 – Class 2 and 3 tax parcels $\geq 1,000$ acres that are at least 75% forested = 1

Cultural Resources that can be Effectively Protected

Layer 27 – National register of historic places and ESRI Street Map USA points (archaeological and battlefields) density areas ≥ 0.018 places per square mile = 1.



Outstanding Geological Features

Layer 28 - ESRI Street Map USA viewpoints density areas ≥ 0.005 points per square mile = 1.

Layer 29 – West Virginia Geological and Economic Survey (WVGES) Karst areas = 1.

Layer 30 - WVDNR Cliff and Talus habitats = 1.

Threatened and Endangered Species

Layer 31 - WVDNR/NatureServe – All high score B Rank sites classified \geq (B4) outstanding state significance = 1.

Other Ecological Values

Layer 32 - TNC Priority network (Climate corridors, Resilient areas with confirmed diversity, climate flow zones and Climate flow zones with confirmed diversity) = 1.

Layer 33- I-Tree County Asthma_Exacerbation - Average Avoided Cases Annually ≥ 28 = 1.

Layer 34 - I-Tree County Asthma_Exacerbation – Avoided Runoff meters cubed per year $\geq 566,773$ = 1.

Mineral Resource Potential

Layer 35 – WVDEP Mined out areas 2020 = 1.

Layer 36 – WVGES areas with no oil and gas = 1.

Layer 37 – WVGES Non-coalfield areas = 1.

Protected Land in the State, to the Extent Practical, Including Federal, State, Municipal Lands, and Private Conservation Organization Lands

Layer 38 – Public and protected lands plus a 1-mile buffer = 1.

Issue Identified by the SFSCC Through the Public Involvement Process

Layer 39 - Climate Change I-Tree county carbon storage $\geq 8,761,476$ Metric Tons/Year = 1.

State Issue 1 - Forest Legacy Areas

Table 1.4 contains data on size, amount of forest, structures, population, timber harvests structures and biodiversity for each of the five FLAs. A narrative description and additional information have been prepared for each FLA.

Table 1.4: Forest Legacy Area Data Comparison Table

Forest Legacy Area (Units or Source)	Cheat River	Potomac Highlands	Allegheny Mountains	Greenbrier / New River	Southern Coal Fields
Total Area (Square Miles)	1,180.2	3,180.1	3,190.6	2,887.0	3,702.5
Forested Area (Square Miles)	953.0	2,613.0	2,903.0	2,398.0	3,365.0
Percent Private Forested Ownership (NWOS 2018)	46.7%	55.1%	46.3%	56.7%	85.0%
Percent change in housing structures 1990-2010 (Census)	29.5%	46.8%	20.6%	12.0%	-3.3%
Non-303(d) Listed Streams (Miles) *	1,517.6	6,603.3	5,803.0	5,365.6	5,913.9
Percent Population Growth 1990 - 2010	18.0%	37.7%	-1.1%	3.5%	-13.5%
Avg. Harvests Density 2005 - Present (Acres / Square Mile)	119.4	73.4	127	85.1	107.5
Percent of State Total Harvest Acres 2005 - Present	6.30%	10.4%	18.0%	10.9%	17.7%
Number of "B Rank" score areas for (B4, B3, B2, B1) **	925	1,421	2,242	1,246	830

*Streams not listed as impaired on the federal Clean Water Act, Section 303d list.

** B Ranks are site biodiversity ranks based on T&E species and other state tracked rare species (including Species of Greatest Conservation Need (SGCN) from the SWAP and rare ecological communities with a high composite score for the area based on Global and State Ranks and population viability/ ecological integrity of the occurrences.

B4 – Outstanding State Biodiversity Significance

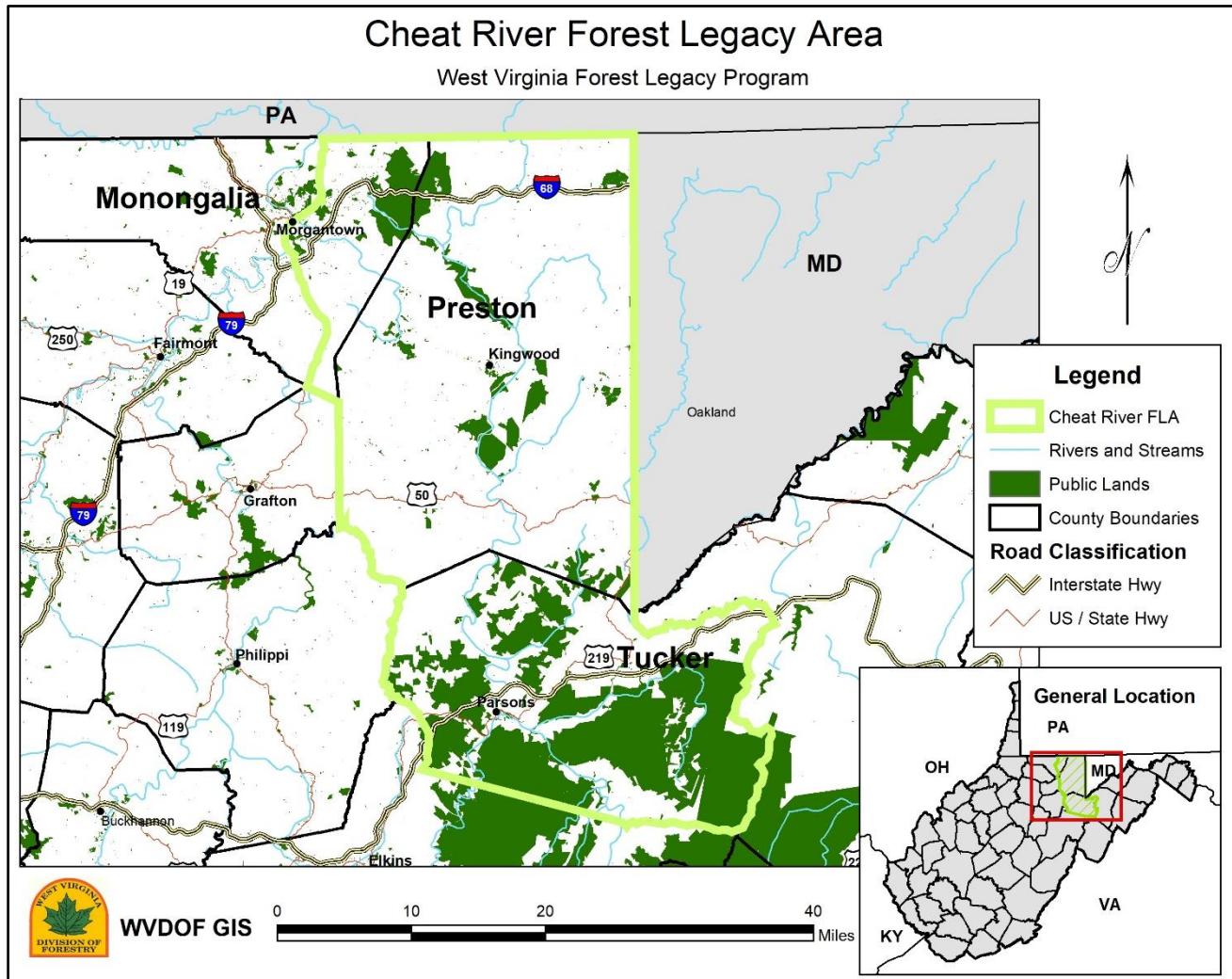
B3 – Global Biodiversity Significance

B2 – High Global Biodiversity Significance

B1 – Outstanding Global Biodiversity Significance

Forest Legacy Area 1-Cheat River

The Cheat River FLA consists of Preston and Tucker Counties and the portion of eastern Monongalia County that is east of Highway 119 (Map 1.12). This FLA lies in the northeastern corner of the state between the two panhandles and adjacent to the Pennsylvania and Maryland borders. The Cheat River FLA consists of about 1,180 square miles in total area, with about 953 square miles of forest land, about 46.7% of which is in private ownership. Much of the private land in this FLA is in Monongalia and Preston Counties, with large areas of public land in Tucker County.



Map 1.12: Forest Legacy Area 1 – Cheat River (WVDOF GIS, 2020).

Development pressure on the Cheat River FLA appears to be primarily through second home development. The FLA experienced an 18.04% growth in population between 1990 and 2010, but the growth in the number of housing structures within the FLA during that decade was nearly 29.52%. The relatively large increase in the number of housing structures suggests that the region is experiencing significant second home expansion. This expansion is creating pressure to parcelize forest lands,



making forest management more difficult. The Cheat River FLA contains 1,517.6 miles of streams that are not classified as impaired on the 303(d) list. The Cheat River watershed has been identified as a high priority watershed for conserving aquatic biodiversity.

The Cheat River FLA supports a variety of forest types, important ecological areas, landscape features, and recreational areas of interest. Important features found in this FLA that offer support include the Cheat Gorge and Canaan Valley Ecologically Important Areas (WVDOF, 2003). The canyon in the Cheat Gorge has numerous mesic rock outcrops, which provide habitat for the many species. The federally endangered flat tooth three spired land snail and rusty batched bumble bee are found in this FLA. Also of importance are wetlands found at Cranesville Swamp and in Canaan Valley. Canaan Valley, with its matrix of wetland communities, is the largest Central Appalachian high elevation wetland complex. This FLA is also of significance, as its higher elevations are within the Allegheny Plateau. The high elevation red spruce-northern hardwood forests found in this area serve as important habitat for such rare species the federally threatened Cheat Mountain salamander. The highest elevations have natural heaths and balds interspersed with the red spruce-northern hardwood forests. Along the eastern sections of this FLA, the Allegheny Front is a nationally significant flyway for neo-tropical migratory birds.

Important areas for recreational and scenic importance and/or protected lands recognized for ecological value include the Cheat River, Coopers Rock State Forest, Cranesville Swamp, Cathedral State Park (SP), Canaan Valley National Wildlife Refuge, Canaan Valley SP, Blackwater Falls SP, and numerous Wildlife Management Areas. Important portions of the Monongahela National Forest include the Dolly Sods Wilderness Area, Fernow Experimental Forest, and Otter Creek Wilderness Area.

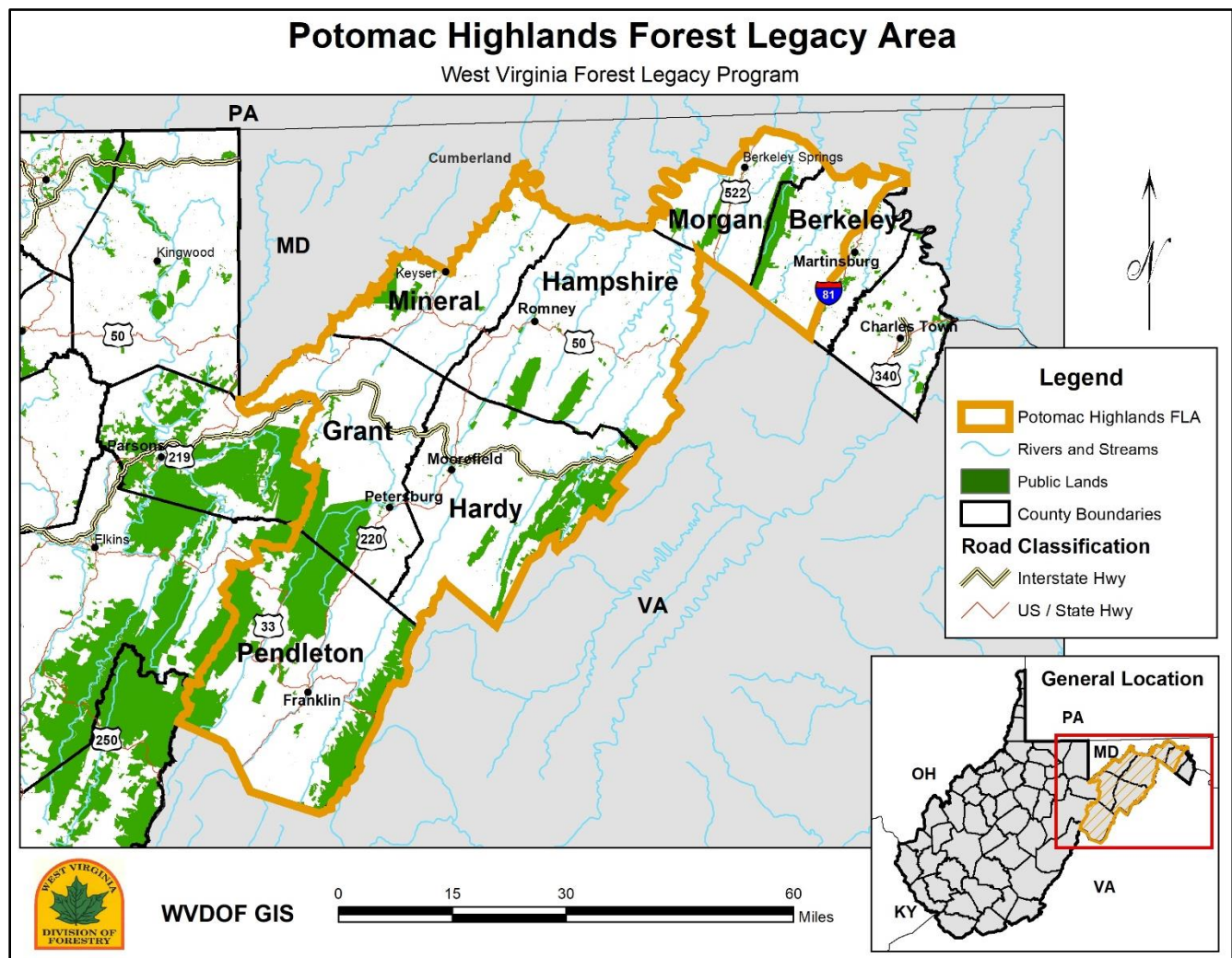
Participation in the FLP for the Cheat River FLA should provide the following public benefits and potential projects should be evaluated to meet the following goals:

- Maintain large and intact working forest land properties,
- Investment in areas with a high likelihood of future forestry,
- Conserve tracts with moderate to high timber resource productivity to support local businesses and communities with a high degree of dependence on the forest products industry,
- Enhance recreational experiences by protecting viewsheds of important recreational areas with working forest,
- Enhance recreational experiences by protecting motorized, non-motorized and handicapped accessible trail systems and their viewsheds with working forest land, and
- Protect and enhance non 303(d) listed streams and high-quality streams, including but not limited to the Cheat River watershed, by conserving adjoining working forests, wetlands, and streamside management zones, and

- Strengthen Cheat Canyon and Canaan Valley Ecologically Important Areas and existing protected lands by conserving working forest.

Forest Legacy Area 2-Potomac Highlands

The Potomac Highlands FLA consists of Grant, Hampshire, Hardy, Mineral, Morgan, and Pendleton counties and the portion of Berkeley County west of Interstate 81, encompassing almost all the area of the eastern panhandle of the state (Map 1.13).



Map 1.13: Forest Legacy Area 2 – Potomac Highlands (WVDOF GIS, 2020).

The Potomac Highlands FLA contains about 3,180.1 square miles, of which some 2,613 are forested. The landscape of this FLA is largely dominated by private ownership with scattered state parks and wildlife management areas in the northeast in Morgan, Berkeley, Hampshire, and Mineral Counties and

large contiguous areas of public lands on the Monongahela National Forest in Grant and Pendleton Counties, and on the George Washington National Forest in Pendleton and Hardy Counties. A small portion of the George Washington National Forest also lies within Hampshire County. Of the 2,613 square miles of forest in the FLA, the majority (55.1%) is in private ownership.

Population in the Potomac Highlands showed the highest growth of any of the FLAs between 1990 and 2010. The region saw a population increase of 37.77%. Housing structure increases of 46.78%, suggest significant development of vacation and second homes in the FLA, bringing increasing pressure on its resources.

The FLA contains the Smoke Hole and Shenandoah Mountain/Cow Knob, parts of the Laurel Fork, and adjoins the Savage River and Green Ridge Ecologically Important Areas (WVDOF, 2003).

The majority of the landscape in the Potomac Highlands is defined by the Ridge and Valley Physiographic Province and a drier regional climate. The topographical variation supports numerous large, dramatic limestone and sandstone cliffs and outcrops which not only defines the scenic landscape in portions of this region, but also provides habitat for many rare, threatened, endangered, and disjunct species. Many areas dominated by limestone geology, such as the Smoke Hole Ecologically Important Area, support some of the highest levels of biodiversity found in West Virginia. This includes examples of rare communities such as open limestone glades, barrens, and native grass-dominated prairies. North Fork Mountain supports some of the best examples of Central Appalachian dwarf pitch pine-scrub oak communities and the southern-most extension of red pine forest in the United States. The drier climate of the region, geology, and topography also make it the heart of the Central Appalachian shale barren distribution. The number of shale barren endemic species is very high relative to any other community type in the region. Significant karst features are also found in this area's limestone geology, with a high number of caves. Spruce Knob and the surrounding area, with its higher elevations and wetter climate, supports a high elevation red spruce-northern hardwood forest ecosystem that provides habitat to the federally threatened Cheat Mountain salamander.

The Potomac Highlands are also home to important freshwater resources. The FLA contains 6,603.3 miles of streams that are not classified as impaired on the 303(d) list. A large portion of the Potomac Highlands is dominated by the Cacapon, South Branch, and Lost River Watersheds and other headwaters of the Potomac River. These watersheds have been identified as a high priority watershed for the conservation of aquatic biodiversity. The headwaters of the Potomac River are considered significant by many entities because the river is the source of drinking water for millions of Maryland, Virginia, and West Virginia residents. Some of the best water quality, habitat conditions, and fisheries in West Virginia are located throughout the FLA. These areas are all in the Chesapeake Bay watershed.

Areas of recreational and scenic importance and/or protected lands recognized for ecological value include Sleepy Creek Wildlife Management Area (WMA), Sideling Hill WMA, Berkeley Springs SP, Cacapon Resort SP, Short Mountain WMA, Lost River SP, Smoke Hole Caverns, and Seneca Caverns. Additionally, important portions of the Monongahela National Forest include the Spruce Knob and Seneca Rocks National Recreation Areas.

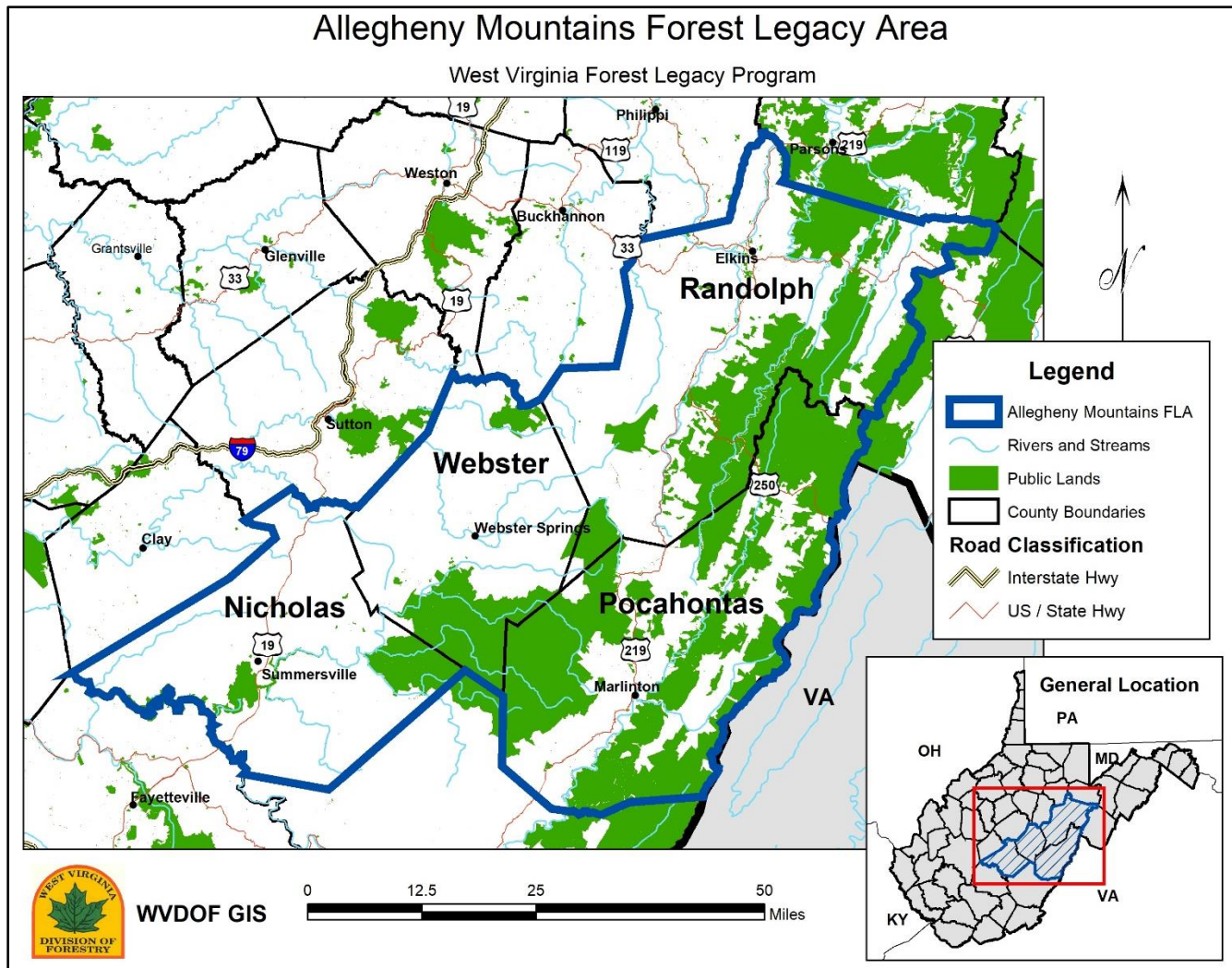
Participation in the FLP for the Potomac Highlands FLA should provide the following public benefits and potential projects should be evaluated on the following goals:

- Maintain large and intact working forest land properties,
- Investment in properties with a high likelihood of future forestry,
- Conserve tracts with moderate to high timber resource productivity so as to support local businesses and communities with a high degree of dependence on the forest products industry,
- Enhance recreational experiences by protecting viewsheds of important recreational areas, such as headwaters of the Potomac River, Seneca Rocks, and Spruce Knob with working forest,
- Enhance recreational experiences by protecting motorized, non-motorized and handicapped accessible trail systems and their viewsheds with working forest land,
- Protect and enhance non 303d listed streams and high-quality streams by conserving adjoining working forests, wetlands, and streamside management zones,
- Protect and enhanced water quality in the Chesapeake Bay as well as drinking water quality for Washington, DC by conserving working forests and streamside management zones, and
- Strengthen Smoke Hole, Shenandoah Mountain, Laurel Fork, Green Ridge, and Savage River Ecologically Important Areas and existing protected lands by conserving working forest.

Forest Legacy Area 3—Allegheny Mountains

The Allegheny Mountains FLA consists of Randolph, Pocahontas, Webster, and Nicholas Counties along the east-central border of West Virginia and Virginia. The area covers 3,190.6 square miles of which 2,903 square miles are forest. The area contains one of the most outstanding mountain landscapes in the United States, with some of the largest expanses of un-fragmented forest lands in the mid-Atlantic. Large portions of this region are within the proclamation boundary of the Monongahela National Forest (Map 1.14). Despite this fact, some 46.3% of the FLAs forested lands are in private ownership. The area is well known for its outstanding vistas, recreational opportunities, productive timberland, and extremely high levels of biodiversity. Providing protection to private working forest lands could be key in protecting the quality of these high-priority forests in West Virginia.

Population change from 1990 to 2010 reflected a decrease of 1.13%. However, the number of housing structures increased by 20.55%. Those trends suggest that recreation and second home developments are increasing and that maintaining working forests may require efforts such as Forest Legacy conservation easements to maintain large and unbroken areas of manageable forest.



Map 1.14: Forest Legacy Area 3 – Allegheny Mountains (WVDOF GIS, 2020).

Many of the corporate timberlands in the state are found in this FLA. This ownership pattern makes this area of the FLA very important to the West Virginia timber industry.

The Allegheny Mountains FLA is extremely significant for its concentrations of high-quality streams and important watersheds. It contains 5,803 miles of streams that are not classified as impaired on the 303(d) list. This particular FLA also contains trout streams with native brook trout populations and has some that are also stocked with brown and rainbow trout. These high-quality trout streams and the fishing they provide bring thousands of anglers to the region annually. Portions of the Cheat, Tygart, and Greenbrier River Watersheds are found in this FLA and all have been identified as important watersheds for the conservation of aquatic biodiversity.

The Allegheny Mountains are also significant for their terrestrial biodiversity and overall ecological condition (WVDOF, 2003). The remote high mountain landscapes combined with some of the highest

levels of precipitation in the state support a wide variety of plant and animal species. In this FLA, high elevation and cooler, wetter climates paired with a southern latitude have allowed an overlap of northern and southern species. This overlap makes the area extremely rich in biodiversity. The climate and rainfall in the Allegheny Mountains FLA support areas of highly diverse mixed mesophytic forest as well. The high elevation red spruce, balsam fir, and northern hardwood forests found on the Cheat Mountain, Canaan Valley, and Cranberry Ecologically Important Areas host the premier landscapes for suitable habitat for the federally threatened Cheat Mountain Salamander. This is the largest extent of red spruce forest south of the Adirondack Mountains of New York state. These high elevation sites are also important areas for wetlands and bogs such as can be found in the Cranberry Wilderness area and on Cheat Mountain. Drier eastern portions of the FLA once were home to large stands of white pine. Remnant stands can still be found along low elevation streams. FLA 3 is of significant importance to federally listed and imperiled bats, as it contains both known summer use areas as well as numerous significant hibernacula. Federally endangered candy darter streams and designated critical habitat are also present in this FLA. This FLA also contains golden winged warbler.

The FLA includes all or portions of the following Ecologically Important Areas: Canaan Valley, Cheat Mountains, Laurel Fork, Big Beaver Creek, Cranberry, Beaverlick Mountain/Mountain Creek Mountain, Gauley River, and Muddlety Creek (WVDOF, 2003). Important areas for recreational and scenic importance and/or protected lands recognized for ecological value are almost too numerous to mention, but would include Cranberry, Otter Creek, and Laurel Fork Wilderness Areas; Gauley River National Recreation Area; Snowshoe and Silvercreek Resorts; Snowshoe Highlands IMBA Ride Center; and Highland Scenic Highway. Kumbrabow, Seneca, and Calvin Price state forests are all located in this FLA. The Rimfire Trail system has plans to expand into Nicholas and Webster counties to provide motorized recreation opportunities in the next five years.

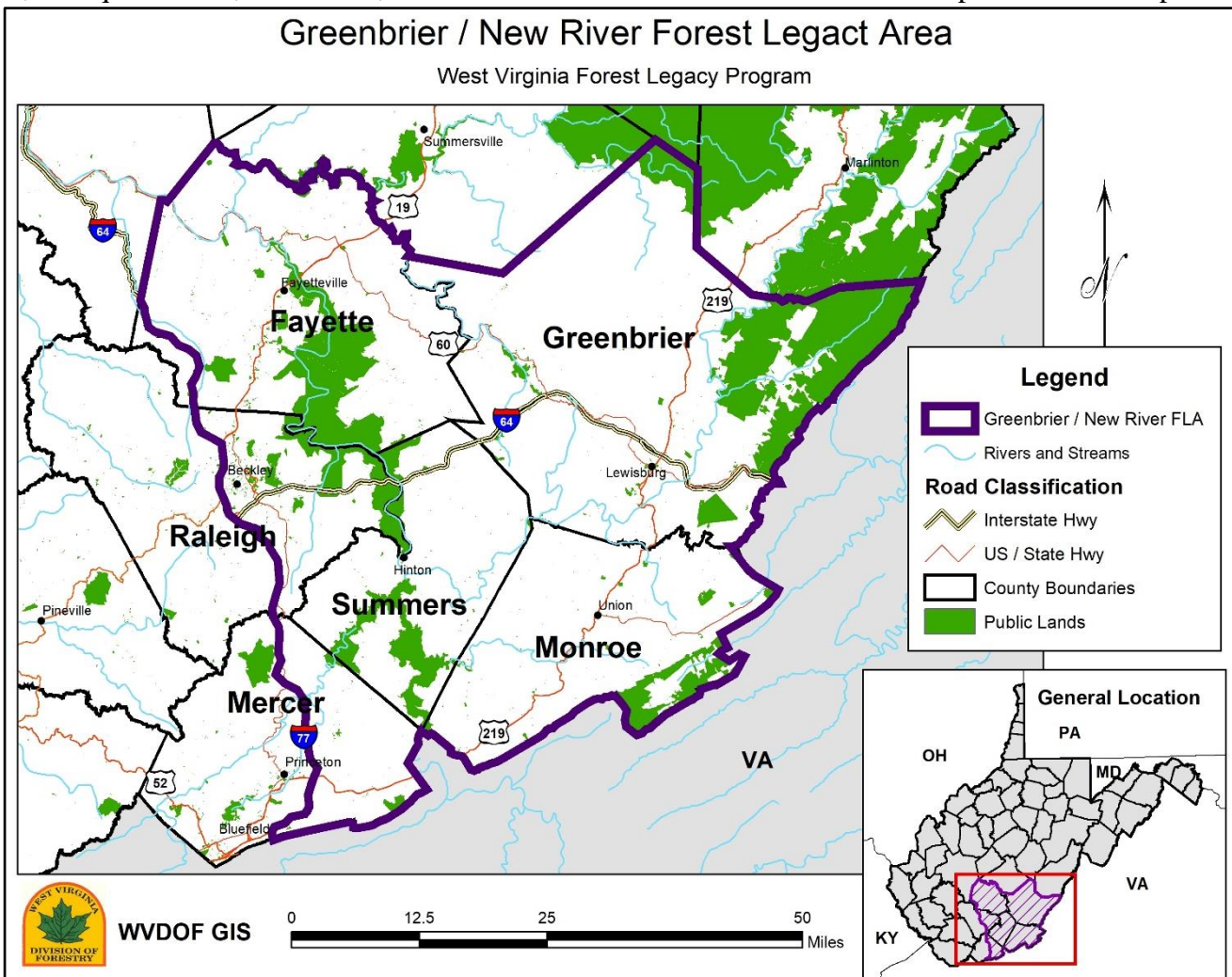
For all of the Forest Legacy Areas, the primary means for protection will be the acquisition of conservation easements from willing sellers. Participation in the FLP for the Allegheny Mountains FLA should provide the following public benefits and potential projects should be evaluated on the following goals:

- Maintain large and intact working forest land properties,
- Investment in properties with a high likelihood of future forestry,
- Conserve tracts with moderate to high timber resource productivity so as to support local businesses and communities with a high degree of dependence on the forest products industry,
- Enhance recreational experiences by protecting viewsheds of numerous important recreational areas with working forest,
- Enhance recreational experiences by protecting motorized, non-motorized and handicapped accessible trail systems and their viewsheds with working forest land,

- Protect and enhance non 303d listed streams and the high concentration of high-quality streams by conserving working forests, wetlands, and streamside management zones, and
- Strengthen the Ecologically Important Areas and numerous existing protected lands by conserving working forest.
- Conserve tracts where early successional golden winged warbler habitat will be maintained with working forest or conserve tracts where landowners want to create and maintain early successional golden winged warbler habitat.

Forest Legacy Area 4 – Greenbrier/New River

The Greenbrier/New River FLA consists of Greenbrier, Monroe, and Summers Counties and those portions of Fayette, Mercer, and Raleigh Counties east of Interstate 77 (Map 1.15). The FLA covers 2,887 square miles, of which 2,398 are forest and 56.7% of the forestland is in private ownership.



Map 1.15: Forest Legacy Area 4 – Greenbrier / New River (WVDOF GIS, 2020).

Population in the Greenbrier/New River FLA from 1990 to 2010 increased by 3.56%. However, housing structures increased by 12.03%. This suggests that second and vacation home development in these areas may be driving land parcelization and fragmentation of forested areas in the areas.

The FLA contains several important aquatic resources. The Greenbrier River is one of the last undammed, high quality mountain streams in West Virginia. The area contains the Greenbrier River, middle New River, and smaller portions of the Upper James and Upper Kanawha watersheds, all of which have been designated as critical for conserving biological diversity.

In addition, the area contains 5,365.6 miles of streams that are not classified as impaired on the 303(d) list. The Greenbrier/New River FLA supports a variety of forest types, important ecological areas, landscape features, and recreational areas of interest. The FLA contains the Beaverlick/Meadow Creek, Mountain Lake, Meadow River, New River Gorge, and Pipestem Ecologically Important Areas (WVDOF, 2003). Some of the best quality shale barrens on earth thrive in the Ridge and Valley portions of the FLA. The Greenbrier Valley is also an important center of biodiversity of national importance. The valley, with its limestone geology, contains some of the largest cave systems in North America, which also supports a very rich diversity of cave fauna. Golden winged warbler is present in this FLA.

Important areas for recreational and scenic importance and/or protected lands recognized for ecological value include the New River Gorge, Gauley River and Bluestone National Recreation Areas, Lake Sherwood, Blue Bend Recreation Area, Big Draft Wilderness, Spice Run Wilderness, numerous smaller state parks and wildlife management areas, Greenbrier State Forest, and the world famous Greenbrier Resort.

The Rimfire Trail system has plans to expand into Fayette County to provide motorized recreation opportunities in the next five years.

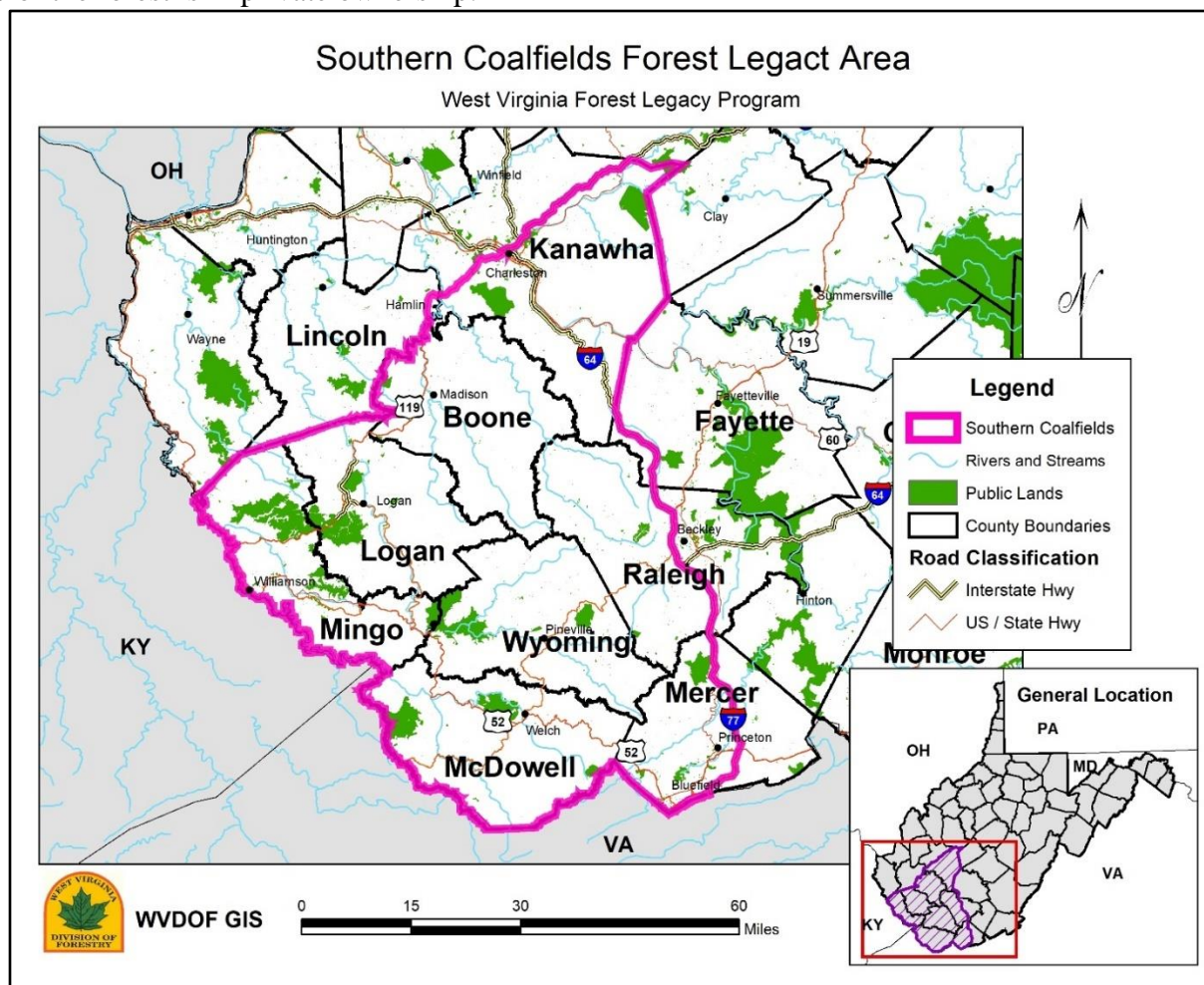
Participation in the FLP for the Greenbrier/New River FLA should provide the following public benefits and potential projects should be evaluated on the following goals:

- Maintain large and working intact forest land properties,
- Investment in properties with a high likelihood of future forestry,
- Conserve tracts with moderate to high timber resource productivity so as to support local businesses and communities with a high degree of dependence on the forest products industries,
- Enhance recreational experiences by protecting viewsheds of numerous important recreational areas with working forest,
- Enhance recreational experiences by protecting motorized, non-motorized and handicapped accessible trail systems and their viewsheds with working forest land,

- Protect and enhance non 303(d) listed streams and high-quality streams by conserving adjoining working forests, wetlands, and streamside management zones,
- Strengthen the Ecologically Important Areas and existing protected lands by conserving working forest, and
- Conserve tracts where early successional golden winged warbler habitat will be maintained with working forest or conserve tracts where landowners want to create and maintain early successional golden winged warbler habitat.

Forest Legacy Area 5 – Southern Coalfields

The Southern Coalfields FLA consists of the following counties: Kanawha south of I-77 and Rt. 119, Boone, Lincoln South of Rt. 119, Logan, Mingo, McDowell, Wyoming, as well as Raleigh, Mercer, and Fayette west of I-77 (Map 1.16). The FLA covers 3,702 square miles, of which 3,365 are forest and 85% of the forest is in private ownership.



Population in the Southern Coalfields FLA from 1990 to 2010 increased by 3.56%. However, housing structures decreased 3.34%. In addition, the area contains 5,913.9 miles of streams that are not classified as impaired on the 303(d) list. The WV endemic and federally endangered Guyandotte River crayfish and the Big Sandy crayfish. WVDNR advised on 1/12/21 that proposed critical habitat for both species has been proposed by the US Fish and Wildlife Service. Cerulean warbler is also present.

The Southern Coalfields FLA supports a variety of forest types with ecological and recreational areas of interest. The FLA contains Camp Creek State Forest as well as Chief Logan, Pinnacle Rock and Twin Falls State Parks. Further, it contains Panther, Anawalt Lake, Berwind, Fork Creek, Horse Creek, Laurel Lake, Morris Creek, RD Bailey Lake, Tomblin, and Tug Fork WMAs. Anawalt Lake and Tomblin WMAs contain elk that were introduced by WVDNR. Moreover, the FLA contains approximately 730 miles of Hatfield and McCoy motorized recreational trails that are located on 150,000 (+/-) acres of private property.

Participation in the FLP for the Southern Coal Fields FLA should provide the following public benefits and potential projects should be evaluated on the following goals:

- Maintain large and intact working forest land properties,
- Investment in areas with a high likelihood of future forestry,
- Conserve tracts with moderate to high timber resource productivity so as to support local businesses and communities with a high degree of dependence on the forest products industry,
- Enhance recreational experiences by protecting viewsheds of numerous important recreational areas with working forest,
- Enhance recreational experiences by protecting motorized, non-motorized and handicapped accessible trail systems and their viewsheds with working forest land,
- Protect and enhance non 303d listed streams and high-quality streams by conserving adjoining working forests, wetlands, and streamside management zones, and
- Buffer and strengthen State Parks, WMAs Areas, and existing protected lands by conserving adjoining working forest.
- Conserve tracts where cerulean warbler habitat will be maintained with working forest or conserve tracts where landowners want to create and maintain cerulean warbler habitat.



Strategy - State Issue 1: Competing Land Uses

The Forest Legacy Program is the mechanism that the WVDOT is using to implement the following long-term strategy discussed here for the Competing Land Uses Issue. The five FLAs are the priority areas for this state issue. The following sub-issues are addressed : 1.1 – Fragmentation, Parcelization, and Loss of Forest Land; 1.2 – Development; 1.3 – Population and Housing Density; 1.4 Conversion to Non-forestry Use; 1.5 – Mineral Extraction; 1.6 – Agriculture; and 1.7 – Property Taxes.

Long-term Strategy

The long-term strategy for sub-issues 1.1 through 1.7. is to protect as much working forest land as possible, through the FLP, within the identified FLAs, from the following:

- 1.The combined threats of conversion to non-forest uses, and
2. Reduction in forest parcel sizes that result from development pressures, population growth, intergenerational transfer of forest land, and other related threats.

Strategy Narrative

The goal of the Forest Legacy Program in West Virginia is to protect from development, parcelization, and fragmentation, regionally significant properties that contain important environmental values and also contribute to working forest economies and local communities. The priority landscape areas for planned land protection activities are the Cheat River, Potomac Highlands, Allegheny Mountains, Greenbrier / New River, and Southern Coal Fields Forest Legacy Areas. Federal Forest Legacy competitive grants, administrative grants, and nonfederal funding sources will be used to provide funding for Forest Legacy Program acquisitions and administration. The Forest Legacy Program objectives and eligibility criteria are described in Table 1.5. Forest Legacy Area Eligibility Criteria were developed in an effort to meet West Virginia's FLP Objectives. A review of the Forest Legacy Area Data Comparison Table (Table 1.4) and the List of Data layers were reviewed to make sure that all FLA eligibility criteria were met.

Table 1.5: Program objectives and eligibility criteria to be used in the West Virginia Forest Legacy Program (WVDOP 2003).

	Program Objective	Area Eligibility Criteria
Threat & Feasibility	Maintain large and intact forest land tracts and smaller tract that adjoin or in close proximity to large tracts.	Experiencing development pressure and at high risk for parcelization, presence of large tracts.
	Invest in areas that will not be engulfed by other land uses.	Likely for the Area to sustain forest management.
	Facilitate compliance with program guidelines and avoid conflict with other industries.	Areas with properties with intact surface and mineral rights and / or areas without known gas fields or coal reserves.
Economic Importance	Conserve tracts with significant timber resource values.	Moderate to high timber resource productivity.
	Support communities by conserving the raw materials for the compatible timber, recreation, and tourism industries.	High community dependence on forest uses for timber, recreation, and scenery.
Environmental Importance	Maintain important water features by conserving working forests, wetlands, and streamside management zones.	Concentration of non 303d listed streams and / or high-quality streams.
	Sustain the most ecologically significant areas of the state.	Concentration of Ecologically Important Areas, critical wildlife habitats, and protected lands.

The Forest Legacy Program will rely primarily on conservation easements and full fee acquisitions of working forest land. The specific project criteria are outlined below:

- Application by landowner (WV Division of Environmental Protection Functional Assessment Scores for Mapped wetlands and Chesapeake Conservation Atlas may provide beneficial information for landowners as they are completing their applications),
- Preliminary screening of potential projects by the State Forest Stewardship Coordinating Committee,
- Due diligence review of potential projects,



- Review, evaluation, and prioritization of potential projects by State Forest Stewardship Coordinating Committee,
- Submittal of prioritized projects by WVDOF to USFS FLP Staff,
- Review of all projects by the US Forest Service FLP Staff and submittal of recommended projects to Congress,
- President's budget request,
- Congressional appropriations,
- Project Completion and Acquisition by WVDOF, and
- WVDOF uses the State Grant Option and is the sole holder of lands and interests in lands.

The State Forest Stewardship Coordinating Committee (SFSCC) will review, evaluate, and prioritize potential projects on the basis of the following evaluation criteria, which will be used to prioritize between competing projects.

Project Evaluation Criteria

1. Tract Size and Location: Priority will be given to large tracts, smaller tracts that adjoin or strategically fit with large tracts that are potential projects, or smaller tracts that strategically fit together to form large blocks of land or that are in close proximity to each other.

2. Degree of threat: Priority will be given to properties that have a high degree of threat of development and / or parcelization. This will be assessed through: desirability of location, site suitability for development, road frontage, access to utilities, growth dynamics of the area, rights-of way, subdivision ordinances, zoning, etc.

3. Forest resource economic benefits: Priority will be given to properties that are likely to have significant forest resource economic benefits. This will be assessed through: forest and soil productivity; parcel size; site index; historical forest management; forest conditions (stocking, maturity, etc.); condition of road system; BMP compliance, access to markets; and likelihood of future forestry in the landscape.

4. Scenic and outdoor recreation benefits: Priority will be given to properties that are likely to have significant scenic and outdoor recreation benefits. This will be assessed through: access rights conveyed (if any); important scenic resources; viewshed benefits; proximity to public land; trails; motorized and / or non-motorized recreation; handicapped access; and bodies of water; and other community economic benefits.

5. Water quality and watershed protection: Priority will be given to properties that are likely to have significant water quality and watershed protection benefits. This will be assessed through: importance of watershed for aquatic biodiversity; presence of high quality streams, presence of streams that are not listed as impaired on the 303d list streamside management zones; wetland, or riparian resources; and benefits to municipal water source or recharge area.

6. Ecological benefits: Priority will be given to properties that are likely to have significant ecological benefits. This will be assessed through: presence of rare or important forest types (e.g. old growth, cove forests, high-elevation spruce forests, etc.); important wildlife habitat or benefits; proximity to ecologically important areas; and management of habitat for federally threatened or endangered species.

8. Community support: Priority will be given to properties that have community support, identified matching funds, and partnerships involved.

9. Historical or cultural resources: Priority will be given to properties that have historical or cultural resources or benefit nearby historical or cultural resources.

10. Educational opportunities and other important values: Priority will be given to projects that provide for forestry and/or environmental educational opportunities or provide for important values not adequately represented in the other criteria.

Project Requirements

- 1) **FLA Inclusion:** The proposed property boundary must lie within a defined Forest Legacy Area.
- 2) **Willing Buyer / Wiling Seller:** All acquisitions are to be conducted on willing buyer / willing seller basis, with amicable agreement and without condemnation.
- 3) **Easement Terms:** WVDOF Negotiates all easement terms using its conservation easement template.
- 4) **Multi-Resource Plan:** The landowner must be committed to obtaining a Multi-Resource Plan prior to closing.
- 5) **Financial Leverage:** At least 25% of the project costs must be secured from non-federal cash or in-kind sources. Bargain sales, where landowners donate 25% of the appraised value are considered to be an in-kind source.
- 6) **Readiness:** In an effort to complete projects within the two year grant time frame, WVDOF will conduct due diligence on applications to make that they are ready to compete for federal funding and to make sure that marketable title can be obtained.



- 7) If public motorized and / or non-motorized recreational access is provided by WVDOF on a fee acquisition project or if it is voluntarily provided by private landowner on an FLP conservation easement, then WVDOF FLP will need to develop specific policies, procedures, and requirements such things that include but are not limited to trail maintenance and law enforcement.

The resource values and goals for the Forest Legacy Program will be achieved through the acquisition of property rights, as detailed below, in conjunction with the current Forest Legacy Program guidelines. The terms of each acquisition, whether in full-fee interest or via a conservation easement, will be subject to negotiation and can vary with each property. The framework below is a guide along with the Forest Legacy Program Guidelines and Forest Legacy Program Grant Requirements. All acquisitions are subject to approval by the WVDOF, USFS, and the landowner(s).

- A. Acquisition of full fee interest is appropriate for tracts that are for sale within all the Forest Legacy Areas. Acquisition of conservation easements is preferred when tracts are not for sale.
- B. Extinguish development rights on all tracts, restrict the rights to subdivide, construct buildings, and utilize the property for non-compatible uses (e.g. landfill, surface mining). Correction of boundary disagreements should be permissible.
- C. Timber harvesting rights should be conditioned with the following provisions:
 1. Compliance with a Multi-Resource Plan that is approved by the State Forester of the Division of Forestry.
 2. Compliance with the Logging and Sediment Control Act and all applicable Best Management Practices.
 3. Compliance with all applicable laws and regulations.
- D. Complete minerals determinations in that include but are not limited to affidavits of non-production for expired gas leases. Restrict gravel / borrow pits for use on the property to a reasonable size. Upon the completion of operations, the land shall be reclaimed, as much as practical, to its original contour and re-vegetated.
- E. No dumping of trash or disposal of waste or hazardous material will be allowed on properties.
- F. Prohibit the use of signs and billboards on all properties, except to state the name and address of the property owner, to post the property for no trespassing, safety concerns, sale of forest products from the property, access restrictions, or to provide Forest Legacy information.
- G. Existing dams, water impoundments, or similar structures may remain and be maintained.



- H. Industrial, commercial, and residential activities, except traditional forest uses and limited mining uses, are prohibited (see above).

Timeline

Approximately three Forest Legacy projects are to be completed prior to June 30th, 2030.

Measure of Success

The Measure of Success will be the acquisition of approximately three (3) Forest Legacy Projects. These working forest projects are to protect properties that are desirable and that will not cause difficulty for the WVDOT. Further, the titles shall be clear and free of defect; rights-of-way shall be free of problems; boundary disputes shall be resolved; and easement language is to be clear, so as to avoid problems in the future. The WVDOT shall not acquire more easements than it can effectively monitor.



Bibliography

AFT. 2002. Farming on the Edge: Sprawling Development Threatens America's Best Farmland. Washington: American Farmland Trust. Available at <http://www.aft.org>

Birch, T.W.; Kingsley, N. 1978. *The forest-land owners of West Virginia*. Recourse. Bull. NE-58. Broomall, PA: US Department of Agriculture Forest Service, Northeastern Forest Experiment Station. 90 p.

Butler, Brett J.; Butler, Sarah M.; Caputo, Jesse; Dias, Jacqueline; Robillard, Amanda; Sass, Emma M. 2020. Family Forest Ownerships of the United States, 2018: Results from the USDA Forest Service, National Woodland Owner Survey. Gen. Tech. Rep. NRS-199. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 56 p. <https://doi.org/10.2737/NRS-GTR-199>

Dewitz, J., 2019, National Land Cover Database (NLCD) 2016 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P96HHBIE>

Morin, Randall. 2019. West Virginia Forest Inventory and Analysis. US Department of Agriculture, Forest Service.

National Resources Inventory. Natural Resources Conservation Service, Washington, DC., September 2020. http://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_dev_wv.html

Riitters, Kurt H., et. al. 2002. Fragmentation of Continental United States Forests. *Ecosystems* 5:815-822.

Row, Clark. 1978. Economies of Tract Size in Timber Growing. *Journal of Forestry*. 76:576-582.

Sampson, R. Neil and L.A. DeCoster. 1997. Public Programs for Private Forestry. Washington, DC: American Forests. 100pp.

US Department of Agriculture, Forest Service. 2020. Forests to Faucets 2.0 Connecting Forests, Water, and Communities. https://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtm

Wear, D.N., R. Liu and J. M. Foreman, 1996. The effects of population growth on timber management and inventories in Virginia. Research Triangle Park, NC: USDA Forest Service.

Wear, D. N., J. M. Foreman, and R. M. Sheffield, 1999. The effects of population growth on timber management and inventories in Virginia. *Forest Ecology and Management* 118:107-115.



WVDEP. West Virginia Division of Environmental Protection. 2016. Integrated Water Quality Monitoring and Assessment Report. https://dep.wv.gov/WWE/watershed/IR/Pages/303d_305b.aspx

WVDOF. West Virginia Division of Forestry, 2003. Forest Legacy Program Assessment of Need for the State of West Virginia, June 30, 2003. 126pp.

WVDNR. West Virginia Division of Natural Resources. 2020. Ecological Communities and Rare, Threatened, and Endangered Species Information. WV Natural Heritage Program. January 17, 2020.

WV Department of Tax and Revenue, August 2019. <https://wvgis.wvu.edu/data/dataset.php?ID=371>



State Issue 2: Communications and Education

Program Overview

It is obvious that Communications and Education is essential to get the forestry message out to the public. Even though 10 years has gone by most of our sub issues from 2010 are still relevant today. A well-informed public, including elected officials, students, and special interest groups, is essential for carrying out all the activities necessary to manage healthy and sustainable forests. It also is very important to conduct educational activities for all age groups and audiences in order to ensure proper understanding of forest management, health, protection, sustainability and other forestry-related issues. Conservation and environmental education can be utilized to inform the public about all aspects of forestry and all the program areas overseen by the West Virginia Division of Forestry (WVDOF).

The WVDOF continues to recognize these sub-issues for this broad state issue:

- **Lack of Forestry Education in Public Schools**
- **Public Perceptions of Forestry (e.g. prescribed fire, timber harvesting, flooding)**
- **Lack of Internal Formal Training for WVDOF Personnel**
- **Taking Advantage of Current and Future Technologies**
- **Future Issues That Will Affect the WVDOF**

Observations and Challenges

While West Virginia is the third most forested state (over 12 million acres out of 15 million) it is still hard for the public to perceive the value of this resource. Several forestry related issues have surfaced in the past 10 years and it takes more to educate the public before any of the issues make it past them. Some issues die before they are given a chance to succeed due to public opinion.

The Communication and Education program work to get the forestry message out to the public through our updated website and social media. We have had several successes with this format. We strive to work with educators, both formal and non-formal, to be the source of forestry education for them.

Rationale

When looking at these issues the rationale behind determining our priority areas is the need to get more training into the schools, focusing on pre-service educators, and building capacity within our own division and forest industry to deliver subject matter. Our priority will focus to increase trainings Statewide. There will be special emphasis in the Chesapeake Bay counties of the state and the southern



part of the state. We have also added in three new programs (Special Operations, Unmanned Aircraft System (Drones) and the honor guard) to the Division that will plan on expanding as funding is available.

Educational Opportunities within West Virginia:

Professional Organizations

- **WV Division of Forestry** -The WVD OF is an integral part of forestry education in the state. The WVD OF's primary program areas, including Fire Prevention, Suppression and Preparedness; the Logging Sediment Control Act (LSCA); Landowner Assistance (Management); Urban and Community Forestry; and State Lands Management provide materials for specialized education to the public.
- **WV Division Allegheny Society of American Foresters** chapter of the Society of American Foresters offers educational opportunities on the forestry for forestry and natural resources professionals and the public.

Project Learning Tree – For more than 40 years, PLT (www.plt.org) has used the forest as a "window to the world" to increase students' understanding of our environment, to stimulate students' critical and creative thinking, to develop students' ability to make informed decisions on environmental issues, and to instill in students the commitment to take responsible action on behalf of the environment. To date, more than 4,900 formal and non-formal educators have been trained through PLT in West Virginia. PLT is co-sponsored by the WVD OF and the West Virginia Forestry Association (WVFA). Today, the state PLT coordinator works within the WVD OF. PLT cooperates closely with West Virginia's Projects WILD and WET.

Project WILD (www.projectwild.org) – Project WILD's mission is to provide wildlife-based conservation and environmental education that fosters responsible actions toward wildlife and related natural resources. The goal of Project WILD is to assist individuals of any age in developing awareness, knowledge, skills and commitment to make informed decisions and engage in responsible behavior and constructive actions concerning wildlife and the environment. WV Division of Natural Resources oversees this program.

Project WET (<http://projectwet.org/water-education-project-wet/water-education-project-wet>) – WV Department of Environmental Protection coordinates Project WET publications, training workshops, global network and community events are grounded in Project WET's core beliefs. One belief is that water connects us all, water moves through living and nonliving systems and binds them together. Then another belief is that water is for all water users, water is vital for all water users (energy producers, farmers, ranchers, fish, wildlife, manufacturers, recreationists, rural and urban dwellers). The next belief



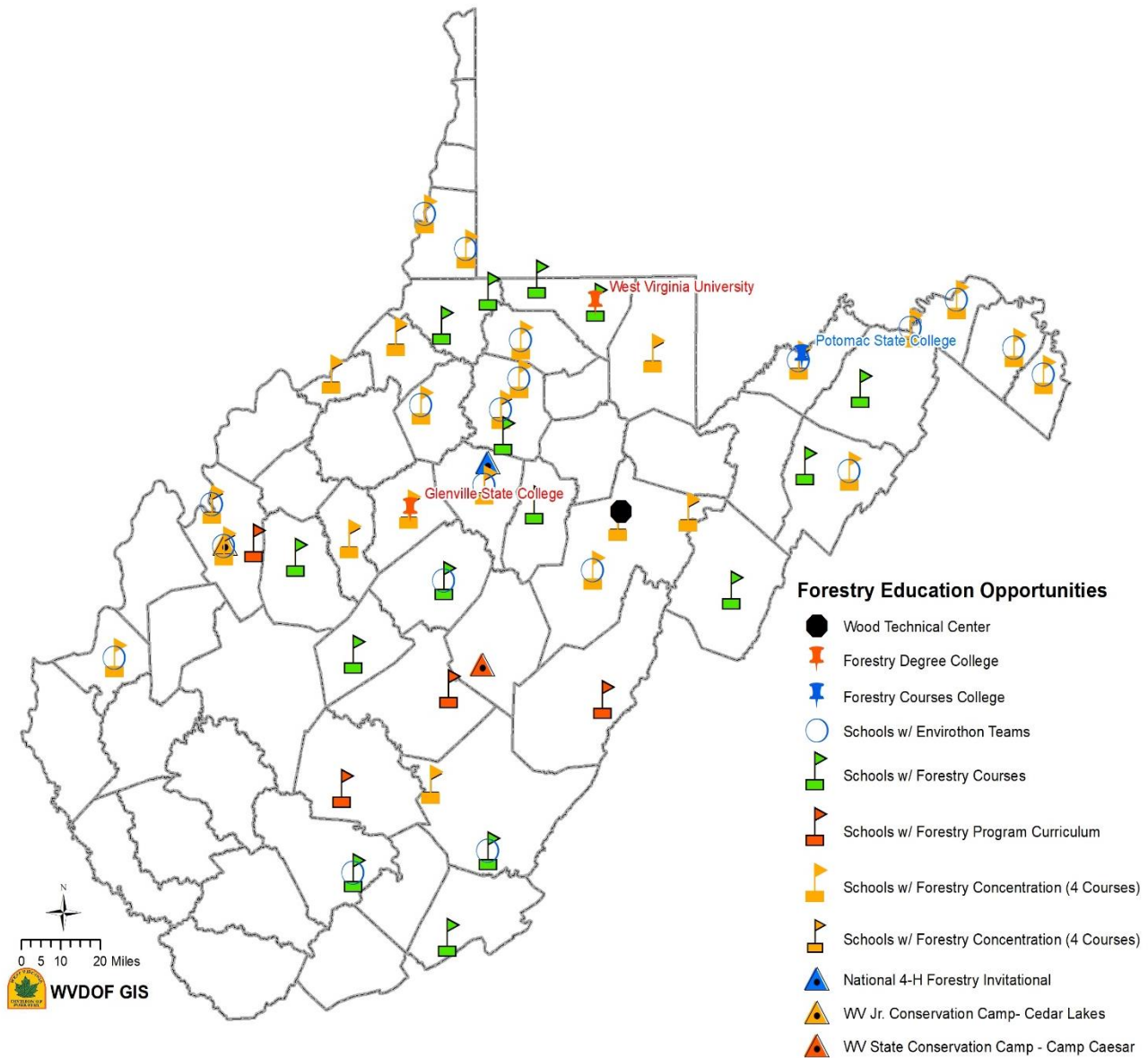
is managing water sustainability, this is critical for providing future generations with social and economic stability in the environment. The last belief is personal responsibility for water resources, we should be aware and respect water resources.

Residential Conservation Camps:

- **West Virginia State Conservation Camp** (www.wvconservationcamp.org) is one of the most unique residential camping experiences in the United States. The camp was started in 1941 and continues to be supported by a staff of professionals from various state and federal agencies. Through the years, the camp's "Outdoor - Open Door" philosophy has drawn more than 19,000 students ages 14-18 through the gates of Camp Caesar in Webster County to get a better understanding of the wise use of West Virginia's natural resources. Many campers have gone on to pursue natural resource careers. Others gained invaluable awareness of their roles as citizens and the impacts that their decisions make.
- **WV Junior Conservation Camp** is for the 11-14-year-old student and is sponsored by the West Virginia Department of Environmental Protection (www.wvdep.org). This camp takes place at the Cedar Lakes Conference Center in Jackson County and has been in existence since 1980.

Competitions: Environmental competitions provide students with opportunities to learn about the wise use of the state's abundant natural resources and to apply that knowledge in a fun, competitive atmosphere.

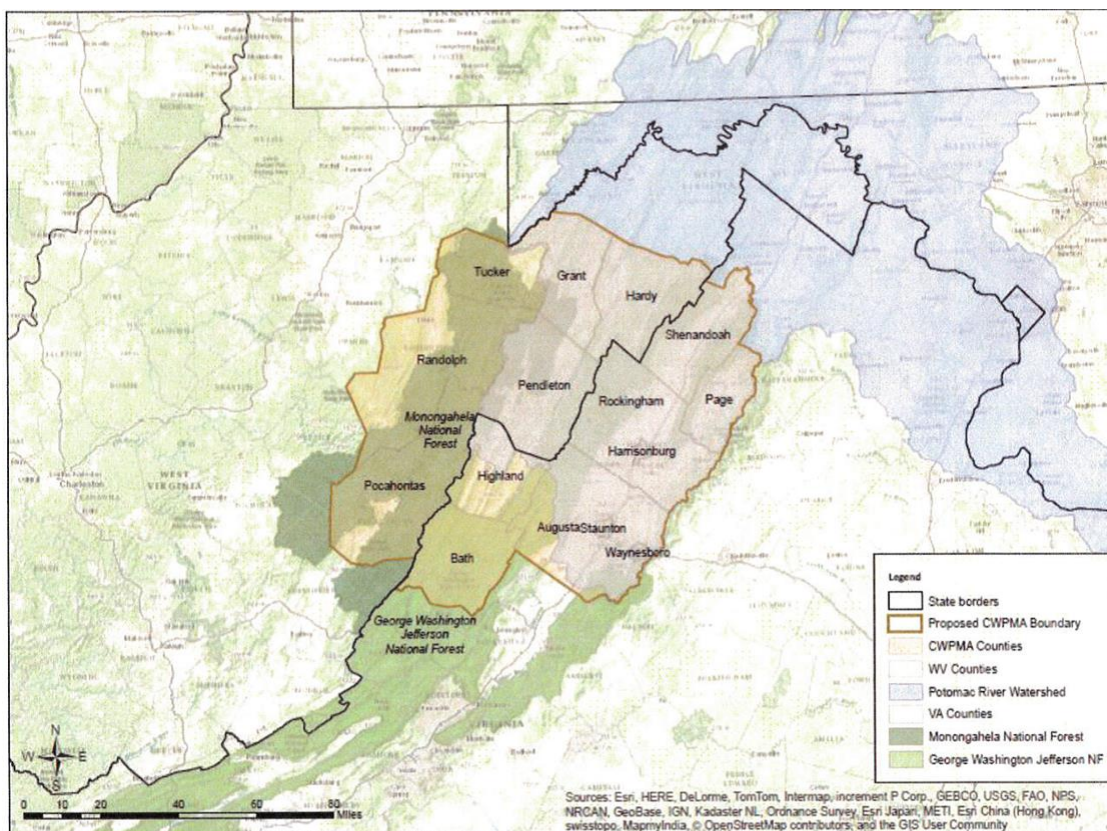
- **WV Envirothon** is a conservation education program and competition for students in grades 9-12. The Envirothon encourages students to work as a team to acquire natural resource knowledge and critical thinking skills. By participating in the Envirothon, students learn about West Virginia's diverse ecosystems and how to conserve and protect them for future generations. On average, 25 teams, each consisting of five students, participate each year. (<http://www.wvca.us/envirothon/>)
- **National 4-H Forestry Invitational:** Each year since 1980, teams of 4-H participants from across the country have come to Jackson's Mill State 4-H Conference Center near Weston, WV to compete for the National 4-H Forestry Championship (<http://www.aces.edu/n4hfi/page21.html>). Jackson's Mill State 4-H Conference Center is the first and oldest 4-H camp in the United States and is operated by West Virginia University.



Map 2.1: Forestry education facilities, conservation oriented residential camps, and other related facilities located in West Virginia (WVDOF GIS, 2020).

MULTI-STATE OR REGIONAL PROGRAMS

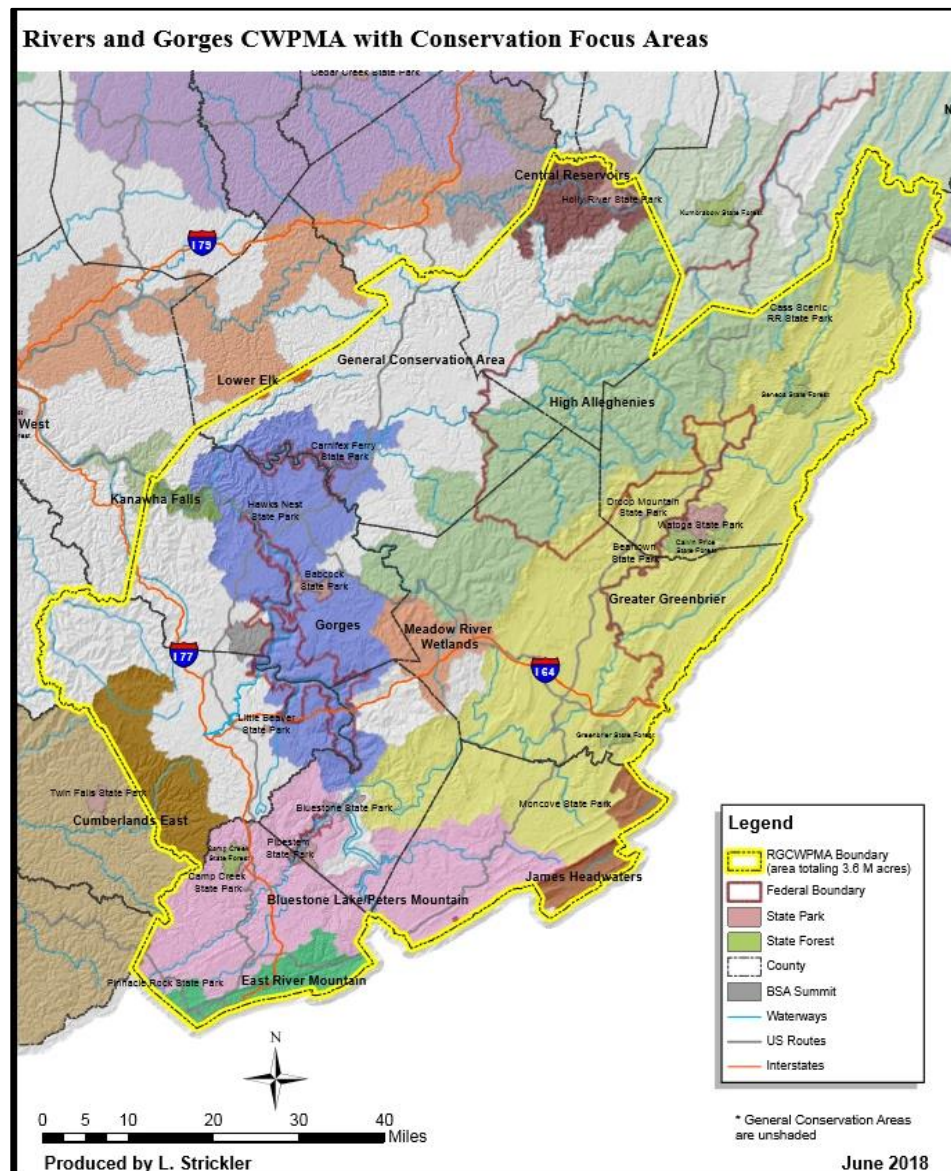
- Cooperative Weed and Pest Management Areas (CWPMA)**- The project's goals will be met by identifying and prioritizing non-native invasive species that pose the greatest biological and economic threats within the CWPMA. Partners will share resources, including educational materials, supplies, equipment (herbicide, tools, etc.), and expertise, to lessen the economic burdens for the members. Treatments for non-native invasive species will be carried out across public and private boundaries. Lastly, this project will create an outreach plan that identifies target audiences and threats from invasive species and develops best management practices to help prevent the spread of invasive species. It may also be beneficial to incorporate workshops for private landowners on pollinator, golden winged warbler and cerulean warbler issues.
- The Potomac Highlands** is taking place within Grant, Pendleton, Mineral, Hampshire, Tucker, Hardy, Randolph, and Pocahontas counties in West Virginia and Highland County, Virginia.
<https://www.phcwpma.org/>



Map 2.1: Potomac highlands cooperative weed and pest management area 2015 (Source: <https://bugwoodcloud.org/mura/phcwpma/assets/File/MOU%20Potomac%20Highlands%20CWPMA%20EXECUTED%20.pdf> accessed October 14th, 2020).

- **Rivers and Gorges** Taking place within Fayette, Raleigh, and Summers, Pocahontas, Greenbrier, Webster, Nicolas, Monroe, and Mercer counties.

<https://riversgorgescwpma.wixsite.com/rgcwpma>

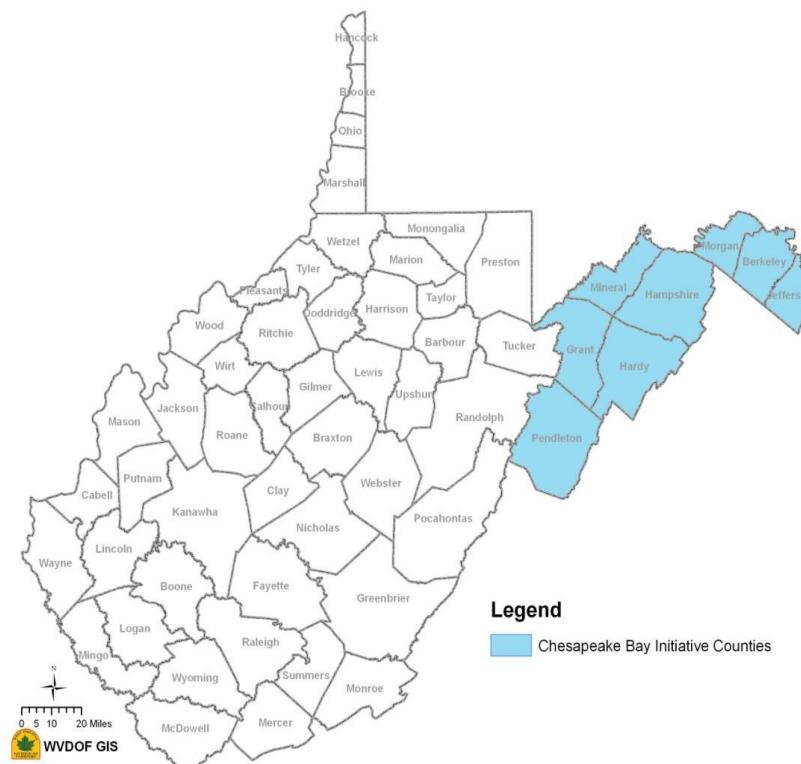


Map 2.2: Rivers and Gorges Cooperative Weed and Pest Management area in West Virginia 2018 (Source: <https://riversgorgescwpma.wixsite.com/rgcwpma> accessed October 14th, 2020).

The goals of these projects are to:

- Decrease the impacts of invasive species on native plant and animal communities, public and private forests, agricultural lands, and local economies.

- Develop and support partnerships among a diverse group of private landowners, concerned citizens, agencies, non-profit organizations, educational facilities, and local governments.
 - Increase public awareness of invasive species problems through workshops, field tours, public meetings, and by sharing information.
- **Chesapeake Bay Program** (www.chesapeakebay.net) is intended to reduce the amount of nitrogen, phosphorus and sediment entering the Chesapeake Bay. West Virginia, a headwater state in the 64,000-square-mile Bay watershed, signed on to participate in the Chesapeake Bay Initiative in 2002. Stakeholders representing the eight county Chesapeake Bay watershed area (Map 2.2) were charged with developing the *West Virginia Potomac Tributary Implementation Strategy*. Funded projects assist in meeting the Stewardship and Community Engagement goals of the Chesapeake 2000 Agreement. Projects support organizations that provide students with Meaningful Watershed Educational Experiences (MWEEs), teachers with related professional development opportunities, and resources related to the Chesapeake Bay watershed. The WVDOF participates in the WV Chesapeake Bay Program Tributary Team to help implement BMP, plant riparian buffers and educate groups on the importance of the water quality that effects the Chesapeake Bay. Education is a component of the Watershed Implementation Plan (WIP). http://www.wvca.us/bay/files/bay_documents/1298_WV_WIP3_final_082319.pdf

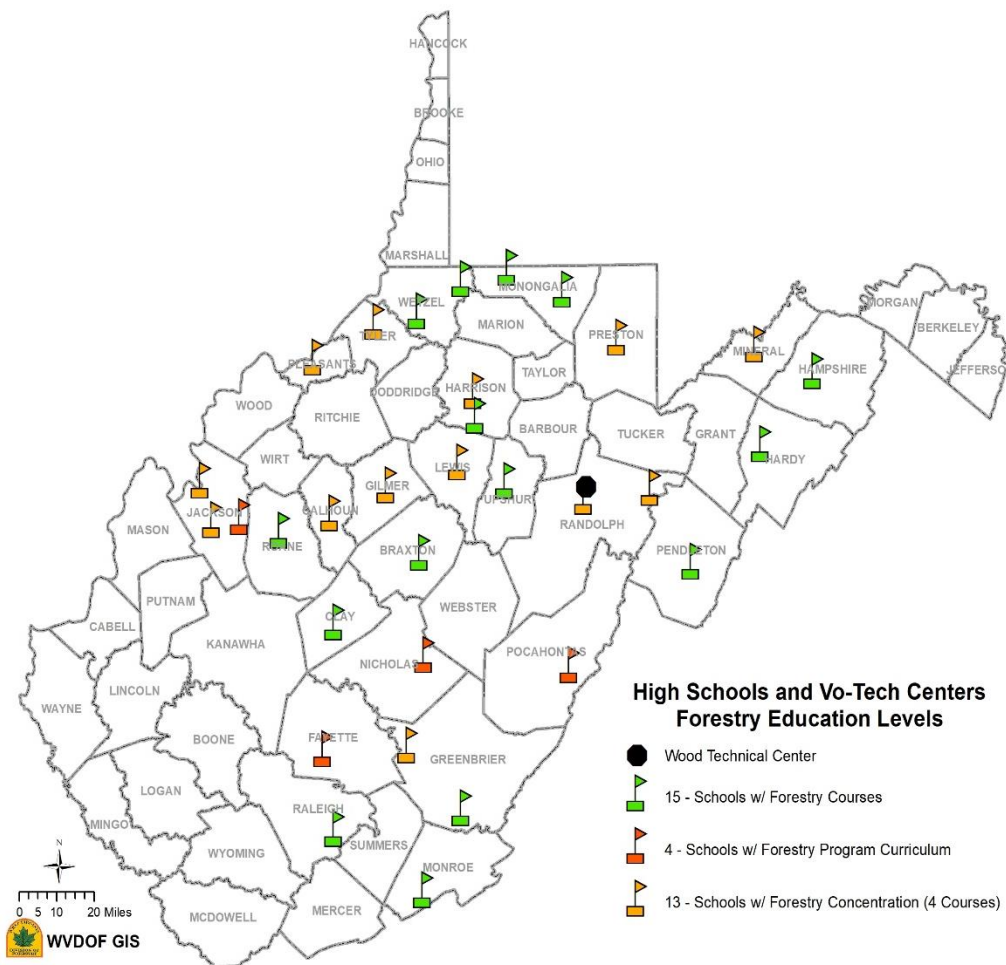


Map 2.2: West Virginia counties participating in the Chesapeake Bay Initiative (WVDOF GIS, 2009).

Sub-issue 2.1: Lack of Forestry Education in Public Schools

Students receive limited exposure to forestry-related education through projects conducted in science and math courses. Upon graduation from high school, most students do not really know what forestry is, how their actions impact the forest, or how the forest impacts them. Most students think of forestry simply as Smokey Bear, a fire tower, or the image of a Conservation Officer. Students lack an understanding about the well-rounded nature of a forestry degree and all that is involved with managing the forest.

Content Standards and Objectives for the Agriculture, Forestry and Natural Resources curriculum can be found at <https://wvde.us/technical-education/curriculum-and-industry-credentials/agricultural-food-and-natural-resources-cluster/>.



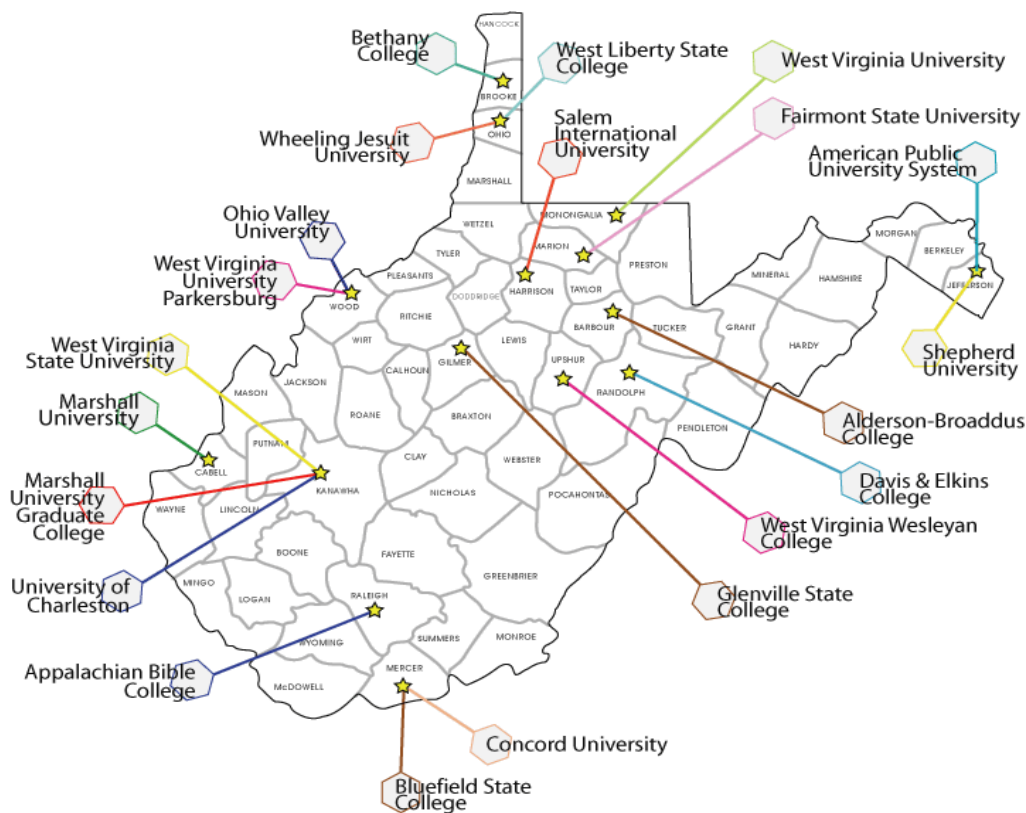
Map 2.3: West Virginia high schools and vocational-tech centers currently offering forestry programs and courses (WVDOF GIS, 2020).

The **West Virginia Wood Technology Center** (WTC) provides forestry-related educational opportunities to the adult population. The WTC is a specialized training facility located in Elkins that

offers instruction and support services to the hardwood industry. The WTC works with the State Board of Education and Regional Education Service Agency (RESA) VII through a partnership to serve adults with basic and technical training.

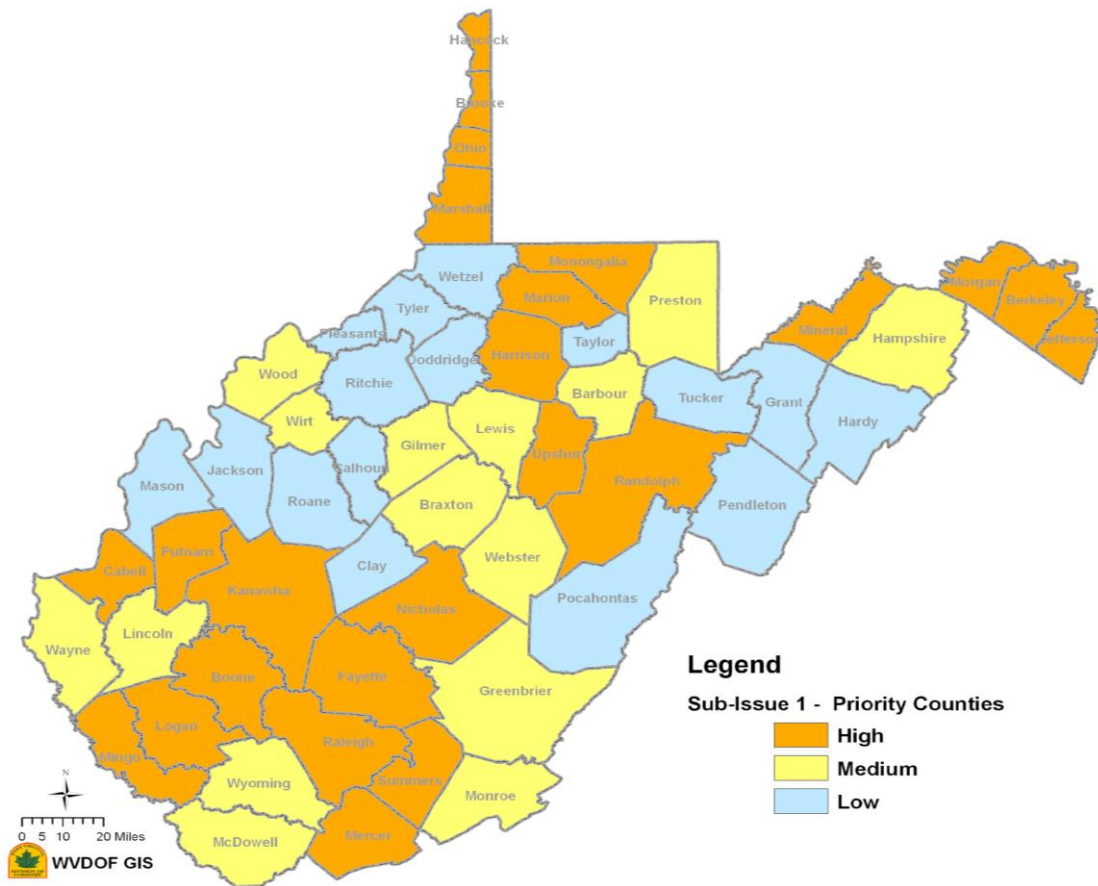
The priority focus areas over the next 10 years for this sub-issue remain the same as the initial assessment in 2009, they are:

- A. Focus forestry training in areas of rapid population growth.
- B. Focus training of forestry elements for pre-service teachers at all teaching colleges and universities within the state (see Map 2.4).
- C. Increase environmental education awareness and opportunities in conjunction with teaching colleges and the forest industry.
- D. Increase forestry learning opportunities and awareness in the southern coalfield areas. (Participation from these areas in forestry education activities, including Envirothon, camps, and FFA is low or non-existent).
- E. Identify what would be the best way to reach students, schools, and parents with forestry messages, opportunities, and literature.



Map 2.4: West Virginia colleges and universities offering teacher education.

High-priority counties for Sub-Issue 1 were identified by calculating a composite score based on the areas of focus (A – E) listed previously. Each county was given a composite score based on the number of times it was included in one of the areas of focus (Map 2.5).



Map 2.5: West Virginia counties with high priority needs for forestry education efforts. Sub-Issue 1, priority focus areas A-E combined (WVDOF GIS, 2009).

The initial input for this map looked at projections of where future population growth is expected to occur in West Virginia through 2020. As new residents relocate to the state there will be more opportunities to educate the growing population on important forestry issues. Many of these new residents are expected to come from more urbanized areas, where conservation education may have been limited or was focused on issues different from those facing West Virginians.

Also, it will be advantageous to the WVDOF to have teachers that better understand and can articulate forestry, environmental, and conservation issues. Partnering with the state's teaching colleges will allow access to pre-service teaching curricula and make environmental education opportunities and resources available to future teachers. Emphasis on the southern areas of the state, where residents have not traditionally participated in environmental education or forestry competitions in the past, should increase interest and participation and provide new opportunities for outreach.



Forestry professionals, including those in the state, private and industrial sectors, should be utilized to impart a cross-section of forestry knowledge. To some degree, PLT workshops accomplish this, but more can be accomplished by focusing on the pre-service teaching curricula that will ultimately be training the next generation of teachers.

Strategy - Sub-Issue 2.1: Lack of Forestry Education in Public Schools

Long-term Strategy 1

Attempt to reach each elementary school with forestry information.

Strategy Narrative

A fire prevention message (Smokey Bear) will be presented in grades K thru 3. Beyond those grade levels, WVDOP will provide career and general forestry information. It might be appropriate to add instructions about water quality, urbanization effects on the forest, the Chesapeake Bay, abandoned mine lands, forest health, and other topics.

Timeline

This will be ongoing with an initial goal of visiting every elementary school within the first 3-5 years, and thereafter, once every three years.

Measure of Success

Every school visited in 3-5-year rotation.

Long-term Strategy 2

Contact pre-service teaching colleges/universities to establish partnering with Environmental Education.

Strategy Narrative

In order to provide forestry education to our upcoming students it is important to start with training pre-service teaching students. It will help lay the foundation for environmental education.

Timeline

Expand to between 5 and 10 teaching colleges over the next 10 years.



Measure of Success

Partner and Train with several universities and colleges.

Long-term Strategy 3

Utilize new WVD OF Assistant State Forester for Communication and Education position to expand education programs across the state.

Strategy Narrative

WVD OF saw the need to create a position dedicated to the education and communication of forestry awareness. This position has revamped the communication efforts of WVD OF by bringing back the WVD OF website and social media platforms, Facebook and Twitter.

Timeline

This is ongoing to increase public awareness of forestry related issues and provide an educational platform to help the public understand critical forestry issues.

Measure of Success

Continue to grow the Project Learning Tree facilitator and student outreach across the state by hosting online and in-person trainings around the state keeping a focus on counties with less conservation education awareness. Also provide workshops to groups such as 4-H and scouting leaders, non-formal and formal educators, and other specialized groups as requested.

Long-term Strategy 4

Provide detailed record of PLT educational standards alignment.

Strategy Narrative

Working with National Project Learning Tree, align WV Educational Standards to Next Generation Science Standards (NGSS), Common Core and STEM curriculums.

Timeline

Within two years correlate educational standards.



Measure of Success

Write up a breakdown of what educational standards are met by the PLT curriculum lesson by lesson. This document will serve as a tool for traditional teachers to better incorporate environmental education into the classroom and meet yearly state teaching requirements utilizing pre and post surveys to measure changes in attitudes and knowledge.

Long-term Strategy 5

Incorporate newest PLT modules into regular workshop agendas.

Strategy Narrative

The WVDOF will strive to create new ideas and materials (educational trunks) to send to classrooms and school programs around the state. The materials may include but are not limited to voice over PowerPoints, Zoom conference calls, and creating packets to send to schools we cannot visit in person.

Timeline

This is being thought about currently and will continue to be thought about for the next 10 years.

Measure of Success

Create online and in classroom materials for the newest p-K through 8 module, Climate Science, Green Schools and other PLT modules as they are released. These materials can be used standalone workshops or added into standard workshop agendas.

Long-term Strategy 6

Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.

Strategy Narrative

Make videos from the West Virginia PLT activities and PowerPoints to be able to give the public access to PLT materials to use. These materials once created will be placed in many online sources for the public. These sources include but are not limited to WVDOF website, blogs, and Facebook. All to create public engagement and free sources for the public to be able to learn more about PLT even when we cannot be there in person, the public should have resources available.



Timeline

This is an ongoing project in the hopes to get the public more materials from PLT and educate the public more about the topics within PLT.

Measure of Success

Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.

Long-term Strategy 7

Continue Environmental Literacy efforts with partnership agencies and area educators

Strategy Narrative

Chesapeake Bay Program and NOAA (National Oceanic and Atmospheric Administration) provide educational standards for environmental literacy by using MWEE's (Meaningful Watershed Environmental Experiences). WVDOF will partner with these groups to encourage a better understanding of the natural environment.

Timeline

Over the next 5 years help with the planning process to get this information out to schools.

Measure of Success

Attend Chesapeake Bay partner meetings for planning MWEEs in the eastern panhandle and participate in trainings when available. Keep an open-door policy for teachers seeking resources and trainings to further enrich MWEEs for students.

Sub-Issue 2.2: Public Perceptions of Forestry

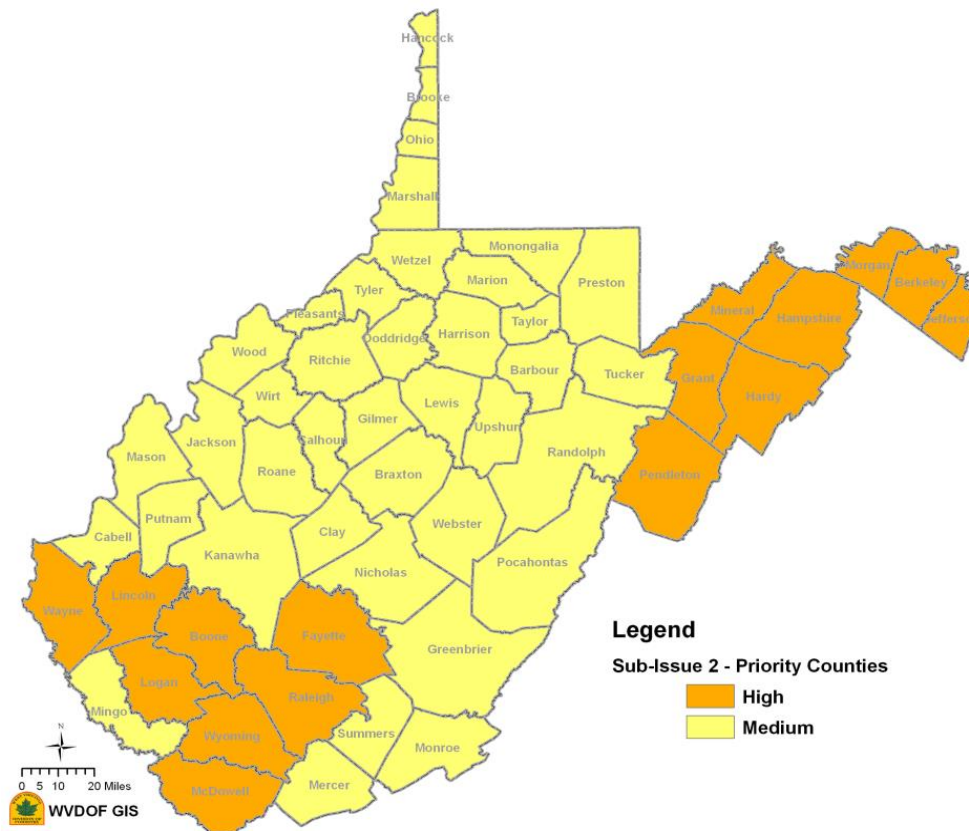
Despite living within a state that contains the third-highest proportion of forested land in the nation, many residents share common and widespread misconceptions about the inner workings of forests and the profession of forestry.

Residents' images of what a forester does and what forestry is often come directly from the media. In many cases, anti-forestry environmental groups can capture more airtime and column space in the media than foresters. Too often, what is seen in the media becomes the public's "credible source," even if that information is one-sided, inaccurate, or false.

The forestry community must find more effective ways to promote itself in a positive fashion and to train its members to be ambassadors for the profession of forestry.

The priority focus areas over the next 10 years for this sub-issue remain the same as the initial assessment in 2010, they are:

- A. Correlate WV Educational Standards to forestry activities.
- B. Focus water quality training (Meaningful Watershed Educational Experience -MWEE's) and Environmental Literacy (E-Lit) within the Chesapeake Bay counties.
- C. Coordinate forestry training with timber industry and secondary schools participating in Future Farmers of America (FFA), Vo-Ag, and 4-H programs.
- D. Increase forestry learning opportunities in the southern coalfield areas.



Map 2.6: West Virginia counties with high priority needs for improving public perceptions of forestry. Sub-Issue 2 priority focus areas A-D combined (WVDOF GIS, 2009).

The process of correlating the state's CSOs to what the WVDOF can provide would be a huge undertaking, but with current work being done on the statewide literacy plan this may be an option in the



not-too-distant future. Knowing what we can contribute to the education of students and how that would fit into their curriculum would benefit both the WVDOP and the state's educational system.

Increased awareness of the Chesapeake Bay Program will depend on additional outreach efforts in the eight Eastern Panhandle counties.

Focusing on southern coalfield counties, where opportunities to be involved in environmental education programs may be lacking, should be a priority.

Strategy - Sub-Issue 2.2: Public Perceptions of Forestry

Long-term Strategy 1

Provide Forestry Interpretive / Interaction area on all State Lands.

Strategy Narrative

West Virginia manages 7 State Forests. Part of the multiple use management of the forest encourages interpretation of forestry practices. WVDOP is beginning to provide signage on the forest to educate the public to what management practices are being used and how this affects the ecosystem.

Timeline

This will be an ongoing project to develop signage on all state forests over the next 10 years.

Measure of Success

Identify and Implement educational segments within State Forests.

Long-Term Strategy 2

Provide Forestry interpretation within the Chesapeake Bay Watershed Area.

Strategy Narrative

The Chesapeake Bay watershed includes an eight-county area in the eastern panhandle. Many natural resource projects are occurring within that area, but the public is often times unaware of these projects.

The WVDOP will coordinate with West Virginia Department of Environmental Protection (WVDEP), various citizen action groups, West Virginia Conservation Agency, and the Chesapeake Bay Program



Tributary Implementation Committee. This is in conjunction with the WV Chesapeake Bay Tributary Team WIP III plan. http://www.wvca.us/bay/files/bay_documents/1298_WV_WIP3_final_082319.pdf

Timeline

Within three years identify and support educational efforts within the Chesapeake Bay watershed.

Measure of Success

Identified and Implemented educational segments within Chesapeake Bay watershed.

Long-Term Strategy 3

Increase education and outreach overlap with state lands projects.

Strategy Narrative

Create educational trails that have activities that will teach kids as they play and walk down these trails. Create pollinator zones to teach the public about pollinators and create an ecosystem to increase pollinators in that area. Also increase signage for visitors to understand and learn the beauty of the area they are in.

Increase red spruce plantings to increase the amount of red spruces in an area and improve food and cover for many mammals and birds in West Virginia. The red spruce also helps with winter cover for White-tailed Deer and squirrels and mice consume and store seeds of red spruce.

Timeline

Starting now in 2020 and will continue where these items seem fit to increase the public knowledge and improve upon ecosystems in West Virginia.

Measure of Success

More emphasis on educational trails, pollinator zones, red spruce release efforts, and interpretive signage on state lands to be enjoyed by patrons of the state forests.

Long-Term Strategy 4

Promote public awareness at the WV Clements State Nursery by hosting public visits throughout the year to tour the facilities.



Strategy Narrative

WVDOF maintains a nursery where the citizens of WV can purchase seedling stock for planting in the State.

Timeline

This is ongoing to provide volunteer labor to assist with nursery production and encourage sales of the seedlings.

Measure of Success

Provide the public an opportunity to take advantage of the services at the state nursery. More public awareness and community involvement could help generate seedling sales.

Long-Term Strategy 5

Create outdoor education centers for public use.

Strategy Narrative

WVDOF has discussed developing educational centers to be utilized by the public and schools to promote forestry education and issues.

Timeline

Development and planning of an educational center over the next 10 years.

Measure of Success

Open outdoor learning opportunities such as a learning center, interpretive trail loop, interpretive literature, and forestry centered festival days for the public to get actively involved with environmental education if funds allow.

Sub-Issue 2.3: Lack of Internal Formal Training

Foresters are not trained teachers. However, some foresters are well-spoken and all have knowledge of forestry-related subjects, including fire prevention, forest management, and forest health issues that students and the public often find very interesting. While the WVDOF has a small number of trained instructors/informal educators, many more are needed. The WVDOF needs to focus on training more of its foresters to be ambassadors, not only for the agency, but also for the forestry profession. Foresters



must be able to communicate effectively to the public about what forestry is, how the public affects the forest, and how the forest affects the public.

Priority focus area the WVDOF will focus on in the next 10 years:

Utilize present opportunities to train foresters to prepare and carry out forestry, conservation education, and public relations programs.

Strategy - Sub-Issue 2.3: Lack of Internal Formal Training

Long-Term Strategy 1

Train those forestry personnel that would like to learn Project Learning Tree.

Strategy Narrative

To be able to spread the lessons of PLT we need to have more facilitators to teach local educators about PLT activities to share with their students or groups they are a part of.

Timeline

This is ongoing as the more facilitators we have around the state can provide more educators with a plan to spread the lessons within PLT to others they know.

Measure of Success

Have 2-3 PLT facilitators and trainers in each region throughout the state.

Long-Term Strategy 2

Coordinate opportunities for different educational delivery of forestry program materials.

Strategy Narrative

Create voice over PowerPoints, educational trunks, and packets to send to schools we are not able to visit. Possibly make videos of activities to share with the teachers to help them better understand how to



do an activity with their class. Create Zoom/Teams workshops to convert some workshops that used to be in person to a virtual platform.

The Monongahela National Forest (MNF) has also started hosting certified interpreter trainings as part of the *Mon Forest Towns* partnership. This is a national certification that could also provide opportunities to WVDOF staff and the public.

Timeline

This will be starting now in 2020 and will continue in the future as new ideas and platforms are created.

Measure of Success

Continue the in-person workshops but prepare a virtual platform for online workshops.

Long-Term Strategy 3

Coordinate online stewardship trainings for foresters and landowners.

Strategy Narrative

Manage online stewardship training for foresters, loggers, and landowners to have a new avenue for trainings. This will make it easier for some who will not have to drive a great distance to get the trainings. This also allows flexibility for the public will utilize other formats for Stewardship trainings and the ability to use other platforms for educators for greater participation in the workshops.

Timeline

2020 and add on in following years.

Measure of Success

Prepare a virtual platform for stewardship training. Increase participation by foresters and landowners.

Long-Term Strategy 4

Train current PLT Facilitators to utilize technology-based education



Strategy Narrative

With an increase in the use of online platforms, PLT facilitators should learn some of these platforms to be able to share PLT lessons to more people around the state.

Timeline

This is ongoing so PLT Coordinator reaches a wider audience and a younger generation.

Measure of Success

Encourage current facilitators to take advantage of online platforms such as PowerPoint, video conferencing programs, and polling sites to reach a wider audience for workshops. Give guidelines for making educational videos for use on the WVDOF website and with other education-based opportunities.

Sub-Issue 2.4: Taking Advantage of Current and Future Technologies

The WVDOF is utilizing new technologies to interface with the public. Current communication technology, including Zoom meetings, Microsoft TEAMS, webinars, online surveys, and blogs are the platforms used to make this happen. Technology is ever-changing and it is up to us to stay current, and so all WVDOF field foresters are now issued state cell phones to leverage mobile platforms.

Although newspapers, television and radio are staples of West Virginia's media, the use of electronic "real-time" media through personal devices is becoming more common. These new platforms and new capabilities have improved communications with the public allowing them to communicate with us. The WVDOF continues to explore every option to find the latest platforms that best fit its needs for disseminating information while also receiving feedback and critical information from the public.

Web sites: The WVDOF web site (www.wvforestry.com) is now on its 3rd version since beginning nearly 20 years ago in 2001, updated in late 2009 and the latest revamp in 2019. The WVDOF website has streamlined information to the public and within six months a report showed a 40% increase in traffic from the July 2019 release. The website also allows the public 24-hour access to submit complaints and forestry related violations with immediate notification sent to DOF field staff.

Special Operations - Our agency has also introduced a Special Operations Unit that houses our Forestry Investigators. Through the WVDOF website a new Violation/Complaint report has been introduced to allow the public to report forestry violations such as fire, timber theft, ginseng, and logging violations. The report uses Esri's ArcGIS Survey 123 application and allows for geospatial data capture, analytics, dash boards, and notifications via "webhooks" technology, all in real-time.



Priority focus areas for this sub-issue are:

- A. Identify what technologies are available throughout the state.
- B. Identify which media are best suited to reach the public with forestry messages.

Strategy - Sub-Issue 2.4: Taking Advantage of Current and Future Technologies

Long-Term Strategy 1

Continue to explore opportunities to communicate with existing and new technologies.

Strategy Narrative

Since the 2010 plan the ability to utilize new technologies to communicate with the public has increased. While our old website was useful it did not fully meet the needs of the public. In 2019 a new revamped website was introduced, and social media platforms Facebook and Twitter have been in place since 2014. All foresters now have state issued mobile devices and use them to respond to public complaints and collect data that can be communicated efficiently for timely and appropriate responses.

Timeline

This is ongoing to engage more public participation to using the WVDOF website and social media for the transmission of information to and from the public.

Measure of Success

Improved communication using technology platforms such as webinars, podcasts, surveys, and other communication outlets.

Long-Term Strategy 2

Adapt CWPMA 5-week invasive species curriculum to a fully online format.

Strategy Narrative

Converting invasive species curriculum and other resources to an online format starts by converting PowerPoints to voice over PowerPoints. Then create online packets or videos of the lessons to make everything available online compared to an in-person lesson.



Timeline

Continue working on future online platforms to match schools and increased access to an online format to be able to share the lesson to as many people as possible.

Measure of Success

Move established lessons and activities to an easily accessible online format. Make the lessons available to a broader teacher audience and to more schools across the state.

Long-Term Strategy 3

Continue upward trend in community engagement with online media content

Strategy Narrative

Create new and fun ideas for online engagement with the public. This could be live Facebook videos, website links and videos, surveys and more.

Timeline

This is ongoing too gain more content for online materials for the public to use and engage with WVDOF.

Measure of Success

Provide engaging online content for the website, Facebook, Twitter and social media blogs. Take initiative to create education and public outreach centered informational posts that encourage interaction and dialogue with online following.

Long-Term Strategy 4

Continue to explore and utilize new technologies within agency.

Strategy Narrative

The WVDOF has been utilizing new technologies to better aid the Division in completion of program mandates using web based and mobile applications. All field forester's now have state-issued cell phones allowing increased efficiencies for field work as an example. Drone technology is also now being utilized within WVDOF programs to assist with fire, logging, criminal investigations, and



management. The WVDOF will continue to explore and incorporate new technology as it becomes more accessible to improve program delivery to the public.

Timeline

This is ongoing as the WVDOF will advance current technology to better meet requirements of individual programs.

Measure of Success

More efficient program delivery using latest mobile and drone technologies for support of DOF core programs.

Long-Term Strategy 5

Include additional informative education-based videos on social media platforms.

Strategy Narrative

Create and place new videos and materials on social media platforms. These will be available for the public use.

Timeline

This is ongoing to give out more materials for the public to use and educate as many people as possible within the state.

Measure of Success

Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.

Sub-Issue 2.5: Future Issues That Will Affect the WVDOF

We recognize a lack of qualified applicants when trying to hire a position within the WVDOF. More needs to be done to attract and educate some of our up-and-coming students about forestry. Although there are residential camping situations that introduce careers and subjects to students a huge loss was the Ted Harriman Forest Industries Camp which closed in 2018. This camp allowed students to participate in

forestry activities for a week. It was supervised by WVDOF personnel, as well as academia in forestry, wildlife, water, and recreation. We need to center some our attention on recruitment.

We need to maintain our involvement in the Chesapeake Bay Environmental Literacy initiative and look to other ways to promote forestry.

Priority focus areas for this sub-issue are:

1. Statewide; with focus on the Chesapeake Bay area for Environmental Literacy.
2. Ohio River area for nursery issues.
3. Statewide; promoting future foresters within the school system.
4. AmeriCorps; through Appalachian Forest National Heritage Area with work statewide.



Photos courtesy of Ron Snow and Steve Shaluta, WV Department of Commerce.

Strategy - Sub-Issue 5: Future Issues That Will Affect the WVDOF

Long-Term Strategy 1

Include future forester centered social media material.

Strategy Narrative

Being able to share information about being a forester and what they do to promote forestry to younger audiences. Many people and children do not know what foresters do and how they are a big part of day to day life. The more people that are aware of forestry the better.

Timeline

This is ongoing to create more understanding and enthusiasm for forestry.

Measure of Success

Include posts, blogs and informational segments geared toward public knowledge of the personal, economic, environmental successes of green jobs. Promote awareness of younger reader audiences to pursue forestry related opportunities.



Long-Term Strategy 2

Re-establish a camping opportunity to educate high school students with focus on forestry education and related sciences.

Strategy Narrative

The Ted Harriman Forest Industries Camp provided students with an interest in forestry an opportunity to experience a week of intense forestry training. The goal was to encourage students to pursue an appreciation for the forestry profession. In 2018, due to many circumstances, the camp had to fold. The goal was to revive the camp and provide education to students that have an interest in forestry and encourage them to continue down that path. the camping structure would have to be re-imagined.

Timeline

This is ongoing so students pursue careers in natural resources and/or forestry.

Measure of Success

Encourage the future of forestry by enabling them the opportunity to attend a camp that would be focused on forestry. Students will pursue a career in the natural resources field.

Long-Term Strategy 3

Establish rapport with Vocational Technical Schools teachers and patrons.

Strategy Narrative

DOF has worked with Vo tech groups to educate them in forestry. We want votech teachers to have to opportunity to have a way to bring natural resources career info to students.

Timeline

Within the next 5 years provide opportunities for teachers to take the Project Learning Tree Green Jobs module.

**Measure of Success**

Maintain dialogue with Vocational Technical schools about new educational resources available to students seeking a forestry related career. Supply information about the PLT Green Jobs module for use in the classroom. Keep up to date with teaching practices utilized at Vo-Tech centers.

Long-Term Strategy 4

Continue to contract AmeriCorps Member to serve as an Outreach and Education Aide.

Strategy Narrative

The AmeriCorps member will assist and prepare materials for educational awareness and programs around the state. These may include PLT activities and workshops.

Timeline

This is ongoing so more people are spreading awareness of PLT lessons and other educational materials to teachers and the public around the state.

Measure of Success

Allow for even more educational awareness and program growth around the state. The AmeriCorps member will be in charge of creating online educational materials, as well as materials for the newest Project Learning Tree curriculums for use in workshops and by other West Virginia PLT facilitators.

Long-Term Strategy 5

Stay current on activities related to Environmental Literacy plan

Strategy Narrative

Most of this strategy would be tied to the Chesapeake Bay Program's Environmental Literacy attempt to get environmental literacy as part of the school programs.

Timeline

This is ongoing so WVDOF will have input into the current Environmental Literacy component for CBP.



Measure of Success

WVD OF and USFS having input on Env. Literacy plan/Coordinate our activities to the current State CSO's and curriculum (where could we fit in).

Goals for the Next 10 Years

Interpretation - The WVD OF is looking to utilize our state lands and nursery for more educational opportunities. We hope to complete interpretive trails, kiosks, and centers for environmental education. This also an opportunity to promote wellness in communities and at the same time help educate them about their surroundings.

Long-term Goals	Measure of Success
Increase education and outreach overlap with state lands projects	More emphasis on educational trails, pollinator zones, red spruce release efforts, and interpretive signage on state lands to be enjoyed by patrons of the state forests.
Promote public awareness at the WV Clements State Nursery	Provide the public an opportunity to take advantage of the services at the state nursery. More public awareness and community involvement could help generate seedling sales.
Create outdoor education centers for public use	Open outdoor learning opportunities such as a learning center, interpretive trail loop, interpretive literature, and forestry centered festival days for the public to get actively involved with environmental education if funds allow.
Promote volunteerism at the WV Clements State Nursery	Generate public involvement with DOF mission through volunteer days at the Clements State Nursery. Raise public awareness of tree planting and care methods, encourage community investment in our State Nursery.
Design and distribute educational literature for public use	Create and update educational literature in the form of pamphlets, informational packets, and signage to be made available to the public as a part of the WVD OF education and outreach effort.

WVDOF Programs - Preparing virtual modules for fire, logging, urban and stewardship training and becoming more versatile in the changing time and utilizing new on-line platforms. Changing delivery of critical information to a wider audience. The need to digitize content for CWPMA/citizen science. That will allow the ability to reach more schools about invasive species.

Long-term Goals	Measure of Success
Coordinate opportunities for different educational delivery of forestry program materials.	Continue the in-person workshops but prepare a virtual platform for online workshops.
Coordinate online stewardship trainings for foresters and landowners.	Prepare a virtual platform for stewardship training. Increase participation by foresters and landowners.
Utilize WVDOF Program topics for specialized student classes	Deliver specialized class agendas to after school programs or camps that utilize fire, logging, urban and stewardship training, drones, and special ops as the main learning focus.
Adapt CWPMA 5-week invasive species curriculum to a fully online format.	Move established lessons and activities to an easily accessible online format. Make the lessons available to a broader teacher audience and to more schools across the state.

Project Learning Tree (PLT)- Increase trainings to include virtual opportunities in secondary, early childhood and newer modules. One goal is to create WV specific content for PLT to enhance online educator trainings. A new PLT module will be forthcoming to address Environmental Literacy.

As a part of WVDOF long term goals for education, more PLT modules such as Green Jobs, Climate Science, Environmental Literacy, and additional secondary modules will be available through workshops to allow for older student audiences all the way up through high school who will have access to the PLT curriculum.

An increase in Early Childhood workshops would be included in the coming years. In addition to a broader age range for the PLT workshops, those parts of the state that lack the level of activity achieved in many of the central parts of the state would be a high priority in order to include more counties, especially those in the southernmost part of the state for future PLT workshop access. To help achieve the above goals, more facilitators statewide would be trained to hold their own workshops and create connections statewide with teachers, non-formal educators and other parties interested in hosting PLT trainings. Grants may help offset additional costs associated with expanding the program.



Long-term Goals	Measure of Success
Utilize new WVDOF Assistant State Forester for Communication and Education position to expand education programs across the state.	Continue to grow the Project Learning Tree facilitator and student outreach across the state by hosting online and in-person trainings around the state keeping a focus on counties with less conservation education awareness. Also provide workshops to groups such as 4-H and scouting leaders, non-formal and formal educators, and other specialized groups as requested.
Continue to contract AmeriCorps Member to serve as an Outreach and Education Aide.	Allow for even more educational awareness and program growth around the state. The AmeriCorps member will oversee creating online educational materials, as well as materials for the newest Project Learning Tree curriculums for use in workshops and by other West Virginia PLT facilitators.
Continued partnership with DEP and sister program Project Water Education for Teachers (WET).	WVDOF will continue to partner with the DEP to put on joint festivals including but not limited to water festivals and facilitator workshops with the goal of bringing more environmental education awareness to students and teachers across WV.
Establish rapport with WV Universities for teaching pre-service teachers.	Make new contacts and keep in touch with current contacts at universities in West Virginia to promote PLT facilitator workshops for Pre-service teachers. Also partner with sister programs such as PWET to provide joint facilitator workshops to Pre-service teachers.
Provide detailed record of PLT educational standards alignment.	Write up a breakdown of what educational standards are met by the PLT curriculum lesson by lesson. This document will serve as a tool for traditional teachers to better incorporate environmental education into the classroom and meet yearly state teaching requirements.
Continue to train WVDOF employees for PLT certification.	Provide workshop opportunities to all personnel. Currently around ⅓ of all WVDOF personnel have earned their PLT certification.
Train current PLT Facilitators to utilize technology-based education.	Encourage current facilitators to take advantage of online platforms such as PowerPoint, video conferencing programs, and polling sites to reach a wider audience for workshops. Give guidelines for making educational videos for use on the WVDOF website and with other education-based opportunities.
Incorporate newest PLT modules into regular workshop agendas.	Create online and in classroom materials for the newest p-K through 8 module, Climate Science, Green Schools and other PLT modules as they are released. These materials can be used standalone workshops or added into standard workshop agendas.



Website/Social Media - Increase education and outreach posts for Facebook and Twitter feeds. Increase traffic to new website and blog pages (wvforestry.com). Also, create more virtual content to assist the public with up to date information as well as important program related real-time data and maps. This information will serve as the primary passive information highway to spark interest in the WVDOF mission within our West Virginia community. We hope to expand public knowledge of current events, State Forests, agency practices and programs, up to date information on laws, and forestry specific information blurbs.

Long-term Goals	Measure of Success
Continue upward trend in community engagement with online media content.	Provide engaging online content for the website, Facebook, twitter, and social media blogs. Take initiative to create education and public outreach centered informational posts that encourage interaction and dialogue with online following.
Allow more public interaction and sharing of information through the website.	Public has more opportunity to provide feedback through surveys on to various topics and share more program related activities that could benefit the public.
Include additional informative education-based videos on social media platforms.	Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.

Environmental Literacy (EL) - EL is part of most educational standards. WV is beginning to utilize Meaningful Watershed Educational Experiences (MWEE) to help school-age students get a hands-on understanding of stewardship and sustainability issues in their surrounding watersheds. This program has been promoted in the Chesapeake Bay Program by the Chesapeake Bay Foundation and NOAA. WVDOF will be working with teachers and partners within the watershed area to bring the MWEE experience to students here in West Virginia.

Long-term Strategy	Measure of Success
Provide detailed record of PLT educational standards alignment.	Write up a breakdown of what educational standards are met by the PLT curriculum lesson by lesson. This document will serve as a tool for teachers using PLT s to better lesson plan and meet all requirements needed for a successful MWEE.
Continue Environmental Literacy efforts with partnership agencies and area educators.	Attend Chesapeake Bay partner meetings for planning MWEEs in the eastern panhandle and participate in trainings when available. Keep an open-door policy for teachers seeking resources and trainings to further enrich MWEEs for students.

Technology – All WVDOP programs are exploring opportunities for incorporating technology to make the agency more efficient, as continued budget constraints force the agency to do more with less resources and personnel. Development of web based, and mobile applications has begun and the establishment of the WVDOP's UAS program have allowed for improved access, data capture, data sharing which is enhancing the agencies capabilities.

The WVDOPs web-based Logging Operation Notification Inspection and Enforcement (LONIE) system for tracking and management of harvest notifications began in 2013. LONIE was one of the first uses of technology to improve the efficiency and delivery of the program mandated by the Logging Sediment Control Act (LSCA). This system uses a web-based interface for users to submit logging operation notifications, foresters to manage these operations for inspection and compliance, management to track program delivery, and data integration with the WVDOP's geographic information system (GIS). The newly formed UAS program leverages drone technology in the delivery the LSCA program allowing foresters to inspect logging operations more efficiently.

Many other WVDOP core programs have begun using drones in forestry, even though this segment of land management has been slow to adapt new methodologies to answer forest management questions. Realizing that certain tasks regarding trees cannot be done from the air, the WVDOP has found many tasks can be done with the use of unmanned aircraft, with current capabilities, or with additional drones that carry more advanced or specialized payloads.

The UAS program planned future use of these tools as follows:

- Add capability of thermal, for active fire management and post-fire documentation.
- Add more advanced drones to the fleet for larger scale and more precise aerial mapping.
- Complete aerial mapping of compartments on state lands or other management areas.
- Post-fire mapping (now on a smaller scale, or larger if a significant fire or investigation).
- Documentation of fire training, Smokey events, forest tours, etc.
- Use aerial imagery to enhance any of our training programs.
- Partner with outside agencies to provide aerial data for their projects (Mon. NF in the works).
- Utilizing 3D mapping technology to provide an in-depth analysis of a logging operation, showing road grades, and measuring amount of disturbance, as an example.
- Continue to explore funding sources, collaborative opportunities with other agencies and service providers, and networking with others.

Mobile platforms have allowed us to do more in the field and respond quicker with 24-hour connectivity. Data collection for accomplishment reporting is also becoming critical for program accountability, planning and management. Public involvement through the WVDOF website is being leveraged through survey submissions and “webhooks” technology connecting the public to their nearest forester.

The WVDOF is currently exploring and developing other mobile applications that will be used by the public to request services and by agency staff and for improved program delivery. Future planned surveys include:

Agency use:

- Complaint resolution form
- Daily fire reports
- UAV flight requests

Public use:

- Burn permits
- Smokey Bear contacts

Long-term Goals	Measure of Success
Expand UAV Program Technological Capabilities	Continue to use and evolve the drone program with upgrades and different uses for the UAS program. Expanded drone usage and capabilities to benefit WVDOF programs.
Continue leveraging mobile platforms expansion and website data sharing	Expanded use of mobile and web platforms such as Survey 1,2,3 to efficiently capture data, share critical information, incorporate data into GIS for analysis and provide management with better-informed decision-making capabilities for WVDOF programs administered to the public.

Future foresters - WVDOF will be working with local Vocational Technical schools to promote forestry education and continue to maintain involvement in these programs to help the forest industry in the state locate competent workers. A residential camping opportunity to showcase forestry as a career was dismantled a few years ago but a renewed effort is underway to bring that opportunity back.

Long-term Goals	Measure of Success
Establish rapport with Vocational Technical Schools teachers and patrons	Maintain dialogue with Vocational Technical schools about new educational resources available to students seeking a forestry related career. Supply information about the PLT Green Jobs module for use in the classroom. Keep up to date with teaching practices utilized at Vo-Tech centers.
Re-establish a residential camping opportunity to educate high school students with focus on forestry education and related sciences.	Encourage the future of forestry by enabling them the opportunity to attend a camp that would be focused on forestry. Students will pursue a career in the natural resources field.
Include future forester centered social media material	Include posts, blogs and informational segments geared toward public knowledge of the personal, economic, environmental successes of green jobs. Promote awareness of younger reader audience to pursue forestry related opportunities.



Bibliography

- Appalachian Forest National Heritage Area - <https://www.appalachianforestnha.org/>
- Chesapeake Bay Environmental Literacy Program - <http://baybackpack.com/mwee/what-is-a-mwee>
<https://www.cbf.org/join-us/education-program/mwee/>
- Chesapeake Bay Program - <https://www.chesapeakebay.net/>
- Drone Safety Awareness - https://www.faa.gov/uas/resources/events_calendar/drone_safety_awareness/
- Environmental Literacy - <https://wvde.us/tree/middlesecondary-learning/science/high-school-environmental-science/>
- Envirothon - <http://www.wvca.us/envirothon/>
- Jr. Conservation Camp - <https://dep.wv.gov/environmental-advocate/YEP/Pages/YouthConservationCamp.aspx>
- National 4H Forestry Invitational - <http://www.aces.edu/n4hfi/page21.html>
- Potomac Highlands Cooperative Weed Pest Management Area - <https://www.phcwpma.org/>
- Project Learning Tree – www.plt.org
- Project Learning Tree Green Jobs - <https://www.plt.org/curriculum/green-jobs-forest-careers/>
- Project WET - <https://www.projectwet.org/>
- Project WILD - <https://www.fishwildlife.org/projectwild>
- Rivers & Gorges Cooperative Weed Pest Management Area - <https://riversgorgescwpma.wixsite.com/rgcwpma>
- Teacher Colleges WV - <https://wvde.state.wv.us/teachwv/teachprep.html>
- USDA -FS Conservation Education- <https://www.fs.usda.gov/conservationeducation>
- WV Agriculture, Food and Natural Resource cluster standards - <https://wvde.us/technical-education/curriculum-and-industry-credentials/agricultural-food-and-natural-resources-cluster/>
- WV State Conservation Camp - <https://wvconservationcamp.com/>
- WV State Educational Standards – <https://wvde.us/college-and-career-readiness/standards/>
- WV State Educational Standards (preK-5) - <https://wvde.us/tree/early-learning-p-5>
- WV State Educational Standards (6-12) - <https://wvde.us/tree/middlesecondary-learning/>

State Issue 3: Sustainability of Forest Resources in West Virginia

For well over a century, the forests of West Virginia have provided several benefits to the citizens of the Mountain State. These benefits are environmental, economic, social, and recreational. In addition to traditional sustainability issues revolving around uses for forest products, societal pressures on this forest resource continue to grow, including ownership changes, fragmentation, forest health challenges, development pressures in many critical areas, non-consumptive demands/expectations, invasive species problems, and many other concerns and issues. These pressures, issues, and concerns must be dealt with in a careful and thoughtful manner to ensure a healthy and sustainable forest resource for future generations.

Sub-Issue 3.1: Growth, Yield, and Management

The discussion of this sub-issue provides a snapshot of the current status of West Virginia's forests in regard to growth, removals, ownership, management and current inventory parameters, relying heavily upon information provided by the USDA Forest Service's Forest Inventory and Analysis program. Since active management of the Mountain State's forests requires both loggers and a strong forest products industry, information about these sectors is also presented.

The determination of a primary priority area for this section entailed delineating the location of non-industrial private forest lands in the state. This will become the primary priority area for the WVDOP's Forest Stewardship and Landowner Assistance programs.

The percentage of forest land in West Virginia was as high as 94% prior to the agricultural and timber booms of the mid to late 1800s and was as low as 58% in 1907 (Figure 3.1). It has remained at the 78-80% level (about 12 million acres) for the past 30 years.

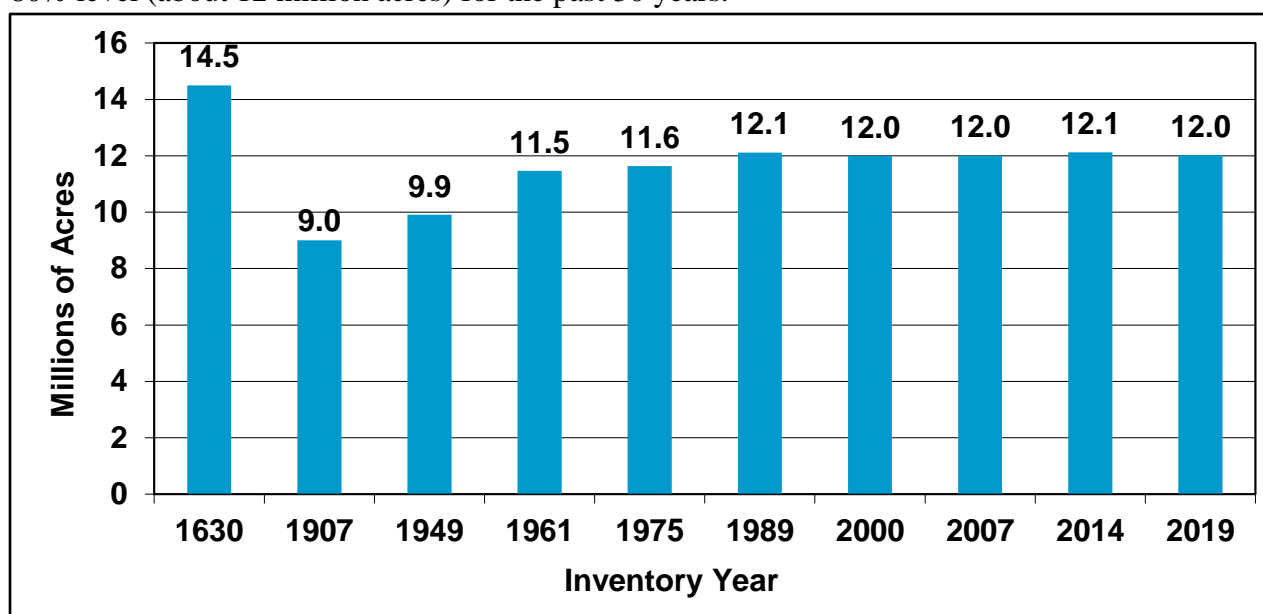


Figure 3.1: Acres of forested land in West Virginia from 1630 to the present (USDA Forest Service, 2019).

Most forest lands in the state (87%) are owned by the private sector, including 51% by “individual and family”, 35% “corporate” and 1% “other” ownerships (Figure 3.2).

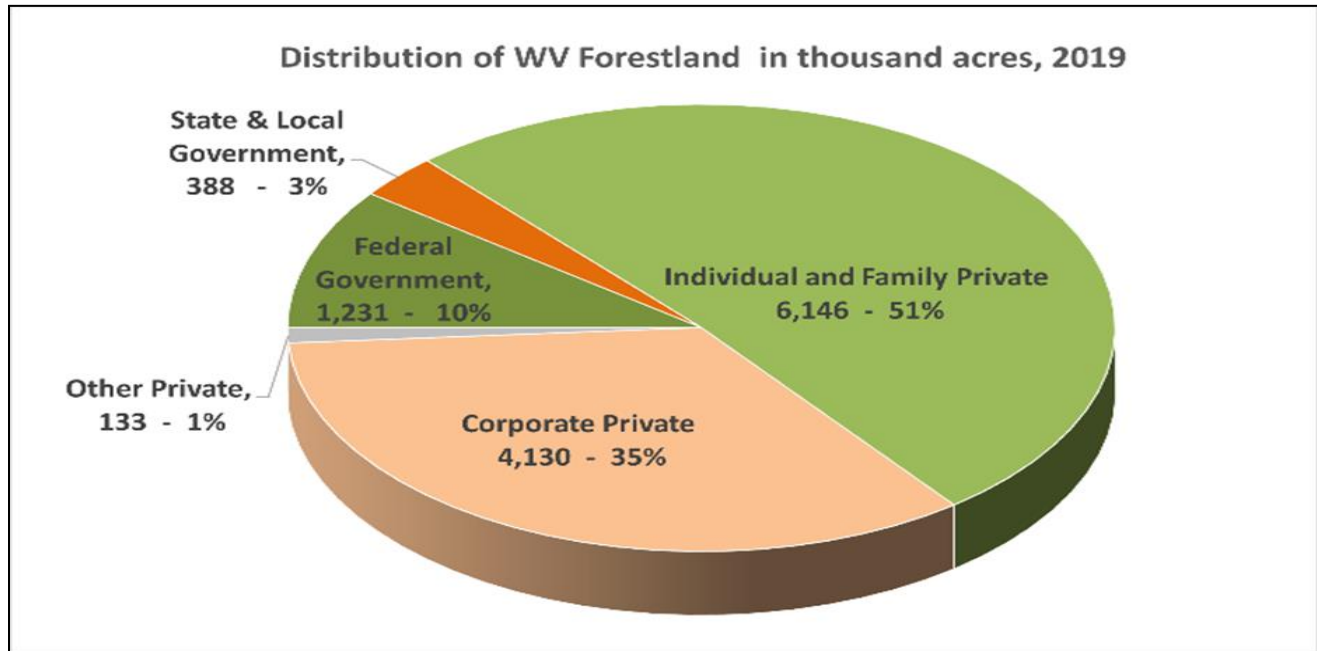
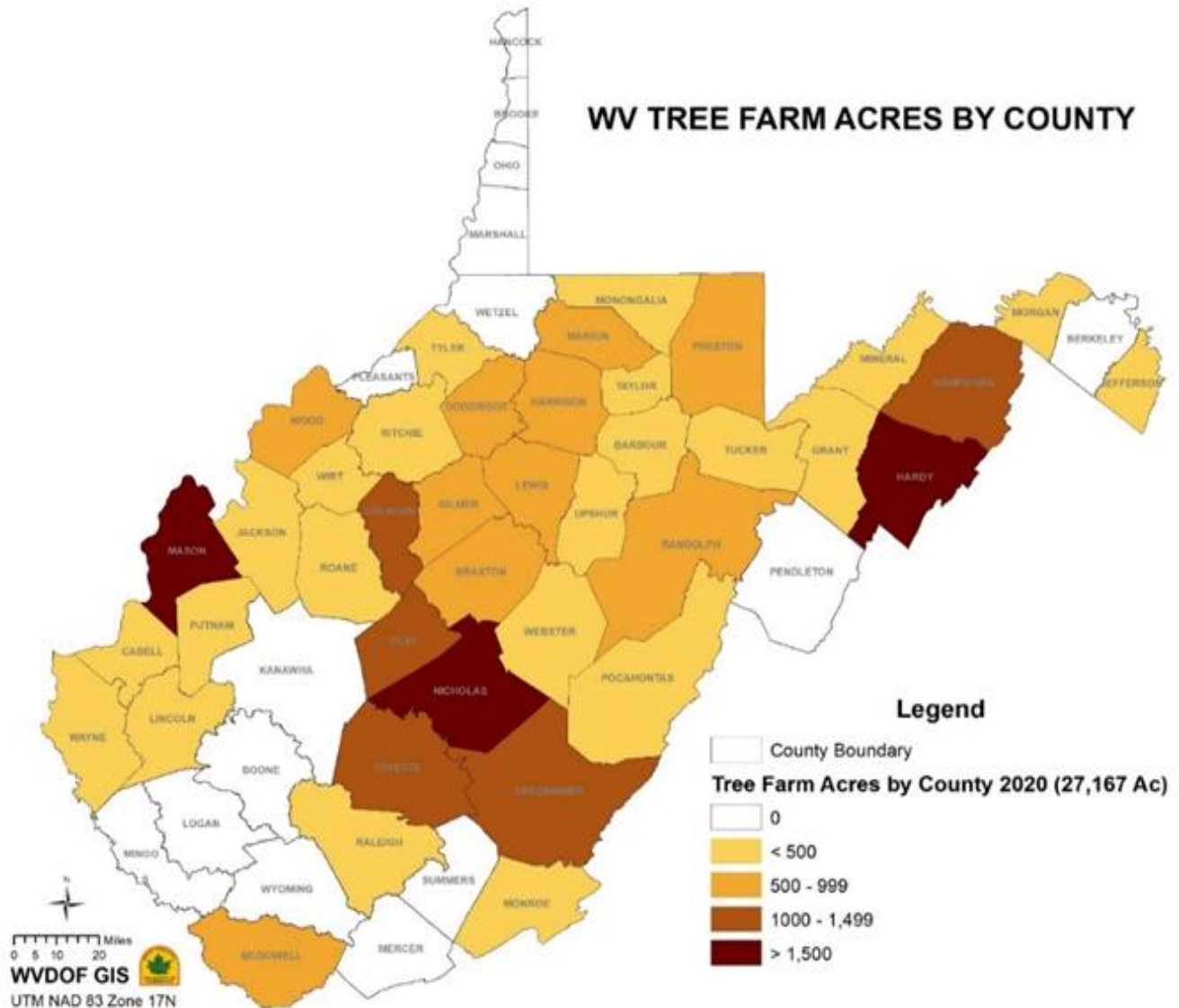


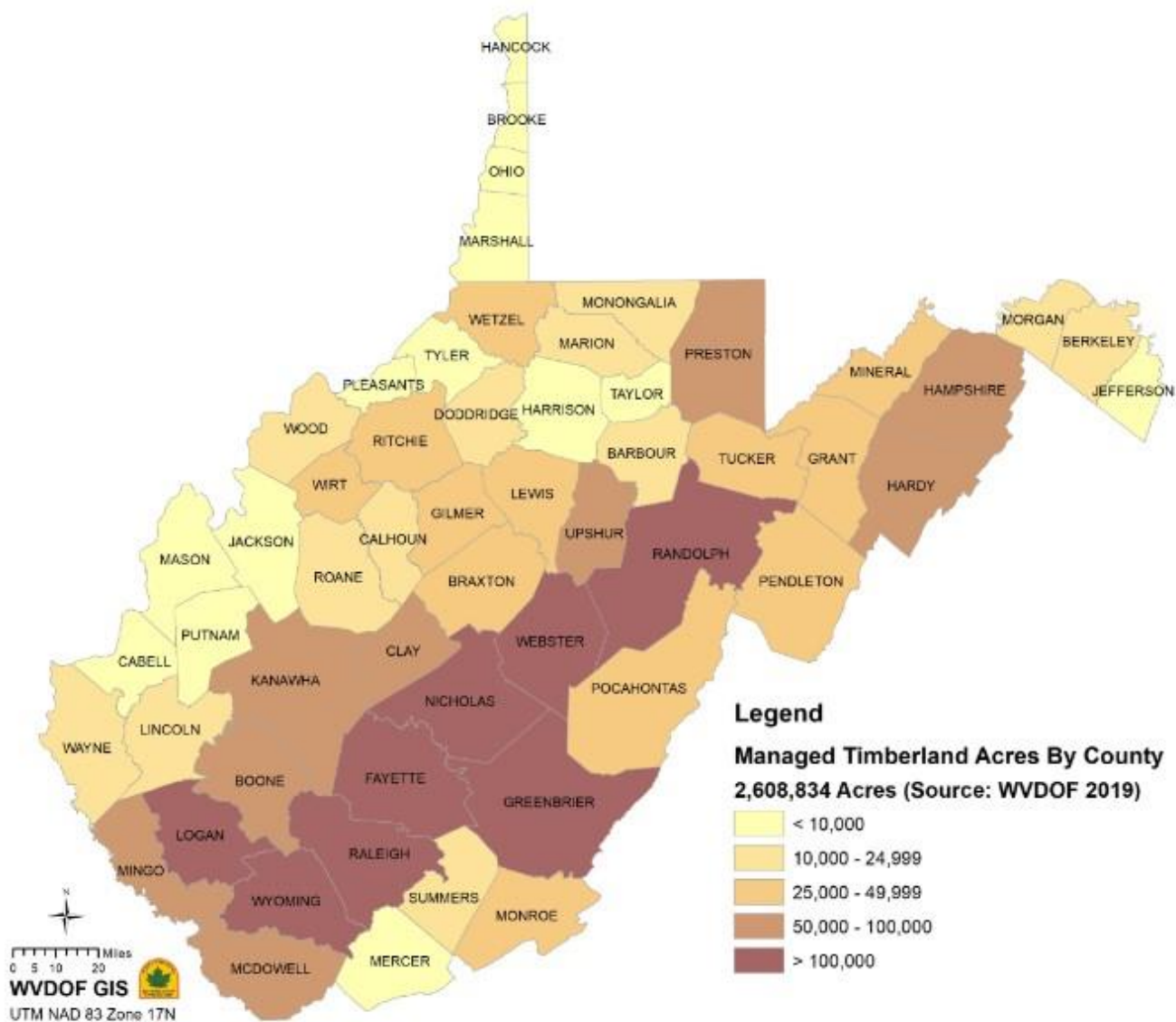
Figure 3.2: Distribution of forestland area (USDA Forest Service, FIA 2019).

Starting in about 1907, the percentage of forest land began to steadily increase to its present level of approximately 78.50%, which makes West Virginia the second most heavily forested state in the nation, trailing only Maine (Oswalt, et al., 2009). In terms of standing hardwood volume, West Virginia ranks second in the nation, slightly below Pennsylvania. This indicates an abundant hardwood resource for the state’s forest products industry.

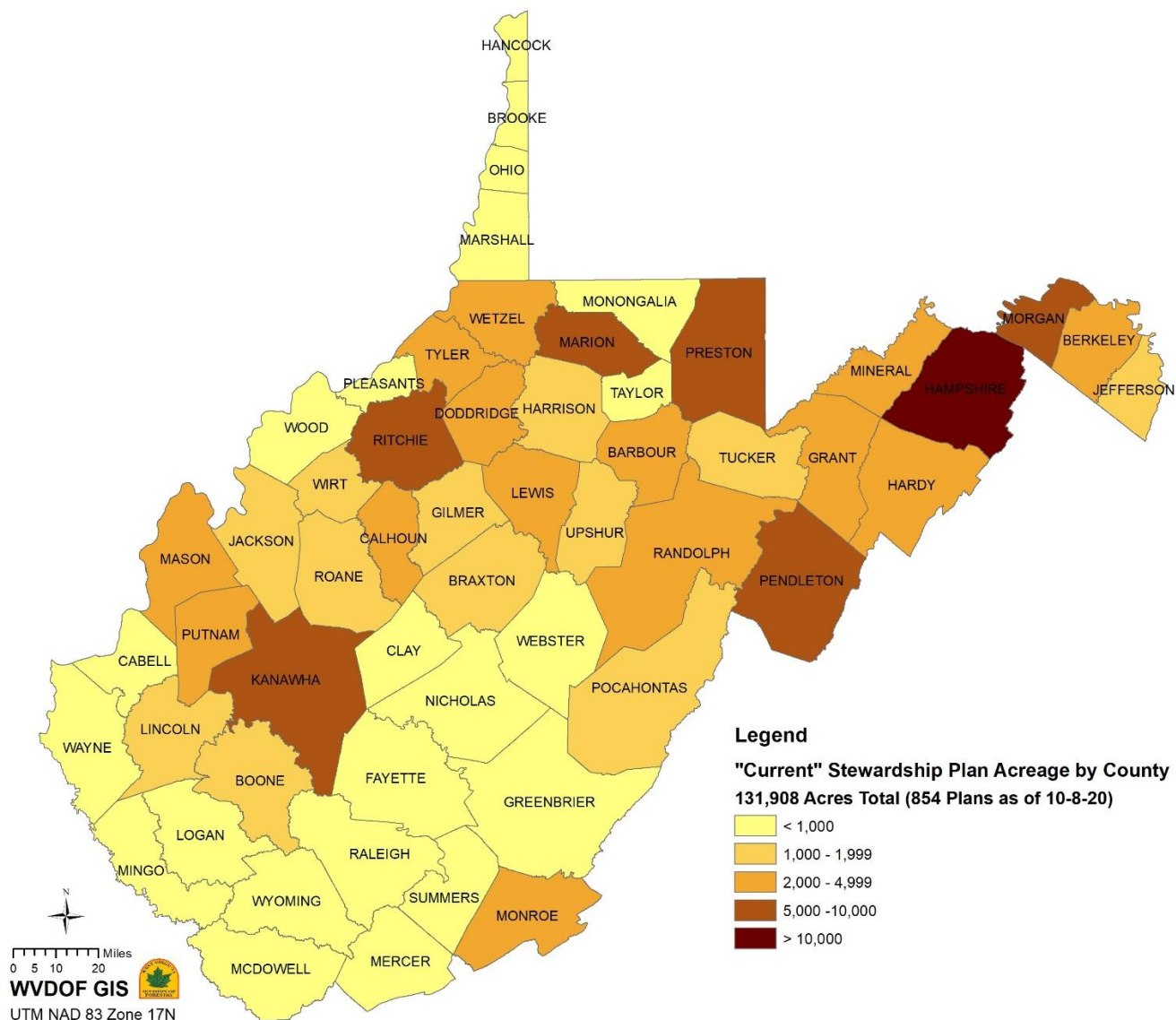
A significant amount of the privately owned forest land in West Virginia is “under some form or level of management.” This includes management for all purposes, not just timber management. Maps 3.1 through 3.4 indicate the number of acres under various management programs, by county.



Map 3.1: Acres enrolled in the American Tree Farm System (AFTS) in West Virginia in 2020, by county (WVDOF GIS, 2020 with data provided by American Tree Farm System database).



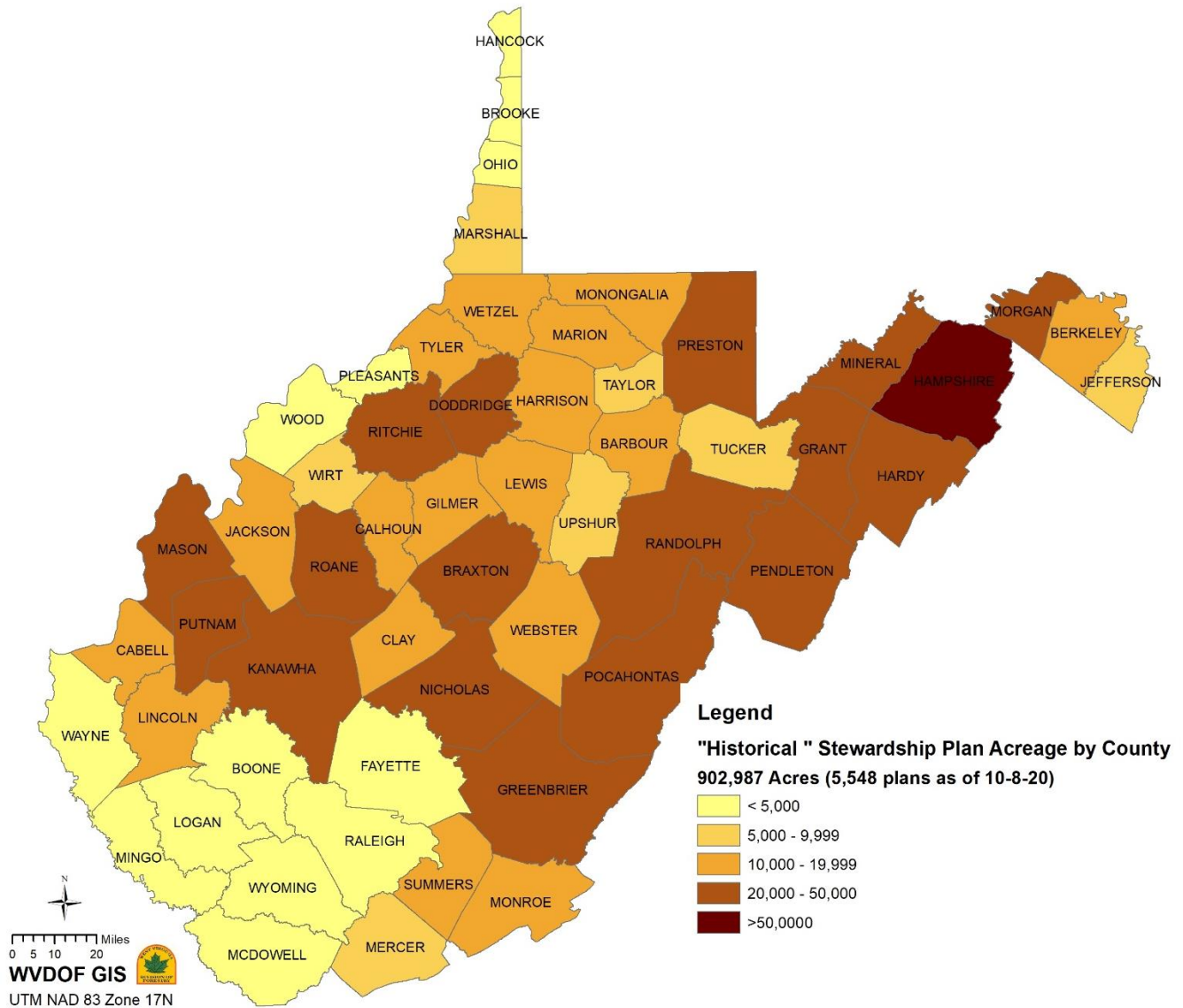
Map 3.2: Acres enrolled in Managed Timber Program in 2019, by county (WVDOF GIS, 2019).



Map 3.3: Acres in West Virginia for which a Forest Stewardship plan has been prepared in the past 10 years, by county (WVDOF GIS, 2020).

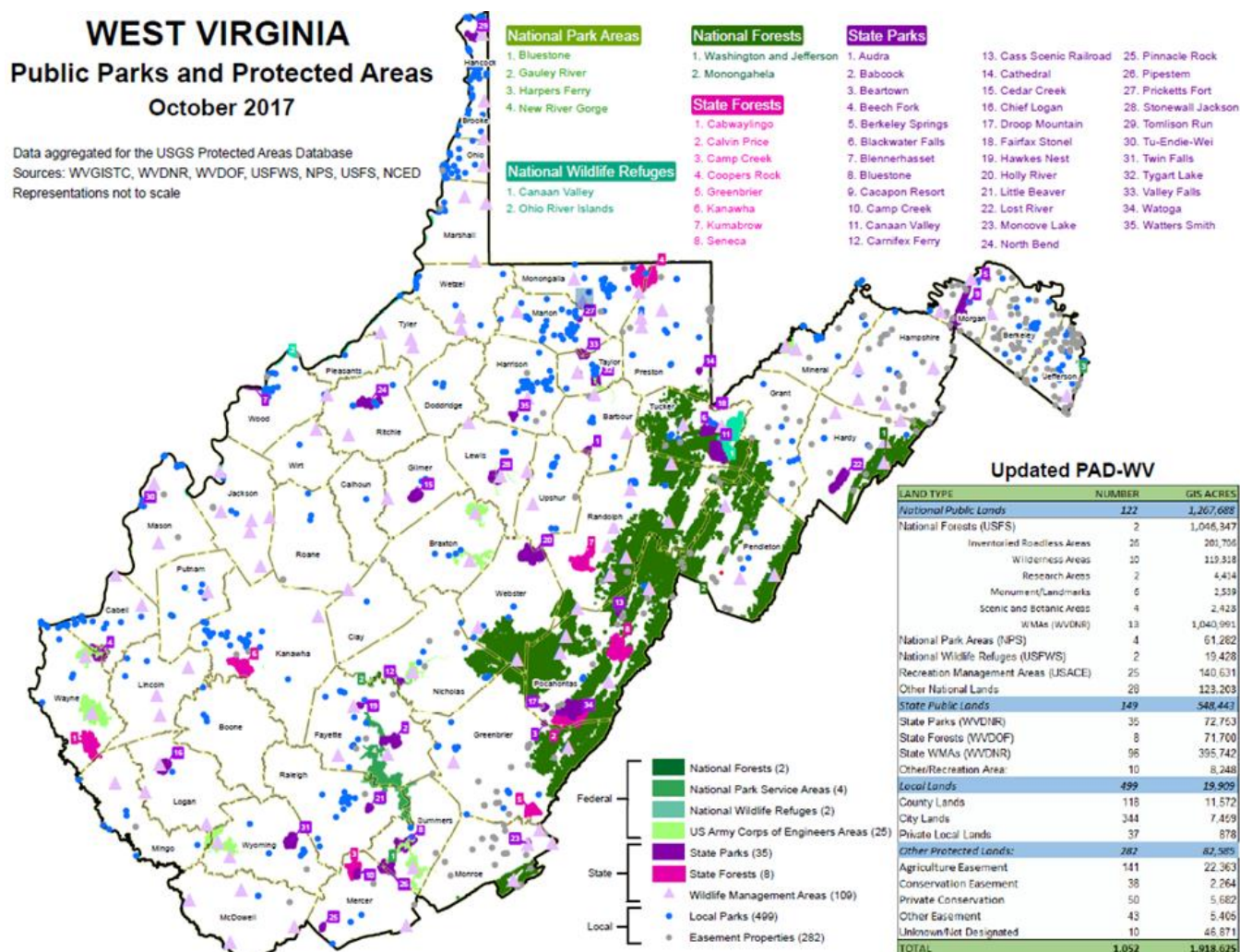
Current Stewardship plans are defined as those prepared in the past 10 years. The current number of plans is 854 totaling 131,908 acres (Map 3.3).

Since the beginning of the Stewardship Program in the early 1990s, 5,548 plans have been prepared covering 902,987 acres (Map 3.4).



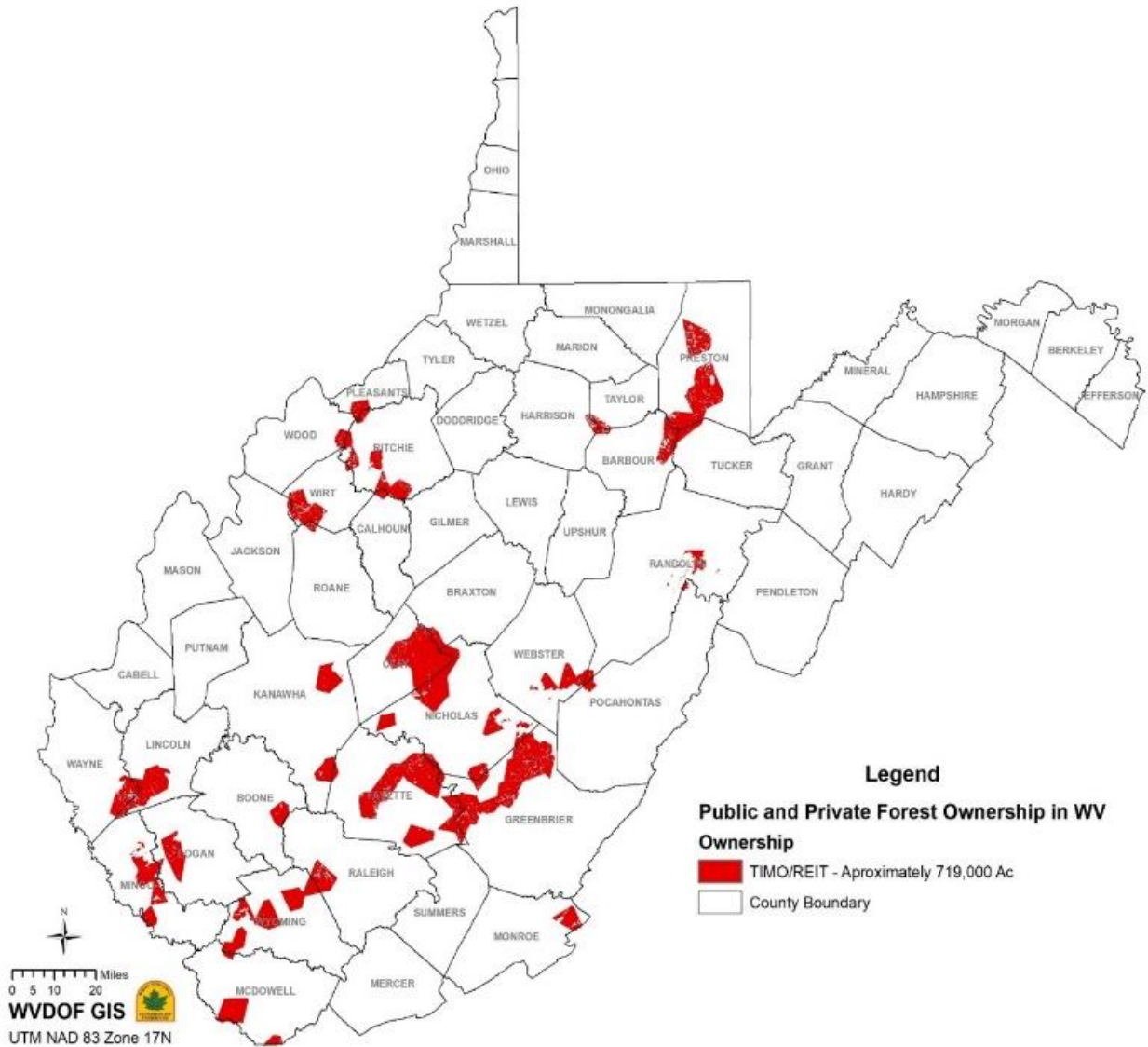
Map 3.4: Acres in West Virginia for which a Forest Stewardship plan has been prepared since the program's inception, by county (WVDOF GIS, 2020).

At this point it should be mentioned that West Virginia's public forest lands (totalling about 1.589 million acres according to the Forest Resources of The United States, 2007) are all under "management," according to the objectives and priorities of the managing agencies. Whether the priorities are recreation, wildlife management, wilderness, special habitat protection, or a variety of other purposes including timber production, the public lands are all considered to be "managed." Map 3.5 shows the categories and locations of public lands in West Virginia.



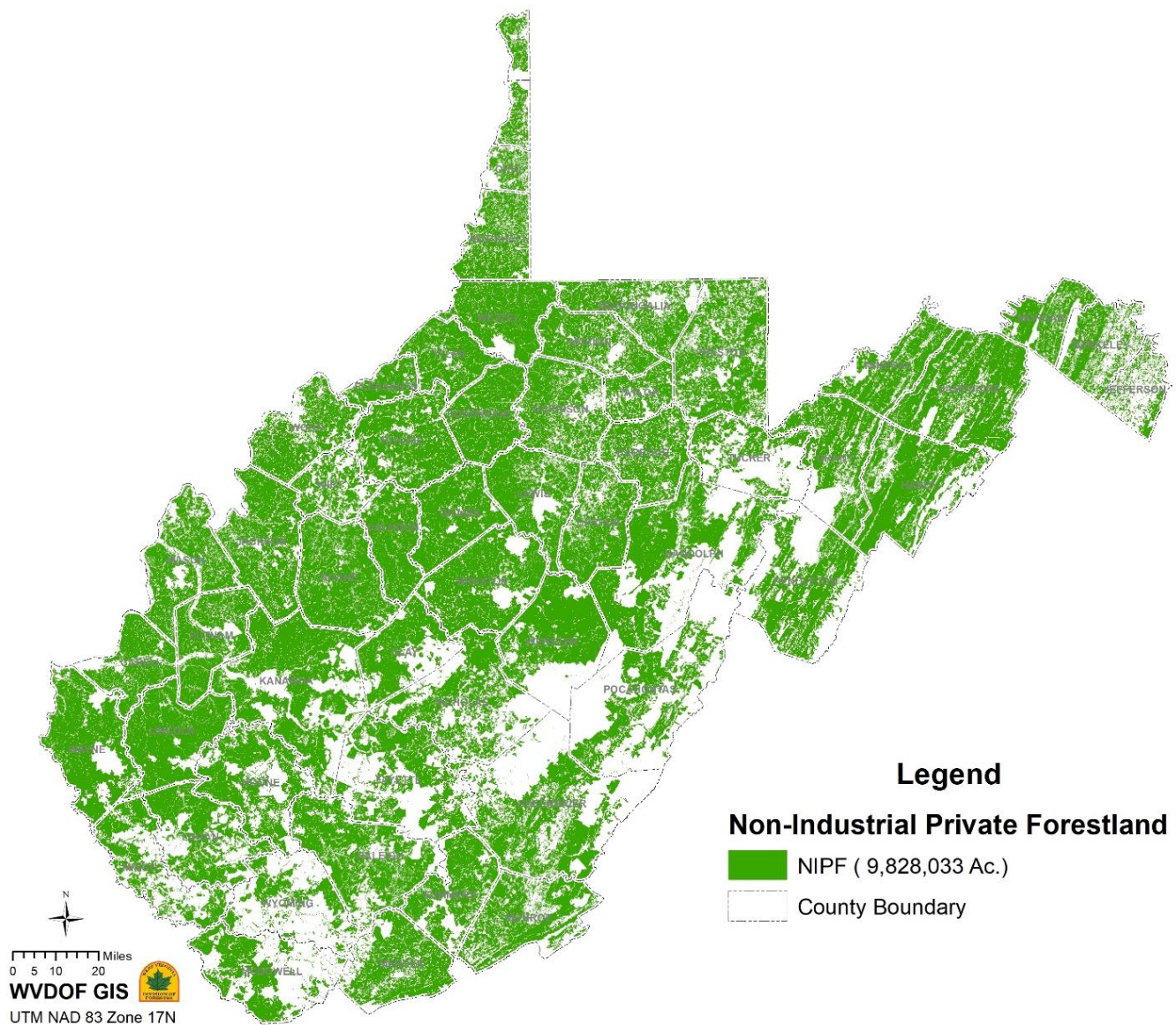
Map 3.5 Public lands under management in West Virginia (WVU GIS Technology Center, 2017).

In addition, a significant number of acres of other private lands are known to be under professional management. This includes land owned or managed by the forest products industry, timberland investment management organizations (TIMOs), real estate investment trusts (REITs), (Map3.6) and a variety of other private ownerships including non-profits organizations, limited partnerships, large family ownerships, and other institutional owners. Based upon currently available information it is estimated that approximately 60% of the total forest land in the state is “under some form or level of management.”



Map 3.6 TIMO/REIT forestland ownership in WV, (USDA Forest Service FIA 2020
https://apps.fs.usda.gov/fsgisx01/rest/services/RDW_AdminAndOwnership/Forest_Ownership_CONUS/ImageServer).

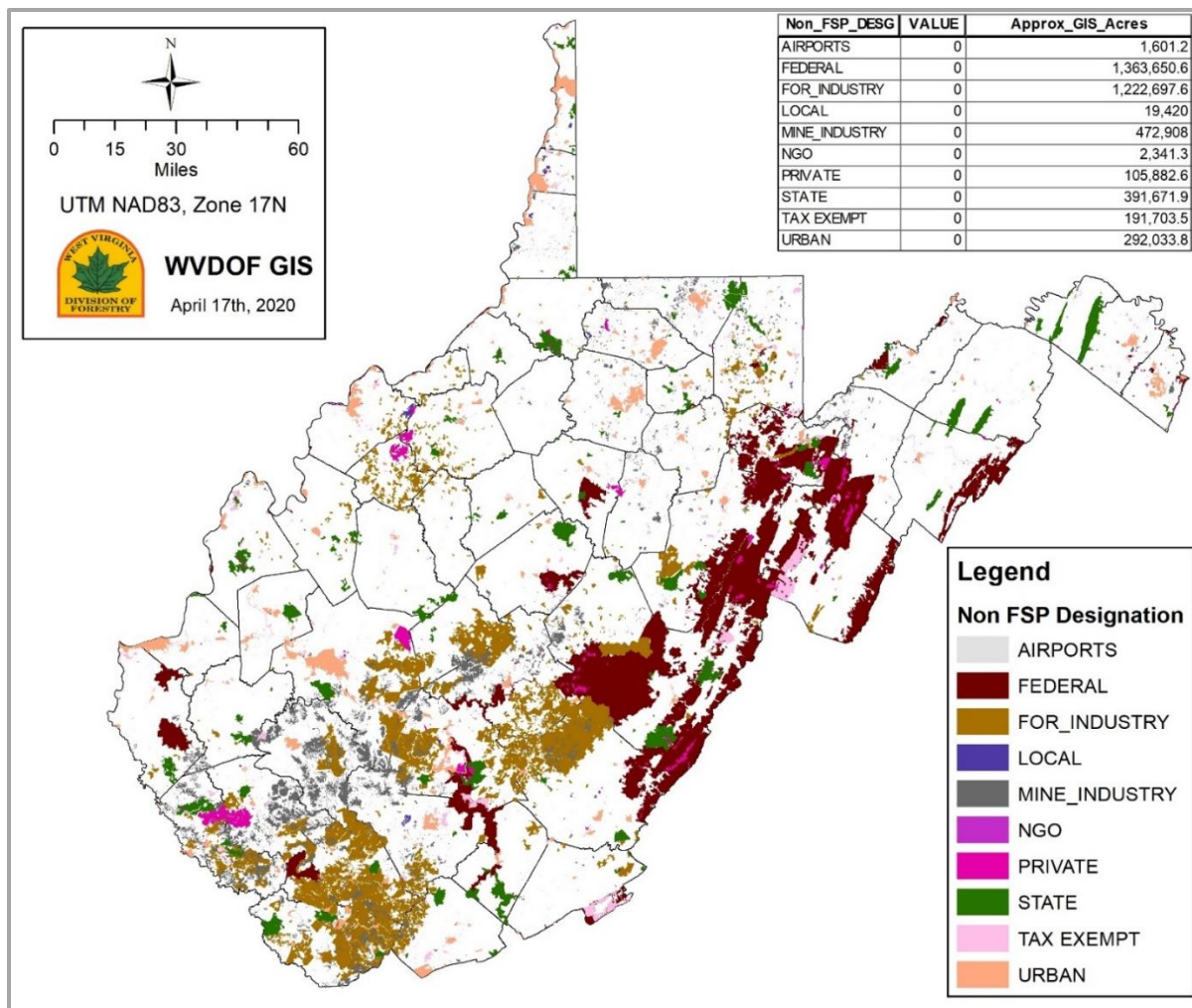
The WVDOF's focus for the Forest Stewardship Program is non-industrial private forest (NIPF) land, as shown in Map 3.7.



Map 3.7: Location of non-industrial private forestland (NIPF) in West Virginia; (WVDOF GIS, 2020f).

To estimate the acreage and geographic extent of NIPF land, the following ownership groups and land classes were subtracted from the state's total forest land acreage, as areas with no Forest Stewardship Program potential shown in Map 3.8, and listed below:

- Airports
- Federal Public
- Forest Industry
- Local Public
- Mine Industry
- NGO Protected
- Private Protected
- State Public
- Tax Exempt
- Urban



Map 3.8: Latest available GIS data for land ownership area classes classified as – airports, urban areas, company lands, mine lands, tax exempt, protected lands, and public lands were removed from total 2016 forestland and low vegetation landcover acreage, (WVDOF GIS 2020).

To prioritize federal investment and demonstrate the positive impact states are having on private forest land, NASF leadership and the Forest Service in January 2019 agreed Forest Stewardship priority areas will be no more than 50% of total eligible Forest Stewardship acres.

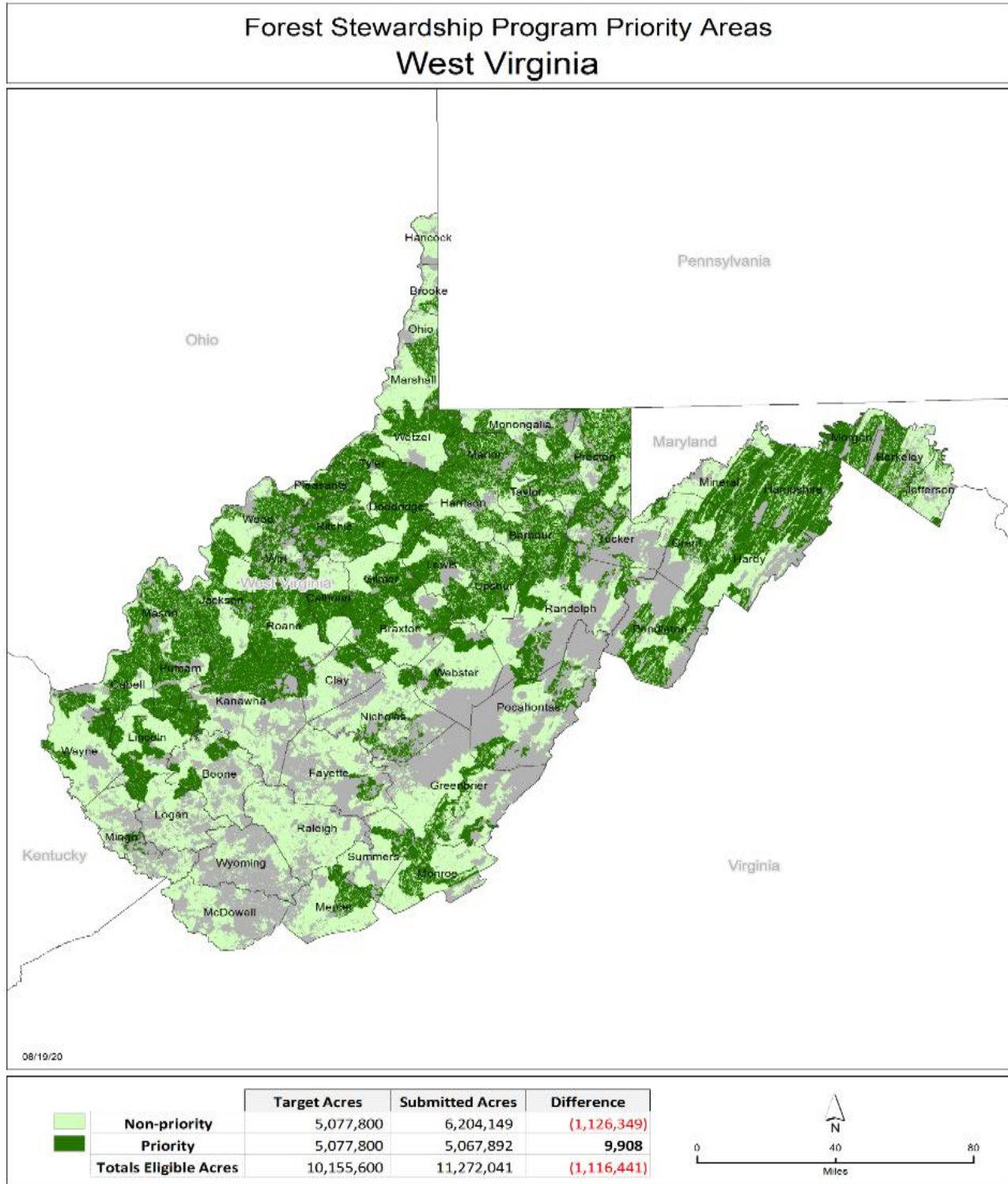
To assist the states in their efforts, a spreadsheet was shared among states with the calculated 50% priority acreage based on USDA and Forest Service estimates. West Virginia's estimated Agriculture land potential is based on USDA highly erodible agriculture land data. The Forest Service and USDA agreed that no more than 10% of highly erodible ag land is eligible for the Forest Stewardship program and can be converted to forests, riparian forest buffers or other agroforestry practices. Total NIPF Acres Holdings of 10 or more acres is based on Brett Butler's National Woodland Owner Survey 2011-2013 data. The data is derived from FIA plot data collected by state forestry agencies. Total Potential Forest Stewardship Acres is the total of Ag Land Potential and Total NIPF Acres. The 50% of eligible acres column is half of the Total Potential Forest Stewardship Acres. Compared to WVD OF estimates where total potential Forest Stewardship Acres were higher by 1.1 million acres in total, and 107,033 acres for NIPF as shown in Table 3.1.

Table 3.1: USDA and WVD OF estimates for potential Forest Stewardship Program acres (USDA FS email communications, WVD OF GIS 2020).

FS/FIA	Ag Land Potential	Total NIPF Acres	Total Potential Forest	FS/FIA B. Butler Est. Ac.
Brett Butler	10% Erodable Ag Land	Holdings >10 acres	Stewardship Acres	50% of Total for Priority
Estimates	434,600	9,721,000	10,155,600	5,077,800
WVD OF	Private Low Vegetation Class*	All NIPF Lands*	Total FSP Potential	WVD OF Priority Acres
Estimates	1,444,008	9,828,033	11,272,041	5,067,892

* Latest available GIS data for land ownership area classes classified as – airports, urban areas, company lands, mine lands, tax exempt, protected lands, and public lands were removed from total 2016 forestland and low vegetation landcover acreage.

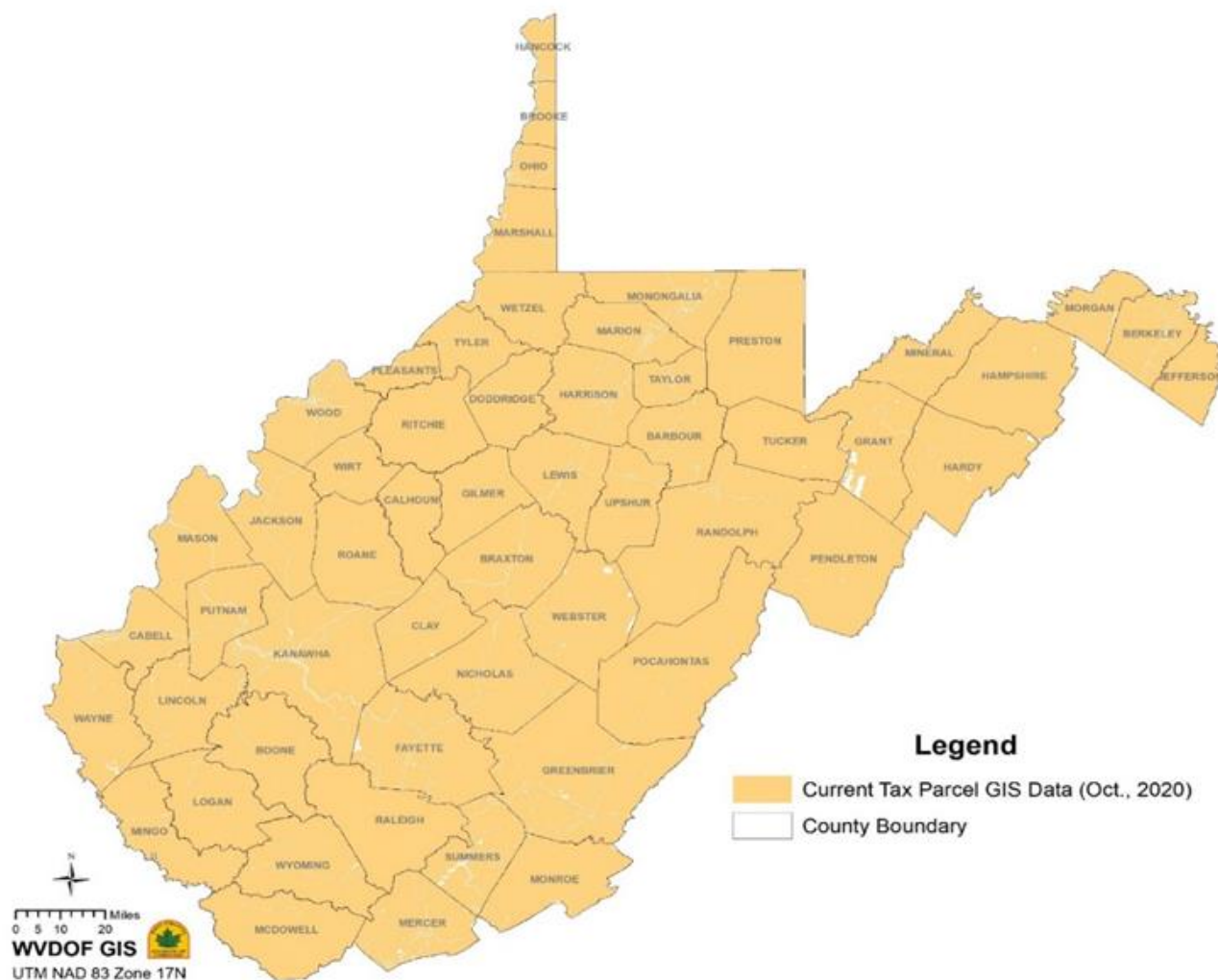
Using the new 50% target acreage of 5,077,800 a ranking scheme was developed based HUC-12 watershed boundaries with summarized data from *Forests to Faucets 2.0*, importance for drinking water stats and rankings, summarized acres and percent of watershed statistics for current and historical Forest Stewardship Program areas, Managed Timberland tax program acres and NIPF acres. A total of 324 watersheds were identified totaling 5,067,892 NIPF acres for the Forest Stewardship Program's primary focus, i.e. "priority area", for the next five years, is shown in Map 3.9.



Map 3.9: Location of Forest Stewardship Program priority areas for WV based on HUC-12 watershed rankings (WVDOF GIS, 2020).

Counties which contain a high percentage of their land area in public land, mined lands, and other non-NIPF lands include: Boone, Clay, Fayette, Greenbrier, Kanawha, Logan, McDowell, Mingo, Nicholas, Pendleton, Pocahontas, Raleigh, Randolph, Tucker, Webster, and Wyoming.

Complete tax parcel information has allowed the WVDOF to delineate all NIPF lands in the state (see Map 3.9). This map will be updated annually as properties are sold and/or subdivided farther.



Map 3.10: Extent of available county tax parcel data in West Virginia. (WVU GIS Technology Center, 2020).

Cost share programs have been an important tool for inducing NIPF landowners to actively manage their forests. Historically, there have been programs such as the Forestry Incentives Program (FIP), Stewardship Incentive Program (SIP), and Forest Land Enhancement Program (FLEP), as well as associated programs including, the Wildlife Habitat Incentives Program (WHIP), Conservation Reserve Program (CRP), and Conservation Reserve Enhancement Program (CREP). Currently, the primary

forestry cost share program available to the private, non-industrial forest landowner is the Environmental Quality Incentives Program (EQIP).

The WVDOF is working closely with the USDA Natural Resources Conservation Service (NRCS) to ensure that private landowners have access to cost share funding and financial assistance through EQIP for a variety of forest management purposes. Some of the approved EQIP practices are tree planting, invasive species control, crop tree release, grapevine control, cull tree removal and other related silvicultural and timber stand improvement practices. Table 3.2 shows the extent of private landowner cost share assistance in the state under the EQIP program since 2011.

Table 3.2: Acres treated under the environmental quality incentives program in West Virginia since 2011 (Aldinger, 2020).

<u>Environmental Quality Incentives Program (EQIP) Accomplishments in West Virginia</u> (Information provided by NRCS, September 2020) All numbers are - Acres					
Fiscal Year	Tree and Shrub Establishment	Forest Stand Improvement	Site Preparation	Riparian Forest Buffer	Access Control
2011	122.5	1144.9	9.0	0.0	880.3
2012	52.8	1217.0	16.0	0.0	1290.7
2013	5755.5	668.5	10.4	0.0	1532.7
2014	31.2	726.9	20.6	0.0	322.7
2015	92.5	1233.0	66.1	0.0	648.2
2016	73.2	580.9	12.5	0.0	536.8
2017	144.2	798.1	18.9	0.2	1443.6
2018	105.8	526.7	25.2	0.3	1227.1
2019	50.3	709.3	44.4	0.2	1161.8
2020	31.3	672.9	15.2	4.6	1388.4

For the first several years of the EQIP program, the focus was primarily on agricultural practices, rather than forestry. In recent years, particularly with the passage of the 2008 and 2018 Farm Bill, forestry practices have begun to receive more attention. Also, there have been recent joint agreements between NRCS, USDA Forest Service, National Association of State Foresters (NASF), and the National Association of Conservation Districts (NACD) to increase the use forestry practices under EQIP. WVDOF has seen substantial increases in forestry related EQIP practices in federal fiscal years since 2010.

Active management of forest resources to produce wood products is a key component of the state's economy. Timber harvesting must be done using sound management techniques and best management practices to ensure the long-term health, sustainability, and productivity of West Virginia's forests. The forests provide many benefits in addition to forest products. Management decisions must ensure that all forest benefits are sustainable into the future. In addition, development pressures must be dealt with in a planned and comprehensive manner to minimize the impacts of fragmentation (both physical and in terms of ownership) on the future viability of managed forest lands.

Overall, the state's forests are well-stocked and timber growth currently exceeds harvest removals (Figures 3.3, 3.4 and 3.5). Across a range of species, the annual growth of forests in West Virginia exceeds removals by an average ratio of 2.2:1 (Figure 3.3).

Average Annual Growth and Removals by species and G/R ratio

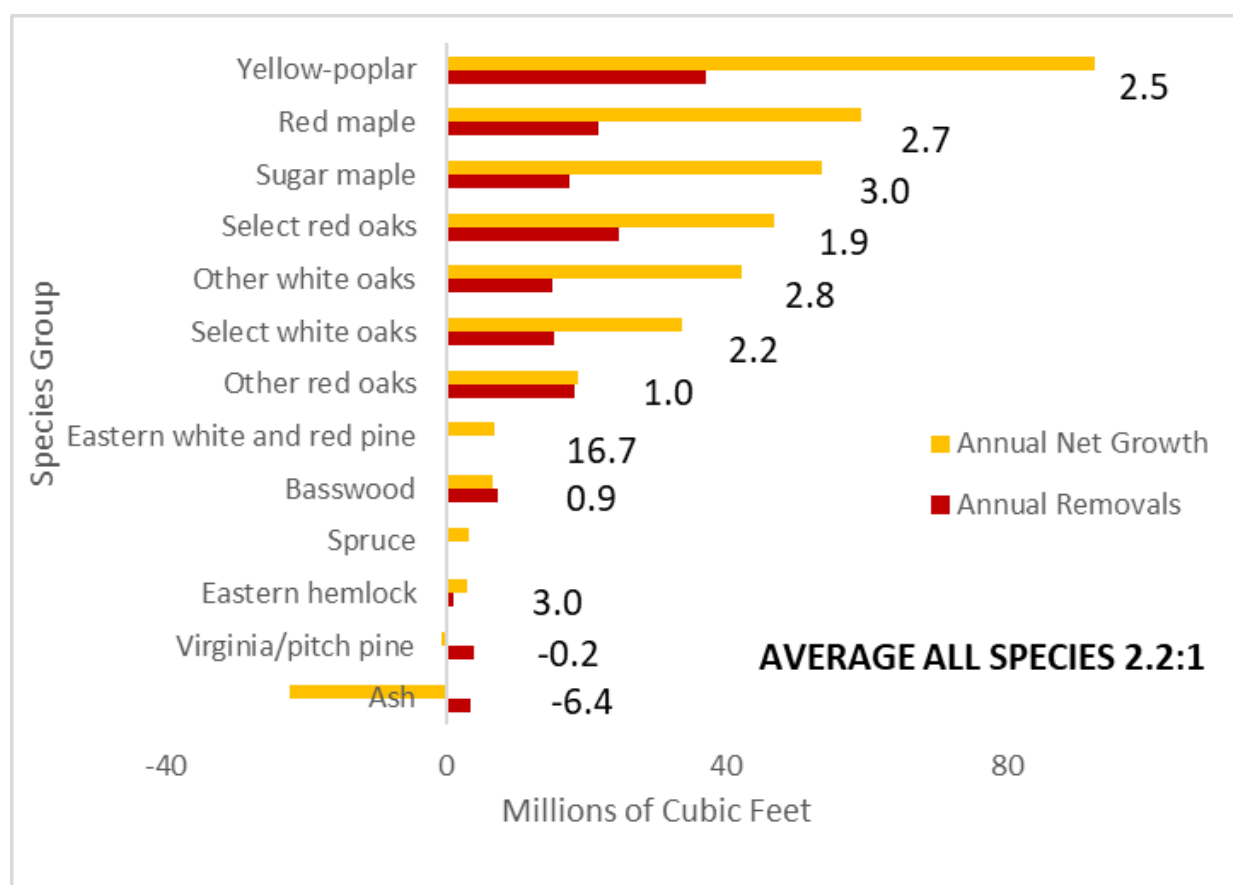


Figure 3.3: Average annual timber growth and removals by species in West Virginia. Numbers within the figure indicate the ratio of growth to removals for each species. The large loss of volume in the ashes is due to Emerald Ash Borer (Morin, 2020).

Figure 3.4 indicates cubic foot volume changes for a few species from 2009 to 2019. While some species volumes have increased and others have decreased, the overall cubic volume for all tree species in the state has increased by 9%. The decline in the volume of eastern hemlock and Virginia pine is likely due to severe insect infestations that have occurred since 2009. The average volume per acre of West Virginia's forests has continued to increase from 1949 to the present (Figure 3.5).

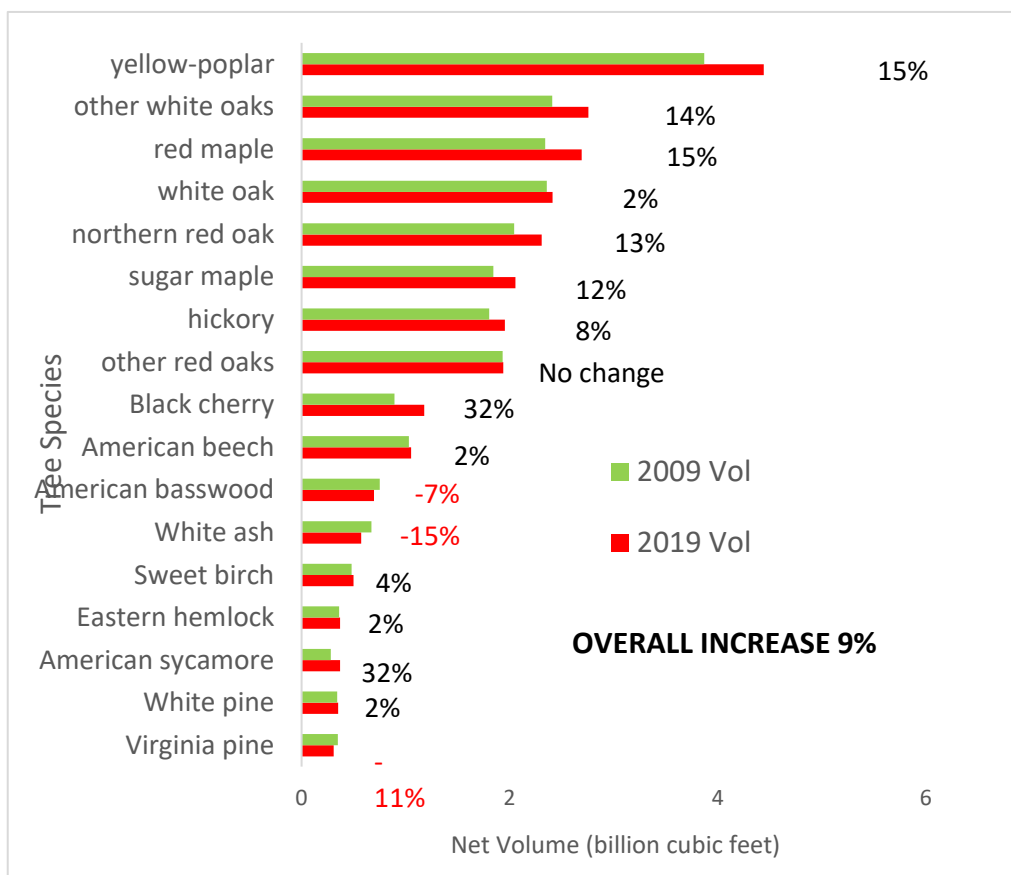


Figure 3.4: Volume change from 2009 to 2019 for various species in West Virginia (Morin, 2020).

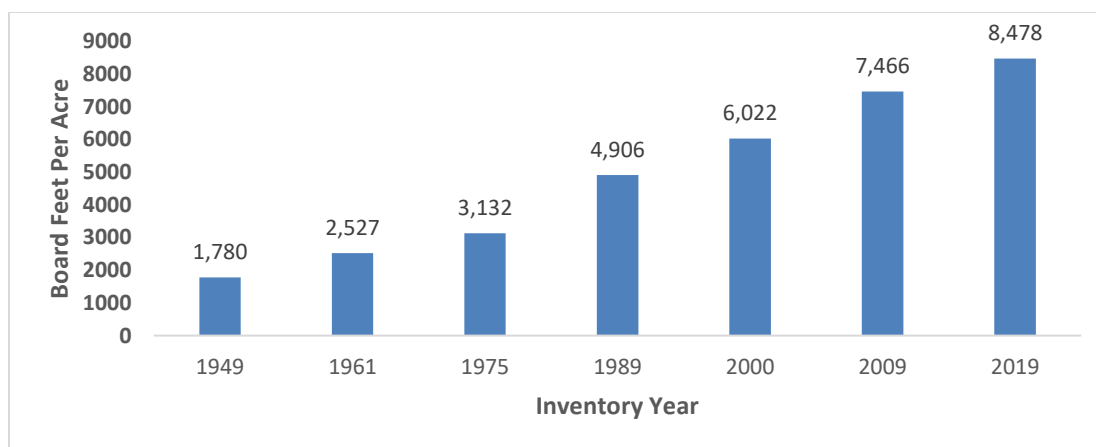


Figure 3.5: Average board foot volume per acre in West Virginia for selected years from 1949 to 2019 (Morin, 2020).

The state's forests have been increasing in tree-size class since at least the early 1960s (Figure 3.6). Currently, 81% of the state's forests are in the sawtimber tree-size class, up from less than 50% prior to 1975. The sapling/seedling size class has decreased significantly since 1961, which could have some implications for future forest management and regeneration activities.

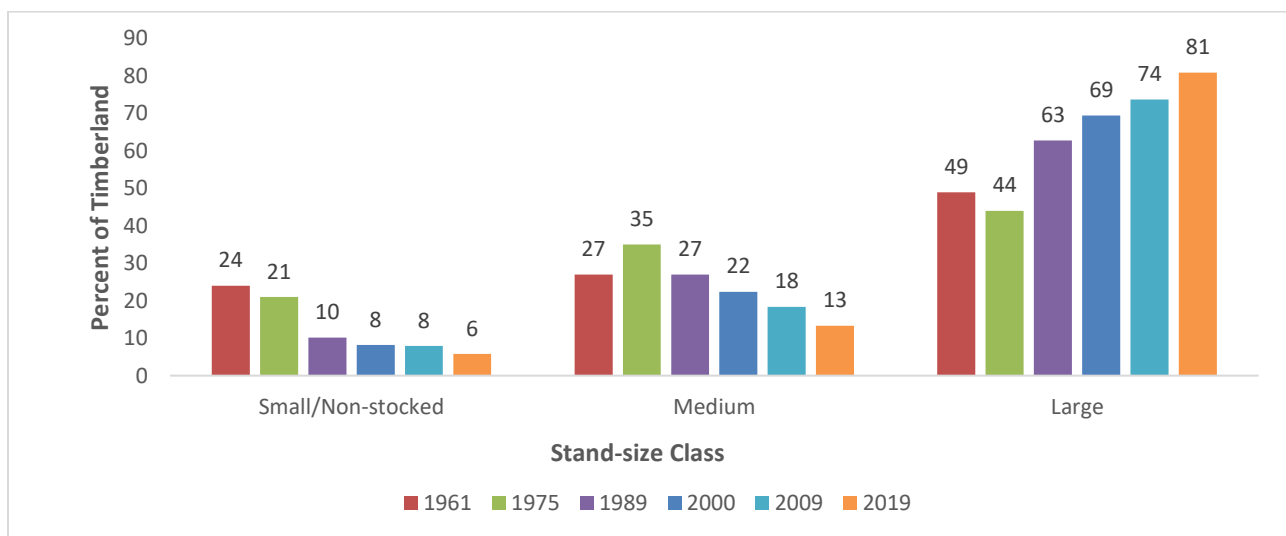


Figure 3.6: Percentage of timberland in various tree-size classes in West Virginia for selected years from 1961 to 2019 (Morin, 2020).

Corresponding to the increase in tree-size class, standing volume contained in larger diameter trees has increased since 2009 (Figure 3.7).

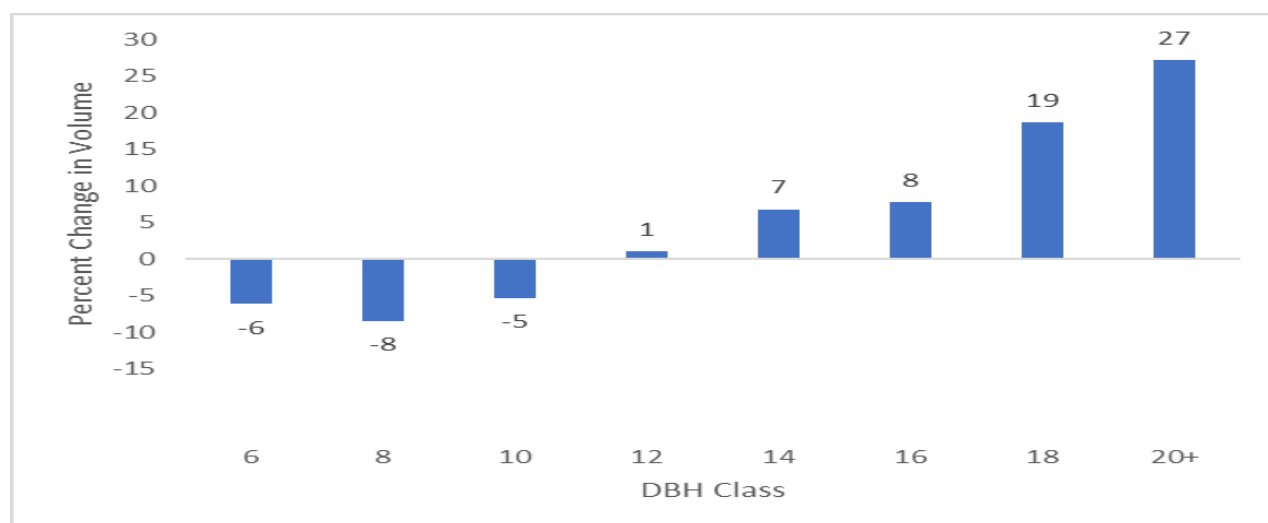


Figure 3.7: Percent change in timber volume by diameter class (DBH) between 2009 and 2019 (Morin, 2020).

The state’s forests are increasing in volume by an average of 240 million cubic feet per year (Figure 3.8). Net growth (gross growth minus mortality) is 414 million cubic feet per year. Of the 277 million cubic feet removed each year, 96% is due to timber harvesting, with the remaining 4% due to conversion of forest land to non-forest uses and the designation of forest land as “reserved” (unavailable for harvest).

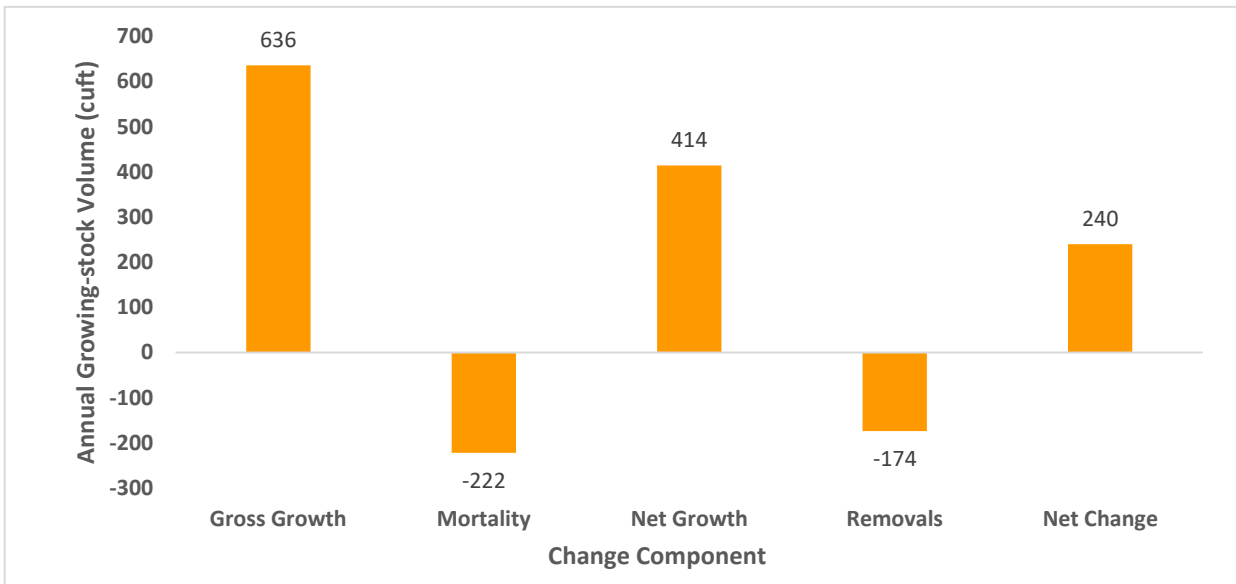


Figure 3.8: Growth, mortality, and removals of timber volume in West Virginia from 2009-2019 (Morin, 2020).

Most forested acres in the state are either moderately or fully stocked (Figure 3.9). The acreage of fully stocked stands has decreased 9% since 2009, while the percentage of poorly stocked stands has increased nearly 5%.

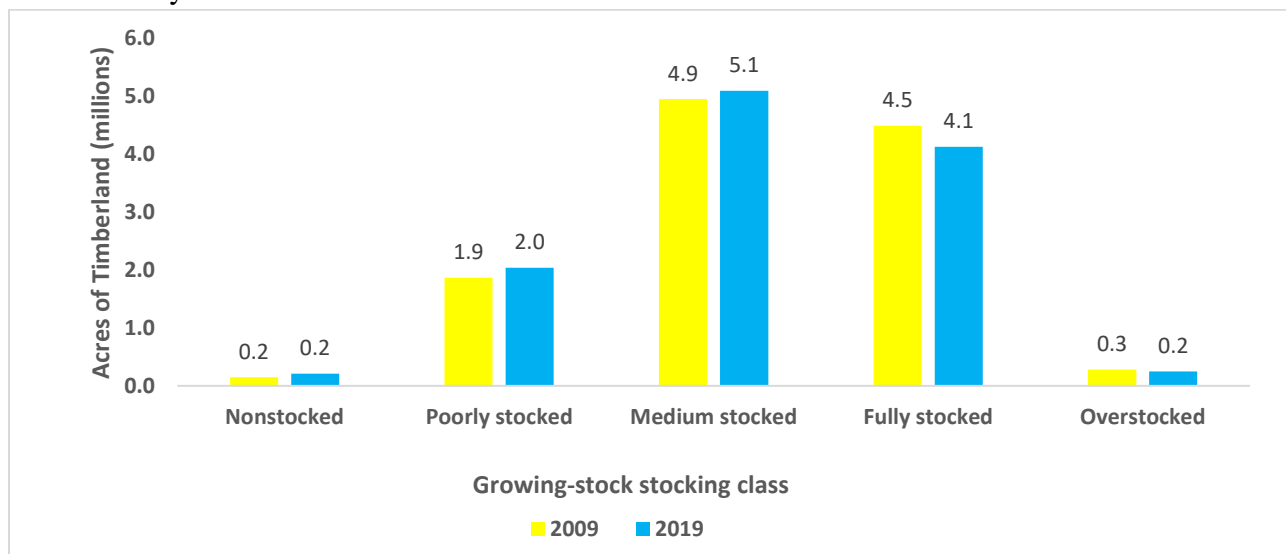


Figure 3.9: Acres of timberland in West Virginia classified under various stocking classes in 2009 and 2019 (Morin, 2020).

Summarizing the USDA Forest Service FIA 2019 information, Research Scientist Randall Morin made some broad forest management and silvicultural conclusions regarding West Virginia's forests. These include:

- The state's forests are mature.
- Species composition of small diameter trees is much different than that of large diameter trees.
- The proportions of maples and other shade tolerant tree species are increasing.
- Present numbers of large oaks and yellow poplar are unlikely to be sustainable. Other species will likely take their place in the large size classes over time.

While the increase in growing stock volume is very encouraging, several issues must be considered in the future. These include, but are not limited to:

Some of these increases are in areas that are inaccessible for timber harvesting for a variety of environmental and social reasons. This can have both positive and negative connotations, depending upon one's perspective.

West Virginia has approximately 243,000 family forest landowners. While some invest in property for traditional, commercial forestry reasons, there are a growing number of individuals who own property for other reasons, such as environmental protection, recreation, aesthetics, privacy, and wildlife viewing (Table 3.3). Historically, government forestry programs have been geared toward traditional timber management. While the economic opportunity should never be discounted or neglected, forestry must embrace these newer concepts. To ensure the relevance of forestry programs, resource professionals and programs must be re-tooled to meet the needs of these new landowners.

Table 3.3: Acreage and number of family forest owners in West Virginia grouped by primary reason for owning forest land in 2018.

(From: Butler, B.J. et. al. 2020. Family forest ownerships of the United States, 2018. Gen. Tech. Rep. NRS-199. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station). Numbers include landowners who ranked each objective as very important (1) or important (2) on a seven-point Likert scale.		
Reason (categories are not exclusive)	Area Acres	Number Owners
	Thousands	Thousands
To enjoy beauty or scenery	4,321	81
To protect nature and biologic diversity	3,827	61
For land investment	2,951	43
Water Protection	3,790	69
Privacy	3,797	70
To pass land on to children or other heirs	4,076	66
To cultivate/collect non-timber forest products	1,100	18
For production of firewood or biofuel	1,439	21
For production of sawlogs, pulpwood, or other timber products	2,467	20
Hunting or fishing	3,192	49
For recreation other than hunting or fishing	3,108	55

Current and expected forest health issues could have a significant impact on net forest growth in the future. These include traditional insect and disease problems, as well as emerging concerns with invasive plant species and lingering wildfire issues. (See Issue 5: Wildfire Management and Issue 7: Forest Health in this section for more information).

Poor silvicultural practices, including high grading, occur frequently in West Virginia. High grading involves removing the most valuable, productive, and genetically superior trees during a harvest operation, leaving behind inferior/stunted trees and low-value species. Many foresters believe that the future quality and productivity of West Virginia's forests will decrease significantly as a result. While results from periodic inventories indicate a continuing increase in timber volume, these figures provide no insight into the quality of timber being grown.

Harvesting levels are higher in some parts of the state than others. The potential for over harvesting in specific regions of the state could result in localized net growth losses. This should be considered carefully because the potential ramifications could be costly, both from an environmental and economic standpoint.

The impacts of continued fragmentation, both physical and in terms of ownership, can severely impact future management and utilization of the state's forests. These impacts are currently occurring most rapidly in the eastern panhandle counties and are continuing to increase in the I-64 corridor between Huntington and Charleston and the I-79 corridor between Clarksburg and Morgantown.

According to the 2018 Woodland Owners Survey, 38% of family forest owners in West Virginia (92,340) own less than 20 acres of forest. Another 29% (70,470) own between 20 and 49 acres of forest. The ramifications of this continuing trend will have major impacts on the future of forest land management in the state.

Many landowners do not understand how to get proper information about how and when to sell timber or to conduct a proper timber sale. Thus, they often realize a lower than fair payment for their timber and they are often faced with a poor logging operation on their property. Call Before You Cut is an ongoing project initiated in Ohio that strives to 1) Encourage private landowners to contact professional foresters for advice and/or assistance with timber harvesting and forest management activities. 2) Encourage landowners to seek reputable loggers for timber sales on their property and to provide information to landowners about proper timber sales contracts.

The White Oak Initiative is a newly formed group of states, US Forest Service, conservation organization, companies and individuals working to ensure the future of White oak in the Eastern United States. West Virginia will participate in this initiative to help ensure that white oak is not over-harvested, and that proper regeneration is occurring so that the species can continue to be a major component of our forest for generations to come.



A big concern for the continued professional management of West Virginia's forests is the recent decline in production by the forest products industry as well as a decline in the numbers of certified loggers and timber licenses issued for harvesting. For proper management of the state's private forest lands, it is essential to maintain the ability to harvest and sell timber and pulpwood.

A number of the items mentioned in Sub-Issue 1 will also be addressed in the Forest Health, Competing Land Uses, Utilization & Marketing, and Wildfire sections. Strategies to address many of our issues will be multi-faceted.

Strategy - Sub-Issue 3.1: Growth, Yield, and Management

Long-term Strategy 1

Gather data and information from USFS Forest Inventory & Analysis on forest growth and yield to monitor forest conditions and trends in the state and make sound management recommendations.

Strategy Narrative

The WVDOT will work closely with the Forest Service's Northern Research Station Forest Inventory and Analysis (FIA) unit to analyze and interpret the data they collect about the condition of the forest resource in West Virginia. This information will heavily influence the administration of the Forest Stewardship Program.

Interaction will occur with the Forest Legacy, Conservation Education, Water Quality, Fire, Forest Health, and other programs. Most notably, there will be considerable interaction with the Utilization, Marketing, and Economic Development program.

Stakeholders with a high interest in this activity will include NIPF landowners, public land management agencies, and the forest products industry.

This strategy will require personnel from state and federal agencies cooperating closely with consultants, private sector foresters, and university researchers. State funds and federal grants will be necessary to implement this strategy.

Timeline

This is ongoing. Annual and periodic FIA updates will allow the WVDOT to monitor forest conditions and trends frequently.

Measure of Success

Accurate and complete data will be available to make informed management recommendations and decisions.

Long-term Strategy 2

Accurately locate in a GIS database all NIPF lands and all “managed” forest lands in the state, including Stewardship, Tree Farm, Managed Timberland, corporate forests, public lands and others.

Strategy Narrative

The WVDOP’s GIS specialist has worked with WVDOP and FIA personnel, as well as the Tree Farm Program, State Tax Department, county assessors, company foresters, and others to locate all categories of forest lands in the state. This will provide an accurate estimate of the “managed” forest acreage in the state, as well as to identify priority areas for increasing the number of acres being professionally managed.

All program areas and identified issues will benefit from this information, as will all stakeholders with interests in the forests of West Virginia.

This strategy will require personnel from state and federal agencies cooperating closely with consultants, private sector foresters, and university researchers. State funds and federal grants will be necessary to implement this strategy.

Timeline

The goal has been completed and will continue to be updated on an annual as new parcels are accepted into the Managed Timberland and Tree Farm program.

Measure of Success

All forest lands in the state will be identified, located and placed into a GIS database. Management type will be broken down by category, as listed above, as well as those areas not being “managed.” These will be updated on an annual basis.

Long-term Strategy 3

Bring more NIPF lands into the Stewardship Program and at a faster rate. Retain these lands as “current” stewardship properties, which will require updating plans after the initial 10-year period.

Strategy Narrative

WVDOP foresters, consultants, and WVU Extension will identify ways to focus efforts on stewardship planning. The WVDOP will work closely with the Natural Resource Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) to identify ways to work together on this long-term strategy.

All program areas and identified issues will benefit from this information, as will all stakeholders with interests in the forests of West Virginia.



This strategy will require personnel from state and federal agencies cooperating closely with consultants, university researchers, and other interested parties. State funds and federal grants will be necessary to implement this strategy.

Timeline

Both performance measures have improved, and work will continue to increase these measures.

Measure of Success

Improvement in retention rates of “stewardship plan” landowners, and an increase in the rate of new plans being prepared.

Long-term Strategy 4

Employ the full range of cost share and financial assistance programs to enable NIPF landowners to actively manage their forests.

Strategy Narrative

WVDOF will work closely with the NRCS and its EQIP program to provide more financial assistance to NIPF landowners for forestry practices. This will benefit all forestry programs and issues in the state.

Key stakeholders will include NIPF landowners, consultants, government agencies, and other interested organizations. The WVDOF will work closely with NRCS, the USFS, and WVU Extension on this strategy.

Federal grants and state budgets will be required to fund forester involvement, and cost share/financial assistance funds must be available for most NIPF landowners to participate.

Timeline

This is ongoing for many years.

Measure of Success

An increase in the number of acres of NIPF lands having intermediate, pre-harvest, and post-harvest silvicultural treatments, as well as necessary forest health treatments.

Long-term Strategy 5

Work more closely with Family Forest Owners (FFOs) to better understand their concerns and priorities; and also, to provide them with professional forestry technical assistance and educational materials to meet their needs in a sound, scientific manner.

Strategy Narrative

There are an estimated 243,000 FFOs in West Virginia 38% of family forest owners in West Virginia (92,340) own less than 20 acres of forest and another 29% (70,470) own between 20 and 49 acres of forest. The total FFO acreage in the state is estimated to be over 7 million acres. These landowners, many of whom are “new” to forest landownership, often have objectives that are different from the larger traditional forest landowners. It is imperative that we work closer with these FFOs, understand their reasons for forest landownership, and find ways to assist them in professionally managing their properties.

All WVDOF program areas, all primary issues identified in the Assessment, and most of the potential multi-state projects identified, will benefit from working closer with FFOs and more fully understanding their concerns. There is a conservation education aspect that flows both ways on this topic, which will help resolve associated issues.

Many landowners do not understand how to get proper information about how and when to sell timber or to conduct a proper timber sale. Thus, they often realize a lower than fair payment for their timber and they are often faced with a poor logging operation on their property. Call Before You Cut (CBYC) is an ongoing project initiated in Ohio that strives to: 1) Encourage private landowners to contact professional foresters for advice and/or assistance with timber harvesting and forest management activities; 2) Encourage landowners to seek reputable loggers for timber sales on their property and to provide information to landowners about proper timber sales contracts.

Other key stakeholders include state and federal agencies, consultants, WVU Extension, and other interested parties. Considerable resources in terms of grants, personnel, budget, and creative ideas/new techniques will be required to begin reaching FFOs.

Timeline

This will be ongoing for many years.

Measure of Success

Increase the number of FFO acres covered by Stewardship Plans. Explore the practicality of landscape-level plans as a way to increase the number of acres covered by Stewardship Plans for this ownership group. Begin working with the UCF program to reach some of these landowners, who are located adjacent to or near communities, especially those who own less than 20 acres of forest land. Emphasize the CBYC program so that FFOs will have access to professional foresters and certified loggers for any timber sales on their properties.



Long-term Strategy 6

Work to ensure appropriate educational, training, and employment opportunities available to professional foresters, technicians, loggers, mills, and others, to adequately manage the state's forests.

Strategy Narrative

An educated and trained workforce is essential to properly manage the forests of the state. Adequate markets for products are also a necessity, to provide sufficient economic incentives to practice forest management.

The Conservation Education, Stewardship, and Utilization, Marketing, & Economic Development programs will need to work together to address this issue. Potential multi-state programs related to biomass, existing and non-traditional markets, the Call Before You Cut Program, and others have a role in finding solutions to issues related to this strategy.

Key stakeholders are all the forest landowners of the state, the forest products industry, WVDOF, consultants, private industry foresters, the WVU Division of Forestry and Natural Resources, and others. Competitive grants and other funding sources will be required to fully address this issue.

Timeline

Ongoing efforts will occur for training and educational opportunities, including continuing education credit courses thru online webinars.

Measure of Success

Adequate numbers of trained foresters, technicians, loggers, and mill workers will be available to assist in the management of the state's forest resources. Adequate markets will be available to sell the products which are the result of professionally and scientifically managed forests.

Sub-Issue 3.2: Fire and Forest Health

Wildfires cause damage to trees in the forest and can be detrimental to soil productivity. Efforts to reduce the size and frequency of wildfires in West Virginia will result in healthier, more sustainable forests. (See Issue 5: Wildfire Management for more details). Wildfire incidence in West Virginia is most prolific in the southern coalfield counties.

The various forest health problems in West Virginia have had, and will continue to have, major impacts on the sustainability of the state's forests. Pathologists, entomologists, and foresters must be diligent to detect, control, and eradicate forest pests. (See Issue 7 - Forest Health for more details).

Currently, West Virginia forests are coping with several native and exotic invasive insect and pathogen issues. Due to West Virginia's high component of oaks, there is a high incidence of mortality agents

such as oak decline, hardwood decline and gypsy moth (*Lymantria dispar*), which places West Virginia in a high-risk mortality category. Virtually all ash trees in the state have been killed due to the emerald ash borer (*Agrilus planipennis*). From personal observations many stands have an abundance of ash regeneration coming back.

West Virginia also has a significant component of beech and hemlock which are susceptible to beech bark disease (*Neonectria coccinea* var. *faginata*) and hemlock woolly adelgid (*Adelges tsugae*), respectively, and which are currently contributing to the mortality of these tree species.

Other mortality agents that occur in West Virginia can be seen in Issue 7:

There are emerging problems and concerns with non-native invasive plant species and their impacts upon the health and sustainability of West Virginia's forests. Several species that are currently of concern are listed below:

- Mile-a-minute weed (*Persicaria perfoliata*, syn. *Polygonum perfoliatum*)
- Autumn olive (*Elaeagnus umbellata*)
- Japanese knotweed (*Polygonum cuspidatum*)
- Tree-of-heaven (*Ailanthus altissima*)
- Japanese stiltgrass (*Microstegium vimineum*)
- Garlic mustard (*Alliaria petiolata*)
- Oriental bittersweet (*Celastrus orbiculatus*)
- Kudzu (*Pueraria Montana*)
- English ivy (*Hedera helix*)
- Porcelain berry (*Ampelopsis brevipedunculata*)
- Japanese honeysuckle (*Lonicera japonica*)
- Chocolate vine (fiveleaf akebia - *Akebia quinata*) – not very common
- Mimosa (silk tree – *Albizia julibrissin*)
- Climbing euonymus (wintercreeper – *Euonymus fortune*)
- Japanese hop (*Humulus japonicas*) – more common on-stream banks and moist areas
- Multiflora rose (*Rosa multiflora*)
- Amur honeysuckle (*Lonicera maackii*)
- Tartarian honeysuckle (*Lonicera tatarica*)
- Morrow's honeysuckle (*Lonicera morrowii*)
- Chinese wisteria (*Wisteria sinensis*)
- Japanese wisteria (*Wisteria floribunda*)

Of the species listed above, Japanese stiltgrass is potentially the most problematic because of seed longevity, apparent ease of dispersal, and the ability to form monocultures under closed canopies.

Natural mortality occurs in all forests. It includes mortality from insects and diseases, weather events, age, natural competition, and even lightning caused fires (though lightning caused forest fires are not common in West Virginia). Natural mortality normally occurs at a low, stable level and does not

significantly affect the timber resource in a negative way. Natural mortality also has positive impacts in terms of snags for wildlife, increased soil productivity, etc.

However, there is mounting concern in some quarters that the combined impacts of existing forest health problems, emerging forest health problems, invasive plant species, certain “declines” that are not well understood, and other factors could converge to create a spike in mortality that would not be offset by growth. This issue bears close watching in coming years.

Certain things can be done to minimize the impacts of natural mortality and keep the forests as healthy as possible. These include:

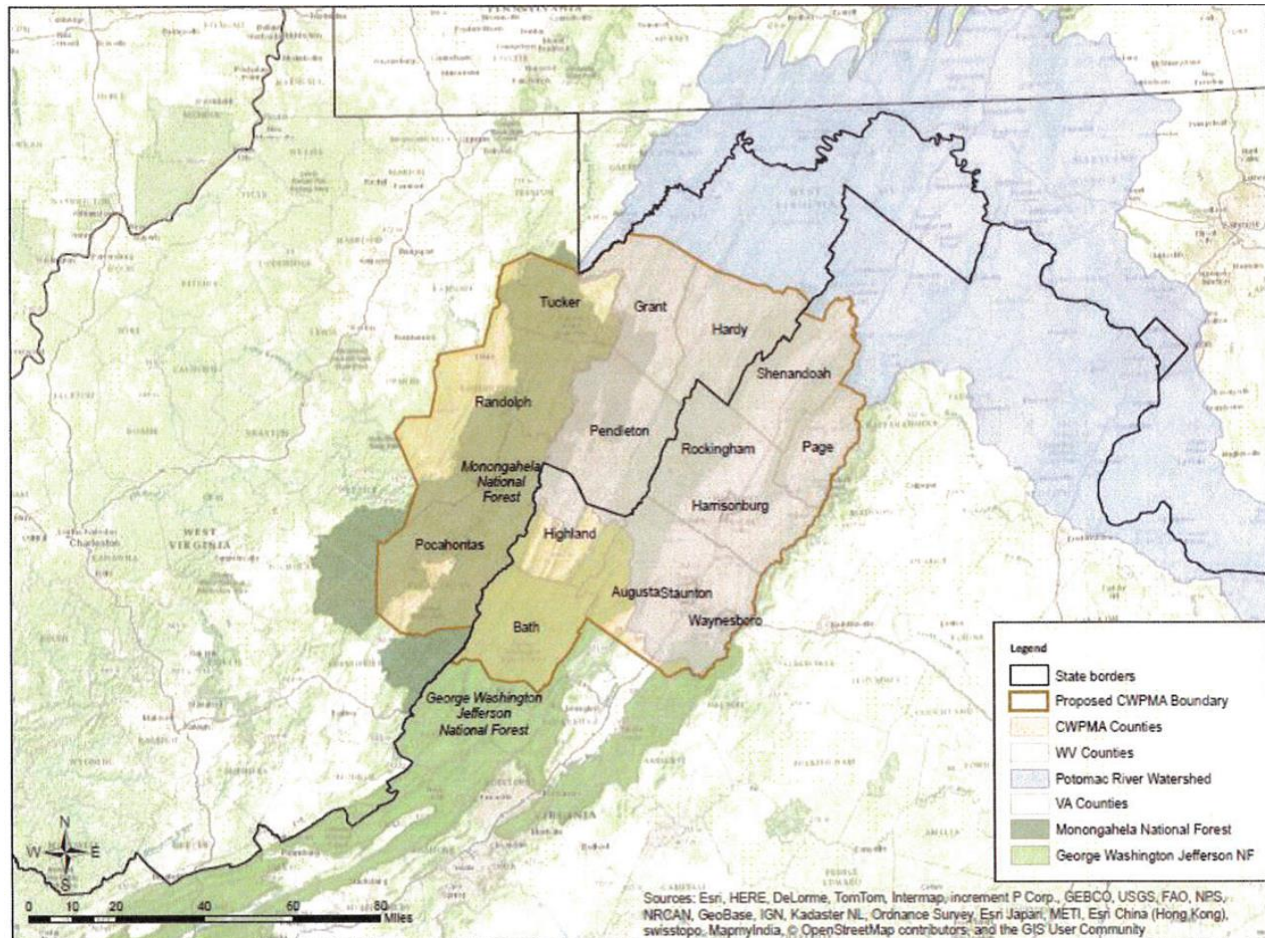
- Maintaining high tree species diversity. Many insects and diseases are “species specific.” A high diversity means that the forest will not be totally devastated if one species suffers significant mortality.
- Maintaining good stocking levels of suitable species for the site to ensure healthy growing forest stands. Crowded stocking conditions and poor species suitability for a site can result in increased stress on the trees, ultimately leading to higher mortality.
- Ensuring that sound, scientific silvicultural techniques are applied to harvests, with consideration given to the regeneration of appropriate species.

For further information about invasive species in WV can be found in the WV Invasive Species Strategic Plan available at (<http://www.wvdnr.gov/wvissp%20for%20public%20comment%209-16-14.pdf>).



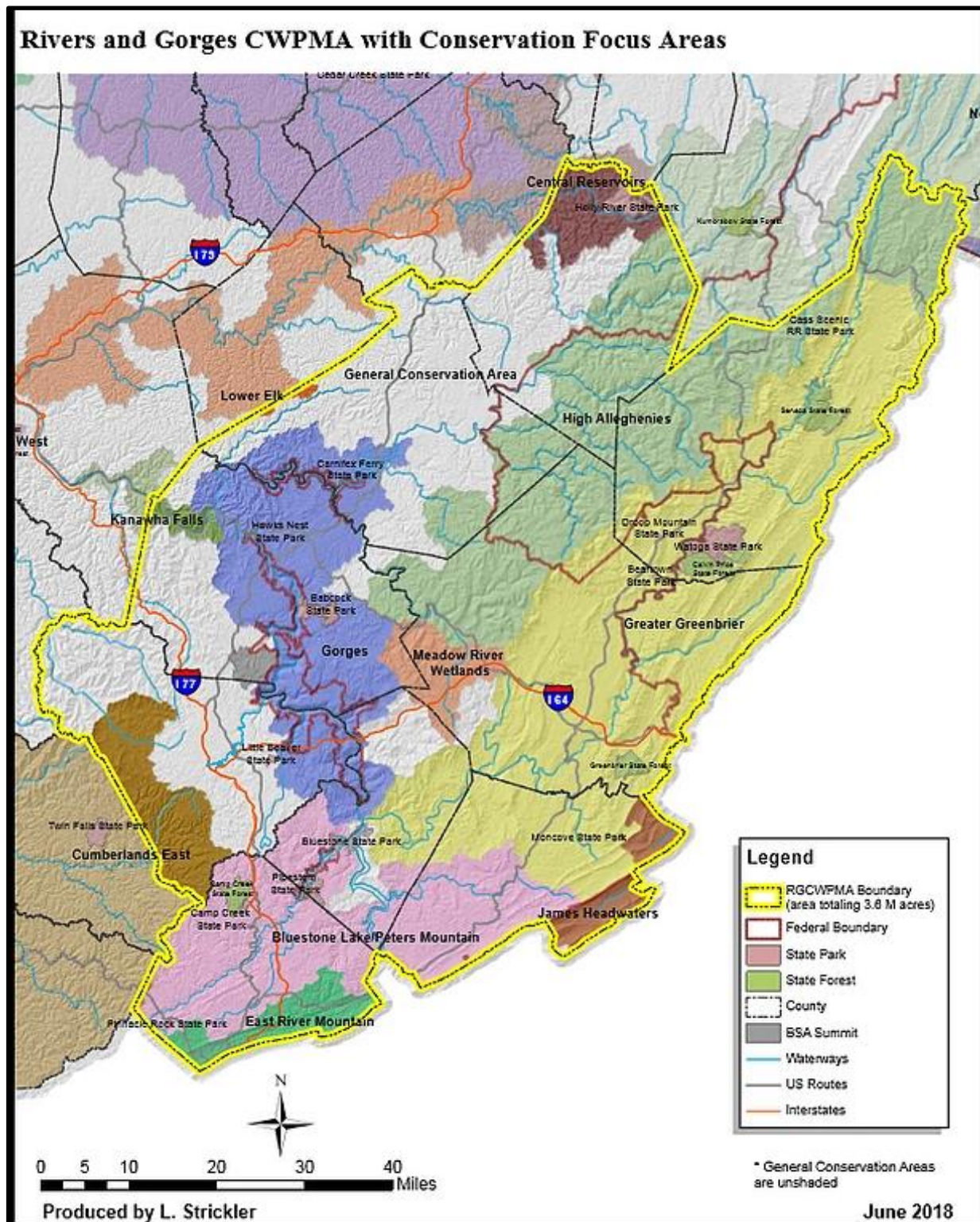
Stilt grass infestation on an old logging road in Calhoun County, typical of invasive plant species locations throughout West Virginia, (Jesse King, WVDOF).

One current activity being undertaken by state and federal agencies in partnership with other interested partners, including The Nature Conservancy, is the designation of a Cooperative Weed and Pest Management Area (CWPMA) in the eastern part of the state (Map 3.11).



Map 3.11: Potomac highlands cooperative weed and pest management area 2015 (Source: <https://bugwoodcloud.org/mura/phcwpma/assets/File/MOU%20Potomac%20Highlands%20CWPMA%20EXECUTED%20.pdf> accessed October 14th, 2020).

The WVDOT has worked closely with the Potomac Highlands CWPMA group over the last 10 years and has recently begun working with the Rivers and Gorges CWPMA in the New River Gorge area (Map 3.12). The WVDOT is a member of the steering committee for both groups.



Map 3.12: Rivers and Gorges Cooperative Weed and Pest Management area in West Virginia 2018
(Source: <https://riversgorgescwpma.wixsite.com/rgcwpma> accessed October 14th, 2020).

Strategy - Sub-Issue 3.2: Fire and Forest Health

Long-term Strategy 1

Meet annually with the Fire Program manager to identify potential efforts to reduce the negative impacts of wildfires on the state's forests.

Strategy Narrative

The quality of the state's forests is negatively impacted by wildfires. Negative impacts occur to soils, habitat, ecosystem health and vigor, tree quality, and other related items. Fewer wildfires mean a healthier forest ecosystem and more sustainable forest resources.

Wildfires occur statewide, but there are 14 "hot" counties in the southern and southwestern part of the state where wildfires occur more frequently. Special efforts will be directed toward these counties (see Issue 5). WVDOP Conservation Education, Water Quality, Fire, Forest Health, and Utilization & Marketing Programs, as well as several multi-state programs, are impacted by this sub-issue.

The entire forestry community is a key stakeholder on this issue. WVDOP, local fire departments, public agencies, large private landowners, and other cooperators must all be involved in addressing this sub-issue. State monies, federal grants, and other funding sources are required to deal with this problem.

Timeline

This is ongoing, but the WVDOP will review wildfire occurrence and acreage burned over a 5-year period to assess effectiveness.

Measure of Success

A reduction in the frequency of wildfires and the acreage burned.

Long-term Strategy 2

Work with the Forest Health Program to keep forest health issues under control.

Strategy Narrative

The Forest Health Program has statewide responsibilities, but the WVDOP will concentrate efforts on NIPF lands and State Forests. Managing forest health issues in such a way as to keep them under control is the WVDOP's goal, relying primarily on the West Virginia Department of Agriculture (WVDA).

All other program areas and issues, as well as several multi-state issues, are impacted by forest health problems. Primary stakeholders include all classifications of forest landowners. In addition to the WVDOP and WVDA, partners needed are USDA agencies, WVU, and others.



State budget dollars and federal grants are necessary to survey, monitor, evaluate, and treat various forest pests.

Timeline

Ongoing. Periodic meetings and annual reviews will occur with the West Virginia Department of Agriculture to evaluate all forest health issues.

Measure of Success

Forest health issues remain “manageable”, with no significant increase in the range or severity of important forest pests.

Long-term Strategy 3

Identify those invasive plants most likely to negatively impact the state’s forests and begin control measures as they become practical.

Strategy Narrative

Non-native invasive plant occurrences are causing concern in the natural resource community. The problems or potential problems these plants are causing are not well understood at this point. At the very least, many of these plants are occupying space formerly occupied by native plants. At the very worst, they may be causing severe ecological problems on many fronts.

In this particular sub-issue strategy, the WVDOF will focus control and/or eradication efforts on NIPF lands where special habitat diversity and important ecosystems occur, as identified in Issue 3 of the Assessment. Invasive species impact or will impact almost every program and issue with which WVDOF deals. The stakeholders are many and varied, but a focus will be placed upon NIPF landowners in this strategy section. It will require a multi-agency, university, and Extension effort to formulate effective strategies to deal with this problem.

The WVDOF will work closely with other agencies to implement the WV Invasive Species Strategic Plan and participate in the Potomac Highlands CWPMA and the newly formed Rivers and Gorges CWPMA.

Timeline

This effort will be ongoing. The WVDOF will need much more information on the extent of invasive species in West Virginia and their impacts, as well as better information on control measures. The WVDOF will need to keep up to date on all new invasive species found in the state.

Measure of Success

Invasive plants remain manageable and under control.

Sub-Issue 3.3: Reforestation of Vacant Lands

This sub-issue deals only with artificial reforestation, i.e. tree planting. It does not deal with natural regeneration (see Sub-issue 4) or old-field succession to forests.

From an historical context, the primary reforestation activities in West Virginia for the past three-quarters of a century have revolved around planting trees on abandoned farmland and old pasture fields. This, and the natural seeding of abandoned agricultural land, have been the primary means by which forest acreage has increased in West Virginia over that time. As subsistence farming became difficult or impossible for most landowners, a considerable amount of land was returned to its original forested condition. Reforestation of agricultural land has slowed considerably in the past 10 years compared to the mid-1900s, although it still occurs at a much-reduced rate.

Some current agricultural lands and pasture fields are replanted to trees from time to time, especially as part of the various USDA Natural Resources Conservation Service and Farm Services Agency programs like the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP) (Table 3.4), and other related programs, such as the Wetland Reserve Program (WRP) (Table 3.5).

Table 3.4: Conservation Reserve Enhancement Program plantings in WV since 2010 (Hinkle, 2020).

WEST VIRGINIA U.S. DEPARTMENT OF AGRICULTURE AS OF: 09-30-2020 FARM SERVICE AGENCY PREPARED ON: 09-30-2020 REPORT ID - MEPRTO-R1 CONSERVATION RESERVE PROGRAM - MONTHLY CONTRACT REPORT PRACTICE SUMMARY FOR ACTIVE CREP CONTRACTS FOR ALL PROGRAM YEARS (2010-2020)								
WV STATE	Number of Contracts	Total Acres Contract	Total Estimated Cost-Share	Average Cost-Share (\$ / Acre)	Practice Code	Practice Acres	Total Est. Practice Cost-Share	Average Practice Cost-share
TOTALS	285	3,086.95	\$3,255,592	\$953.86	CP1	148.03	\$17,358	\$117
					CP3A	7.3	\$1,232	\$169
					CP21	306.77	\$191.305	\$298
					CP22	2,624.85	\$3,045,697	\$1,160
CP1 = Establishment of Permanent Introduced Grasses and Legumes (cool season grasses) CP3A = Hardwood Tree Planting, CP21 = Filter Strip (grass), CP22 = Riparian Forested Buffer								

There are currently 567.11 acres of wetland easements through the Wetland Reserve Program (WRP) in West Virginia, consisting of three 30-year easements and 21 permanent easements (Table 3.5).

Easements range in size from 1 acre to 80 acres with the average easement size being 28.5 acres. These easements are located throughout the state in Barbour, Berkeley, Clay, Grant, Greenbrier, Jefferson, Mason, Nicholas, Pendleton, Pocahontas, Preston, Summers, Taylor, and Upshur counties. Riparian tree plantings often take place in these areas, as well.

Table 3.5: Wetland easements in West Virginia under the Wetland Reserve Program (Aldinger, 2020).

WRP Summary of Past Contracts		
State Total	Number	Acres
30 Year Easements	3	27.75
Permanent Easements	21	539.36
Total	24	567.11

Strategy - Sub-Issue 3.3: Reforestation of Vacant lands

Long-term Strategy 1

Reforest old farms and pastures, riparian areas, and other lands as opportunities arise under various state and federal programs.

Strategy Narrative

Most abandoned or reverting farmland was planted to trees throughout the 1950s, 60s, and 70s. However, there is still a need to plant such areas on an annual basis. In addition, there are riparian areas in need of planting, streambank stabilization projects, wildlife habitat plantings, and several of the 2013 Farm Bill financial assistance programs that involve tree plantings. It is the WVDOP's intention to provide an adequate number of seedlings annually to meet the requests of all landowners and agencies.

The Conservation Education, Water Quality, and other programs will also benefit from this strategy. Competitive grants, other state and federal dollars, WVDOP staff, and consultants will all be involved with this. The WVDOP's state tree nursery will be responsible for producing enough seedlings annually to meet these needs.

Care will be taken when working in the Golden Winged Warbler Area (GWWA) priority counties since old field/early succession habitats are relatively rare and birds associated with those habitats are broadly declining. The WVDOP will work closely with the NRCS to implement Working Lands for Wildlife practices in the GWWA priority counties.

Timeline

Annually, according to needs and requests.



Measure of Success

More acres converted, reforested, and planted with seedlings. Adequate tree seedlings are available for all areas needing tree planting and for all landowners desiring to do so.

Long Term Strategy 2

Maintain a viable nursery to produce seedlings compatible for planting in West Virginia.

Strategy Narrative

WVDOP will work to upgrade Clements Nursery so that it is modernized and remain economically viable. This upgrade may mean that the nursery will have to be shut down for a time to allow for improvements to be made to the infrastructure of the facility. It is the WVDOP's goal for the nursery operations to be self-sufficient.

Timeline

Annually.

Measure of Success

Clements Nursery remains viable and produces adequate variety, quality, and quantity of seedlings to supply most planting needs in West Virginia. This will mean that the facility may need to be shut down temporarily until funds can be obtained to upgrade the nursery.

Sub-Issue 3.4: Forest Regeneration

For the most part, the native tree species regenerate naturally, from either seeds or sprouts, following a timber harvest. However, there are several factors that can hinder the regeneration, including over-browsing by deer, repeated wildfires, competition from non-native invasive plant species, and dense understory vegetation and ground cover, especially ferns.

Over-browsing by deer can be a serious hindrance to natural hardwood regeneration and is most serious in areas with high deer populations. Deer population densities can be estimated from deer harvest numbers (Map 3.13).

There is an apparent lack of sufficient regeneration of certain oak species. This is of concern to both wildlife and forestry officials. Oaks are a valuable forest product, as well as an important food source for many wildlife species. Solutions to this problem will require additional research in the areas of silviculture, forest health, and prescribed fire. Some of this information is shown in Sub-Issue 1 of this section.



More research is needed to determine exact causes of forest regeneration problems in various areas around the state. To date, most information on this topic is anecdotal in nature.

Strategy - Sub-Issue 3.4: Forest Regeneration

Long-term Strategy

Work to identify, understand, and resolve the forest regeneration issues in the state.

Strategy Narrative

A lack of information about forest regeneration problems in the state has been identified as a significant data gap. Scientific information is needed in order to make management recommendations. Most of the supposed “forest regeneration problems” in West Virginia are anecdotal in nature. The WVDOP will need to determine the factual existence and extent of the problem, the various types of contributing factors, and then make solid management recommendations about how to resolve the issues.

All other programs and issues identified in the Assessment are in some way linked to this strategy. All sectors of the forestry, wildlife, and natural resource communities are stakeholders in this effort. It will require the full range of expertise and funding to fully understand and resolve this issue.

Timeline

Ongoing.

Measure of Success

Forest regeneration issues are well understood, and measures are available to resolve any concerns that arise. Adequate regeneration of desirable species occurs, in most instances, to fully populate new forest stands.

Sub-Issue 3.5: Habitat Diversity and Conservation

Conservation of forest land helps to maintain and protect West Virginia’s diversity of native plant and animal species and natural communities, while also helping to sustain forestry, outdoor recreation, wildlife habitat, scenic views, water quality, and other public values. West Virginia includes some of the largest intact blocks of forest land in eastern North America.

While most of West Virginia’s large, intact forest blocks occur on public land, numerous areas also occur on private land. Although many of West Virginia’s private landowners wish to conserve their forest land, it is often economically burdensome for them to do so. The Forest Legacy Program and various other programs with state agencies, land trusts, and conservation organizations, are helping landowners to conserve their forest land through the strategic use of conservation easements (See Issue 1: Competing Land Uses).

Some of the state's large forest blocks contain concentrations of rare plants and animals and exemplary natural communities, such as those identified in the West Virginia Division of Natural Resources' (WVDNR) 2015 WV State Wildlife Action Plan (SWAP).

This is not surprising, since the Central Appalachian Forest Eco-Region, which includes West Virginia, is one of the richest places on earth for the diversity of freshwater fish, mussels, crayfish, lungless salamanders, cave invertebrates, and many other animals and plants. West Virginia red spruce forests, calcareous forests, and floodplain forests – among others – provide habitat for many of these rare plants and animals.

The general locations and frequencies of known occurrences of state and federally listed rare, threatened, and endangered (RTE) plant and animal species in West Virginia are included in the SWAP available at: (http://www.wvdnr.gov/wildlife/action_plan.shtm).

The following information is from the West Virginia State Wildlife Action Plan 2015:

Table 3.6: Habitat Types from the State Wildlife Action Plan (WVDNR, 2015),
(Detailed descriptions available at: http://www.wvdnr.gov/wildlife/action_plan.shtm).

Statewide Terrestrial Habitat Type	Habitat Acres	Percent of WV Land Area
Acidic Rock Outcrops, Cliffs, and Talus	89,783	0.59%
Agriculture	1,435,287	9.36%
Anthropogenic Shrubland & Grassland	159,128	1.04%
Calcareous Cliffs and Talus	9,208	0.06%
Developed	1,138,906	7.43%
Dry Calcareous Forests, Woodlands, and Glades	71,523	0.47%
Dry-Mesic Oak Forests	4,989,621	32.53%
Dry Oak(-Pine) Forests	2,470,980	16.11%
Heath-Grass Barrens	2,817	0.02%
High Allegheny Wetlands	20,935	0.14%
Mixed Mesophytic Forests	2,945,997	19.21%
Montane Red Oak Forests	21,140	0.14%
Northern Hardwood Forests	994,851	6.49%
Pine-Oak Rocky Woodlands	76,399	0.50%
Red Spruce Forests	177,969	1.16%
River Floodplains	120,210	0.78%
Shale Barrens	1,793	0.01%
Sinkhole and Depression Ponds	149	0.00%
Small Stream Riparian Habitats	494,276	3.22%
Unresolved	116,730	0.76%
Total	15,337,700	100.00%

Assessing potential forest blocks for conservation on an eco-regional level opens the door to partnerships with adjacent states to conserve forest land of regional and national significance. This could also help reduce the obstacle of limited funding availability.

High-priority conservation forest ecosystems that the WVDNR has listed in their SWAP, and which were also provided by The Nature Conservancy (TNC), include: red spruce forests; hemlock forests; calcareous forests and woodlands (Ridge and Valley physiographic province, i.e. Chesapeake Bay watershed); flood plain forests; and swamps. Swamps are primarily restoration efforts, since most swamps have been previously drained, developed, or converted to agriculture. Swamp restoration might be a strategy for selected areas especially within the Chesapeake Bay watershed counties.

In addition, there are other high-priority ecosystems in the state which have been identified by WVDNR and TNC that are not entirely “forested” ecosystems; however, many of these contain tree species or could be potentially impacted by adjacent forest management activities. The WVDNR will work with these organizations to identify protective measures as appropriate. These areas include shale barrens; sandstone glades; limestone barrens and glades; caves and karst topography; rock outcrops/cliffs/talus; wetlands; and various other types of aquatic ecosystems.

The WVDNR intends to work closely with the appropriate agencies, landowners, and organizations to provide technical forestry assistance in conservation efforts to protect, enhance, and/or restore these important ecosystems.

Strategy - Sub-Issue 3.5: Habitat Diversity and Conservation

Long-term Strategy 1

Increase efforts to identify, protect, and restore high-priority conservation forest ecosystems, unique native ecological communities, and other significant habitats on State Forests and NIPF lands. This will include invasive species control in the Potomac Highlands Cooperative Weed and Pest Management Area (CWPMA) and any similar areas that are established in the future.

Strategy Narrative

State and federal agencies, non-governmental organizations (NGOs), universities, and other forestry entities are extremely interested in these types of projects. Recognizing the importance of this aspect of forest ecology and its role in healthy forest ecosystems is just now becoming commonly accepted by all affected parties and stakeholders.

The Forest Legacy, Fire, Conservation Education, Forest Health, Water Quality, and other programs, including potential multi-state projects, will all be involved in this issue. Grant funding, federal and state monies, cost-share activities, volunteer efforts, and other means will be involved in finding solutions and implementing strategies.



Multi-partner groups, like the current Potomac Highlands CWPMA, will be necessary to effectively solve some of the problems. That group involves state and federal agencies, private citizens, NGOs, universities and other research entities, Extension, and others.

Timeline

Annual progress will be monitored. The overall efforts of the strategy will be ongoing for many years to come.

Measure of Success

Indicators of performance success will include such things as: identifying all areas of ecological importance, increased acreages protected and/or restored, the number of MOU's in effect, projects undertaken, and projects completed. Be aware of changes being made by climate change.

Long-term Strategy 2

Participate in the Fire Learning Network to better understand prescribed fire's importance and use in certain types of silvicultural prescriptions and for certain types of ecological habitats.

Strategy Narrative

Prescribed fires, under carefully controlled and monitored conditions, can have important silvicultural, habitat diversity, and other ecological benefits. While prescribed fire has been common in other parts of the country for many years, it is somewhat new to West Virginia. A policy is being developed by the WVDOF fire section for training WVDNR wildfire suppression and prescribed burning.

WVDOF is interested in working with public agencies, universities, NGOs, and others to begin implementing prescribed fire projects where it is determined to be beneficial. A certain degree of education and acceptance will be necessary for all parties to become fully engaged in these activities.

The Conservation Education, Fire, and Forest Health programs will be highly involved initially. Federal grants, state budgets, and other funding sources will be necessary. Research entities and Extension will have roles, as will forestry-related companies, consultants, NGOs, and private landowners.

Timeline

Ongoing in future years.

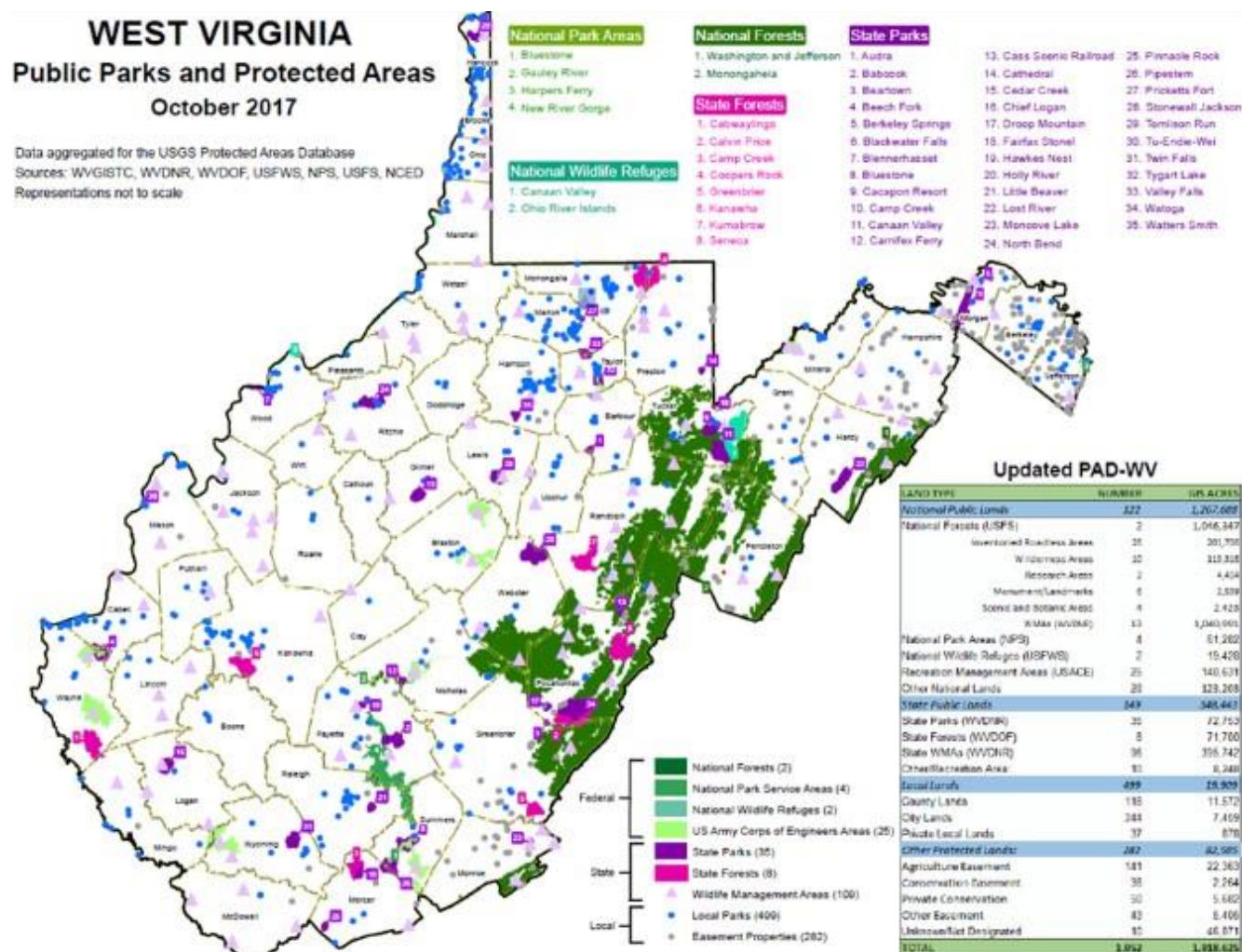
Measure of Success

Prescribed fire benefits are well understood and actively used to achieve specific goals when the situation warrants it.

Sub-Issue 3.6: Public Lands

Publicly owned and managed land make up a significant acreage in West Virginia (Map 3.14). These acres include a wide variety of uses, including historical sites and monuments, agricultural facilities, city properties, military related sites, and school facilities.

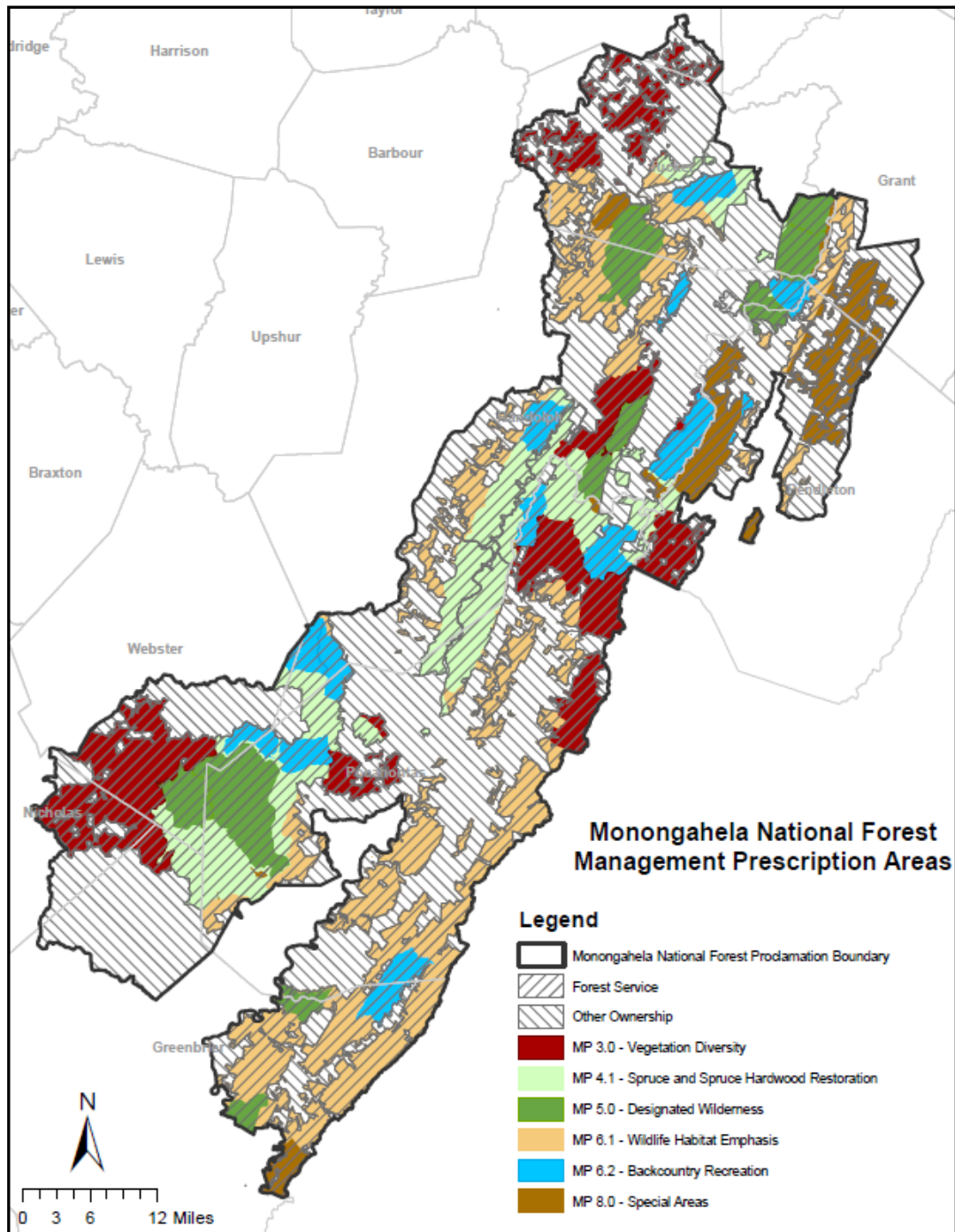
For the purposes of this assessment, the focus is on public lands that are managed for forestry or related natural resource purposes. These include national forest lands; state forests; state wildlife management areas; state Department of Agriculture lands; national wildlife refuges; lands managed by the US Army Corp of Engineers; and lands managed by the Department of Defense.



Map 3.14 Public lands under management in West Virginia (WVU GIS Technology Center, 2017).

NATIONAL FOREST LAND

According to the Monongahela National Forest Land and Resource Management Plan, updated in 2011, the Forest includes more than 921,000 acres. Most of the acreage is included in the following Management Prescription (MP) areas, which emphasize a range of management conditions, activities, goods, and services. These areas are depicted in Map 3.15 and described on the following page.



Map 3.15: Monongahela National Forest Management Prescription Areas (Piehler, 2020).

MNF Management Prescription (MP) areas:

MP 3.0 (194,600 ac) emphasizes age class diversity and sustainable timber harvest.

MP 4.1 (153,600 ac) emphasizes restoration of spruce and spruce-hardwood communities.

MP 5.0 (115,779 ac) is congressionally designated Wilderness emphasizing wilderness attributes.

MP 6.1 (277,600 ac) emphasizes wildlife habitat and sustainable mast production.

MP 6.2 (96,000 ac) emphasizes non-motorized backcountry recreation.

MP 8.0 (79,060 ac) are special areas (National Recreation Area (NRA), National Natural Landmark (NNL), Scenic Areas, Ecological Areas, Research Areas).

Forest Integrated Desired Conditions

The desired condition for the Forest is to care for the land and serve people through the maintenance and restoration of productive and sustainable ecosystems. The Forest continues to cooperate, coordinate, and consult with a variety of agencies, organizations, and government entities to achieve mutual benefits from Forest resource management. The Forest features a broad array of landscapes and opportunities, from wilderness areas where natural conditions predominate, to concentrated development areas where conditions have been highly altered to meet specific resource needs or concerns. Specific uses, practices, or activities on the Forest are adjusted as needed to reduce impacts to natural resources or to reduce conflicts between users.

Ecosystems on the Forest:

- Have ecological and watershed integrity, meaning they have a viable combination of all the diverse elements and processes needed to sustain systems and to perform desired functions,
- Are dynamic in nature and resilient to natural and man-caused disturbances and changes, including climate change,
- Have a range of vegetative composition and structure that provide habitat for native and desired non-native plant, wildlife, and aquatic species, and
- Are managed in an environment of public and interagency trust, and cultural and socio- economic sustainability.

Ecosystems have the following physical, biological, social, and economic components and conditions:

- Soils are productive and in a condition that promotes vegetative growth, hydrologic function, long-term nutrient cycling, erosional stability, and carbon sequestration. Streams and lakes provide clean water, appropriate temperatures, and a variety of connected habitats to support native and desired non-native aquatic species.



- Terrestrial and aquatic communities are within desired conditions for composition, structure, patterns, and processes. Vegetation forms a diverse network of habitats and connective corridors for wildlife, and provides snags, coarse woody material, and soil organic matter.
- Habitats support species diversity, with emphasis on maintaining or restoring populations of game and non-game wildlife and fish; TEP and sensitive species; and rare plant communities. Riparian areas connect upland and aquatic habitats and promote stable and diverse stream channel conditions. Existing non-native invasive species populations are not expanding, and new invader species are not becoming established.
- Fire is used to manage vegetation where needed to enhance ecosystem resiliency in fire- adapted communities and lower hazardous fuel levels.
- Recreational settings range from semi-primitive to developed, offering a wide spectrum of opportunities and uses. Facilities--such as roads, trails, campgrounds, and administrative sites--are constructed, reconstructed, or eliminated as needed to provide a balance of safe, effective, and environmentally responsible recreational opportunities. Visitors enjoy a variety of special attractions, including the National Recreation Area, Wilderness, Scenic Areas, The Highland Scenic Highway, recreational complexes, historic landmarks, and Botanical Areas. People can explore and learn about cultural heritage. Significant cultural sites are preserved and accessible.
- Forest ecosystems provide a variety of sustainable products and services for current and future generations. Timber, range, wildlife, water, recreation, minerals, and special use programs offer opportunities for economic development, and contribute to local community needs, while maintaining ecological integrity.
- The Forest continues to provide a positive response to climate change by growing trees that absorb carbon dioxide and produce oxygen, by storing carbon in above-ground vegetation and below-ground roots and soil nutrients, and by promoting sustainable operations that conserve resources and reduce our environmental imprint.
- The Forest maintains a list of sensitive species, currently known as Regional Forester Sensitive Species (RFSS). Sensitive species of native plants and animals receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing.

A ten-year timber sale history for the Monongahela National Forest is shown in Table 3.7.

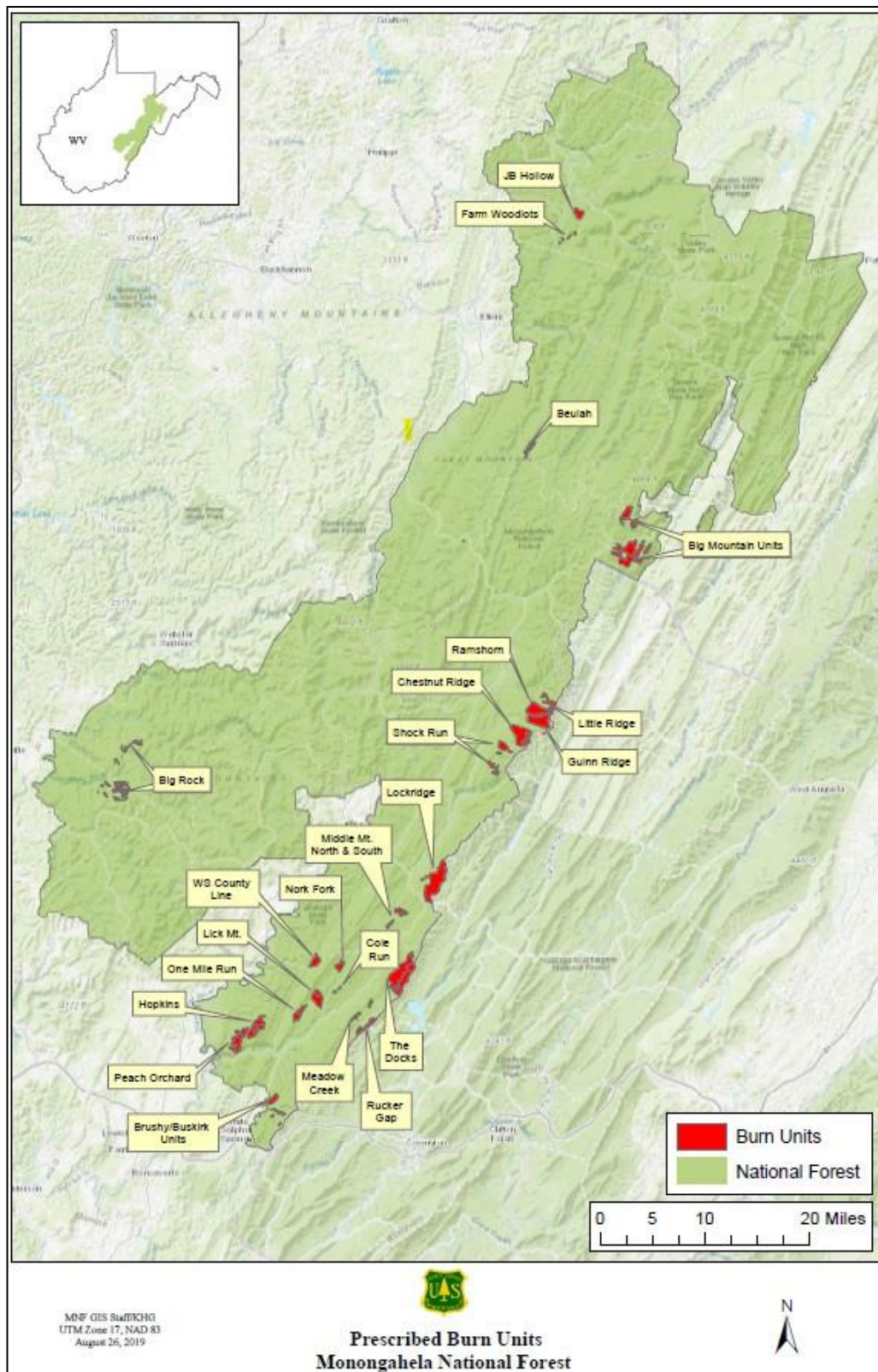
Table 3.7: Timber sale, harvest volumes, and acreage harvested on the Monongahela National Forest from 2009 – 2020 (Boyd, 2020).

Timber Program Volumes* Monongahela National Forest Fiscal Years 2009 through 2020						
Fiscal Year	Total Volume Offered		Total Volume Sold		Sale Volume Harvested	
	CCF	MMBF	CCF	MMBF	CCF	MMBF
2009	14,333.3	8.6	10,000.0	6.0	7,000.0	4.2
2010	12,500.0	7.5	12,500.0	7.5	7,666.7	4.6
2011	12,666.7	7.6	12,666.7	7.6	8,166.7	4.9
2012	16,657.0	10.0	16,657.0	10.0	13,886.0	8.3
2013	8,833.3	5.3	8,809.0	5.3	14,713.0	8.8
2014	11,531.7	6.9	11,531.7	6.9	20,116.2	12.1
2015	10,698.5	6.4	10,698.5	6.4	11,121.3	6.7
2016	12,122.6	7.3	12,122.6	7.3	5,465.0	3.3
2017	18,815.3	11.3	18,815.3	11.3	13,604.5	8.2
2018	29,421.0	17.7	24,883.6	15.9	23,180.0	13.9
2019	29,999.0	18.0	26,803.0	16.1	22,260.0	13.4
2020	47,976.0	28.8	27,269.0	16.4	19,181.0	11.5
Totals	225,554.4	135.3	192,756.4	116.6	166,360.3	99.8

*Approximately two-thirds of the Timber Sale Program Volume sold/harvested is Mixed Hardwood saw timber and approximately one-third is mixed hardwood pulpwood.

FY 20 – Total volume offered includes volume re-advertised in the same year due to no bids on original advertisement.

Map 3.16 reflects prescribed fire units that have been previously been implemented or identified as proposed prescribed fire units in the future. Additional prescribed fire units maybe added in the future to assist with meeting resource objectives specified in the Monongahela National Forest Land Management Plan.



Map 3.16 Monongahela National Forest implemented and proposed prescribed fire burn units, (Piehler, 2020).

WVDOF has been working with the US Department of Agriculture, US Forest Service, under the federal Good Neighbor Authority (GNA) since 2018 on activities to enhance active management of forests in the state. A Master Good Neighbor Authority Agreement was executed on June 12, 2018 between the Monongahela National Forest (MNF) and the WV Department of Commerce, WV Division of Natural Resources (WVDNR) and the WV Division of Forestry (WVDOF). This agreement expires on June 1, 2028.

There are four Supplemental Project Agreements (SPA) under this Master Agreement:

1. Natural Resources Surveys in Support of Land Management, Executed June 29, 2018. Provides framework for WV DOF to provide Common Stand Exam (CSE) surveys on multiple project areas on the MNF.
2. Botanical Surveys, Executed August 11, 2018. Provides framework for WV DNR to provide botanical surveys on several project areas on the MNF.
3. Restoration Services, Executed May 20, 2019. Provides framework for WV DOF to provide Fire Line Creation/Fire Prep and creation of Early Successional Habitat (ESH) on the MNF.
4. Brushy Mountain Grouse Management Area Timber Removal, Executed March 9, 2020. Provides framework for WV DOF to conduct timber harvesting and timber stand improvement activities on the Brushy Mountain Project Area on the Marlinton-White Sulphur Ranger District.

GEORGE WASHINGTON AND JEFFERSON NATIONAL FORESTS IN WEST VIRGINIA

The George Washington and Jefferson National Forests are separately proclaimed units with individual Land and Resource Management Plans; however, they are managed together with one Forest Supervisor, one Supervisor's Office in Roanoke, Virginia and eight Ranger Districts. The George Washington National Forest (GWNF) encompasses about 1,065,389 acres, with 125,628 acres in West Virginia, while the Jefferson National Forest (JNF) encompasses 723,350 acres, with 18,526 acres in West Virginia. The George Washington National Forest Land and Resource Management Plan (revised in 2014) provides strategic management direction through the allocation of management areas across the forest, whereas the Jefferson National Forest Land and Resource Management Plan (revised in 2004) allocates direction through management prescriptions. Table 3.8 highlights the allocation of all National Forest management areas/prescriptions in West Virginia.

Table 3.8: Management Prescription areas for the George Washington, Jefferson, and Monongahela National Forests (Bridges, 2020).

National Forest Management Areas in WV	
George Washington and Jefferson NF	Acres
Potts Creek	18,526
Shenandoah	51,780
Wardensville	55,322
Total	125,628
Monongahela NF	Acres
Beaver Dam	37,674
Blackwater	58,978
Cheat	80,771
Cove Creek	428
Cranberry	158,147
Little River	124,483
Neola	112,430
Otter Creek	68,782
Potomac	158,589
Rimel	67,251
Tea Creek	67,919
Total	935,452
West Virginia Total National Forest Acres	1,061,080

NATIONAL WILDLIFE REFUGES

The U.S. Fish and Wildlife Service manages fish and wildlife habitats, considering the needs of all resources in its decision-making. A requirement of the Refuge Improvement Act is to maintain the ecological health, diversity, and integrity of refuges. The refuge is a vital link in the overall function of the ecosystem. To offset the historic and continuing loss of riparian and forested floodplain habitats within the ecosystem, the refuge helps to provide a biological "safety net" for migratory non-game birds and waterfowl, threatened and endangered species, and other species of concern. There are two national wildlife refuges in West Virginia.

The Ohio River Islands National Wildlife Refuge (ORINWR) currently manages 3,440 terrestrial acres on numerous islands in the Ohio River. An estimated 85% of that acreage is forested (approximately 1,400 acres). Some old fields remain (reverting from past agricultural uses). The long-term habitat goal is conservation and restoration of floodplain forest habitat. The major habitat strategies

involve invasive species control and active planting of native bottomland hardwoods. The refuge system mission is "wildlife first," with compatible wildlife-dependent recreation encouraged (hunting, fishing, photography, interpretation and education). Management Plans are outlined in the Comprehensive Conservation Plan (2002).

The Canaan Valley National Wildlife Reserve (CVNWR) comprises 16,550 acres, of which 7,162 acres (43%) is forested. The northern hardwood upland forest is the predominate forest type, but there are about 215 acres of coniferous forest (red spruce) and 416 acres of bottomland wetland forest consisting of a mix of northern hardwoods, conifers, and aspen (Table 3.16). Management plans are outlined in the draft Comprehensive Conservation Plan (2011). Proposed management activities include removal of old logging roads to reduce forest fragmentation and restore hydrology, improving forest understory structure, and increasing the acreage of forest exhibiting mature forest characteristics. Plans are to increase the acreage of mixed spruce forest through planting and silvicultural practices. Forest edges will be managed for early successional forest habitat. All management practices are focused on a wildlife community comprised of federal trust species, threatened and endangered species, and Species of Greatest Conservation Need (SGCN), as outlined in the State Wildlife Action Plan (SWAP). Invasive species are controlled through a combination of herbicide application and mechanical removal. Some areas currently existing as old fields will be allowed to develop into early successional shrubland habitat.

Table 3.15: Acreage of major vegetative cover types on the Canaan Valley National Wildlife Refuge (CVNWR Habitat Management Plan, 2017).

CANNAN VALLEY NWR	
COVER TYPE	ACRES
Conifer (spruce) / mixed forest	215
forested wetland	416
herbaceous wetland	1938
managed grasslands	438
northern hardwood forest	6,531
old field	2,558
open water	166
shrub wetland	3,241
shrubland	1,050
TOTAL ACRES	16,550



THE US DEPARTMENT OF DEFENSE LANDS

Camp Dawson, a West Virginia Army National Guard (WVARNG) facility, is a 3,758-acre state-managed military training area located in Central Preston County. Camp Dawson is divided into four distinct, non-contiguous Training Areas (TA's). These four TA's are all federally supported and are managed by the WVARNG. The TA's are:

- 1) Camp Dawson Proper (410 acres)
- 2) The Volkstone TA (504 acres)
- 3) The Briery Mountain TA (1,251 acres)
- 4) The Pringle Tract TA (1,593 acres)

These properties are managed for:

- Training Activities
 - bivouacking
 - tactical maneuvers
 - land navigation
 - large equipment training
- Ecological Concerns
 - wildlife habitat
 - species diversity
 - forest management

Successful forest management is a significant issue since the Camp Dawson property consists of nearly two-thirds forestland. The primary management goal of the Camp Dawson ATS Environmental Management Office is to promote and sustain a productive, healthy and diverse forest ecosystem. Several forest health issues have been identified on Camp Dawson's training lands including, but not limited to, gypsy moth, beech bark disease, emerald ash borer, and invasive plants; however, the ATS Environmental Office continues to oversee an invasive species program that is proving successful in improving forest health at Camp Dawson.

THE US ARMY CORPS OF ENGINEERS (USACE) is the steward of the lands and waters at Corps water resources projects. Its Natural Resource Management Mission is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations.

In all aspects of natural and cultural resources management, the Corps promotes awareness of environmental values and adheres to sound environmental stewardship, protection, compliance, and restoration practices.

The Corps manages for long-term public access to, and use of, the natural resources in cooperation with other federal, state, and local agencies, as well as the private sector.

The Corps integrates the management of diverse natural resource components such as fish, wildlife, forests, wetlands, grasslands, soil, air, and water with the provision of public recreation opportunities. The Corps conserves natural resources and provides public recreation opportunities that contribute to the quality of American life.

Project acreages in Table 3.16 are for West Virginia projects associated with reservoirs. There are a few additional acres associated with locks and dams, which are primarily operations and maintenance type areas.

Table 3.16: Properties and acreage in West Virginia associated with U.S. Army Corps of Engineers reservoirs (McCoy, Ramey and Wood 2020).

CORPS OF ENGINEERS RESERVOIR PROPERTIES				
RESERVOIR	FISH & WILDLIFE	OPERATIONS	RECREATION	Totals
Beech Fork Lake	8,224	322	4,042	12,588
Bluestone Lake	19,933	202	1,779	21,914
Burnsville Lake	13,127	14	83	13,224
East Lynn Lake	22,928	1,809	84	24,821
Jennings Randolph	952	3,178	220	4,350
R. D. Bailey	18,510	69	419	18,998
Stonewall Jackson	15,753	309	1,833	17,895
Summersville Lake	4,947	13	3,690	8,650
Sutton Lake	12,849	149	156	13,154
Tygert Lake	1,126	50	360	1,536
TOTAL ACRES				137,130

The WVDOF coordinated with the following **Federal Land Management Agency** contacts for SFAP content contributions, updates, and comment review of the entire plan.



Federal Land Management Agency	Contact	Title
Monongahela National Forest	Shawn Cochran	Forest Supervisor
	Kelly Bridges	Public Affairs Officer
	Jack Tribble	Greenbrier District Ranger
	Cindy Sandeno	Marlinton - White Sulphur Springs District Ranger
	John Fry	Assistant Fire Management Officer
	Tami Conner	Ecosystems Staff Officer
	Gavin Hale	Heritage Program Manager
	Will Wilson	Geology Program Manager
	Jim Boyd	Timber Contracting Officer
	Linda Burke	Forest Silviculturist
	Kirk Piehler	Natural Resources Staff Officer
George Washington and Jefferson National Forest	Christopher MacDonald	Biophysical Resources and Planning Staff Officer
Canaan Valley National Wildlife Refuge	Dawn Washington	Biologist
US Army Corps of Engineers - Huntington District	Aca Ramey	Regulatory Specialist
	Michael McCoy	Park Ranger
US Army Corps of Engineers - Pittsburgh District	Jeffrey Horneman	Professional Surveyor/GIS
	Heather Wood	Natural Resource Specialist
WV Army National Guard	Anthony J Cimorelli CPT, FA, WVARNG	Plans, Training, Mobilization Manager Camp Dawson

STATE FOREST LAND

Chapter 19-1A-1 of the Code of West Virginia states, "The Legislature further finds that the state forests are an important resource for silviculture and scientific research, developed and undeveloped outdoor recreation; propagation of forest trees, fish and wildlife; wildlife and fisheries management; aesthetic preservation; hunting and fishing; timber production; and demonstration of state-of-the-art forestry management and therefore should be managed on a multiple-use basis." (1985, c. 41.) It is the policy of the Division of Forestry to manage each state-owned forest for multiple benefits while ensuring that our actions are ecologically responsible and economically viable.

The Division's goal is to meet the needs of the present without compromising the future. It is through public involvement, interagency cooperation, the practice of silviculture, and the implementation of a natural resources stewardship ethic that the Division of Forestry satisfies its legislative mandate (see page 15 of State Forest Management Guidelines) to serve the many needs of various user interests.

Goals

Based on the aforementioned mission, following are the goals for State Forest resource management:

- Manage the forest ecosystem and its resources such as clean water, aesthetics, wildlife, soils, and recreation through a planning system which involves interagency cooperation and public involvement.
- Provide abundant and diverse wildlife habitat.
- Provide intensive and extensive recreational opportunities commensurate with the resource base.
- Provide multiple forest resource products.
- Demonstrate sound forest resource management practices so as to sustain and improve the overall health, productivity, and quality of the forest resources.
- Protect, maintain, and actively manage environments for rare, threatened, and endangered species of flora, fauna and rare natural communities.
- Provide areas for research for the management of forest-based resources. The most intensive forest research is conducted on the 7,500-acre West Virginia University Research Forest, which is the northern portion of the Coopers Rock State Forest.
- Protect the forest resource from fire, insects and disease, and other destructive influences so as to maintain the overall health of the forest.
- Demonstrate sound forestry concepts through public education.

The Division of Forestry's objective is to enhance sustainability of species diversity and forest health over time while providing for other uses. Management activities will consider the relationship between

organisms and the environment. Many current silvicultural practices help maintain landscape diversity. It is expected that the majority of the forested acres within the forest shall continue to support stand ages of 60-150 years and diameters of 16"-24" DBH with volumes expected to be from 2,400 bd. ft./ac. to 6,000 bd. ft./acre International 1/4" tree scale. This forest is also expected to support populations of turkey, ruffed grouse, squirrels, raccoons, white-tailed deer, cottontail rabbits, bobcats, foxes and black bears. Songbirds, small mammals, reptiles, amphibians, and insects will also be supported by the forest habitat. Wildlife habitat activities are undertaken in coordination with WVDNR Wildlife Resources Section and are in accordance with the 2015 West Virginia State Wildlife Action Plan (SWAP - http://www.wvdnr.gov/wildlife/action_plan.shtm).

Recreation

All of the State Forests managed by WVDNF, with the exception of Calvin Price, include a designated recreation area within the Forest. These recreation areas are managed by the WV Division of Natural Resources, Parks and Recreation Section. The improved recreation areas on the forests contain camping areas, picnic sites, scenic overlooks, historic sites, and picnic shelters. Four of the forests have cabins for rent, two have swimming pools, and two others have a lake for fishing.

Other recreational opportunities at state forests include, but are not limited to, hiking, picnicking, sightseeing, hunting, trapping, nature observation, horseback riding, photography, mountain biking, bird watching, cross-country skiing and geocaching. Rock climbing and bouldering occur at Coopers Rock State Forest. Horseback riding is primarily limited to forest roads. Most of these activities are seasonal, while others are enjoyed throughout the year. Most state forests have at least some of their facilities upgraded to provide handicapped accessibility.

Recreation opportunities are provided according to agency regulations and policies, in coordination with WVDNR Parks and Recreation Section, and are in accordance with the State Comprehensive Outdoor Recreation Plan (SCORP), which was prepared by the West Virginia Development Office and is in compliance with the National Park Service's Land & Water Conservation Fund requirements. SCORP is available at: (https://commerce.wv.gov/assets/files/lwcf/SCORP_version_2.pdf).

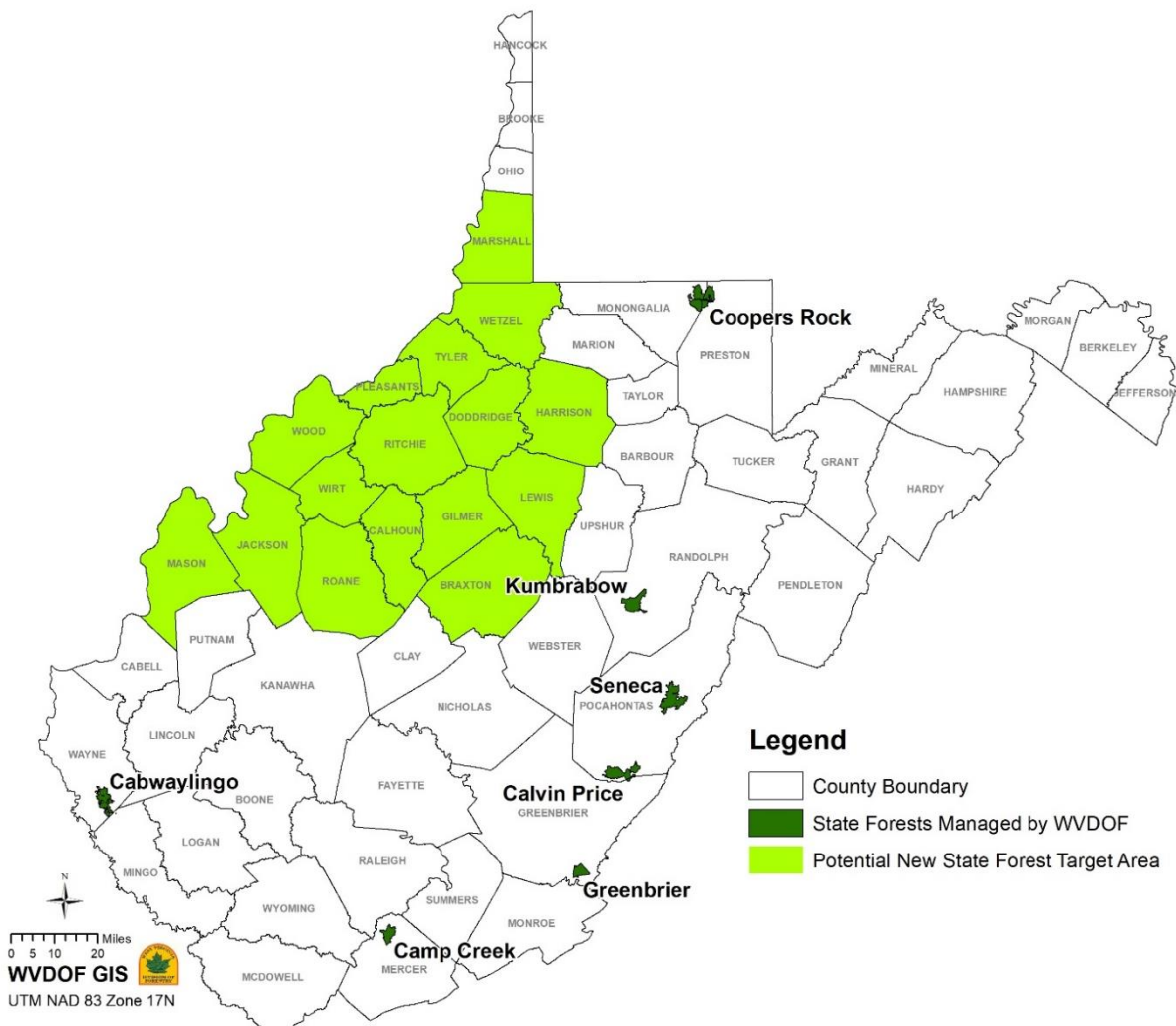
Sub-Issue 3.6: Public Lands Priority Areas

The seven state forests managed by WVDNF are the primary public land priority area(s) for West Virginia (Table 3.9). Other priority areas are:

- Lands adjacent to existing state forests that might become available for purchase.
- Target area counties for the possible establishment of a new state forest, as shown in Map 3.17.

Table 3.9: Location and acreage of State Forests managed by the West Virginia Division of Forestry (Miller, 2020).

STATE FORESTS MANAGED BY THE WV DIVISION OF FORESTRY			
STATE FOREST	COUNTY	ACRES	YEAR ESTABLISHED
Cabwaylingo	Wayne & Mingo	8,224	1935
Calvin Price	Pocahontas & Greenbrier	10,812	1953
Camp Creek	Mercer	5,269	1947
Coopers Rock	Monongalia & Preston	12,747	1936
Greenbrier	Greenbrier	5,133	1938
Kumbrabow	Randolph	9,165	1934
Seneca	Pocahontas	13,681	1924
TOTAL		65,031	



Map 3.17: Public lands priority area for new potential State Forest in WV, (WVDOF GIS, 2020).



Following is a brief description of each of the State Forests.

Cabwaylingo State Forest - Cabwaylingo State Forest, in Wayne County was established in 1935. The present acreage is 8,224. This forest is a mosaic of stands of various ages. This is due to the forest being made up of many small former farms. Once farmland was added to the forest, it was allowed to revert back into woodland. The forest in general has experienced many fires. Because of the severity of many of the fires, forest development was set back many decades on parts of the forest.

Calvin Price State Forest was the last to be added to the State Forest system. The bulk of this area was purchased from the New River Lumber Company in 1953. The 10,812 contiguous acres are located in southern Pocahontas County, adjacent to Watoga State Park, near Hillsboro. A small area in the southeast part of the forest extends into Greenbrier County. The forest land had been largely cut over and was being heavily grazed at the time of the purchase. The rich moist sites of the forest are primarily occupied by a high-quality mix of oaks and yellow-poplar. The drier sites grow primarily white pine, which is also found along most of the stream bottoms. White pine is found in pure stands along the streams of the forest, with volumes approaching 30,000 board feet per acre. This is in contrast to the oak stands which rarely exceed 15,000 board feet per acre.

Camp Creek State Forest is located in the northern part of Mercer County, 16 miles north of Princeton and 19 miles south of Beckley. The forest comprises 5,269 acres. In 1988, 487 acres of the original forest were designated a State Park by the State Legislature. The current forest is primarily of sprout origin, with the exception of the yellow-poplar, pines and hemlock which are of seed origin.

In 1945, the State of West Virginia began purchasing land for the establishment of Camp Creek State Forest. In 1951, the Legislature appropriated funds for the development of recreational facilities and the forest was opened for general public use in the summer of 1953.

Camp Creek is stocked with trout in the spring and the head waters of Camp Creek have been stocked periodically with trout fingerlings. Excellent small game, deer and turkey hunting can be found on the forest.

Coopers Rock State Forest, with approximately 12,747 acres, is the largest of the State Forests located 13 miles east of Morgantown and 8 miles west of Bruceton Mills and is easily accessed by Interstate 68. The original forest was cut over by the early part of the twentieth century. In addition to the clearing done by the iron ore industry, many areas were cleared for farming. The current forest is primarily of sprout origin, except for areas of hemlock and pine, which are from seed origin.

In 1936, the West Virginia Conservation Commission purchased land from the Lake Lynn Lumber and Supply Company to manage as Coopers Rock State Forest. Two additional purchases were made later. In 1970, a right-of-way was granted to the WV Department of Highways for the construction of Corridor "E", now known as Interstate 68. In 1959, approximately 7,068 acres were leased for 99 years to the Board of Governors of West Virginia University, for use as a research and teaching forest. This area lies north of Interstate 68 and is now known as West Virginia University Research Forest.

Greenbrier State Forest is located in southeastern Greenbrier County, two miles west of White Sulphur Springs off U.S. Route 60 and I-64 and one mile south on Secondary State Route 60/14. This 5,133-acre forest is bisected by Kate's Mountain. The first settlers in the area cleared land for their farms and started a tradition of burning to help establish herbaceous material for their cattle to graze. This burning and grazing practice continued for decades. In 1938, the State of West Virginia purchased what is now Greenbrier State Forest from the White Sulphur Springs Park Association.

The forest consists of many steep, rocky, parallel ridges and valleys that run perpendicular to Kate's Mountain toward Howard's Creek, with more branching and rolling ridges on the side toward Quarry Hollow. The deep moist hollows are rich with herbaceous plants in contrast to the dry ridges.

Kumbrabow State Forest, located in Randolph County, had a history rich in timber harvesting and utilization prior to its acquisition by the state from the Midland Corporation on December 29, 1934. No less than four major sawmill companies cut timber from the area.

Prior to the logging boom, Kumbrabow was covered primarily by red spruce. After the era of logging, fires devastated the remaining forest areas on several occasions. This, accompanied by uncontrolled grazing which didn't end until the 1950s, resulted in some of the most spectacular black cherry stands in the eastern United States. Other parts of the forest have equally well-developed oak-hickory stands. Red spruce is still present and is re-establishing itself on much of its former range. Kumbrabow State Forest is 9,165 acres in size.



View looking east from the fire trail lookout on Kumbrabow State Forest, (Source: Travis Miller, WVDOF).

Seneca State Forest comprises 11,681 acres in central Pocahontas County, along the banks of the Greenbrier River and is the oldest of the state forests. The Greenbrier River Trail and the Allegheny Trail both traverse the forest, while ten other trails provide 14 miles of hiking opportunities and an additional eight miles are provided by logging roads. The area which is now Seneca State Forest has been a heavily forested upland wildlife enclave since prehistoric times. The bulk of the forest was purchased by the state in early 1924. The state created a tree nursery on the forest in 1928. Seedlings were sold to the public at cost in the early 1930s.

Kanawha State Forest is basically a state forest in name only. It comprises 9,052 acres. During the 1978 West Virginia Legislative session, HB 1256 was introduced to remove the authority of the Director of the Department of Natural Resources (WVDNR) to permit timber harvesting and mineral extraction in Kanawha State Forest (KSF). A deal was brokered that allowed oil and natural gas interests to put roads in the forest to access a new natural gas discovery and the amended bill was passed banning the

sale of timber from the forest. At that time, the Division of Forestry (then part of the WVDNR) had not harvested any timber from the forest. Between 1978 and 2000, the WVDOP provided the necessary expertise to locate access roads for natural gas exploration, while striving to provide for low road maintenance and high-water quality.

Severe fire and wind damage to the Forest in the late 1990s prompted the Forest Management Review Commission (a legislative body) to look into the possibility of having the Division of Forestry perform a one-time salvage harvest operation on the forest. Extensive public comment led the Legislature to transfer management responsibility of the forest from the Division of Forestry to the Division of Natural Resources, Parks and Recreation Section in 2000. Kanawha State Forest is now essentially managed as a state park with hunting and mineral extraction allowed. Wildlife habitat management is no longer economically viable on this area.

Panther State Forest became Panther State Forest/Wildlife Management Area on March 3, 2008. It comprises 7,820 acres. The Division of Forestry is no longer active in the management of this property.



Recently constructed Savannah on Calvin Price State Forest, (Source: Travis Miller, WVDOP)



Loaded log truck hauling logs from a harvest on Kumbrabow State Forest, (Source: Travis Miller, WVDOP)

Table 3.10: Timber sales from West Virginia's State Forests from 2010 – 2020 (Miller, 2020).

STATE FOREST TIMBER SALES 2010 - 2020			
STATE FOREST	Year	ACRES OFFERED	BF VOL SOLD
Cabwaylingo	2010	123	793,503
Calvin Price	2010	-	66,493
Greenbrier	2010	205	855,780
Kumbrabow	2010	50	547,129
Camp Creek	2011	85	452,929
Kumbrabow	2011	70	715,008
Cabwaylingo	2012	99	675,531
Camp Creek	2012	55	490,751
Coopers Rock	2012	158	982,203
Kumbrabow	2012	120	1,024,024
Seneca	2012	6	61,325
Cabwaylingo	2013	42	239,238
Camp Creek	2013	80	468,249
Coopers Rock	2013	-	18,399
Greenbrier	2013	265	838,685
Kumbrabow	2013	253	1,937,112
Seneca	2013	262	964,220
Cabwaylingo	2014	146	785,342
Greenbrier	2014	80	306,051
Kumbrabow	2014	80	620,968
Seneca	2014	-	27,271
Cabwaylingo	2015	123	256,934
Calvin Price	2015	179	1,049,329
Camp Creek	2015	137	1,570,319
Kumbrabow	2015	40	611,699
Cabwaylingo	2016	281	1,147,062
Calvin Price	2016	142	568,535
Camp Creek	2016	45	324,647
Kumbrabow	2016	105	1,089,987
Seneca	2016	87	450,223
Cabwaylingo	2017	148	748,957
Calvin Price	2017	85	609,008
Kumbrabow	2017	50	374,566
Seneca	2017	50	351,774
Cabwaylingo	2018	134	720,542
Calvin Price	2018	65	276,807
Greenbrier	2018	100	698,705
Kumbrabow	2018	196	1,006,615
Seneca	2018	96	179,262
Cabwaylingo	2019	65	466,804
Calvin Price	2019	80	417,465
Camp Creek	2019	65	849,063
Greenbrier	2019	20	317,076
Kumbrabow	2019	62	396,839
TOTALS		4,534	27,352,429

WEST VIRGINIA WILDLIFE MANAGEMENT AREAS

The Statewide Wildlife Management Program is designed to conserve and manage high quality habitats for a variety of wildlife species and to improve public access to these resources. Management activities on state and national forest lands include planting of trees and shrubs for food and cover, the establishment of wildlife habitat, maintenance of food plots, and the development of wetlands. Construction of roads, parking lots, trails, and public shooting ranges are vitally important to wildlife management programs.

The acquisition of Wildlife Management Areas (WMAs) is a critical component of the Wildlife Resources Section's effort to fulfill its mission to the citizens of West Virginia. Spurred by the decline in public access to private land and by the continued destruction of critical habitats, the WMA Program enables wildlife biologists to conserve and manage habitat to benefit all wildlife species. At the present time, 1.4 million acres, representing 8% of the state's total land area, are managed by the Wildlife Resources Section for public wildlife-associated recreation (Table 3.11). Many of these lands are leased from both public and private entities; this includes approximately 1.1 million acres of national forest land.

Table 3.11: West Virginia Wildlife Management Area locations and acreage (WVDNR, 2020, Keith Krantz - WVDNR).

Wildlife Management Areas					
NAME	ACRES	OWNERSHIP	NAME	ACRES	OWNERSHIP
Allegheny	6,397	DNR	Center Branch	975	DNR
Amherst/Plymouth	7,611	OTH/DNR	Cheat Canyon	3,668	OTH/DNR
Anawalt Lake	1,792	DNR	Chief Cornstalk	11,840	DNR
Andrew Rowan	510	OTH	Chief Logan	325	DNR
Bear Rocks	242	DNR	Conaway Run	630	DNR
Becky Creek	1,930	OTH	Cross Creek	2,080	DNR
Beech Fork	7,531	COE	Dents Run	1,208	OTH/DNR
Beury Mountain	10,474	DNR	Dunkard Fork	470	OTH
Big Ditch	389	DNR	East Lynn	22,928	COE
Big South	4,971	OTH/DNR	Edwards Run	398	DNR
Big Ugly	5,550	OTH	Elk Fork Lake	1,530	OTH
Bluestone Lake	17,744	COE	Elk River	18,396	DNR/COE
Bright McCausland Homestead	634	DNR	Fairfax Pond - Rehe	638	DNR
Buffalo Run	143	DNR	Federal Ridge	1,123	DNR
Burches Run	55	DNR	Fork Creek	9,280	OTH
Burning Springs	2,162	DNR	Fort Mill Ridge	217	DNR
Burnsville Lake	12,452	COE	Fox Forest	110	OTH
Castlemans Run	836	DNR	Frozen Camp	3,814	DNR



Wildlife Management Areas (Continued)					
NAME	ACRES	OWNERSHIP	NAME	ACRES	OWNERSHIP
Green Bottom	1,097	DNR/COE	Sand Hill	2,847	OTH
Handley	784	DNR	Sandy Creek	2,266	DNR
Hilbert	298	DNR	Shannondale	1,630	DNR
Hillcrest	2,212	DNR	Short Mountain	8,457	DNR
Horse Creek Lake	45	OTH	Sideling Hill	2,508	DNR
Hughes River	6,492	DNR/OTH	Slatyfork	61	DNR
Huttonsville State Farm	2,721	OTH	Sleepy Creek	22,952	DNR
Jug	2,075	DNR	Smoke Camp	252	DNR
Kanawha Falls	46	OTH	Snake Hill	3,142	DNR
Lantz Farm	545	OTH	South Branch	1,183	DNR
Laurel Lake	11,798	DNR/OTH	Stonecoal	3,000	OTH
Lewis Wetzel	14,072	DNR	Stonewall Jackson Lake	18,289	COE
Little Canaan	3,034	DNR	Stumptown	1,803	DNR
Little Indian Creek	1,083	DNR	Summersville Lake	5,982	COE
Little Kanawha	8,255	OTH	Tate Lohr	1,071	DNR
Lost River	52	DNR	Teter Creek	137	DNR
Lynn Camp	2067	DNR	Thorn Creek	586	DNR
McClintic	3,655	DNR	Toll Gate	938	DNR
Meadow River	2,673	DNR/OTH	Tomblin	25,057	DNR/OTH
Mill Creek	1,453	DNR	Tug Fork	6,530	DNR/OTH
Moncove Lake	896	DNR	Turkey Run	64	DNR
Morris Creek	9,874	OTH	Underwood	3,449	DNR
Nathaniel Mountain	10,676	DNR	Upper Deckers Creek	56	DNR
O'Brien Lake	1,153	OTH	Upper Mud River	1,427	OTH
Panther	11,439	DNR	Valley Bend Wetland	31	DNR
Pedlar	766	DNR	Walker Creek	3,194	DNR
Pleasants Creek	2,976	DNR/COE	Wallback	12,627	DNR
Plum Orchard Lake	3,321	DNR	Warden Lake	140	DNR
Pruntytown	1,764	OTH	White Horse Mountain	1,725	DNR
R.D. Bailey Lake	17,218	COE	Widmeyer	424	DNR
Ritchie Mines	6,712	DNR	Woodrum	1,696	DNR
Rollins Lake	75	DNR	TOTAL - 99	425,904	ACRES

Timber harvesting is an important component of habitat management activities on Wildlife Management Areas. There have been 27 timber sales on WMA sites since 2015 (Table 3.12).

Table 3.12: Timber sales conducted on West Virginia Wildlife Management Areas since 2016 (Krantz, WVDNR 2020).

Timber Sales on Wildlife Management Areas 2016-2020			
District	Year	WMA	Harvest/Acres
1	2016	Lewis Wetzel WMA	Slab Camp - 75 Acres
	2017	Lewis Wetzel WMA	Buffalo Run - 60 Acres
	2019	Bear Rocks WMA	Bear Rocks - 22 Acres
	2019	Hillcrest WMA	Hill Crest #1 - 45 Acres
	2019	Lewis Wetzel WMA	Oak Ridge - 52 Acres
	2019	Pleasant Creek WMA	Trestle Track - 23 Acres
2	2017	Sleepy Creek WMA	GMA#1 - 102 Acres
	2019	Sleepy Creek WMA	Cerulean Warbler - 96 Acres
3	2016	Summersville Lake WMA	McKee Creek - 83 Acres
	2017	Stonewall Jackson Lake WMA	Millstone Run - 85 Acres
	2018	Elk River WMA	Flatwoods Run - 100 Acres
	2019	Handley WMA	Handley - 75 Acres
	2019	Summersville Lake WMA	McKee Creek - #2 57 Acres
	2020	Burnsville Lake WMA	Spruce Fork 100 Acres
	2020	Burnsville Lake WMA	Falls Mill #2 - 10 Acres
	2020	Elk River WMA	Barker Ridge - 100 Acres
4	2016	Meadow River WMA	GP#1 - 100 Acres
	2017	RD Bailey WMA	Elk Trace - 100 Acres
	2019	RD Bailey WMA	Sturgeon - 165 Acres
	2019	RD Bailey WMA	Groundhog #1 - 335 Acres
	2020	Beury Mountain WMA	Powerline Salvage - 29 Acres
5	2016	Chief Cornstalk WMA	Pond Branch - 70 Acres
	2019	Beech Fork WMA	Reuban's Branch - 75 Acres
	2020	Beech Fork WMA	Jim's Branch - 111 Acres
6	2019	Ritchie Mines WMA	MacFarlan Ridge - 25 Acres
	2019	Frozen Camp WMA	Trace Fork - 46 Acres
TOTAL			2,254 Acres

WEST VIRGINIA DEPARTMENT OF AGRICULTURE

The properties described in this section were once Farm Management Commission properties (Table 3.13). This commission was abolished in 1995 and the properties were transferred to the Department of Agriculture. These properties house various types of institutions which also contain crop land, pastureland, and woodland. The woodlands are managed under West Virginia Stewardship Plans that have been written by the Division of Forestry for each farm. The Division of Forestry has assisted with timber sales on these properties for the last ten years (Table 3.14). Portions of some of these properties are also managed as Wildlife Management Areas under an agreement with the Division of Natural Resources, Wildlife Resources Section. For more details on this land use please see the section on Wildlife Management Areas.

Table 3.13: West Virginia Department of Agriculture farm properties (Carrington, WVDA 2020).

DEPARTMENT OF AGRICULTURE FARM PROPERTIES			
FARM	COUNTY	TOTAL ACRES	WOODLAND ACRES
Hopemont	Preston	804	293
Pruntytown	Taylor	1,587	481
Moundsville	Marshall	141	24
Huttonsville	Randolph	1,524	1,220
Beckys Creek	Randolph	1,952	1,952
Elkins Childrens Home	Randolph	117	96
Andrew S. Rowan	Monroe	650	397
Lakin	Mason	950	366
Colin Anderson	Pleasant	694	511
Barboursville	Cabell	697	169
TOTAL ACRES		9,116	5,509

Table 3.14: Timber sales conducted on West Virginia Department of Agriculture farm properties from 2010 - 2020 (Miller, 2020).

DEPARTMENT OF AGRICULTURE FARM PROPERTY TIMBER SALES			
FARM	YEAR	ACRES HARVESTED	BF VOL. HARVESTED
Huttonsville	2010	64	377,287
Huttonsville	2015	90	589,098
Beckys Creek	2015	247	1,535,479
TOTALS		401	2,501,864



OTHER PUBLIC LANDS

There are several other sizable tracts of public land that have not been addressed individually. These include State 4-H facilities such as Jackson's Mill and Camp Caesar; the State Board of Education facility at Cedar Lakes; Mountwood Park in Wood County; 1,700-acre Oglebay Park in Wheeling, run by the Wheeling Park Commission; and property managed by West Virginia University. There are more than 20,000 additional public land acres in West Virginia in miscellaneous locations and managed by a variety of agencies, counties, municipalities, and institutions.

Additional Remarks

The Division of Forestry has working relationships and interaction with most of the agencies mentioned in this sub-issue. In the future it will become even more important to build on these relationships, and to cultivate new ones, in order to maximize the positive impact on the natural resources in West Virginia.

Decreasing budgets and increased competition for scarce grant dollars make cooperative projects essential in order to address a variety of natural resource issues. Most natural resource problems occur across boundaries and do not recognize ownership differences. This includes issues in forest health, fire management, invasive species, habitat restoration efforts, water quality related projects, and many other issues.

Two concerns that the Division of Forestry has in regard to public forest lands are:

- **Forest Health** - With the growing number of insects, diseases and invasive plants invading public lands, natural resource management is becoming more challenging with every year that passes. It is important to remain vigilant in our efforts to slow the spread and keep our forests healthy.
- **Management Plans** – All public lands should have an approved forest management or natural resource management plan. This is important for the state as a whole. It is also important to be able to show private landowners how land can be professionally managed. Not all public lands have management plans completed. In addition, many of the approved management plans for public lands are not being fully implemented. The WVDOP plans to work with all those entities involved to develop creative and innovative ways to implement these plans. Public lands may be a combination of federal, state, county, city, institutional, and other ownerships.

Appalachian Forest National Heritage Area (AFNHA)

The WVDOP is working with federal and state agencies along with Non-Governmental Organizations (NGOs) to promote the forests of the eastern mountains of West Virginia and western Maryland and the culture and history associated with this forested landscape. This grassroots partnership works in both

states to explore the relationship between the Appalachian Highlands forests and the people who live within this area.

The AFNHA is an effort to integrate central Appalachian forest history, culture, natural history, products, and forest management into a heritage tourism initiative to promote rural community development. (See Section V, Multi-State Project 11 for more information).

Central Appalachian Spruce Restoration Initiative

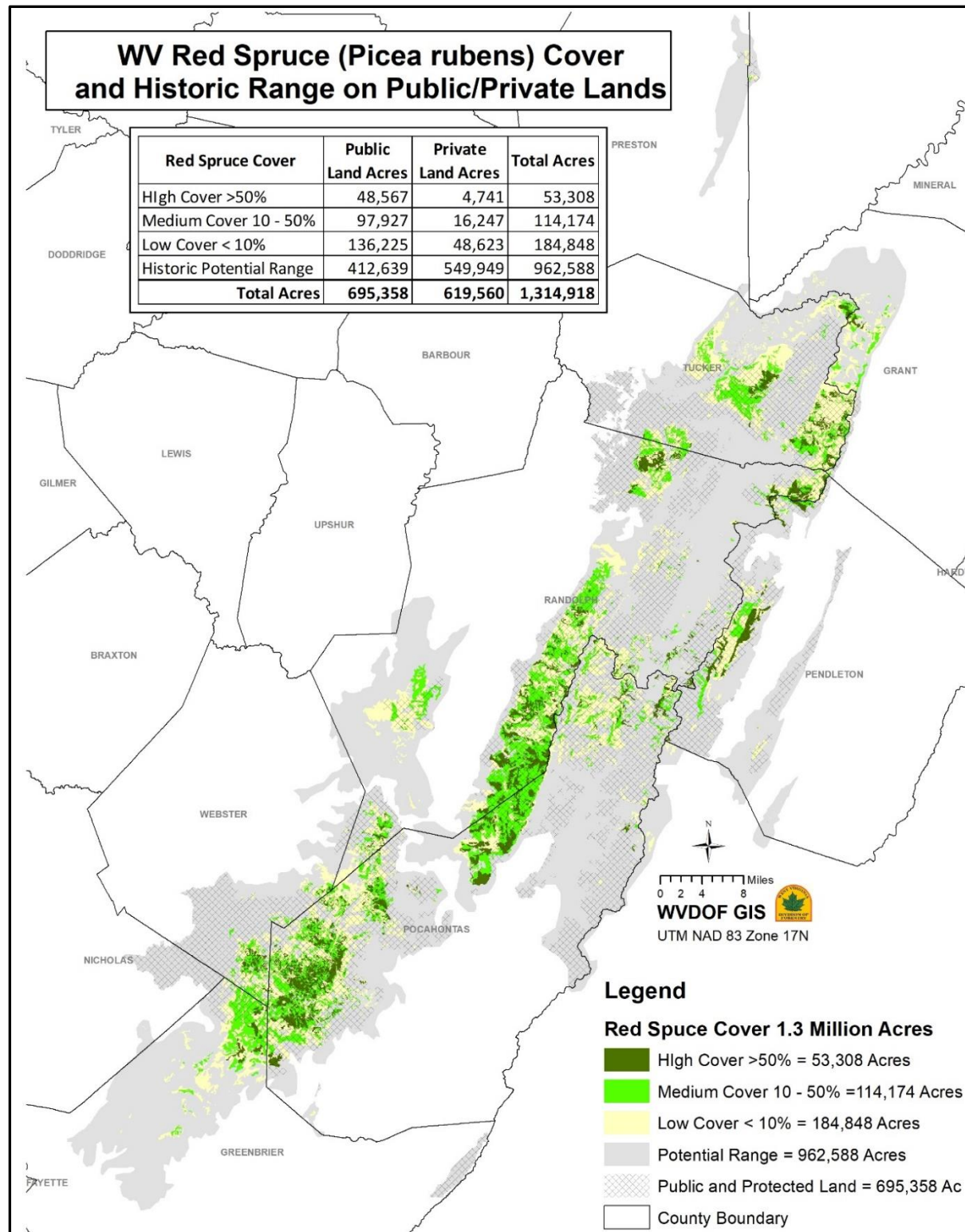
The WVDOR works with partner agencies such as; the USDA Forest Service, US Fish & Wildlife Service, The Nature Conservancy, USDA Natural Resources Conservation Service, WVDNR, the WV Highlands Conservancy and others to collaborate on the restoration and conservation of the red spruce-northern hardwood ecosystem, including some areas of balsam fir.

The WVDOR continues to work with CASRI partners to restore red spruce ecosystems on public lands within the historic range priority areas shown in Map 3.18 with potential opportunities on approximately 400,000 acres. Kumbrabow State Forest is one example of an ongoing red spruce restoration project that has been completed and proven to be successful.



Left Photo: Red spruce seedling planted on Kumbrabow State Forest, Randolph County, (Source: Travis Miller, WVDOR).

Right Photo: Forest Supervisor Shawn Cochran plants a red spruce seedling on the Mower Tract, Greenbrier Ranger District, Monongahela National Forest, Randolph County, (Source: Kelley Bridges, USFS).



Map 3.18 Red Spruce (*Picea rubens*) distribution in West Virginia with private versus public breakdown, (WVDOT GIS, 2020 and Byers et al., Red Spruce Cover spatial dataset

<http://wvgis.wvu.edu/data/dataset.php?ID=455>).



Cooperative Hemlock Conservation Group

The WVD OF works with the USDA Forest Service; National Park Service, US Fish & Wildlife Service, WV Department of Agriculture, and The Nature Conservancy to develop priority areas and to cooperatively develop strategies for hemlock conservation in West Virginia. (See Issue 7: Forest Health for information about the impact of hemlock woolly adelgid on this resource.

Gypsy Moth Working Group

The WVD OF works with the West Virginia Department of Agriculture, the USDA Forest Service, the National Park Service, USDA – Animal and Plant Health Inspection Service (APHIS), and other interested groups to keep informed about the status of this pest, and the methods and funding being used to limit the damage it causes.

Invasive Species Working Group

The WVD OF works with: the West Virginia Department of Agriculture; the USDA Forest Service; the National Park Service; USDA – APHIS, Plant Protection and Quarantine Division; WVDNR; WVU Extension Service; US Fish & Wildlife Service; National Park Service; West Virginia Nursery & Landscape Association; West Virginia Quail Unlimited; WVDEP and others to facilitate actions for the prevention or reduction of invasive species. The group coordinates planning, communications, assessment, research, education, and control activities on all lands and aquatic communities in the state.

Strategy - Sub-Issue 3.6: Public Lands

State Forests (SFs) are the WVD OF's "public lands" priority area. According to State Code, the SFs are an important resource: for silvicultural and scientific research; developed and undeveloped outdoor recreation; propagation of forest trees; wildlife and fisheries management, aesthetic preservation; hunting and fishing; timber production; and demonstration of state-of-the-art forest management. Therefore, they should be managed on a multiple-use basis. By following these mandates, the WVD OF helps support the objectives and meet the goals of other statewide strategies.

State Forests support the sustainability of forest resources in the state, providing for forest regeneration, and habitat diversity and conservation. Demonstration areas on State Forests are educational and help improve public perceptions of forestry, as well as address future issues that will affect the WVD OF. State Forest management practices protect riparian areas. Forest health threats on State Forests are



surveyed, monitored, and evaluated by the WV Department of Agriculture (WVDA). The WVDOP works with WVDA to manage and eradicate pests and educate the public regarding forest health issues on State Forests. The management of State Forests contributes to ecological services, biomass energy potential, wood products, and timber quality.

Long-term Strategy 1

Increase the area available to demonstrate forest management to the public.

Strategy Narrative

Adding to the State Forest system in either the Forest Legacy Areas, or in the north western counties of West Virginia, would provide more public land for the residents of the state. The north western region of West Virginia lacks public forest land. Any State Forest expansion into these parts of the state will require a “willing seller”, funding, or possibly a land donation.

Timeline

The goal is to achieve this in the next ten years.

Measure of Success

Add to the State Forest system.

Long-term Strategy 2

Cooperate with other agencies to achieve management goals on public lands.

Strategy Narrative

The State Lands Manager is working with other agencies on three specific working groups all dealing with forest health issues: the Gypsy Moth Working Group, the Hemlock Conservation Group and the Invasive Species Working Group; in addition, other cooperative efforts are occurring with the CWPMA, the Fire Learning Network, High Elevation Restoration Working Group, the Monongahela National Forest, and various other potential partnerships.



Timeline

Utilizing interagency MOUs, the WVD OF will strive to meet forest health management goals set by the three forest health working groups mentioned above over the next ten years, as well as increase interaction with the Monongahela National Forest over the next five years.

Measure of Success

The goal is to work together to maximize WVD OF efforts to protect important forest resources on public lands in West Virginia.

Long-term Strategy 3

Continue to update State Forest management plans.

Strategy Narrative

The management plans for the State Forests are considered to be active documents that are updated as needed. Updating these plans involves coordinating with other state agencies that have management responsibilities on these properties, state and federal agencies which manage similar properties, and those agencies which manage for rare, threatened and endangered species that may occur on these properties.

Timeline

Each State Forest plan will be revised and upgraded once every ten years.

Measure of Success

These include: acres inventoried, boundary lines marked, wildlife habitat projects accomplished, timber stands marked and sold, erosion control projects completed, invasive species control projects implemented, and other forestry and natural resource projects as identified in annual work plans. All State Forest plans will include goals and targets for interpretive projects and educational activities.

Long-term Strategy 4

Maintain State Forest property boundaries.



Strategy Narrative

Part of land management is designating property boundaries on the ground. This work is dependent upon having funds for materials, labor, and contractors.

Timeline

The goal is to work with adjoining landowners and other managing agencies to make sure the boundaries are freshly marked every ten years.

Measure of Success

All State Forest property boundaries are painted and maintained.

Long-term Strategy 5

Invasive species control.

Strategy Narrative

Invasive species control work is important to maintain native plant diversity and functioning ecosystems. Management activities on State Forests can accidentally introduce non-native invasive species (NNIS). Private contractors are often required to help control invasive species and these contractors require funding. The WVDOP is working with other public land managers through the Invasive Species Working Group on a statewide invasive species plan.

Timeline

Continuous.

Measure of Success

Identify, prioritize, and continue to treat NNIS and develop more effective ways to control NNIS on State Forests.

Long-term Strategy 6

Encourage natural regeneration.



Strategy Narrative

It is important to encourage natural regeneration on public lands. The importance of regeneration is not always clear to non-industrial private landowners and they are often lacking in knowledge about how to achieve adequate regeneration. Regeneration can also be cost prohibitive under certain circumstances for some tree species. On public lands, it is a wise investment and vital to maintaining species diversity. There are opportunities to apply these same principles to family forests; one of the purposes of State Forests is to demonstrate sound, scientific forest management.

Timeline

Continuous.

Measure of Success

Each time a new silvicultural prescription is prepared for a stand on a State Forest, a portion of that project will be dedicated to creating conditions suitable for natural regeneration.

Long-term Strategy 7

Provide diverse wildlife habitat.

Strategy Narrative

One of the mandates for the management of State Forests is to demonstrate sound, scientific, multiple-use management. To that end, providing diverse wildlife habitat is important. This is accomplished through working with the other land management agencies and also obtaining funding from outside sources, such as the National Wild Turkey Federation (NWTF) and the Ruffed Grouse Society (RGS). This work is primarily for early successional habitat and/or savannah development that will provide age class diversity, as well as other important habitat types and conditions.

Timeline

Continuous.

Measure of Success

Ten percent of each new silvicultural project area will be managed specifically for wildlife.

**Long-term Strategy 8**

Provide for rare, threatened and endangered species (RTE).

Strategy Narrative

The guidelines under which State Forests are managed dictate that special care will be given to the protection of existing rare, threatened, and endangered species and their required habitats. Consideration will be given to unique species and habitats when found. This is done by working with the state and federal wildlife agencies and can be funded with competitive grants. For further information about RTE species refer to the SWAP available at: (http://www.wvdnr.gov/wildlife/action_plan.shtm).

Timeline

Continuous.

Measure of Success

Identify potential habitat, protect existing habitat, and expand habitat where possible.

Long-term Strategy 9

Develop carbon offset projects.

Strategy Narrative

One of the mandates for the management of State Forests is to demonstrate sound, scientific, multiple-use management. To that end, managing State Forests for maximum carbon sequestration as a forest resource is important.

Measure of Success

Implement carbon offset projects on all State Forests.

Timeline

Next 5 years.



Long-term Strategy 10

Implement prescribed fire as a management tool on state lands.

Strategy Narrative

One of the mandates for the management of State Forests is to demonstrate sound, scientific, multiple-use management. Prescribed fire is backed by science and has been proven to be an economical tool in forest management. WVDOF will assist with developing a prescribed fire council in WV. WVDOF will also coordinate with the Forest Service to include areas of state land where it feasible to implement prescribed fire at a landscape level.

Timeline

Next 5 years.

Measure of Success

Implement prescribed fire on state lands to promote natural regeneration and diverse wildlife habitat.



Bibliography

Aldinger, Kyle. 2020. Natural Resource Conservation Service (NRCS), Environmental Quality Incentives Program (EQIP) Accomplishments in West Virginia.

Aldinger, Kyle. 2020. Natural Resource Conservation Service (NRCS), Wetland Reserve Program (WRP) easements summary of past contracts.

Boyd, Jim. 2020. Monongahela National Forest. Personal communications regarding timber sales on the MNF to Travis Miller fall 2020.

Butler, B.J. et. al. 2020. Family forest ownerships of the United States, 2018. Gen. Tech. Rep. NRS-199. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station

Byers, Elizabeth A., Kenneth C. Love, Kristin R. Haider, Evan J. Burks, and Jeremy E. Rowan. 2013. Red Spruce (*Picea rubens*) Cover in West Virginia. Version 1.0 West Virginia Division of Natural Resources, Central Appalachian Spruce Restoration Initiative, Appalachian Forest Heritage Area Americorps, Monongahela National Forest, and U.S. Fish and Wildlife Service

Cimorelli, Anthony. 2020. CPT, FA, WV Army National Guard (WVARNG). Camp Dawson. Personal communications regarding acreages and management on Camp Dawson, provided Winter, 2020.

Hinkle, Kevin. 2020. Natural Resource Conservation Service (NRCS), Farm Service Agency, Conservation Reserve Enhancement Program plantings in WV, 2010-2020.

Horneman, Jeffrey. 2020. US Army Corps of Engineers (USACE). Pittsburgh District. Personal communications regarding acreage breakdowns for USACE managed properties in WV, provided Winter, 2020.

Krantz, Keith. 2020. West Virginia Division of Natural Resources (WVDNR), Wildlife Section. Personal communications regarding Wildlife Management Area acreage breakdowns to Travis Miller 2020.

Krantz, Keith. West Virginia Division of Natural Resources (WVDNR), Wildlife Resources Section. Personal communications regarding timber sales on Wildlife Management Areas and US Army Corps of Engineers properties to Travis Miller 2020.

MacDonald, Christopher. 2020. George Washington and Jefferson National Forests Management. Personal communications regarding management prescription areas provided to Travis Miller, fall 2020.

McCoy, Michael. 2020. US Army Corps of Engineers (USACE). Hintington District. Personal communications regarding acreage breakdowns for USACE managed properties in WV, provided Winter, 2020.

McGill, Dave. WV Forestry Association (WVFA). Personal communications regarding Tree Farm acreages by county for WV to Steve Harouff fall 2020.



Miller, Travis. 2020. WVDOF, WV State Forest timber sales 2010-2020.

Miller, Travis. 2020. WVDOF, WV Department of Agriculture timber sales 2010-2020.

Morin, Randall. 2020. Personal communications regarding FIA data for West Virginia to Charles Copeland and Steve Harouff. Fall 2020.

Oswalt, Sonja N.; Smith, W. Brad, Miles, Patrick D.; Pugh, Scott A., coords. 2019. Forest Resources of the United States, 2017: a technical document supporting the Forest Service 2020 RPA Assessment. Gen. Tech. Rep. WO-97. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 223 p. <https://www.fs.usda.gov/treearch/pubs/57903>.

Piehler, Kirk. 2020. Monongahela National Forest. Personal communications regarding management prescriptions and objectives, prescribed burns, and future desired conditions for the MNF to Steve Harouff fall 2020.

Ramey, Aca. 2020. US Army Corps of Engineers (USACE). Huntington District. Personal communications regarding acreage breakdowns for USACE managed properties in WV, provided Winter, 2020.

Skelly, Brett. 2020. Antlered bucks harvested by county during the November two-week firearms deer season 2019. West Virginia Division of Natural Resources (WVDNR), Wildlife Section. Provided October 2020.

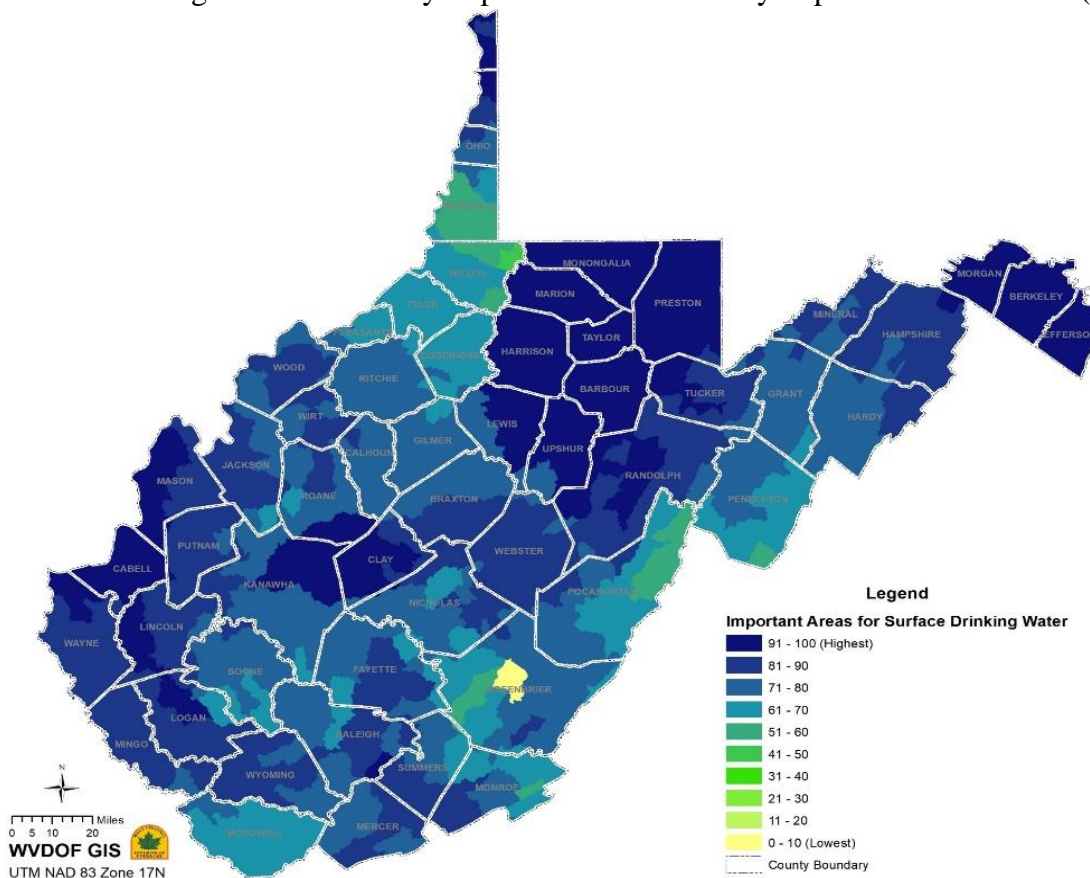
Washington, Dawn. 2020. US Fish & Wildlife Service (USFWS). Canaan Valley NWR. Personal communications regarding information on NWR management practices, acreage breakdowns, provided Fall, 2020.

Wood, Heather. 2020. US Army Corps of Engineers (USACE). Pittsburgh District. Personal communications regarding acreage breakdowns for USACE managed properties in WV, provided Winter, 2020.

WVDOF GIS, 2020. Managed Timberland accounts 2019, historical Forest Stewardship program participants 1997 -2020, historical wildfire occurrence 1987 -2020, historical harvest notifications 2005 -2020 and public lands 2020.

State Issue 4: Water Quality

West Virginia is a headwater state for both the Chesapeake Bay and the Ohio River drainage systems, with several rivers having their sources within the mountains. The combination of rugged topography, fragile soils, and high annual rainfall poses a very real threat to water quality far outside West Virginia's borders. Fortunately, the state has an abundance of forests that filter and clean water. The people of West Virginia and numerous downstream states rely on this clean water for recreation, drinking water, transportation, and irrigation. Fish and wildlife can be negatively impacted by land use practices that impair water quality. It is important that proper forest management practices are used, especially in critical forest riparian areas, to minimize effects on water quality and sedimentation that could occur from utilization of forest resources. In a study by the USFS (Barnes, et al "Forests, Water and People" (FWAP, 2009)), it was indicated that West Virginia has remarkable potential to produce clean water when considering such factors as land use, soil erodibility, road density, and population density. A similar project done by the USFS (USDA Forest Service. Forests to Faucets 2.0 [spatial dataset] "Forests to Faucets 2.0 Connecting Forests, Water and Communities." (F2F2)) also found that the headwaters of West Virginia are extremely important for their ability to produce clean water (Map 4.1).



Map 4.1: Important areas for surface drinking water in WV by HUC12 score. (Source: USDA Forest Service. Forests to Faucets 2.0 [spatial dataset]. (2019). Available: <http://bit.ly/F2F2Data>. [01/17/2020].

The authors of the F2F2 study have provided significant GIS data supporting their study summarized by hydrologic unit codes (HUC). A HUC is a U.S. Geological Survey hierarchical system based on surface hydrologic features classified into hydrologic unit codes. Summarized data from the F2F2 study included a composite score for the importance of surface drinking water production known as the “Important Watersheds for Surface Drinking Water” (IWSDW). Much of the state scores high, using this system, which translates into a need to protect and conserve our forested watersheds if we want to produce clean water (Map 4.1). This is due to the high percentage of forested acreage within the state and the forest’s ability to produce clean, fresh water. Because this composite score represents a large amount of data, it plays an important part in the prioritization methodology.

Sub-Issue 4.1: Sedimentation from Silvicultural Operations

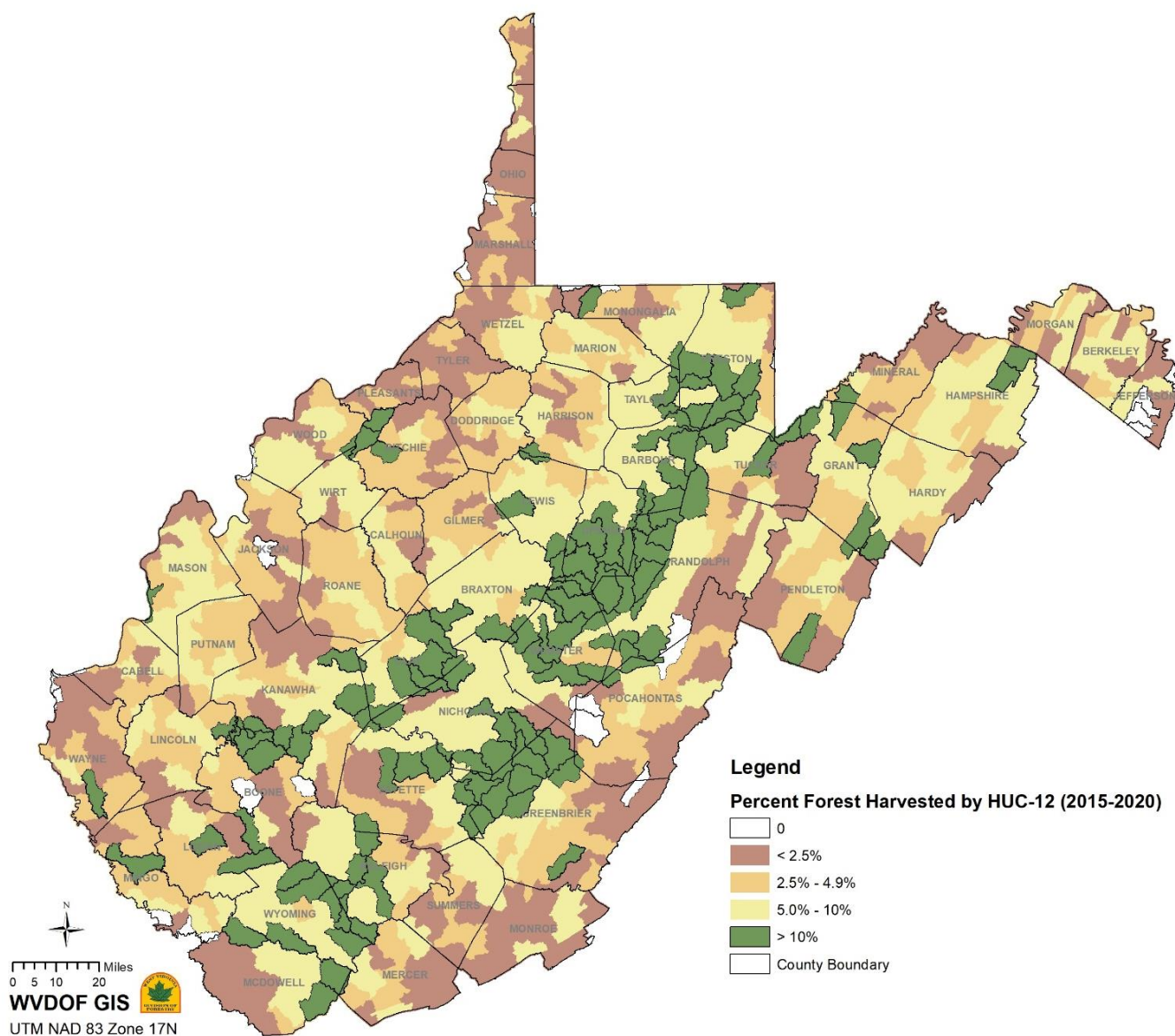
West Virginia’s waterways are threatened by sediment, which is the leading pollutant within the state’s waterways. Unlike many chemical pollutants, it is widespread across the state. With any cut bank hydrological system some sedimentation is natural and unavoidable, but it is important that activities near waterways be planned properly to minimize additional sediment movement into stream waters.

There are many human caused sources of stream sedimentation to the waters of the state, including excavation for development, road construction and maintenance, oil and gas activities, surface mining operations and silvicultural operations. The only one of these the WV Division of Forestry has any ability to impact is silvicultural operations.

Silvicultural operations on forest land, when done improperly, can also contribute to sediment loading within the state’s waterways (Figure 4.1). Though West Virginia has state regulations that exceed the demands of the federal Clean Water Act, it is still important to remain vigilant. Unlike many of the other issues contributing to sedimentation, forestry operations are statewide, occurring in every county.



Figure 4.1: Extreme Sedimentation due to poor logging practices. (Source: WVDof)



Map 4.2: The percentage of forest land, within a sub-watershed, harvested between 2015 and 2020.

Map 4.2 is a good indicator of where the heaviest logging concentration areas lie. There are only a few areas where more than 10% of a sub-watershed has been harvested. Should additional funds ever be allocated for efforts above and beyond the state mandates, these would be important areas to consider. Especially where they overlap with watersheds as illustrated in Map 4.1.

Strategy - Sub-Issue 4.1: Sedimentation from Silvicultural Operations

Long-term Strategy

Continue to enforce the Logging Sediment Control Act (LSCA) and seek ways to make those actions more efficient.

Strategy Narrative

In a state with a mandatory best management practice (BMP) compliance, licensing for loggers, and a regulatory inspection system for the state's harvesting operations; West Virginia's forest industry is required to meet legislatively mandated performance standards. However, the budget issues of the last few years have severely impaired the ability of the agency to administer and enforce the provisions of the code.

In July of 2016, budget cuts forced us to lay off most of our field staff. A large part of those were directly responsible for on the ground inspection and enforcement of the provisions of the code. Though we did manage to get a few of those positions back in 2017, we were still badly understaffed and were forced to reorganize. We had to move away from program specialized employees and towards a service forester model in which one forester covers a multitude of programs in each project area.

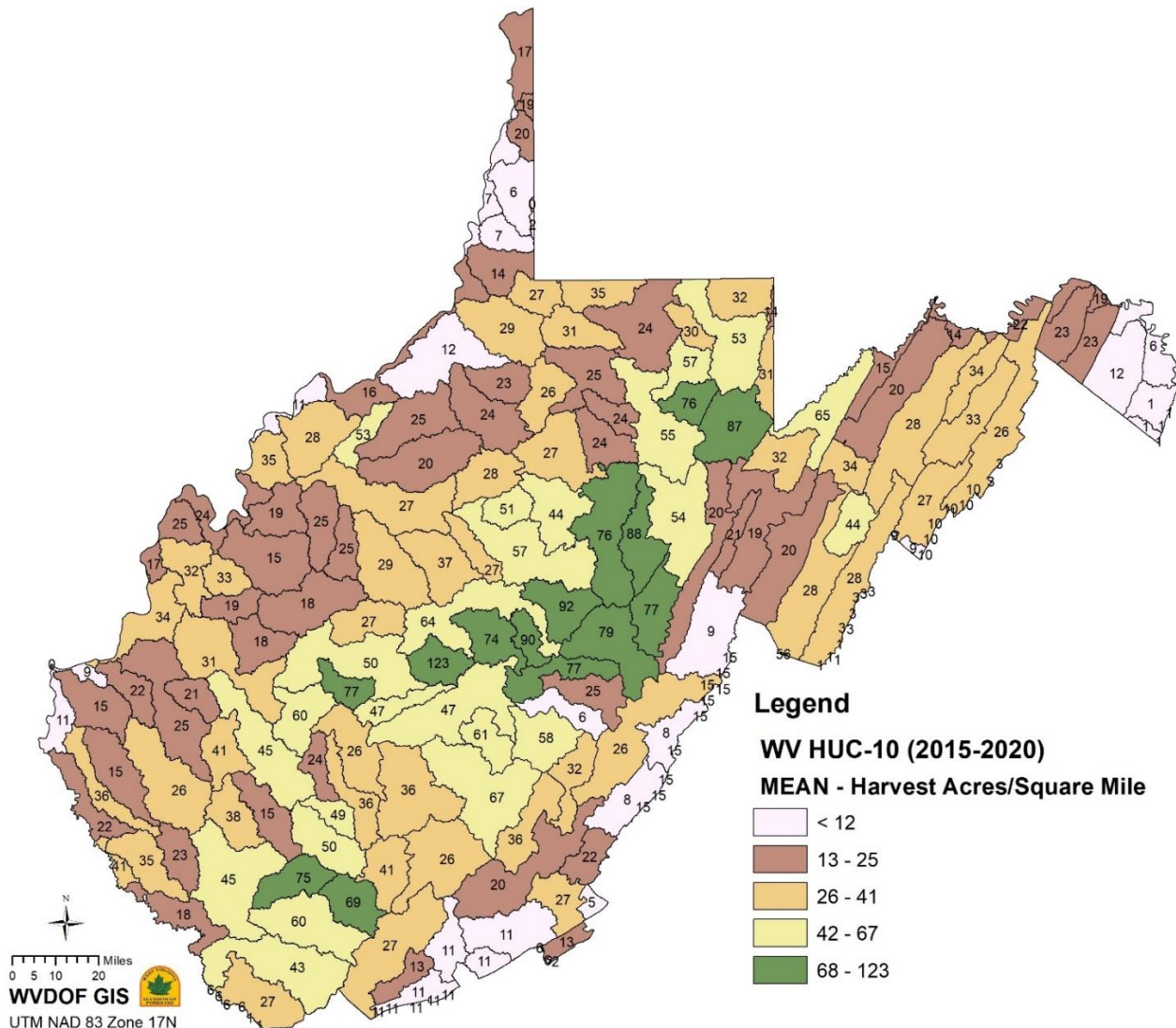
WVDOF is also moving forward with plans to utilize Unmanned Aerial Vehicles (UAV) in our inspection program and have already purchased several aircraft and trained several pilots with more on the way. This will likely be a program that we can focus on to improve efficiency going forward. We are currently in the process of determining best practices for UAV use during LSCA inspections and by the time of the five-year update, we hope to have those solidified and in place.

We also put a web-based tracking system online in 2013 which allows for near real time tracking of all logging operation notifications, inspections and enforcement actions taken by the Division. The benefits of this database have been innumerable so far. As helpful as the database is though, we will continue to evaluate shortcomings and seek funding sources to adapt and make improvements as we go forward.

Priority Areas

Because this is a code mandated requirement, we cannot focus our priority areas on geographical regions. Though we have adequate historical data to prioritize employee placement based on the density of logging operations in any given watershed or county. These could help if we face any more

significant funding shortfalls in the next decade and have to choose and pick areas where our employees would have the most impact.



Map 4.3: Average Harvest acres per square mile by HUC-10 Watershed. (Source: WVDOF GIS 2020).

Timeline

This is an ongoing, continuous program.

Measure of Success

The WVDOF will monitor the number of complaints received and percentage rate of BMPs in compliance for comparison to historical data going back to 1992. A change in these metrics is probably the best indicator of whether the WVDOF is preventing problems before they become serious enough to be noticed by the public.

Sub-Issue 4.2: Protection of Riparian Areas

Riparian areas, wetlands, and streamside management areas are the critical interface between forest land and the waterways of the state (Figure 4.2). They filter out sediment from runoff and the vegetation within these areas holds the stream bank in place during high water events. Although all forested land is important to clean water, these areas are critical to the long-term protection of waterways.



Figure 4.2: Riparian Buffer & Tree Planting in Romney, WV (Source: Potomacpartnership.org).

In West Virginia, many riparian and wetland areas are threatened by agriculture, as farmers keep them cleared for additional crop production or grazing or drain them to increase productive acreage. Many farmers let their animals have access to the stream channel itself for watering purposes, which causes a host of other issues, including bacterial contamination, increased biological oxygen demand, and sedimentation. Even though there are cost share and incentive programs in place to eliminate this practice, their effectiveness depends on attaining the interest and cooperation of private landowners.

Development also negatively impacts riparian areas within the state. These critical buffers are often infringed upon as land is graded flat for construction or cleared for lawns in housing developments, adding stress to the buffers and diminishing their protective capabilities. More significantly, riparian areas are sometimes removed entirely as segments of streams are channelized underneath parking lots or fill.



Strategy - Sub-Issue 4.2: Protection of Riparian Areas

Long-term Strategy

Increase riparian planting and protection efforts.

Strategy Narrative

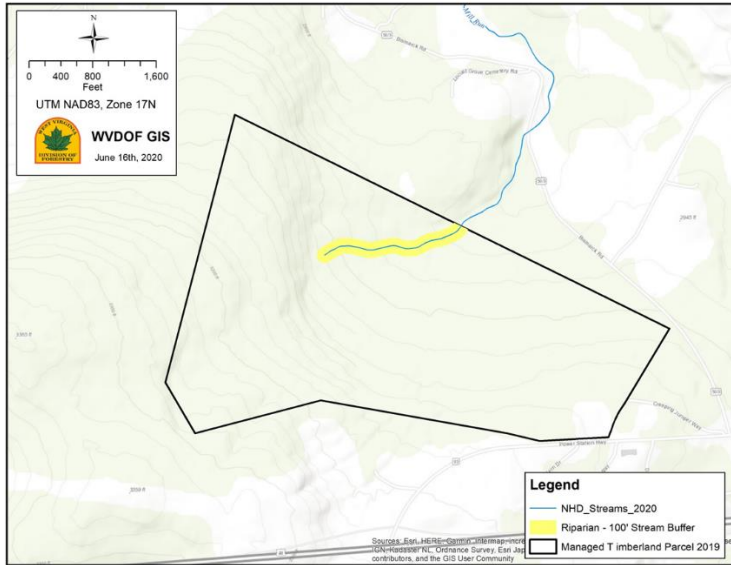
West Virginia has a lack of flat ground suitable for development and much of what does exist is located in stream bottoms and flood plains. This has led to significant encroachment by industry and urban development into riparian areas. There are areas where agriculture or inadequate landowner knowledge have led to riparian buffer degradation or outright removal. If restored, these riparian and wetland sites can be important for improving both stream quality and habitat diversity, since these areas tend to be ecologically rich and diverse.

The primary programs that will be involved within the WVDOP will be the Water Quality and Landowner Assistance programs, to educate and motivate landowners and get the practices in place. Stakeholders with a high interest in this activity will include private landowners, public land management agencies, various citizen action groups, the WVDNR, the West Virginia DEP, the USDA Forest Service, NRCS, FSA, and the Environmental Protection Agency.

Though some funding is available through cost share programs already in place, there are many high-priority areas that are not being addressed due to the reliance on volunteer work and a lack of sufficient funding.

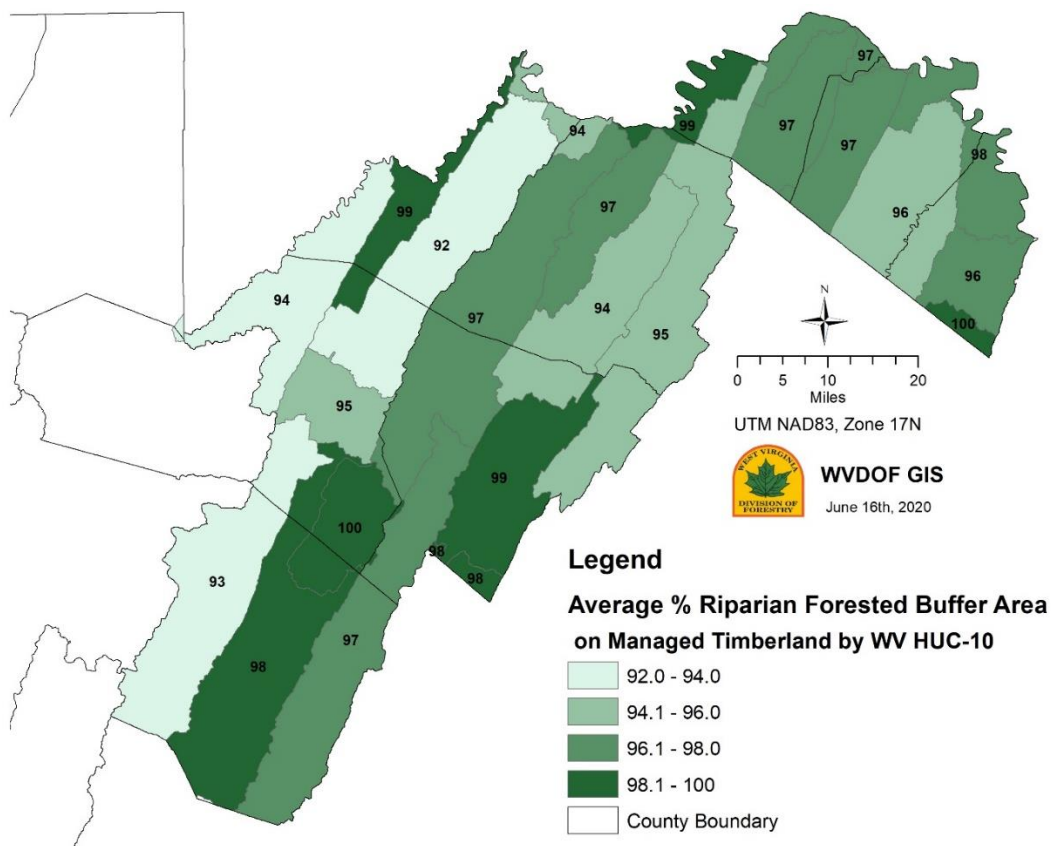
Priority Areas

As with the rest of the sub-issues, excepting 4.1, we have targeted the Eastern panhandle and the Potomac River watershed for our efforts going further. More specifically, we are targeting Managed Timberland parcels that border or include areas defined as having Riparian potential. These landowners have a vested interest in increasing the amount of forested acreage on their property. If demand for plantings is higher than anticipated, we will rank project priority by high priority watersheds in the Potomac identified in coordination with the WV Chesapeake Bay Tributary Team's Forestry Workgroup.



Riparian buffer (Image source: <https://fundforlakemichigan.org/wp-content/uploads/2019/01/Dby-CG6XUAArTjZ-min.jpg>).

Map 4.4: Parcel with 100' riparian buffer identified for project potential (Source: WVDOF GIS 2020).



Map 4.5: West Virginia Eastern Panhandle Potomac HUC-10 watersheds percent forested riparian buffers on Managed Timberland parcels (Source: WVDOF GIS and WVU NRAC, NAIP 2016 5-meter grid 5 class land cover <https://wvgis.wvu.edu/data/dataset.php?ID=489>).

**Timeline**

This will be an ongoing program, for as long as funding remains and there are riparian areas in need of protection.

Measure of Success

Increased number of stream feet planted or restored.

Sub-Issue 4.3: Protection of Public Drinking Water

Many of the state's sub-watersheds are sources of public drinking water. It has been estimated that several of the state's sub-watersheds are among the most important in the country, based on the percentage of the population which depend on surface water sources for drinking water (Barnes et al 2009). More than three major watersheds have headwaters in West Virginia including the Ohio, the James and the Potomac which all serve millions of downstream consumers.

The best way to supply clean water to this populace is by keeping as much of the sub-watershed in forest as possible and taking extra care to protect these sub-watersheds. Protection of water quality is as much a public health issue as it is a natural resource issue. Unfortunately, most lands in the state are privately held, the WVDOF role in this is largely limited. But there are paths we can take to influence this in subtle ways.

Strategy - Sub-Issue 4.3: Protection of Public Drinking Water**Long-term Strategy**

Protect forested headwaters in watersheds with public water intakes.

Strategy Narrative

Though this is a very broad strategy, it will be applied to very specific watershed areas in conjunction with the narratives outlined in sub issues 4.1 and 4.2 above. Forested land with riparian protection produces some of the cleanest water of any land use. The cleaner the water coming into the public intake, the cheaper and easier it is to treat for human consumption and other uses. By protecting the land we already have in forest and encouraging the establishment of new Riparian forests we can maximize our efforts across the targeted area.

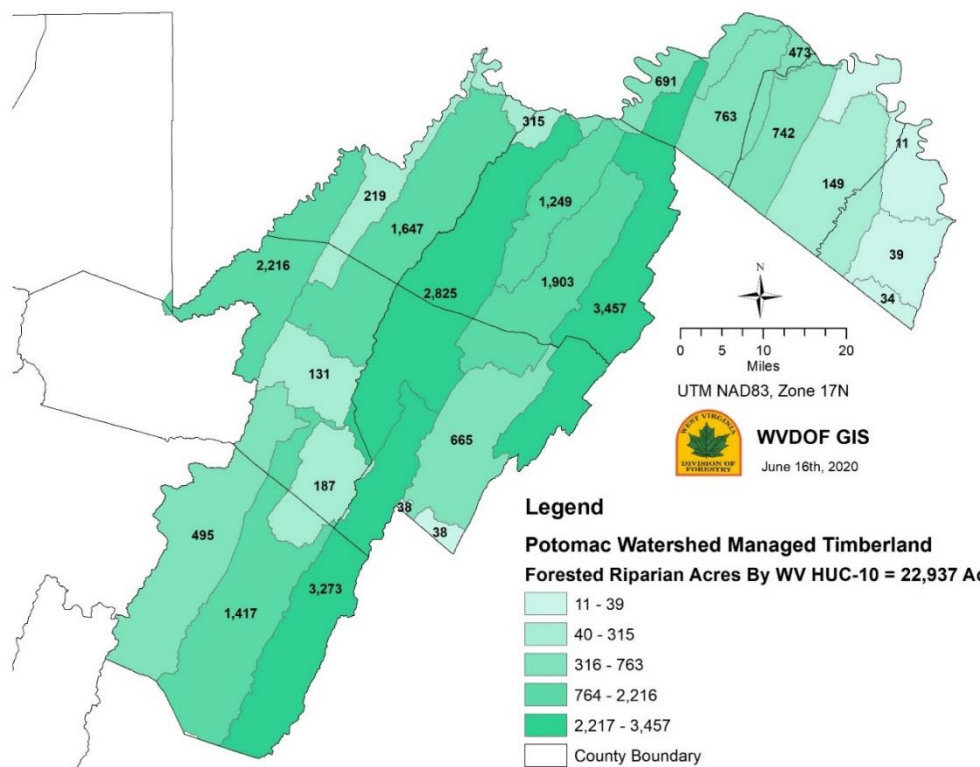
The primary programs that will be involved within the WVDOF are the Water Quality and Landowner Assistance Programs. These programs will educate other stakeholders and provide advice and oversight to ensure that forestry operations are properly planned and implemented for maximum return on the investment of funds and time. The Forest Legacy Program will likely purchase some conservation easements in forested headwaters, and the Fire Program will target many of these watersheds for increased fire prevention activities.

In addition, the Managed Timberland program offers landowners a property tax incentive to keep their land in productive forests and to not develop it or clear it for agriculture. We plan to contact landowners with property enrolled in Managed Timberland and try to educate and interest them in the value of riparian forest management principles. We also plan to launch a recruitment campaign to encourage more forest landowners to enter their land into the program, but the exact form of that campaign has not been determined yet due to unpredictable funding levels.

Stakeholders with a high interest in this activity include municipalities and local governments, various citizen action groups, public land management agencies, conservation organizations, WVDEP, the USDA Forest Service, the Environmental Protection Agency, and the West Virginia Department of Health and Human Resources.

Priority Areas

As with the rest of the sub-issues, excepting 4.1, we have targeted the Eastern panhandle and the Potomac River watershed for our efforts going further. As with sub issue 4.2, we are targeting Managed Timberland parcels that border or include areas defined as having Riparian potential.



Map 4.6: West Virginia Eastern Panhandle Potomac HUC-10 watersheds acres of forested riparian buffers on Managed Timberland parcels (Source: WVDOF GIS and WVU NRAC, NAIP 2016 5-meter grid 5 class land cover <https://wvgis.wvu.edu/data/dataset.php?ID=489>).

Timeline

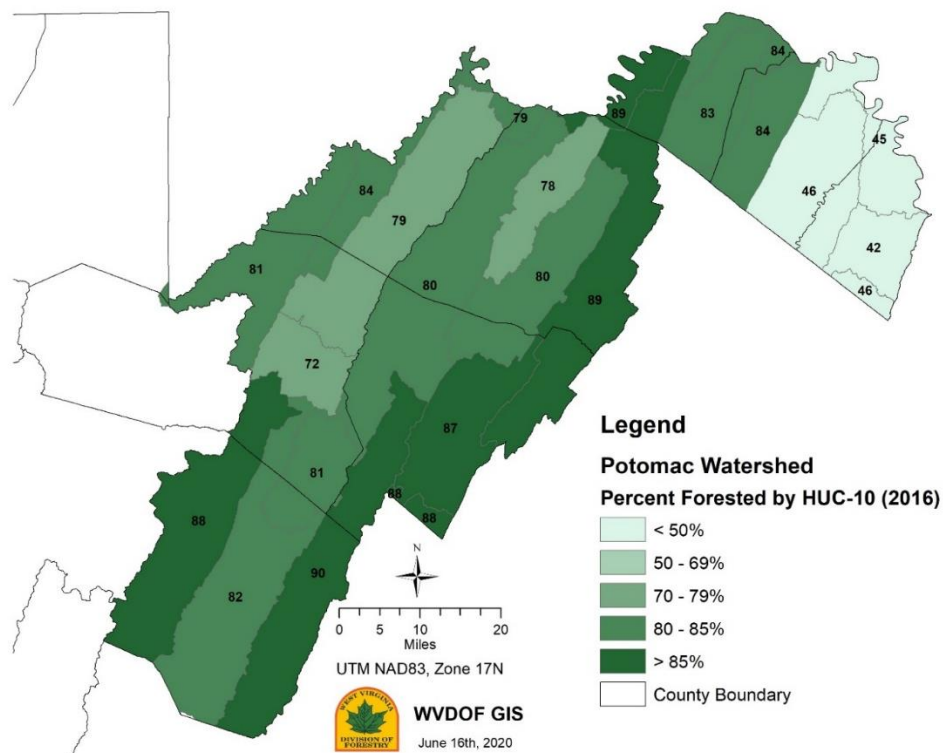
This will be an ongoing program for as long as funding remains or until it is no longer feasible to achieve further improvements in water quality.

Measure of Success

Number of acres added or lost to Managed Timberland in the Potomac Watershed area. In addition, the number of parcels with forest management plans riparian protections in place.

Sub-Issue 4.4: Chesapeake Bay Watershed

Two of the three major watershed basins that feed the Chesapeake Bay have headwaters within the state, of these two though the Potomac is easily the most conspicuous. Its protection and improvement are the goals of several federal and cooperative state projects. Although the issues within the Chesapeake Bay drainage are technically no different than any of the other issues addressed in this section, it has been targeted as an area of special concern. With all or parts of nine counties within the Bay watershed, West Virginia has made special effort to encourage protection, education, and public support among its citizens (Map 4.7). It is currently the only watershed in the state that has a Division of Forestry employee specifically assigned to focus on water quality efforts specifically within the watershed.



Map 4.7: West Virginia Eastern Panhandle Potomac HUC-10 watersheds percent forested (Source: WVU NRAC, NAIP 2016 5-meter grid 5 class land cover <https://wvgis.wvu.edu/data/dataset.php?ID=489>).

The biggest obstacle to success in the Potomac River drainage is development pressure and public buy-in. Many WVDOF programs rely almost exclusively on public interest and involvement. In short, people and landowners have to sign up. However, this is some of the most valuable land in the state. It is often more economically attractive to keep the land in agriculture or to develop it, rather than to put the land into a riparian protection project or easement. This is an area that truly needs to be addressed and for which there is no easy solution. See Issue 1: Competing Land Uses, Forest Legacy Area 2 for more information.

High priority areas were identified using criteria outlined below. These areas possess conditions that indicate possible water quality issues that may be addressed with restoration and protection of sub-watersheds by traditional forestry practices and management.

Strategy - Sub-Issue 4.4: Chesapeake Bay Watershed

Long-term Strategy

Continue participation in the Chesapeake Bay Program.

Strategy Narrative

The 2020 Chesapeake Bay Shared Stewardship Agreement highlights the importance of this area and West Virginia's part in the watershed. Many of the recommendations for forest restoration efforts made in the agreement are scattered throughout this document and across various programs administered by the Division. It is important that we keep a Forestry voice present in the conversation and outreach to address those strategic goals.

The WVDOF's Chesapeake Bay Forester position, cooperatively funded by USFS, WVDEP and WVDOF, has made a positive impact upon the state's efforts by improving education and conservation activities in watershed tributaries. The WVDOF will continue to provide specialized forestry education and advice to cooperators and interested parties and increase awareness and interest in the program. The primary programs that are involved within the WVDOF are the Water Quality, Landowner Assistance and Managed Timberland programs. These programs will educate other stakeholders and provide advice and oversight to ensure that forestry operations are properly planned and implemented for maximum return on the investment of funds and time. The Forest Legacy Program has significant impact by purchasing conservation easements in the area.

Stakeholders with a high interest in this activity include municipalities, local governments, various citizen action groups, public land management agencies, conservation organizations, the WVDEP, the USDA Forest Service, and the Environmental Protection Agency. The consequences of the activities affect areas outside the state since this is part of a multi-state program.

**Priority Areas**

As with the rest of the sub-issues, excepting 4.1, we have targeted the eastern panhandle and the Potomac River watershed. In the future they may be some interest in expanding cooperative efforts with the James River. Though right now interest in the James is only beginning to emerge and WV only has a tiny portion of Monroe County within the watershed.

Timeline

This will be an ongoing program for as long as funding remains or until water quality impairment from non-point sources in the Chesapeake Bay watershed is reduced to an acceptable level.

Measure of Success

Performance can be evaluated by meetings attended and number of contacts made by WVDOF employees with our partners and stake holders in the region.

Bibliography

Barnes, M.C., A.H. Todd, R.W. Whitney, and P.K. Barten. 2009. “Forests, Water and People: Drinking water supply and forest lands in the Northeast and Midwest United States”. USDA Forest Service.

Chesapeake Bay Shared Stewardship Agreement 2020,
<https://www.fs.usda.gov/sites/default/files/Chesapeake-Bay-Shared-Stewardship.pdf>

USDA Forest Service. Forests to Faucets 2.0 [spatial dataset] 2019 “Forests to Faucets 2.0 Connecting Forests, Water and Communities.”

WVDOF GIS, 2020. Historical Harvest Locations 2005 – 2020.

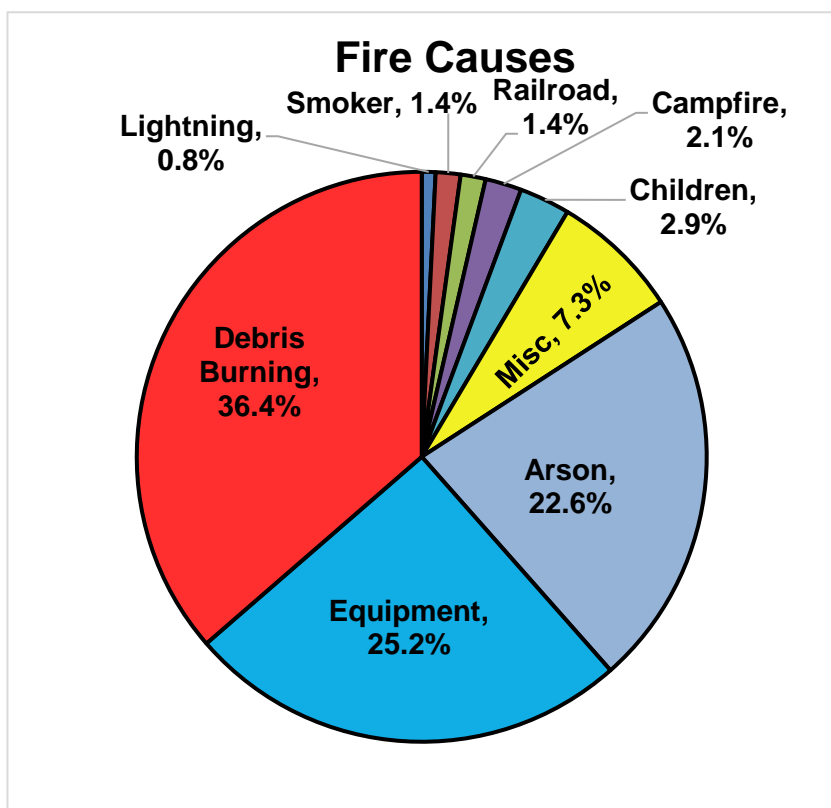
State Issue 5: Wildfire

The Division of Forestry is responsible for protecting all non-Federal land and personal property in the state from wildfire. The Division of Forestry is also mandated by state law to suppress wildfires on all lands of the state. The Forest Protection section of the Division of Forestry is charged with meeting these responsibilities and engages in three primary programs – Prevention, Preparedness, and Suppression. These three programs will be addressed in this section.



Sub-Issue 5.1: Prevention

Wildfire prevention includes all activities which reduce the number and size of wildfires that occur in the state. Over 99% of all wildfires in West Virginia are caused directly by humans or human activities. Debris burning continues to cause the most wildfire occurrence, averaging over 35% of all wildfire occurrence over the past ten years. Arson and power lines are the other primary causes of wildfire occurrence, averaging about 24% each over the past ten years. Arson wildfires account for about 45% of the total acreage burned. About 21% of the acreage burned is related to past coal mining activity. Burning coal seams and



heat from decomposition in coal refuse areas ignite forest litter and frequently go undetected for several hours or days due to their remote locations. Prevention activities are focused on these primary causes of fire occurrence and acres burned. There are two statutory “Fire Seasons” in West Virginia, March 1 to May 31 and October 1 to December 31, that prohibit outdoor debris burning from 7 a.m. to 5 p.m. The purpose of the law is to reduce the probability of debris fires to escape and cause wildfires when the risk is high.

Strategy - Sub-Issue 5.1: Prevention

Long-term Strategy

1. Continue to deliver prevention education to children in elementary schools
2. Continue to participate in local and state fairs and festivals to deliver prevention education to children and adults
3. Maintain fire danger signs to provide wildfire risk information at the local level
4. Use local media to provide wildfire risk information
5. Continue investigation and law enforcement measures to reduce arson fires
6. Continue to pursue the installation of mitigation measures on burning coal seams and refuse areas
7. Work with electric companies to reduce wildfires caused by power lines
8. Increase prevention efforts in areas with a high incidence of wildfires due to debris burning

Strategy Narrative

Delivering wildfire prevention education programs in elementary school has always been a primary objective of the DOF. On average, the DOF presents a prevention program to about 14,000 students in the classroom. The use of Smokey Bear and associated prevention materials will continue to be used in schools. In addition, a prevention message is delivered to people of all ages at fairs and festivals throughout the state. The DOF presents a prevention message at an average of about 90 of these festivities each year that reach an estimated 55,000 attendees. West Virginia is a member of the Middle Atlantic Forest Fire Protection Compact which has a Prevention Committee. The DOF provides a representative on this committee to develop multi-state, regional, and national prevention programs.

The DOF has installed and maintained fire danger signs throughout the state for decades. These signs have been effective in providing a daily notice of the predicted fire danger on a local basis. An effort has been made in recent years to replace old, deteriorated wooden signs and this will continue until replacements are completed. Signs are also being relocated to areas with more visibility due to traffic pattern changes over the years. Most signs are located at or near volunteer fire departments and members assist the DOF with changes to the daily fire danger rating. Many low power AM radio stations are located in rural areas throughout the state. These stations are popular in those local areas and the only radio signal available in many cases. The DOF provides local wildfire risk information to these stations for broadcast.



There are areas in the southern half of West Virginia where arson fires are most prevalent. An increased effort in investigation and law enforcement has been made since the mid 1990's in these areas. Two wildland fire investigators/bloodhound handlers are located in this area to investigate suspected arson fires, identify suspects, and gather evidence for prosecution. In addition, all DOF personnel responsible for wildfire suppression are required to complete the NWGC Wildfire Origin and Cause Determination course to better determine wildfire causes which helps to identify probable arson fires.

Wildland fire hazards related to coal mining are burning coal seams and mining refuse disposal areas that generate heat from decomposition. Many of these are on corporate owned property in remote areas with difficult access and contribute to large fire occurrence as the fire may go unnoticed or unreported for several hours or days. The known hazards have been mapped so they can be monitored during times they are most likely to cause a wildfire. Wildfire control plans are in place if the hazard should cause a wildfire. Some hazards have mitigation measures installed. Corporations that own large acreages support temporary employees for monitoring, maintenance of hazard mitigation measures, and suppression. The DOF has and continues to work with landowners where the hazards are located to install mitigation measures. Rights of ingress and egress and liability issues have been a hinderance to installing more mitigation measures, but negotiations are ongoing.

Power transmission lines have increased as a cause of wildfires throughout the state and are responsible for about 24% of wildfire occurrence. This may be partly due to better wildfire origin and cause investigations over the past several years. Trees falling into powerlines from outside right of ways are a major reason for powerline fires. Poor maintenance of right of ways and powerline structures also contribute to wildfires. Efforts are being made to improve powerline right of way maintenance. Debris burning continues to be the predominant cause of wildfire throughout the state and primarily involves adults. Prevention education focused on adults and debris burning are being increased. Fire danger messaging is being increased in areas with a high incidence of fires caused by debris burning.

Timeline

These activities are ongoing.

Measure of Success

Fewer fires and less acreage burned.

Sub-Issue 5.2: Preparedness

Preparedness activities done in advance of wildfire occurrence ensure timely, effective, and safe suppression actions. The Division of Forestry continues to maintain and build capacity for wildfire suppression. The preparedness program involves training, equipment acquisition for response and suppression, remote automated weather station (RAWS) network, radio communication systems, GIS mapping and data analysis, community wildfire protection plans, and hazard mitigation. Agency funding is hindering an adequate level of preparedness.

Many front-line vehicles are past their recommended replacement age and mileage. The DOF radio system is past its lifespan, so parts are becoming unavailable for repairs. Repeaters and control stations need replaced as well as mobile and portable radios. RAWS installations need upgraded equipment to meet the Weather Information Reporting System standards that become mandatory in a few years. A one-third reduction in field personnel occurred in 2016 and staffing has only increased slightly.

West Virginia is a mountainous, rural state over 80% forested and most communities are in the wildland-urban interface. However, few high-risk communities are interested in developing or implementing wildfire protection plans. Liability, ingress-egress issues, and property transfers have hindered installation of mitigation measures on known wildfire hazards. Volunteer fire departments are a primary component of the state's wildfire suppression capacity.



Remote Automated Weather Station (RAWS)



FFP fire truck provided to VFD for crash response at aircraft training site

The DOF will continue to support building the capacity of volunteer fire departments through training and equipment. On average, the DOF trains over 500 volunteer fire department members each year in wildfire suppression and safety. The DOF provides over 95% of Volunteer Fire Assistance grant funds to fire departments to increase their response and suppression capacity. The DOF also works with fire departments to acquire equipment through federal programs, primarily the Defense Logistics Agency Fire Firefighter Property (FFP) program.



Strategy - Sub-Issue 5.2: Preparedness

Long-term Strategy

1. Continue suppression and safety training programs, focused on volunteer fire departments
2. Continue equipment acquisition programs to increase capacity for response and suppression
3. Maintain RAWs network to meet required standards
4. Replace outdated radio communication equipment
5. Continue to maintain and improve GIS mapping and data analysis
6. Increase the development and implementation of CWPPs
7. Continue interaction with cooperating agencies and neighboring states for mutual aid and jurisdictional issues

Strategy Narrative

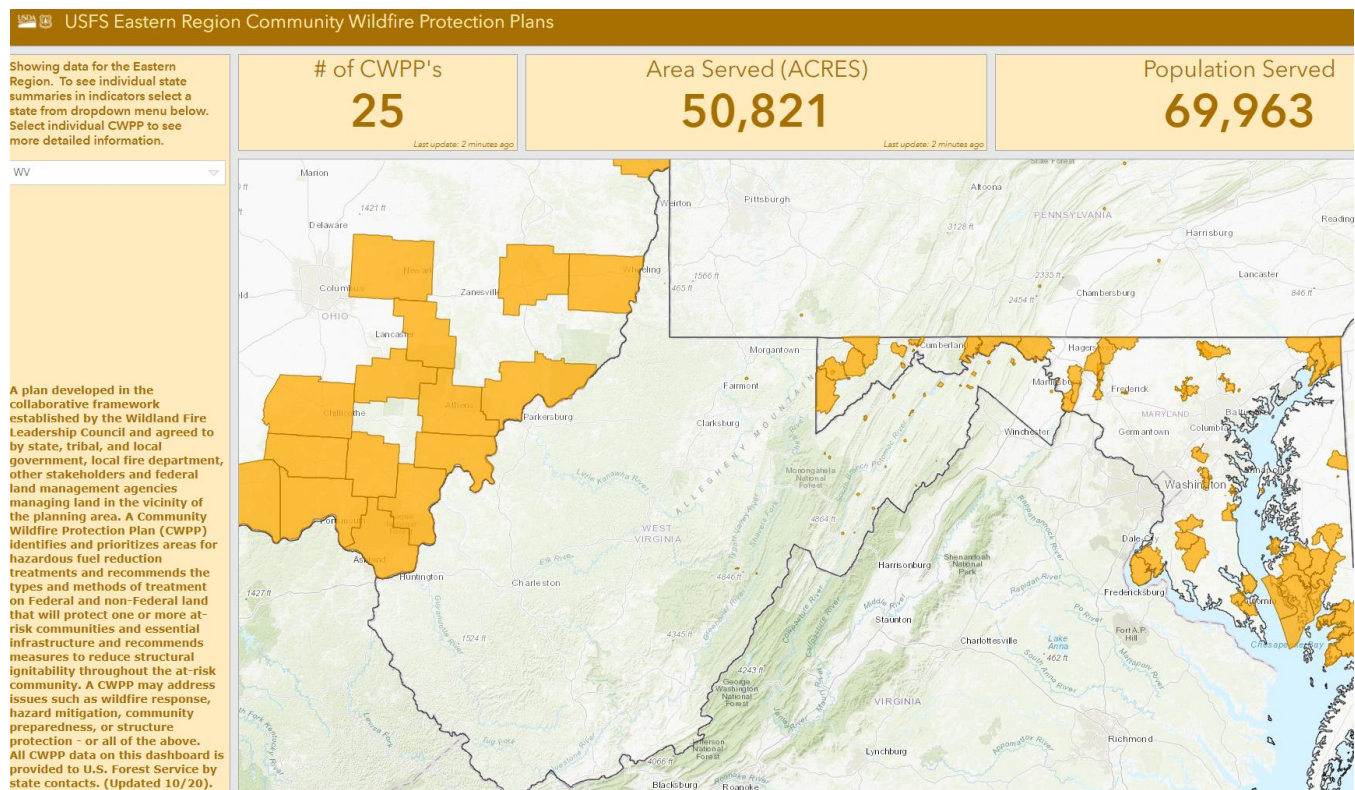
The DOF has had a good relationship with almost all fire departments in the state. The VFDs provide most of the manpower for wildfire suppression. Field personnel are required to make periodic contact with local VFDs to assess needs and capacity. Wildfire suppression and safety training is offered at no cost and an equipment incentive is offered to encourage training. The amount of Volunteer Fire Assistance grant funds allocated to VFDs to acquire equipment and PPE for wildfire response and suppression has been substantially increased with over 95% of the funds going directly to VFDs. This funding will continue as long as funds are available and has increased the capacity of several hundred VFDs to provide wildfire suppression assistance. Continue to provide supplies and equipment to VFDs through the Federal Excess Personal Property and the Defense Logistics Agency Fire Fighter Program. The DOF also coordinates with the Forest Service and National Park Service to assist VFDs in or near their jurisdictional areas.

The DOF maintains a network of 13 Remote Automated Weather Stations (RAWs) that provide weather information to the national wildfire weather system for wildfire danger forecasting throughout the state and region. Information from the stations is also used to predict fire occurrence probability throughout the day to gauge readiness needs. In addition, these stations are critical to provide local hourly weather information to predict fire behavior in order to perform safe and effective wildfire suppression.

The GIS program continues to compile a wide range of data important to provide critical information for preparedness planning. Wildfire occurrence data that shows fire origins and cause from 1987 to 2019 has been imported into the system. Most wildfire burned area boundaries for fires 10 acres and larger since 2010 have been imported into the system as well as available fire boundary data prior to 2010. Available wildfire risk data has also been incorporated. Property ownership and value information has been imported for most counties in the state and missing counties will be added as data becomes

available. The GIS program will continue to be maintained and the most current data incorporated as it becomes available.

Due to the rural nature of the state and over 80% of the state comprised of forest land, most communities in the state are in the Wildland-Urban Interface. Data related to infrastructure and property locations and values has become available. Better risk data has also become available. This data and our 33-year data on fire occurrence and acreage burned is being incorporated into our GIS program and will allow the DOF to better identify communities at high risk. Efforts to develop a CWPP will be focused on communities at highest risk. Currently there are 25 CWPPs in West Virginia covering 50,821 acres serving a population of 69,963 as shown below from the national [CWPP dashboard](#).



Approximately 10% of the forest land in West Virginia is owned by the federal government and managed by several federal agencies. Private and State property are interspersed throughout the federal property holdings. The Division of Forestry coordinates with the federal partners prior to the spring and fall fire seasons regarding mutual aid and jurisdictional responsibility.

West Virginia shares a border with five other states and these states are members of the Middle Atlantic Forest Fire Protection Compact or the Southeastern Interstate Forest Fire Protection Compact. West Virginia is a member of both compacts and the DOF works with the border states through the compacts and interstate group meetings regarding mutual aid and jurisdictions.

Timeline

RAWS upgraded by 2024. Radio equipment replaced by 2025. Other strategies ongoing.

Measure of Success

Decrease number of volunteer fire departments that have not received training within past 5 years. Maintain or increase assistance to VFDs for equipment acquisition. Replacement of outdated radio equipment. RAWS installations upgraded to meet national standard. Increase the number of communities with a CWPP and implementation of a CWPP.

Sub-Issue 5.3: Suppression

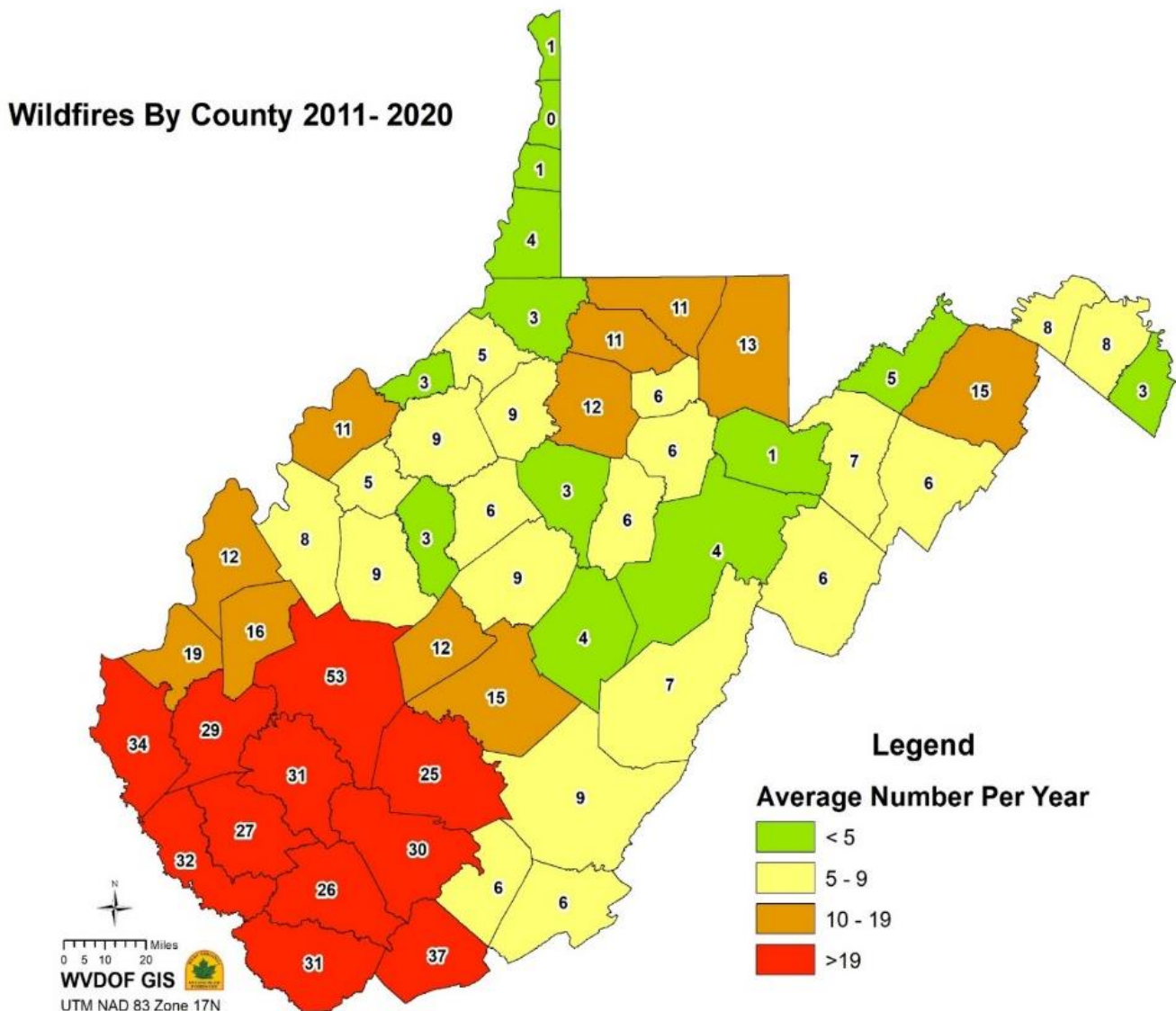
The Division of Forestry is mandated by state law to suppress all wildfires in the state. DOF field personnel have multiple duties, but wildfire suppression takes precedence over all other activities. The DOF depends heavily on volunteer fire departments as first responders and manpower for suppression. The DOF has insufficient personnel to serve as first responders to all wildfires and in most cases, only has one or two personnel available in each county for wildfire suppression. When possible, DOF personnel are temporarily relocated from low fire occurrence areas to high occurrence areas to support suppression efforts. Since the one-third reduction in field personnel in 2016, average fire size has increased.

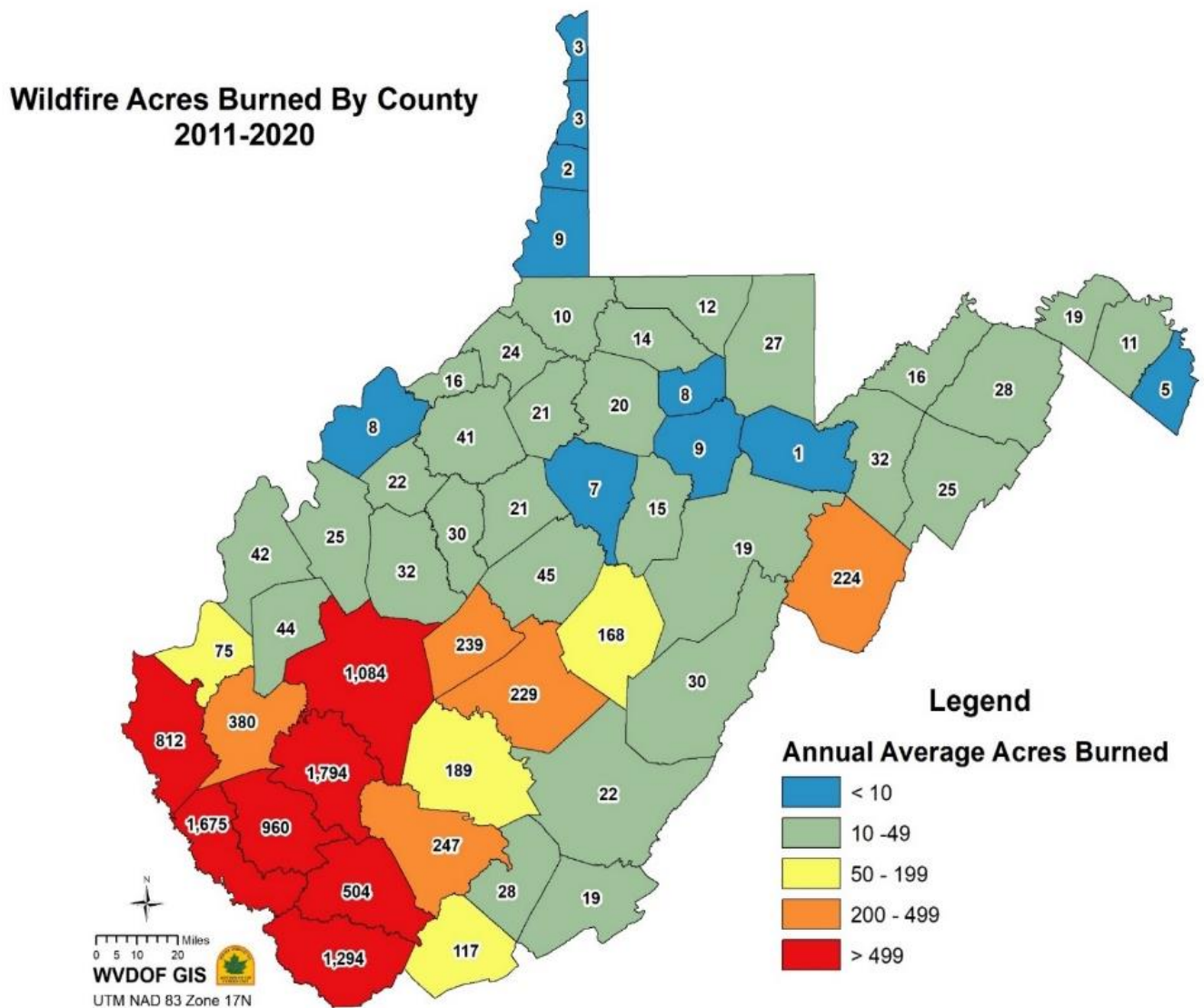


Spring wildfire in Mercer County, West Virginia

West Virginia is a rural, mountainous state that contains large expanses of remote areas. Aerial detection is utilized on days when a high risk of fire occurrence is expected to locate fires that would otherwise go undetected. In recent years, contractors for this service have declined so aerial detection is frequently unavailable on days when it is most necessary.

Funds to acquire heavy equipment have been unavailable for decades so wildfire suppression take place mostly with hand tools and leaf blowers. Dozers are used on a contracted basis when available for large fire suppression but until recently, the DOF had no dozers for its own use. The DOF acquired two dozers from the State of Ohio through a Middle Atlantic Forest Fire Protection Compact mutual aid agreement but operators and transports are still lacking.





The DOF has an excellent relationship with corporations that own large acreages of land in the southern counties that have the most fire occurrence and majority of the acreage burned. The DOF has agreements with several of these corporations to provide temporary employees for wildfire suppression during our statutory fire seasons, March-May and October-December. These agreements allow the DOF to hire one to three additional personnel in these southern counties for detection and suppression of wildfires on all lands in the area. These temporary employees also maintain fire breaks around hazards for prevention measures.

Strategy - Sub-Issue 5.3: Suppression

Long-term Strategy

1. Increase DOF personnel to 2016 level at minimum
2. Continue to train and equipment volunteer fire departments to provide more effective wildfire suppression
3. Secure additional funding to replace DOF frontline vehicles
4. Identify means and methods to increase wildfire detection
5. Increase communication capabilities on wildfires
6. Acquire transport vehicles for dozers and train operators
7. Maintain relationship with landowners of large acreages to aid with hiring of temporary personnel for increased suppression capacity

Strategy Narrative

In 2016, one-third of the DOF positions were eliminated due to a budget reduction, all of which were field positions. This resulted in a significant reduction in suppression capacity – personnel and experience. Wildfires are burning longer before suppression action is taken and average fire size has increased even though fire occurrence has been below the 10-year average. A few positions have been added and personnel rehired, but staffing is just over 70% of the 2016 level. Efforts are being made to secure funding necessary to replace the lost positions.

Volunteer fire departments are the primary wildfire first responders. Suppression and safety training will continue to be provided to these organizations. Volunteer Fire Assistance grant funds will continue to be allocated to VFD's for the purchase of suppression and safety equipment to build capacity. The DOF continues efforts to acquire equipment for VFDs, primarily through the Defense Logistics Agency Fire Fighter Property program.

Many of the large wildfires are a result of being undetected or unreported for several hours or days after initial ignition. Since abandoning the fire tower network in 1986, aerial detection is used on days of high risk to locate these types of fires. In recent years, the availability of contractors to provide aerial detection has significantly decreased resulting in less flights when they are most needed. Efforts are being made to increase aerial detection flights by coordinating military flight training with wildfire detection when possible.

Fireline communication is an important factor in wildfire safety and suppression coordination. The DOF operates a radio system for agency communication. The system's repeaters and control stations are 25 years old and past their life span. Parts to repair these stations are no longer available so



electronic component have to be repaired. Repairs can take weeks or months which reduce communication capability when they may be most needed. Efforts are being made to secure funding for equipment replacement. The DOF participates in the Statewide Interoperability Radio Network (SIRN) that allows statewide communications with other agencies and fire departments. SIRN mobile radios are needed to supplement the portable radio issued to each employee. Efforts are being made to secure funding for the purchase of SIRN mobile radios.

Dozers are necessary equipment for large fire suppression. Until recently, the DOF had none for agency use. Through a mutual aid agreement with the Ohio Division of Forestry, two dozers suitable for wildfire suppression have been acquired on loan. The DOF has no suitable transports or trained operators for the equipment. Efforts are ongoing to obtain transport vehicles and train operators

In the counties in the southern part of West Virginia where most wildfires occur and acreage is burned, corporations own a high percentage of undeveloped property. The DOF has fostered and maintained a good working relationship with these corporations to assist with prevention and suppression. Cooperation agreements between the DOF and several of the corporations provide temporary personnel during the times of year when most fires occur and serve public and private property in addition to the corporate property. The additional personnel patrol assigned areas to compel compliance with outdoor burning regulations which help prevent wildfires caused by debris burning, monitor hazard areas, assist with detection, and are critical for suppression capacity on private and public property. Efforts to continue and expand participation in the agreement will be ongoing.

Timeline

Detection capability by 2023. Communication capability and transports by 2025. Remaining strategies ongoing.

Measure of Success

Increase in field staff. Increase in wildfire detection capability. Increase fireline communication capability. Heavy equipment transports acquired. Support for temporary employees maintained. Reduced average fire size.

Sub-Issue 5.4: Prescribed Fire

In 2018, the first legislation regarding prescribed fire in West Virginia was passed. The legislation only authorizes the use of prescribed fire on wildlife management areas, state forests, and federal property for ecological, silvicultural, and wildlife management. The DOF was mandated to:

- Develop and administer a certified prescribed fire manager process
- Specified subjects for a certified prescribed fire manager training course
- Specified requirements to be certified as a certified prescribed fire manager
- Specified manner in which prescribed fire is to be performed

- Specified the requirements for a prescribed fire plan
- Specified actions that may result in revocation of prescribed fire manager certification

The certified prescribed fire manager training course is in the final stages of development. Only federal, Division of Forestry, and Division of Wildlife employees may be a certified prescribed fire manager.

By definition, state law limits application of “Prescribed Fire” only to wildlife management areas, state forests, or federal lands. This essentially prohibits the use of prescribed fire on private land or other public land. There has been minimal interest in prescribed fire use on private land, so the prohibition is not currently a major concern. As prescribed fire use increases on authorized public land and is demonstrated to be a safe and effective method to achieve land management objective, increased interest for use on private land may increase. The DOF will support expanding prescribed fire use to private land if enough desire for private land use is indicated.



Prescribed fire on West Virginia University research forest, a part Cooper's Rock State Forest

Strategy - Sub-Issue 5.4: Prescribed Fire

Long-term Strategy

1. Complete certified prescribed fire manager (CPFM) training and certification process
2. Develop a means to track training and certification as a CPFM
3. Expand the use of prescribed fire to private land
4. Establish a prescribed fire council



Strategy Narrative

The prescribe fire legislation enacted in 2018 authorized the use of prescribed fire on federal and state property, mandated the creation of a training and certification process for certified prescribed fire managers, and mandated the presence of certified prescribed fire manager on any prescribed burn.

Plans are to incorporate a Certified Prescribed Fire Manager (CPFM) state qualification into the West Virginia Incident Qualification System (IQS). IQS will be used to track an individual's training and certification and serve as a depository for certificates.

State law limits application of "Prescribed Fire" only to wildlife management areas, state forests, or federal lands. This essentially prohibits the use of prescribed fire on private land or other public land. The DOF will support expanding prescribed fire use to public land if enough desire for public land use is indicated.

Several governmental land management agencies have expressed an interest in forming a prescribed fire council to promote and advise on the use of prescribed fire. The DOF will support efforts to form a prescribed fire council.

Timeline

The training and certification process and IQS state CPFM qualification is expected to be completed with final approval by September 1, 2020. Expansion of prescribed fire use to private land and establishment of a prescribed fire council is expected to occur before 2030.

Measure of Success

Increase number of CPFM's, certification and training program created, increased use of prescribed fire for hazard mitigation and resource management.



Bibliography

WVDOF GIS, 2020. Historical Wildfire Locations 1987 - 2020.

West Virginia State Code, Chapter 20, Article 3, Section 5, 1994. *§20-3-5. Forest fire seasons; prohibited and permissible fires; burning permits and fees; fire control measures; criminal and civil penalties.* <http://www.wvlegislature.gov/wvcode/code.cfm?chap=20&art=3>



State Issue 6: Sustainability of Urban Forests

Program Overview

The West Virginia Division of Forestry has been working with cities and communities to manage our valuable urban forest resource since 1991. The Division of Forestry recognizes and supports the significant role urban trees play in enhancing the quality of life for all West Virginians. Our urban forestry activities include: helping build program capacity at the municipal and county levels; enhancing canopy cover in urban areas to conserve energy and to help mitigate climate change; encouraging management and strategies to increase ecosystem benefits and sustaining forest land. WVDof is a member of the WV DEP Chesapeake Bay Program and supports efforts to improve water and air quality and meet WV's commitments to the U.S. EPA Chesapeake Bay Program. This plan identifies three broad issues of the most concern and general strategies that will provide the most effective impact.

Observations and Challenges

West Virginia presents some unique challenges to providing the citizens with urban forestry assistance. Over half of West Virginians live in rural areas and an additional 15% live in urban clusters, consisting of small, often unincorporated communities. Only about a third of the population lives within urban areas with municipal government entities. Most of these municipalities are small towns with limited financial and other resources. Therefore, budgeting for urban tree care is a common challenge. Only Morgantown presently employs a full-time City Arborist. A lack of professional staff and professional tree care expertise at the community level is the norm.

Our program strives to be a source of urban forestry technical assistance to as many communities as possible. We focus on establishing and supporting local tree boards and frequently serve as the technical consultant to many of these tree boards. Another significant program component has been providing financial assistance to these communities with pass-through grants from our USFS budget. This is becoming increasingly difficult with increasing costs and without a dedicated state budget for urban forestry. Our current federal allocation covers urban staff salary and a modest travel and operational budget, with very little remaining to support community investments. An unknown level of state support makes future planning and program expansion challenging. Consequently, we need to focus our limited resources on communities that have demonstrated the greatest commitment and capacity to effectively manage their urban tree resources.

Rationale

All West Virginia communities need more trees, as well as a greater investment in tree management, staff, and funding. Some communities have proven to be very successful and committed to long-term tree care by sustaining effective tree boards, providing adequate urban tree care budgets, and

implementing good tree care practices. These successful communities are largely represented by our Tree City USA Award recipients. Our priority for state assistance is based on commitment rather than need with those communities proven to be effectively managing local tree resources receiving the highest priority. Additional communities will be recruited and assisted with the goal of achieving Tree City USA status, but they will not be eligible for financial assistance until a higher level of commitment has been demonstrated.

Sub-Issue 6.1: Sustain Program Capacity at the Community Level

Many of our communities are small and rural facing challenges with providing adequate funding for tree establishment, maintenance, and long-term management. Only a few are fortunate enough to have an arborist or forester as a local resource. These needs are often filled by our urban and community forestry program. Many communities rely on our Urban Forester as their sole source of technical expertise and our grants and other resources are major components of their tree care efforts. It has been our experience that communities must develop the infrastructure necessary to support an urban forestry program in order to be successful. A starting point for success is achieving three of the basic standards of the Tree City USA Award: the development of an advocacy group, tree ordinance and a tree care budget. Two additional steps towards becoming an actively managing municipality are defined and tracked by the USFS Community Accomplishment Reporting System (CARS): the development of a tree inventory with corresponding management plan, and the addition of professional staff. Our program strives to assist communities with the implementation of these five elements of success.

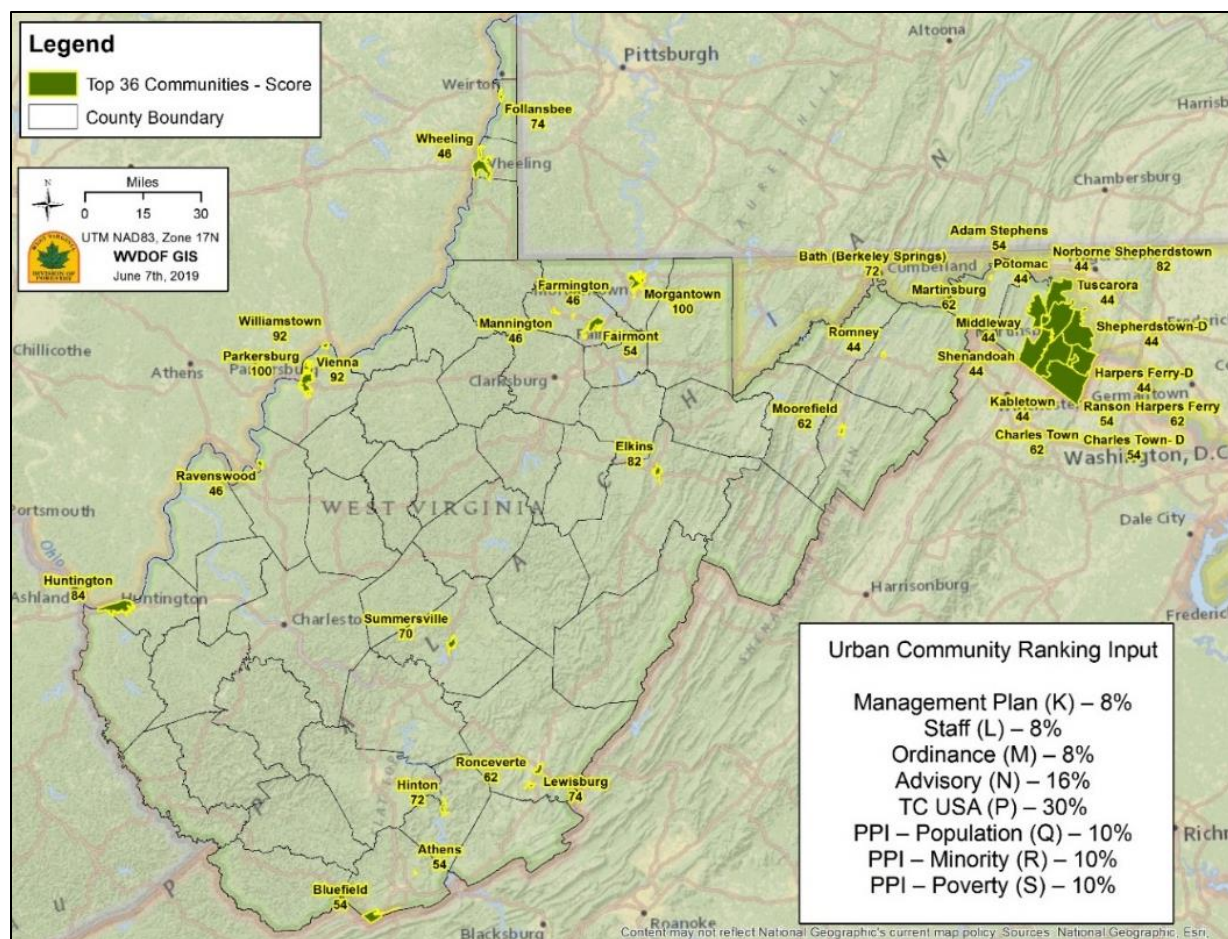
As discussed in the rationale above, our priority for state assistance are the communities that have demonstrated a commitment to investing in sustained urban tree care by developing effectual program infrastructure. Even with this infrastructure, these communities are often challenged to find sufficient local funding for professional tree inventories, management plans, Urban Tree Canopy (UTC) assessments and strategy development, green infrastructure projects, tree planting and maintenance and other needs. Financial support from outside sources is vital to their continued success. A challenge for our UCF program is to provide additional financial support with limited federal and state urban forestry funds. Pass-through financial support to communities from our core federal budget is modest. Additional support from state dollars is necessary to sustain our grant programs. We will continue to seek additional funding from corporate, government and NGO partnerships to support these communities.

West Virginia is approximately 78.50% forested and these forest lands provide great benefits to adjacent communities. However, this abundance of forests can sometimes cause urban trees to be under-appreciated and taken for granted by some communities. It is often challenging to generate sustained investments in urban forestry in small, rural communities. Many have participated in episodic tree planting and other programs but have not made the financial and time commitment towards developing tree boards, budgets, and ordinances. We will continue to recruit and assist additional communities with

the goal of achieving Tree City USA status, but they will not be eligible for direct financial assistance until a higher level of commitment has been demonstrated.

Table 6.1 – Priority Communities

Place Name	Rank	Place Name	Rank	Place Name	Rank
Morgantown	1	Harpers Ferry	13	Farmington	25
Parkersburg	2	Charles Town	14	Wheeling	26
Williamstown	3	Moorefield	15	Ravenswood	27
Vienna	4	Martinsburg	16	Romney	28
Huntington	5	Ronceverte	17	Norborne (CDP)	29
Shepherdstown	6	Fairmont	18	Kabletown (CDP)	30
Elkins	7	Bluefield	19	Middleway (CDP)	31
Follansbee	8	Athens	20	Shepherdstown (CDP)	32
Lewisburg	9	Ranson	21	Potomac (CDP)	33
Bath (Berkeley Springs)	10	Adams Stephens (CDP)	22	Shenandoah (CDP)	34
Hinton	11	Charles Town (CDP)	23	Tuscarora (CDP)	35
Summersville	12	Mannington	24	Harpers Ferry (CDP)	36



Map 6.1 - Priority Communities based on ranking results (WVDOF GIS, 2020).

Priority Area Methodology

Prioritization of WV communities was performed using a formula based on capacity and need. Capacity is most important, and future priority will be given to communities that have the infrastructure in place for successful urban forestry programs, i.e. Tree City USA status, advisory board, ordinance, management plan and staff. Need has been captured by incorporating PPI for population, minority and poverty into the final community ranking. The following weighted formula was applied to determine priority communities: Management Plan 8%, Professional staff 8%, Ordinance 8%, Advisory body 16%, Tree City USA 30%, PPI – Population 10%, PPI – Minority 10% and PPI – Poverty – 10%.

Desired Conditions and Goals for the next 10 years

Our Urban Forester provides essential outreach, technical assistance, and training to communities across the state. It is vital that this role expands over the next 10 years to meet the ongoing and emerging needs of our communities. Typical on-going technical and training opportunities include: planting plans, tree establishment, pruning, inventories, tree risk assessment, ordinance development, and pest and pathogen identification. Emerging needs will likely involve developing training to address: green infrastructure projects, UTC assessments and goals, smart and low impact development, and controlling invasive species. We will engage partners like Cacapon Institute, WVU and WVSU to expand our technical and training capacity. WV Tree Minders is a developing online training program providing basic and intermediate tree care knowledge and skills. Over the next decade, we will partner with WVSU to expand the curriculum and promote WV Tree Minders certification to tree board members, city maintenance staff and other volunteers.

Demonstration City Grants have long been a cornerstone of our program that provides both financial and technical support to communities. These pass-through grants have been funded from our core USDA Forest Service budget and stimulate local investment in urban tree care by requiring an equal local match. However, our core budget is no longer able to support a robust grant program without state support. Our goal for the coming decade is to permanently migrate a portion of the urban staff salary to state revenue which would allow more federal dollars to be utilized by the Demonstration City Grant program. State support will be essential to maintaining a proven grant program that builds and sustains the capacity of many communities across WV.

It is vital that existing Tree City USA communities and Tree Campus USA schools continue to receive technical and financial support from our program. Our 10-year goal is to move developing communities to a sustained level. This will be challenging as many do not have the means to employ a full-time arborist or forester. We will promote and fund ISA certification among existing municipal staff and encourage larger communities to invest in professional staff.

Another area of need is a lack of current management plans in some Tree City USA communities. These communities will be targeted with funding and technical assistance to develop community



forestry plans and UTC assessments with the goal of having working plans in all Tree City USA communities. Other, often small, and rural communities participate in urban forestry at the project level such as conducting periodic tree planting events. We will continue to provide outreach and encouragement to these communities through no-cost opportunities including Mountaineer Treeways and Project CommuniTree. Our goal is to utilize these programs to cultivate an appreciation for urban trees resulting in new Tree City USAs.

Strategy - Sub-Issue 6.1: Sustain Program Capacity at the Community Level

1. Provide urban forestry technical assistance to communities based on individual needs.
2. Provide funding through Demonstration City Grants and other sources to support tree inventories and management tools, green infrastructure projects, strategic tree planting and maintenance projects.
3. Provide a variety of training opportunities to tree advocacy groups and municipal and county employees to improve tree care and management skills.
4. Partner with WVSU to implement the WV Tree Minders on-line training program to increase the number of knowledgeable and skilled tree care providers on municipal tree boards.
5. Promote the Tree City USA and Tree Campus USA programs to ensure communities and educational institutions have the basic tools necessary for a successful and sustained urban forestry programs. This includes fostering new tree boards, ordinances, and other infrastructure in additional communities.
6. Encourage municipalities to budget for professional tree care staff and promote the ISA Certified Arborist program for existing staff.
7. Utilize the WV Big Tree Program to increase public awareness of the many values and benefits provided by large trees in urban settings and surrounding forest land.
8. Utilize the Mountaineer Treeways Programs to facilitate volunteer-based tree planting projects to help meet local UTC goals.

Measure of Success

Increase in the number of communities achieving 'Developing' and 'Managing' status in 'CARS'.

Sub-Issue 6.2: Mitigate Climate Change and Enhance Ecosystem Services

West Virginia's climate is changing. Most of the state has warmed 0.5°F to 1°F in the last century, and heavy rainstorms are becoming more frequent, contributing to an increase in annual precipitation by up to 10% in many parts of the state. By 2100, temperatures in West Virginia could increase by 3°F in winter, spring, and summer and 4°F in the fall. Precipitation is also estimated to increase by 20% in all seasons, slightly more in summer. In the coming decades, this is likely to increase flooding, harm ecosystems, increase some health problems, and possibly threaten some recreational activities. (US Environmental Protection Agency, August 2016, EPA 430-F-16-050 2018. *What Climate Change Means for West Virginia*).

Human health will be negatively impacted by climate change. Higher temperatures and increased frequency of heat waves may increase the number of heat-related deaths and the incidence of heat-related illness. High air temperatures can cause heat stroke and dehydration and affect people's cardiovascular and nervous systems. The elderly, particularly those living alone, are at greatest risk. The US EPA has found that climate change could also increase concentrations of ground-level ozone. High temperatures, strong sunlight, and stable air masses tend to increase urban ozone levels. Ground-level ozone is associated with respiratory illnesses such as asthma, reduced lung function, and respiratory inflammation. In addition, a longer growing season may increase the length and severity of the pollen season for ragweed and other allergens. EPA and the West Virginia Department of Environmental Protection have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will be more difficult. (US Environmental Protection Agency, *Climate Change Indicators in the United States*, Fourth Edition 2016.)

A recent WVU study demonstrated how the strategic of planting trees in urban environments can provide many well-known benefits. Trees absorb pollutants from the atmosphere and release back oxygen. They are also beneficial for stormwater control and soil stabilization. When planted near houses, trees provide shade from the sun, decreasing the consumption of energy from air conditioners in summer months; and provide a windbreak to decrease heating costs in the winter. Even the physical structure of tree branches and leaves collect particulate matter from the air. All these ecosystem services increase with increasing tree cover, often exponentially. Results of this WVU research document that trees in West Virginia's Tree City USAs make significant contributions to communities including sequestering 2,847,190 tons of carbon, providing a total benefit of \$53,308,328 in stored carbon. Additional ecosystem services involve the annual capture of 4,348,592 pounds of pollutants with an estimated value of \$6,441,179 across Tree City USA communities. (Dahle, G. et al., (2017). *Ecosystem Benefits of Tree City USA Cities in West Virginia*, Arboriculture & Urban Forestry Program Davis College, School of Natural Resources, West Virginian University.)

Assessment Methodology

A UTC assessment of each of the thirty-six priority areas was performed using i-Tree Canopy version 6.1. in January 2020. The methodology utilized was adapted from the 2017 UTC study by WVU (Dahle, G. et al., (2017)). Twenty-six communities and ten census district polygons were randomly sampled using 500 data points each. Each point was classified into one of the following categories: trees, shrub, lawn, ground, building, parking lot, street, driveway, other impervious, and water. Ecosystem services were calculated using i-Tree Canopy for each area sampled.

Table 6.2 – Urban Tree Canopy (UTC) Cover of Priority Communities – i-Tree Canopy Analysis (January 2020).

Place Name	%	Place Name	%	Place Name	%
Ronceverte	58.2	Hinton	44.2	Elkins	35.5
Harpers Ferry	57.6	Fairmont	44.0	Follansbee	35.0
Farmington	56.0	Mannington	44.0	Martinsburg	34.8
Bluefield	53.0	Shepherdstown-Jefferson	42.8	Parkersburg	31.0
Shepherdstown	51.0	Romney	42.4	Adam Stephens-Berkeley	30.8
Summersville	50.8	Potomac-Berkeley	41.8	Vienna	30.8
Shenandoah-Berkeley	49.4	Kabletown-Jefferson	40.8	Middleway-Jefferson	30.2
Wheeling	49.2	Morgantown	38.4	Charles Town	26.7
Norborne-Berkeley	48.6	Ravenswood	37.8	Williamstown	24.6
Harpers Ferry-Jefferson	48.4	Athens	35.9	Charles Town-Jefferson	24.4
Tuscarora-Berkeley	45.8	Huntington	35.8	Ranson	24.0
Bath (Berkeley Springs)	45.6	Lewisburg	35.6	Moorefield	23.4

Table 6.3 – Impervious Surface Area of Priority Communities – i-Tree Canopy Analysis (January 2020).

Place Name	%	Place Name	%	Place Name	%
Vienna	39.00	Romney	25.40	Ronceverte	16.80
Parkersburg	36.80	Ravenswood	23.80	Harpers Ferry	16.00
Elkins	34.04	Fairmont	22.80	Charles Town	13.22
Adam Stephens-Berkeley	33.80	Wheeling	22.20	Ranson	10.20
Bath (Berkeley Springs)	33.60	Mannington	21.80	Harpers Ferry-Jefferson	8.80
Follansbee	32.20	Williamstown	21.60	Potomac-Berkeley	7.40
Shepherdstown	30.00	Athens	21.25	Tuscarora-Berkeley	7.2
Huntington	29.60	Bluefield	21.00	Norborne-Berkeley	5.60
Martinsburg	29.40	Lewisburg	19.80	Shenandoah-Berkeley	5.20
Charles Town-Jefferson	26.20	Farmington	19.40	Middleway-Jefferson	5.20
Morgantown	26.20	Summersville	18.80	Shepherdstown-Jefferson	3.20
Moorefield	25.40	Hinton	17.80	Kabletown-Jefferson	2.60

Desired Conditions and Goals for the next 10 years

West Virginia communities will experience increasing temperatures, precipitation, and the frequency of severe weather events in the coming decades as a result of a changing climate. Strategically planted trees in urban areas provide many direct benefits relevant to climate change including: cooling shade for buildings and air conditioning units, maintaining permeable surface area, carbon storage, reduced storm water runoff and a reduction in energy used for heating and cooling. Our i-Tree Canopy analysis supports this and shows that trees in the priority areas are collectively storing 4 million tons of carbon in cities with a total benefit of \$185.6 million. Moreover, trees in priority CDPs store 12.7 million tons with a value of \$586.5 million in stored carbon. These same trees capture air borne pollutants with an estimated annual value of \$395,471 across the 26 cities and \$1,320,402 among the 10 CDPs. Urban trees will also indirectly reduce carbon dioxide emissions from fossil fuel-based power plants and the resulting atmospheric carbon as energy demands for heating and cooling are lowered. This avoidance of carbon emissions from power plants could be four times greater than direct carbon storage over the life of a mature tree. (Nowak, D.J. 1993. "Atmospheric carbon reduction by urban trees", *Journal of Environmental Management*. 37: 207-217).

Of the 36 areas analyzed with i-Tree Canopy, UTC ranged from 58.2% in Ronceverte to 23.4% in Moorefield with an average 40.4% (Table 2). Buildings, parking lots, streets, driveways and other impervious areas combined take up an average of 20.4% of total land within these priority areas (Table 3). It will be difficult to significantly increase Urban Tree Canopy (UTC) in these communities in just 10 years. However, encouraging investments in tree planting and canopy preservation to increase and maintain UTC is the most vital role our urban forestry program can play to help communities adapt to future temperature and precipitation extremes and mitigate the negative impacts of a high impervious surface ratio. Over the next 10 years, we will support priority communities as they conduct UTC assessments, develop UTC goals and strategies, conduct tree inventories with management plans and plant and maintain trees through direct technical and financial assistance.

Strategy - Sub-Issue 6.2: Mitigate Climate Change and Enhance Ecosystem Services

1. Encourage and fund communities to conduct UTC assessments and set canopy cover goals.
2. Assist communities with the identification of high-priority planting areas and opportunities.
3. Provide funding through Demonstration City Grants and other sources to support UTC strategies, tree inventories and plans, strategic tree planting and maintenance projects.
4. Prioritize communities that have greater than 20% impervious surface area for UTC enhancement.



5. Partner with Cacapon Institute to support WV Project CommuniTree (CTree) to increase planting efforts on a regional scale.
6. Strengthen partnerships with institutions of higher learning, non-profits, and electric utilities to develop additional tree planting opportunities.
7. Support Forest Legacy efforts and assist communities with USFS Community Forestry & Open Space Conservation grants to identify and preserve critical forest land across the urban interface.

Measure of Success

Increase in the number of communities managing urban canopy cover and long-term canopy cover increases and associated ecosystem services.

Sub-Issue 6.3: Promote Urban Tree Canopy Cover Management within the Chesapeake Bay Watershed

The Potomac Watershed in West Virginia spans 8 counties which drain into the Chesapeake Bay. This area in the Eastern Panhandle is developing faster than any other region of the state making it a priority for UTC enhancement efforts. According to the Chesapeake Bay Program, stormwater runoff represents the fastest growing source of pollution across the watershed. (Chesapeake Bay Program. *Learn the Issues – Stormwater Runoff*, https://www.chesapeakebay.net/issues/stormwater_runoff). The roads, parking lots, roof tops and other impervious surfaces found in cities act as both conduits and sources of pollution. Rain that falls on roads and other impervious surfaces will flow rapidly toward storm drains and urban streams instead of being absorbed by soil or vegetation. In the process, runoff water picks up nitrogen, phosphorous, motor oil, deicing salts, various fossil fuels, antifreeze, heavy metals, pesticides and other pollutants. The rapid flow can also cause urban stream banks to erode rapidly producing substantial amounts of sediment pollution.

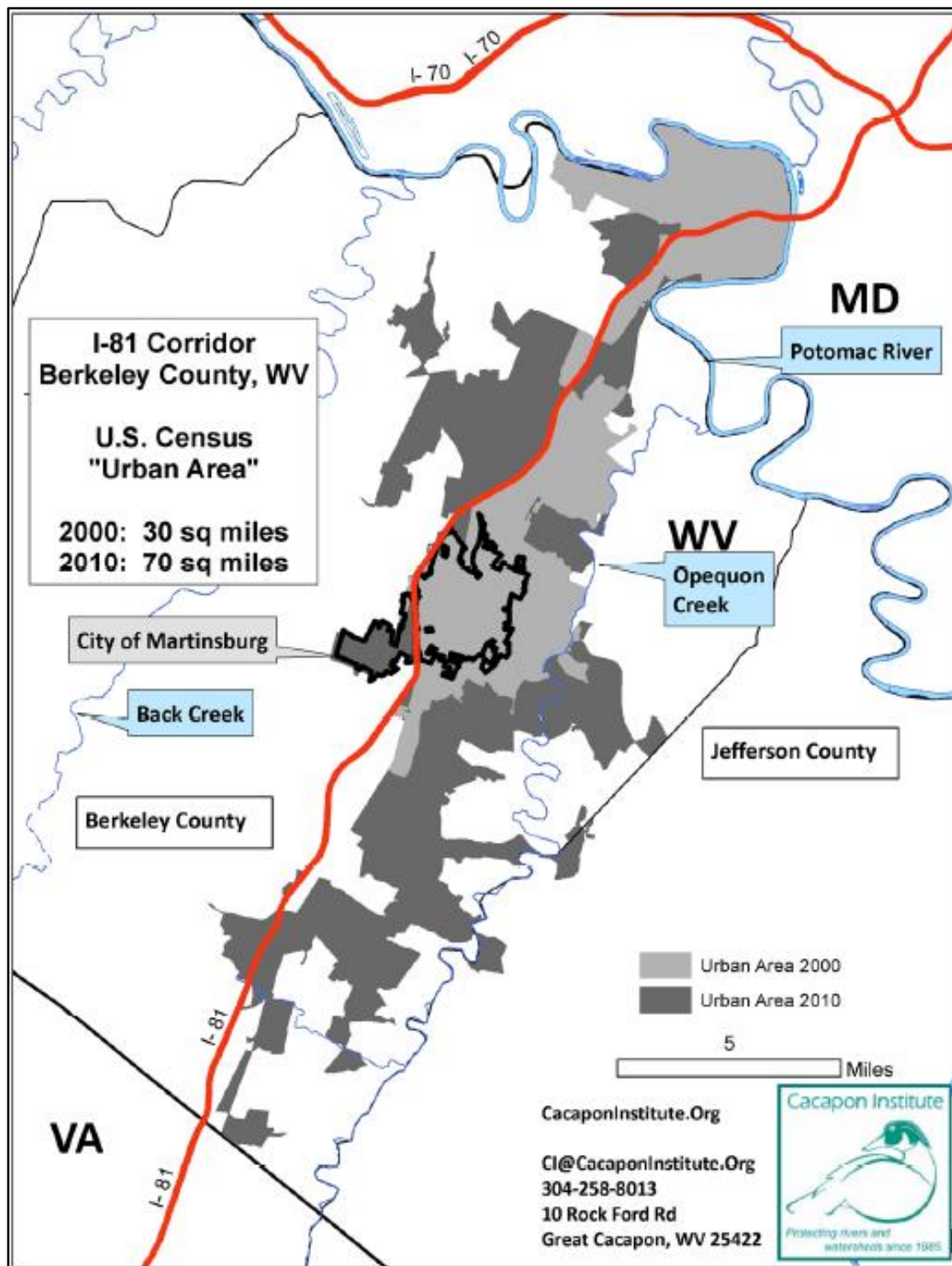
Both point and mobile sources of air pollution can contribute contaminants to distant and adjacent watersheds. Various nitrogen oxides are produced from the burning of fossil fuels in power plants, manufacturing facilities, motor vehicles, lawn and power equipment and other equipment. Typically, these sources are concentrated in or near urbanized areas. The Chesapeake Bay Program has found that polluted air can have quite an impact on the health of local waters and estimates that one third of the nitrogen in the Bay comes from the air through a process known as atmospheric deposition. When vehicles, power plants or other sources emit air pollution, it can be carried by wind and weather over long distances until it falls onto land or directly into the water. (Chesapeake Bay Program. *Learn the Issues – Air Pollution*, https://www.chesapeakebay.net/issues/air_pollution).

The Eastern Panhandle has added more than 64,000 residents over the last two decades while in most other areas of the state, the population has been stagnant or declining. Growth in the Potomac Watershed has largely been fueled by its proximity to major metropolitan areas. “Earnings outside of the area account for more than one-third of the region’s income.” Roughly 40% of the panhandle’s workforce works in the greater Washington D.C. area. (Lego, B. et al., (2019). *West Virginia Economic Outlook 2020-2024*, Bureau of Business & Economic Research, John Chambers College of Business & Economics, West Virginian University.) The Hagerstown Urban Area, which includes Martinsburg, has the fastest rate of urban land cover growth in the Mid-Atlantic. Between 2000 and 2010, U.S. Census Bureau statistics show this area experienced an urban land cover increase of 74% and a population growth of 52%. Cacapon Institute assessments indicate that urban land cover along the Interstate 81 corridor more than doubled growing from 30 acres to 70 acres in the same ten-year period. Population growth in the Eastern Panhandle is expected to progressively increase from east to west from 2020 to 2040. The ICLUS v2.1 model predicts this increase to be as much as 78.8% in some counties, which will drive the conversion of forest and agriculture lands to feed urban development. Municipal and county governments will need to develop strategies to minimize the negative consequences of urban development since retaining forest tree cover is the most efficient way to positively impact water and air quality.

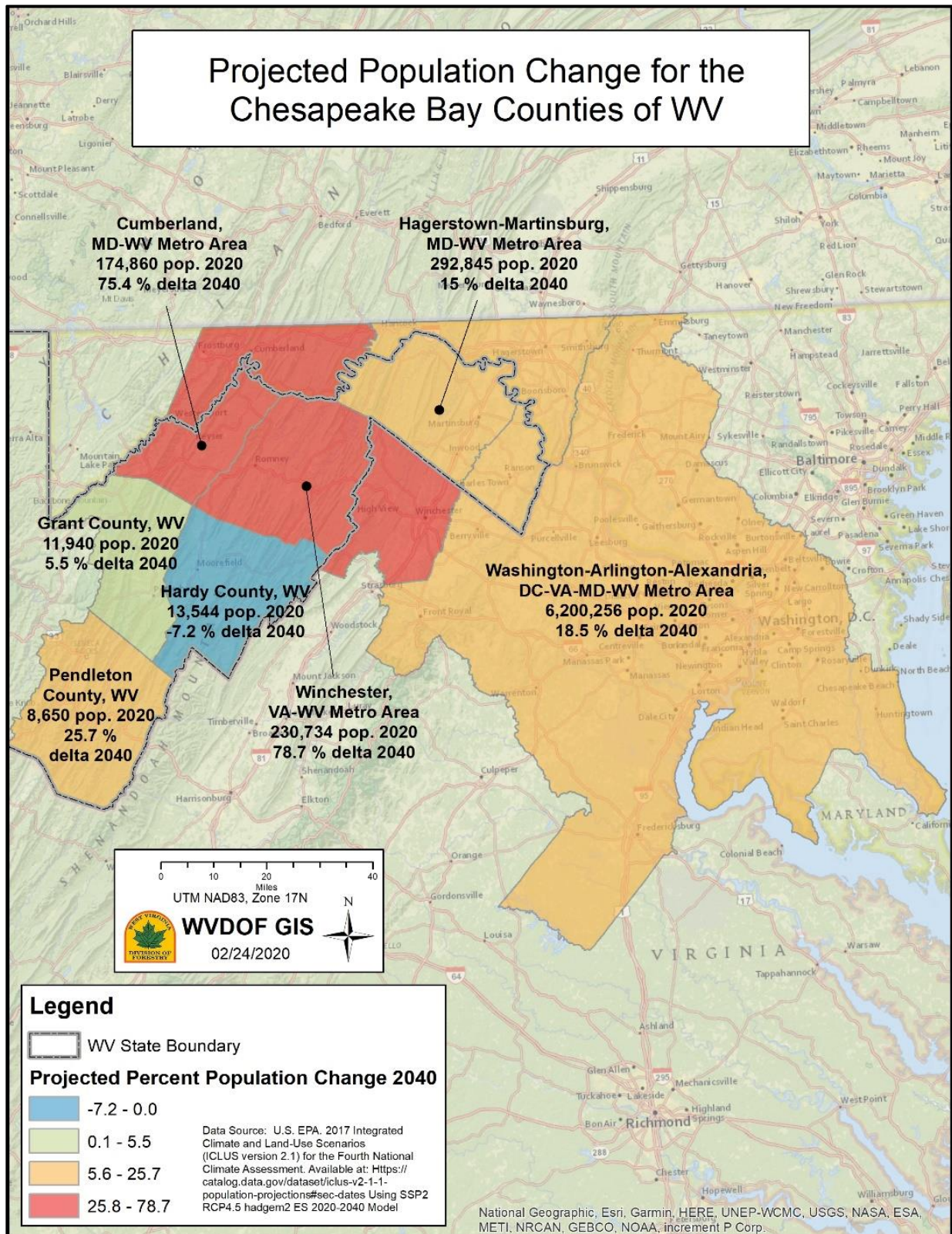
Assessment Methodology

A population assessment was completed with the ICLUS v2.1 model. Projected populations for 2020-2040 under the SSP2 (medium population), RCP4.5 (medium emissions) scenarios and the hadgem2-ES climate model for higher sensitivity to CO₂ increases were used to determine the percentage of population change for this 20-year time period.

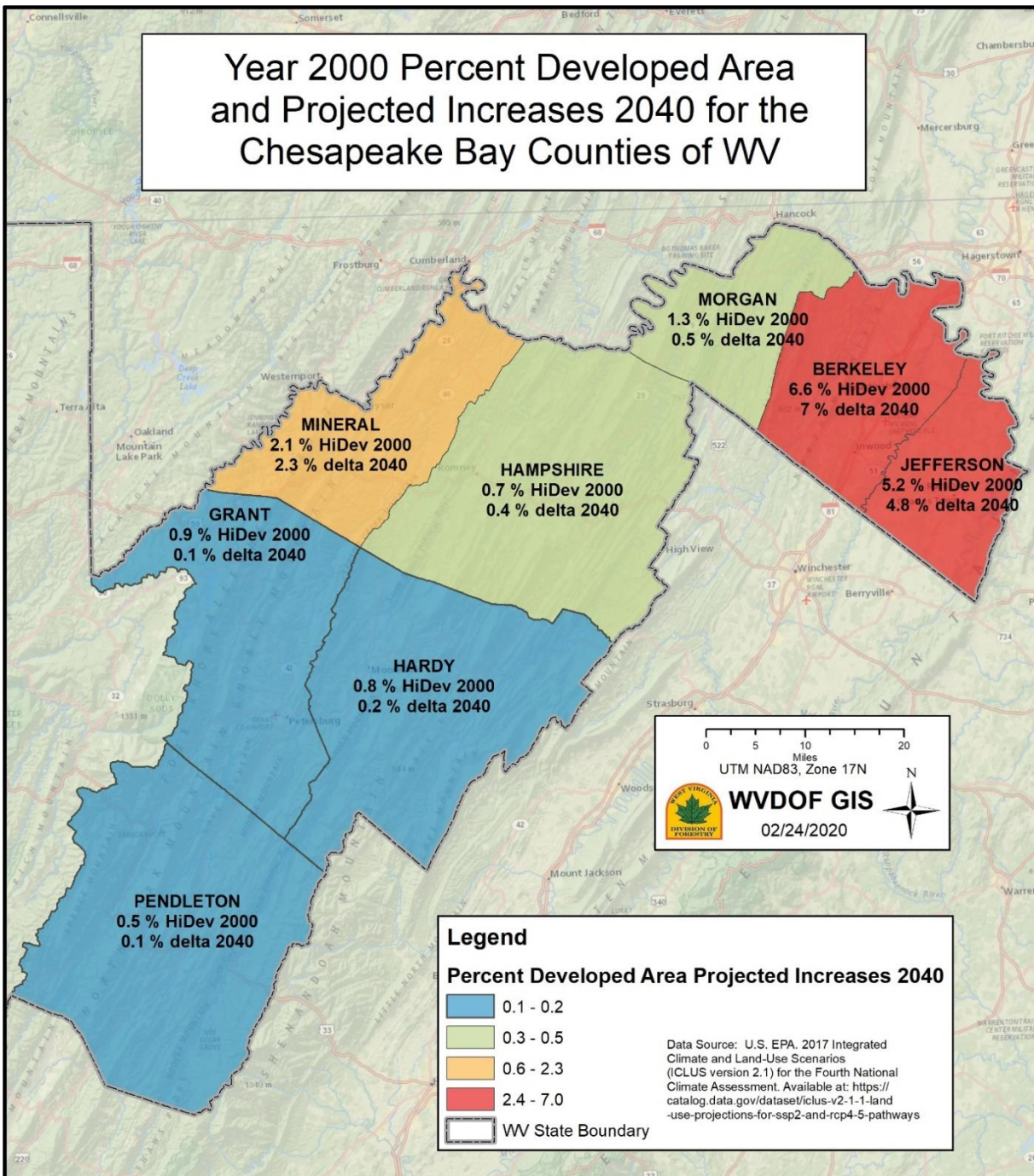
Land-use was assessed involving land cover estimates for year 2000 and 2040 under the SSP2 (medium population), RCP4.5 (medium emissions) scenarios and the HadGEM2-ES climate model for higher sensitivity to CO₂ increases. The area in square meters for each ICLUS class was tabulated by county in GIS to derive percent area for each county for development, agricultural and forest classes. Percent change in county area for development, agricultural and forested classes was then calculated from 2000-2040 based on the combination of development classes 12-18, agricultural classes 5-7 and class 4 for forest, from the ICLUS v2.1 model.



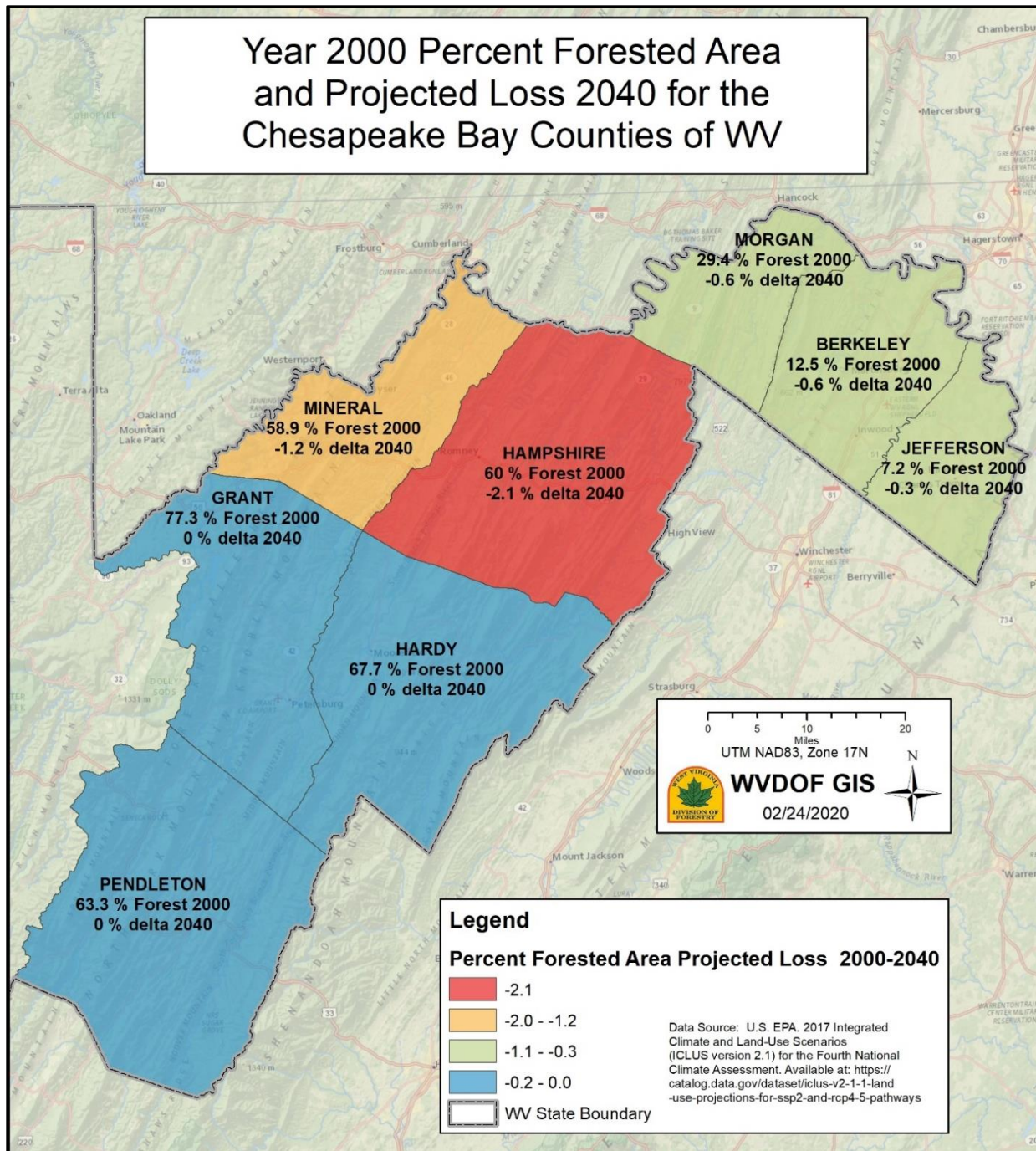
Map 6.2: Cacapon Institute: U.S. Census TIGER shapefiles for the “Hagerstown Urban Area,” clipped to West Virginia, to compare the size of the “urban area,” as delineated by the U.S. Census Bureau, from the 2000 and 2010 censuses. 2010 data available at: <https://catalog.data.gov/dataset/tiger-line-shapefile-2017-2010-nation-u-s-2010-census-urban-area-national>
2000 data available at: <https://www.census.gov/geographies/mapping-files/time-series/geo/cartoboundary-file.2000.html>.



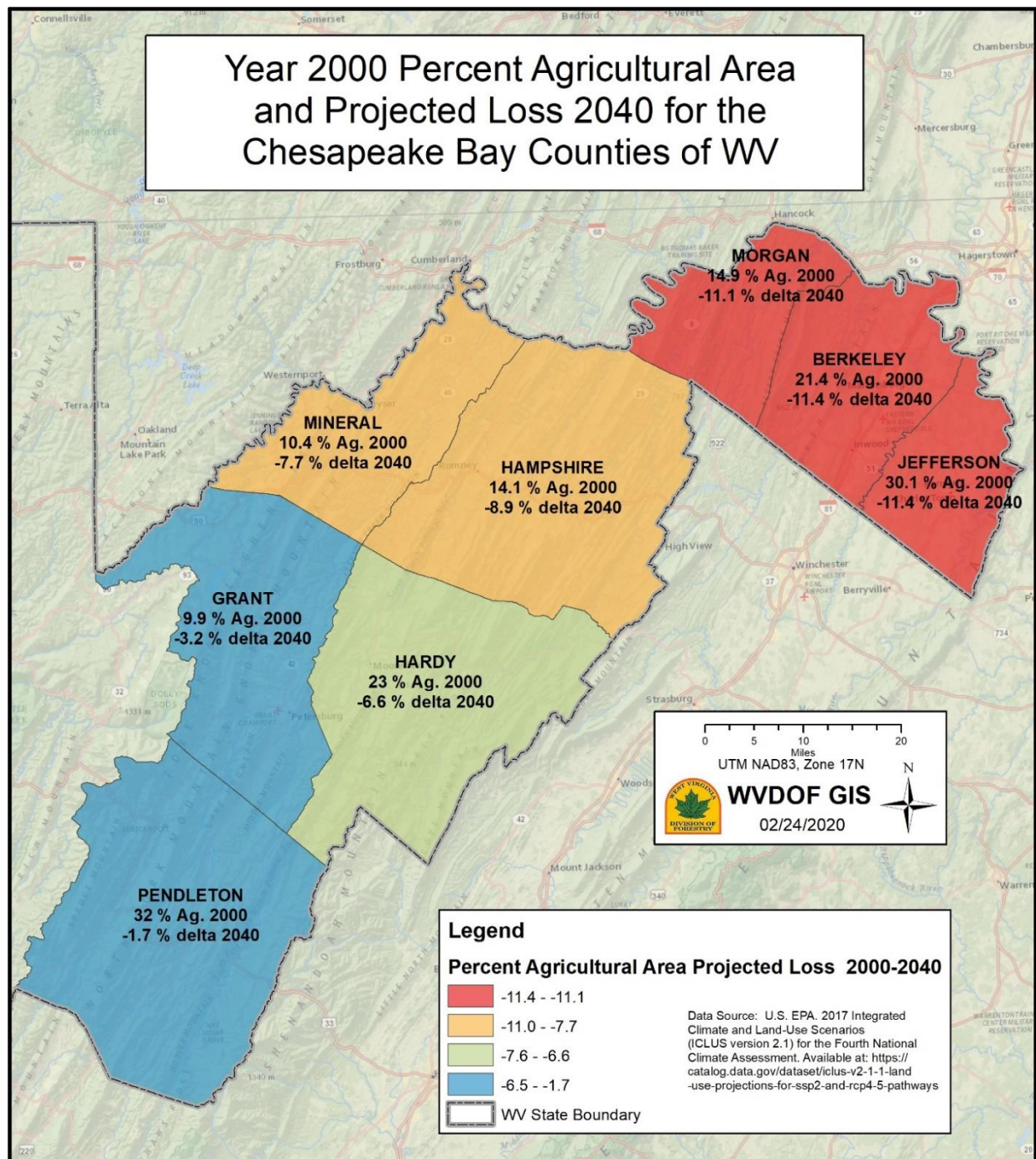
Map 6.3: Population projections 2040 by county (Source: U.S. EPA. 2017 Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-population-projections#sec-dates>).



Map 6.4: Developed land projected increase 2040 by county (Source: U.S. EPA. 2017 Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-land-use-projections-for-ssp2-and-rcp4-5-pathways>).



Map 6.5: Projected forest loss 2040 by county (Source: U.S. EPA. 2017 Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-land-use-projections-for-ssp2-and-rcp4-5-pathways>).



Map 6.6: Projected agricultural land loss 2040 by county (Source: U.S. EPA. 2017 Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-land-use-projections-for-ssp2-and-rcp4-5-pathways>).

Desired Conditions and Goals for the next 10 years

In 2000, high-density developed areas ranged from 6.6% to 0.5% of the total land area in the in the Potomac Watershed in West Virginia and are projected to nearly double in the easternmost counties by 2040. The ICLUS v2 model also predicts other significant land use changes, particularly the loss of forest and agricultural lands to development. An investment in forests is an investment in clean water and air, and sustainable forestry will help address sprawling development, climate change and energy independence. (Chesapeake Bay Program. *Learn the Issues – Forests*.

<https://www.chesapeakebay.net/issues/forests>).

Retaining as much forestland as possible is the most cost-effective way to reduce pollution and benefit water and air quality. Our efforts for the next 10 years will concentrate on increasing UTC and fostering green infrastructure projects within urban areas to mitigate and slow storm water runoff, promote groundwater infiltration, and reduce flooding while decreasing contaminants entering West Virginia's waters. Tree City USA communities and county governments will be targeted with technical and financial assistance to promote UTC assessments, strategic tree plantings and storm water retention structures such as infiltration strips and rain gardens. Tree planting opportunities for communities and volunteer organizations will be accomplished through Project CommuniTree, pass-through grants with USFS funds, Mountaineer Treeways and WVDOF Chesapeake Bay program. These efforts directly parallel several action items described in the USDA Forest Service, December 2012, Chesapeake Forest Restoration Strategy. Two of these action items incorporated in this plan are: "Provide training and technical assistance to help communities move from assessments to action with supportive local policies and programs to both preserve and expand tree canopy and "Focus Urban and Community Forestry program funding and partnership efforts to support work toward meeting local tree canopy goals."

<https://federalleadership.chesapeakebay.net/chesapeakeforestrestorationstrategy.pdf>.

Another priority will be to utilize the resources of partners like the Cacapon Institute to assist municipalities and county governments to conduct assessments and adopt smart growth practices. The goal is to have the capacity to help communities focus on developing areas with existing infrastructure such as roads, utilities and public transportation as opposed to areas that will require new infrastructure. Future development should also follow low impact practices that incorporate natural systems and green infrastructure to manage stormwater runoff.



Strategy - Sub-Issue 6.3: Promote Urban Tree Canopy Cover Management within the Chesapeake Bay Watershed

1. Partner with Cacapon institute and other partners to promote Carla Hardy WV Project CommuniTree, UTC assessments, smart growth policies, education and outreach to increase UTC within the tributaries to the Chesapeake Bay.
2. Cooperate with the WVDOP Chesapeake Forester to increase urban and rural riparian planting opportunities.
3. Encourage and fund communities to conduct UTC and impervious surface assessments and set targets for canopy cover and to invest in low impact development practices that incorporate green infrastructure.
4. Provide funding and trees through Demonstration City Grants and Mountaineer Treeways to support strategic tree planting projects.
5. Provide Demonstration City Grants to fund municipal green infrastructure projects that mitigate permeable surface area, storm water retention and ground water recharge.
6. Utilize the WV Big Tree Program to increase public awareness of the many values and benefits provided by large trees in urban settings and surrounding forestland.
7. Support Forest Legacy efforts and assist communities with USFS Community Forestry & Open Space Conservation grants to identify and preserve critical forestland across the urban interface.
8. Support the December 2012, USDA Chesapeake Forest Restoration Strategy regarding helping communities move assessments to policies and funding to meet local tree canopy goals.
9. Support Wildland Urban Interface initiatives to reduce wildfires, which pose serious threats to air quality on a regular basis.

Measure of Success

Increase in community urban canopy cover assessments, plans and goals and priority driven planting efforts.

Bibliography

Chesapeake Bay Program. *Learn the Issues – Air Pollution*, https://www.chesapeakebay.net/issues/air_pollution

Chesapeake Bay Program. *Learn the Issues – Forests*. <https://www.chesapeakebay.net/issues/forests>

Chesapeake Bay Program. *Learn the Issues – Stormwater Runoff*, https://www.chesapeakebay.net/issues/stormwater_runoff

Dahle, G. et al., (2017). *Ecosystem Benefits of Tree City USA Cities in West Virginia*, Arboriculture & Urban Forestry Program Davis College, School of Natural Resources, West Virginian University. Available at: <https://www.wvforestry.com/pdf/WV%20TCUSA%20Tree%20Canopy%20Survey-%20WVU%209-13-2017.pdf>

Lego, B. et al., (2019). *West Virginia Economic Outlook 2020-2024*, Bureau of Business & Economic Research, John Chambers College of Business & Economics, West Virginian University. Available at: https://researchrepository.wvu.edu/bureau_be/311/

Nowak, D.J. (1993). “Atmospheric carbon reduction by urban trees”, *Journal of Environmental Management*. 37: 207-217. Available at: <https://www.fs.usda.gov/ccrc/sites/default/files/Atmospheric%20carbon%20reduction%20by%20Urban%20Trees.pdf>

U.S. Census Bureau. (2010). U.S. Census TIGER shapefiles for the “Hagerstown Urban Area data” available at: <https://catalog.data.gov/dataset/tiger-line-shapefile-2017-2010-nation-u-s-2010-census-urban-area-national>

U.S. Census Bureau. (2000). U.S. Census TIGER shapefiles for the “Hagerstown Urban Area data” available at: <https://www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.2000.html>

U.S. EPA. (2016). *Climate Change Indicators in the United States*, 2016 Fourth Edition. Available at: https://www.epa.gov/sites/production/files/2016-08/documents/climate_indicators_2016.pdf

U.S. EPA. (2017). Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-population-projections#sec-dates>

U.S. EPA. (2017). Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment. Available at: <https://catalog.data.gov/dataset/iclus-v2-1-1-land-use-projections-for-ssp2-and-rcp4-5-pathways>

U.S. EPA. (August 2016). EPA 430-F-16-050 2018. *What Climate Change Means for West Virginia*. Available at: <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-wv.pdf>.

U.S. Forest Service. (December 2012). Chesapeake Forest Restoration Strategy. Available at: <https://federalleadership.chesapeakebay.net/chesapeakeforestrestorationstrategy.pdf>



State Issue 7: Forest Health

West Virginia's forests have historically been impacted by native insects and diseases, such as loopers, decay, oak wilt, oak decline, and others. International trade and the inadvertent movement of non-native invasive species from countries around the world have impacted, and continue to impact, the species composition of the state's forests. American chestnut was the most common tree species in the state a century ago and was extremely important to animals and humans. However, the introduction of the Chestnut blight fungus (*Cryphonectria parasitica* = *Endothia parasitica*) from Asia virtually eliminated American chestnut from the native forests. Over the years, a number of non-native insects and diseases have followed on the heels of chestnut blight and continue to threaten the forest and its sustainability. An emerging issue has been the recognition that exotic invasive plants such as Japanese stilt grass, garlic mustard, tree-of-heaven, kudzu, oriental bittersweet, and others are having an impact on forests. New exotic insects, diseases, and plants have been identified and could cause even more significant ecological and economic damage, should they become well established.

Sub-Issue 7.1: Native and Exotic Diseases, Insects, and Invasive Species of Concern

The National Insect and Disease Risk Map (NIDRM) was completed in 2006 and updated in 2018. It was created from 188 models that predict how individual tree species will react to various mortality agents. The models, in turn, are the interaction of predicted agent behavior with known forest parameters. The West Virginia Risk Map coverage is a subset of only those insect and disease models that are relevant to West Virginia. The Forest Health Layer of the West Virginia Statewide Assessment of Forest Resources places a great deal of importance on the National Insect and Disease Risk Assessment. It provides a strategic assessment of tree mortality risk. The expectation is that, without remediation, 25% or more of the live standing basal area (BA) of trees greater than 1 inch in diameter will die over the next 15 years due to insects and diseases.

Within the entire United States, nearly 695 million square feet of BA may be lost to all exotics within the next 15 years, with 24 million acres experiencing 25% mortality or higher due to exotics alone. Most BA loss to exotic pests occurs in the eastern United States and California, with gypsy moth (*Lymantria dispar*) being the primary pest in the East. According to the pest risk map, West Virginia leads all states in total area at risk to exotic insects and diseases. Approximately 651,000 acres of forest land in West Virginia are at risk of suffering 25% or greater mortality in the next 15 years due to exotics.

Currently, West Virginia forests are coping with a number of native and exotic invasive insect and pathogen issues. Due to West Virginia's high component of oaks, there is a high incidence of important mortality agents such as oak decline, hardwood decline, and gypsy moth which place West Virginia in a high-risk-of-mortality category. West Virginia also has a significant component of beech and hemlock, which are susceptible to beech bark disease (BBD) (*Neonectria coccinea* var. *faginata*) Beech Leaf Disease (*Litylenchus crenatae mccannii*) and hemlock woolly adelgid (HWA) (*Adelges tsugae*),

respectively. These mortality agents are currently contributing significantly to the mortality of these species.

Other mortality agents that occur in West Virginia are of concern, even though the tree species affected by these agents do not constitute a large portion of the forest. In some cases, the pathogen or insect has a limited geographic distribution or is poorly dispersed. These include:

- white pine blister rust (*Cronartium ribicola*)
- bacterial leaf scorch (BLS) (*Xylella fastidiosa*)
- dogwood anthracnose (*Discula destructiva*)
- oak wilt (*Ceratocystis fagacearum*)
- butternut canker (*Sirococcus clavigigenti-juglandacearum*)
- Spotted Lanternfly (*Lycorma delicatula*)
- balsam woolly adelgid (*Adelges piceae*)
- common pine shoot beetle (*Tomicus piniperda*)
- southern pine beetle (*Dendroctonus frontalis*)
- emerald ash borer (EAB) (*Agrilus planipennis*)

Future Diseases and Insect Pests of Concern

There are many emerging problems that could impact the forests of North America and West Virginia. There are a number of forest pests in North America not yet known to occur in West Virginia that could have a major impact on the forest resource, should they be introduced here. With the exception of siricid wood wasp, these pests have a broad host range and could wreak havoc on forests once they are introduced and become established. These non-native invasive pests include:

- siricid wood wasp (*Sirex noctilio*)
- Asian long-horned beetle (ALB) (*Anoplophora glabripennis*)
- light brown apple moth (LBAM) (*Epiphyas postvittana*)
- sudden oak death (*Phytophthora ramorum*)
- jewel beetle (*Agrilus sulcicollis*)

- thousand canker disease (*Geosmithia morbida*, and the walnut twig beetle, *Pityophthorus juglandis*)

There are forest pests that have been identified in other countries that could become significant pests if introduced into North America and West Virginia. Each of the following non-native invasive pests has an extremely broad host range and is capable of causing serious problems, if any one of them becomes established. These include:

- nun moth (*Lymantria monacha*)
- phytophthora root rot, (*Phytophthora quercina*)
- phytophthora root rot, blight and canker disease (*Phytophthora kernoviae*)
- oak splendor beetle (*Agrilus biguttatus*)
- Asian gypsy moth (*Lymantria dispar*)
- rosy gypsy moth (*Lymantria mathura*)

Invasive Plant Species of Concern

Invasive plant species also impact West Virginia's forests. Anytime there is an opening created by fire, timber harvesting, coal mining, oil and gas drilling, road construction, wind-throw, etc., there are invasive plants ready to occupy the opening. In some cases, these invasive species are much less desirable than the pre-existing vegetation. When openings are created, invasive plants often have a greater opportunity to become established. These invasive plants include:

- mile-a-minute weed – (*Persicaria perfoliata*) (syn. *Polygonum perfoliatum*)
- tree-of-heaven – (*Ailanthus altissima*)
- Japanese stilt grass* – (*Microstegium vimineum*)
- Japanese barberry – (*Berberis thunbergii*)
- Japanese knotweed – (*Reynoutria japonica*)
- garlic mustard – (*Alliaria petiolata*)
- oriental bittersweet – (*Celastrus orbiculatus*)
- kudzu – (*Pueraria montana*)
- English ivy – (*Hedera helix*)

- porcelain berry – (*Ampelopsis brevipedunculata*)
- Japanese honeysuckle – (*Lonicera japonica*)
- chocolate vine (*fiveleaf akebia*) – (*Akebia quinata*) – not very common
- mimosa (silk tree) – (*Albizia julibrissin*)
- climbing euonymus (wintercreeper) – (*Euonymus fortune*)
- Japanese hop – (*Humulus japonicas*) – more common on streambanks and moist areas
- multiflora rose – (*Rosa multiflora*)
- amur honeysuckle– (*Lonicera maackii*)
- tartarian honeysuckle– (*Lonicera tatarica*)
- Morrow's honeysuckle– (*Lonicera morrowii*)
- Chinese wisteria – (*Wisteria sinensis*)
- Japanese wisteria – (*Wisteria floribunda*)

* Of the plants listed above, Japanese stilt grass is probably the most problematic because of seed longevity, apparent ease of dispersal, and ability to form monocultures under closed canopies.

West Virginia Invasive Species Working Group

As a response to the growing threat of non-native invasive species, the West Virginia Invasive Species Working Group was formed in October 2001 and meets in the spring and fall each year. It is a consortium of state and federal agencies, land grant university research and extension programs, other colleges and universities, industry organizations, private organizations, and individuals with an interest in the invasive species problem. Its purpose is two-fold: 1) to address the threat of invasive species to the people of West Virginia and the state's resources and industries in a coordinated and unified manner; and 2) to provide a forum for the statement and discussion of the objectives and interests of its members. Additionally, sub-committees have evolved from the working group to work on various topics, including a comprehensive plan to deal with invasive species entitled "The West Virginia Invasive Species Management Plan."

**Strategy- Sub-Issue 7.1:** Native and Exotic Diseases, Insects, and Invasive Species of Concern**Long-term Strategy**

Develop effective survey and monitoring methodologies and work with other agencies to establish effective biocontrol and eradication strategies to combat the potential impact of these exotic pests.

Strategy Narrative

In a state that is 78.50% forested, forest health by its very nature is a statewide issue. Major native and exotic diseases and pests can impact forests in any region of the state. The West Virginia Department of Agriculture, through the Cooperative Forest Health Program, is responsible for monitoring forest health in the state. Funding for this program comes from state dollars, as well as federal grants through the USFS. There are many stakeholders, mostly comprised of public and private landowners. The West Virginia Forestry Association, West Virginia Association of Consulting Foresters, Woodland Owners Association, and West Virginia Farm Bureau are among the many groups that could be considered stakeholders as well. Among the major issues when dealing with native and exotic pests is the development of effective methods to detect, survey, and monitor pests.

Timeline

Annually.

Measure of Success

Effective survey and monitoring procedures are established.

Sub-Issue 7.2: Survey, Monitor, and Evaluate

The WVDA Forest Health Protection Program and the Cooperative Agricultural Pest Program each provide an early warning system to detect and abate invasive species through the surveys that are conducted throughout the state.

Although detection at the earliest stages may allow for the eradication of certain pests, in most cases this will not be possible. In the majority of cases, it will be necessary to establish an integrated pest management (IPM) approach. The effective use of IPM requires certain basic information be available, and this can only be achieved through ongoing survey and detection of pests.

Currently, surveys are being conducted to detect the following pests: gypsy moth, hemlock woolly adelgid, beech leaf disease, beech bark disease, Asian longhorned beetle, spotted lanternfly, walnut twig beetle, red bay ambrosia beetle and sudden oak death. These surveys evaluate the spread of each pest or disease and are generally conducted according to protocols supplied by the USDA Forest Service. The

resulting data, including geo-referencing information, is recorded on tablets in a format that can be loaded into a national database. The final data is submitted to the Forest Service.

Strategy - Sub-Issue 7.2: Survey, Monitor and Evaluate

Long-term Strategy

Survey, detect, and monitor the following forest pathogens and pests: beech bark disease, exotic wood borers/bark beetles, spotted Lanternfly, sudden oak death, oak decline, and other hardwood declines, as well as any new and emerging pests.

Strategy Narrative

The WVDA currently conducts surveys and monitors the effects of pathogens and pests, including beech bark disease, exotic wood borers, Asian longhorned beetle, sudden oak death, walnut twig beetle, oak decline, beech leaf disease and spotted lanternfly. For certain pathogens and pests, simply determining its presence in a given county is sufficient. For others, the WVDA will continue monitoring to determine the impact these pathogens and pests have on the forest. These decisions are made based on the potential for spread and the severity of impact on the resource.

Timeline

Annually.

Measure of Success

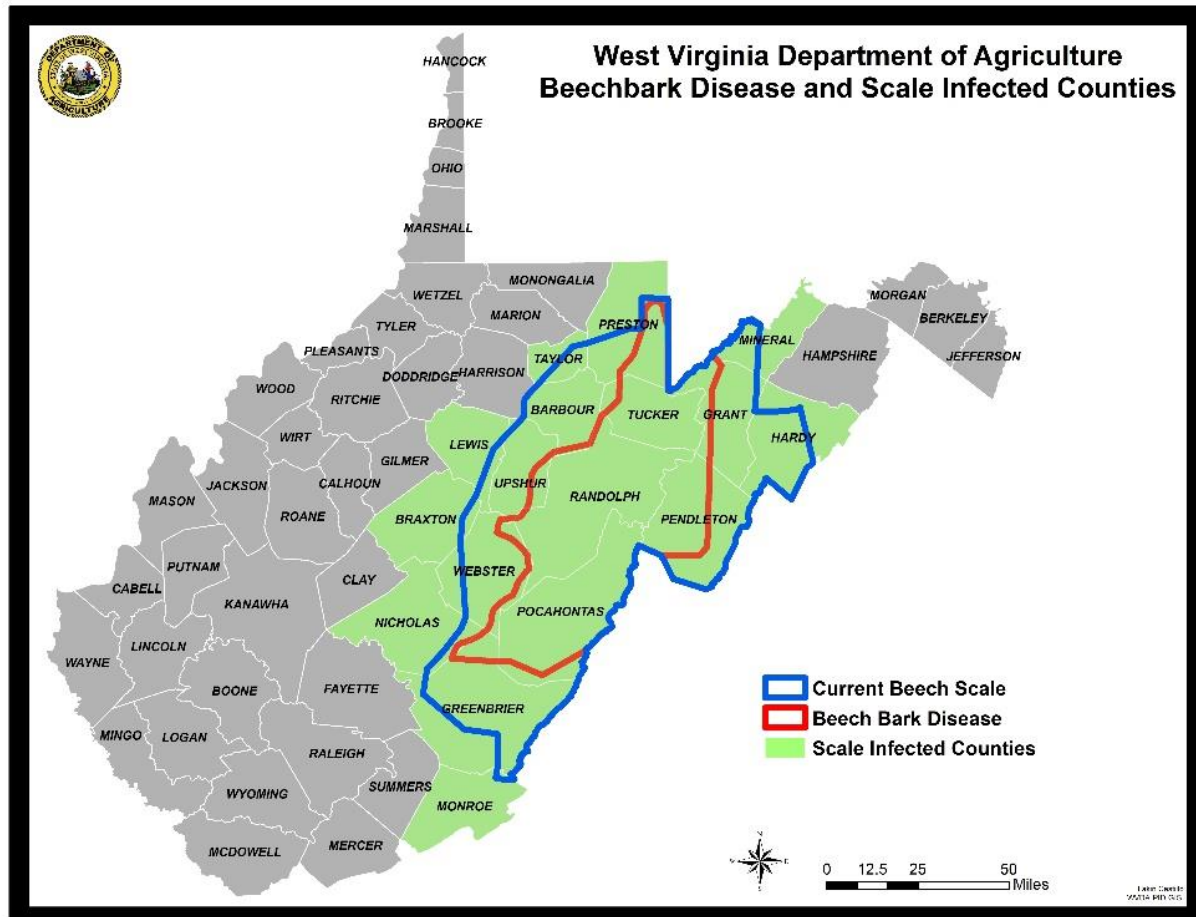
Through surveys and lab analysis, detect the presence of forest pathogens and pests and their rate of spread, when possible.

Sub-Issue 7.3: Pest Management and Eradication

Beech Bark Disease

Beech bark disease (BBD) results from attacks by the exotic beech scale insect *Cryptococcus fagisuga*, followed by one of two fungi: *Neonectria coccinea* var. *faginata* or *Neonectria galligena*. In 1981, when beech scale was first detected in Randolph County, the scale insect was found infesting beech trees on over 70,000 acres of timberland in Randolph and Pocahontas counties. Since then, beech scale has spread to encompass over 3.6 million acres in 17 counties; mortality from beech bark disease encompasses nearly 1.4 million acres in nine counties (Map 7.1).

The WVDA, under an initiative of the USFS, is currently surveying for scale-free/disease-free beech in areas of heavy scale infestation and mortality. Once candidate trees have been deemed scale-free, scion material will be sent to the USFS, which has been working on developing resistant varieties of American beech in hopes of determining how resistance to the beech scale is inherited.



Map 7.1: Distribution of beech scale insect infestations and mortality from beech bark disease in West Virginia, as of 2020 (WVDA GIS, 2020).

As beech scale and BBD have spread from Randolph and Pocahontas counties, other counties that have a significant beech component have become, and will continue to become, infested with beech scale.

There are no control measures to eradicate or suppress the disease complex once it becomes established, although there are silvicultural steps that can be taken ahead of infestation by scale insects to slow its spread. There is interest in looking at beech that has survived BBD. Efforts are underway to survey areas that are heavily affected with beech mortality to locate pockets of beech that have survived, in an effort to learn more about natural resistance to this disease complex.

Beech Leaf Disease

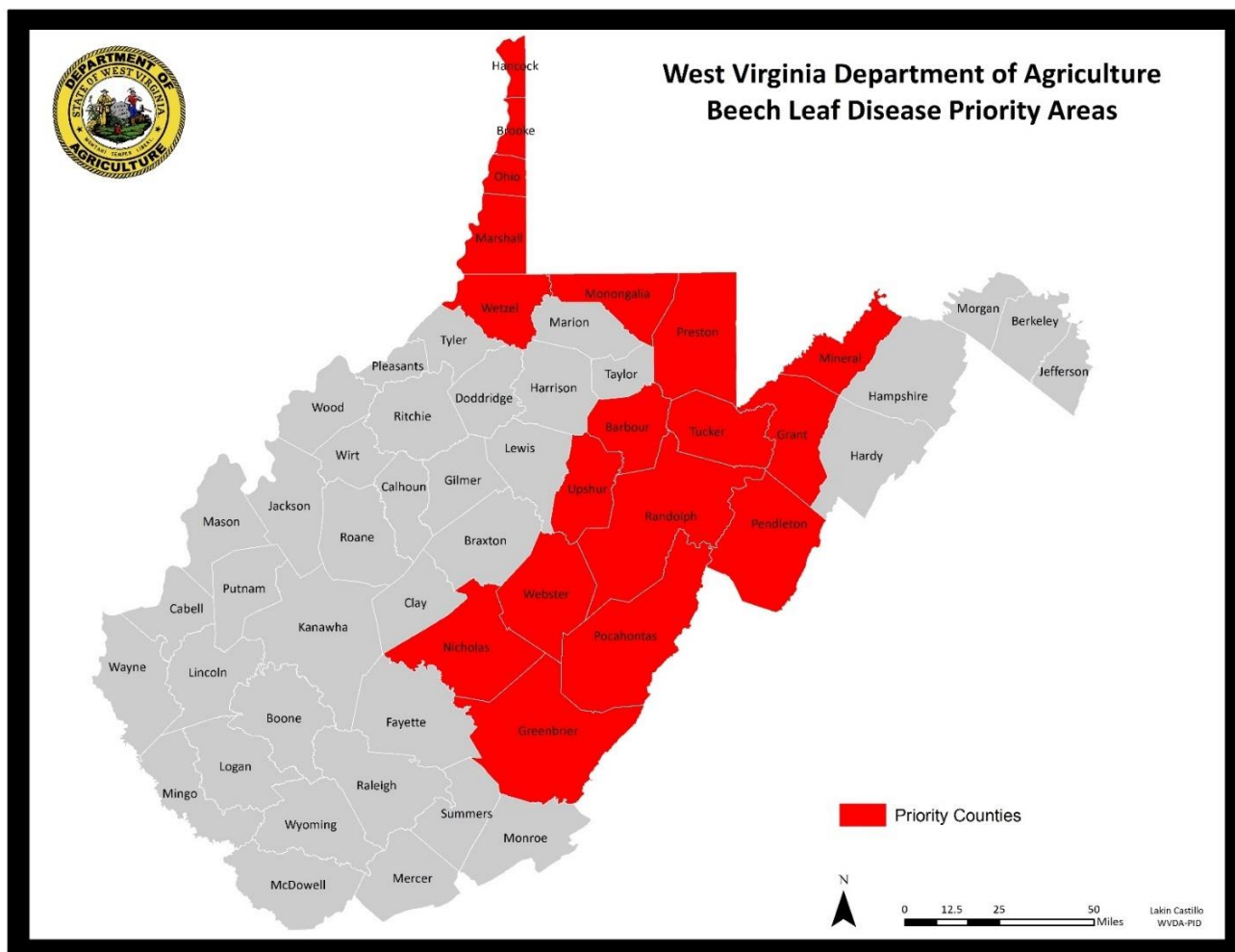
American beech trees (*F. grandifolia*) in the north-eastern United States are suffering from a currently undiagnosed and seemingly lethal disease that is provisionally called beech leaf disease (BLD). The symptoms of BLD were first reported in 2012 within forests in Lake County Metroparks located in the north-eastern corner of the state of Ohio. At that time, with lack of additional local occurrence reports and the absence of similar symptoms reported on beech trees from other areas of the world, the symptoms were first assumed to be caused by abiotic factors, including locally abnormal weather conditions (i.e., a warmer winter and drier spring) that occurred prior to 2012. Additional research has concluded the disease is associated with a nematode, *Litylenchus crenatae mccannii*. BLD has only been discovered in recent years and much about it, including the full cause and how it spreads, is still unknown.

Initial symptoms of the disease appear as a dark green, interveinal banding pattern on lower canopy foliage. Often, the first sighting of BLD occurs in the shrub or sapling layer of a beech stand. The banding pattern occurs on normal-sized leaves and may appear between a few veins or cover up to two third of the leaf surface. Later symptoms result in solidly darkened leaves that are shrunk and crinkled. These leaves are thickened and leathery in texture. The banding pattern and additional symptom stages are evident at bud break and persist throughout the growing season, suggesting the symptoms progress through the buds.

The West Virginia Department of Agriculture is currently surveying for the presence of Beech Leaf Disease and establishing long-term monitoring plots in areas with abundant beech resource. To date BLD has been discovered in Hancock County in the Northern Panhandle.



Photo courtesy of Kristen Carrington, WVDA



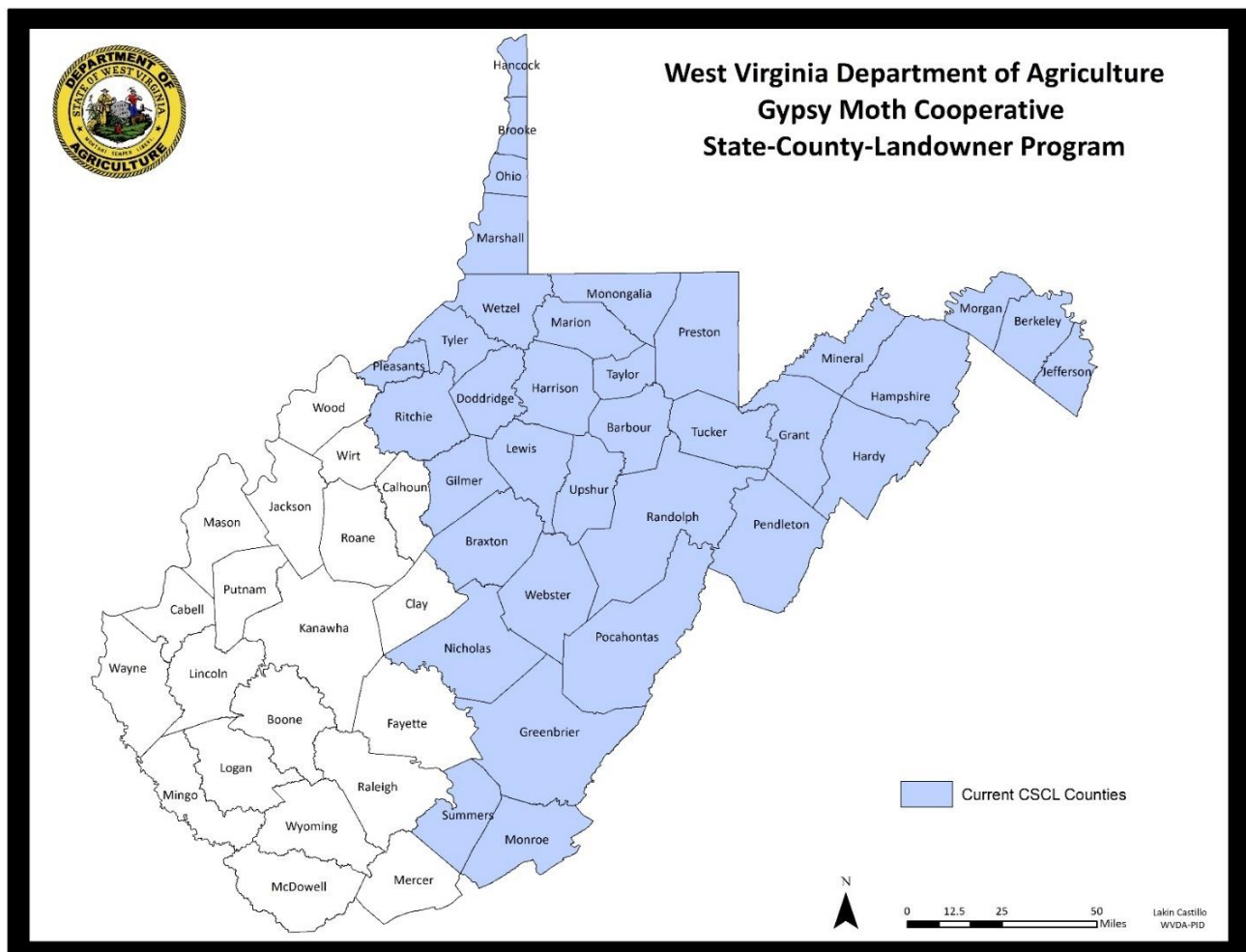
Map 7.2: Distribution of beech resource at risk of BLD in West Virginia, as of 2020 (WVDA GIS, 2020).

Gypsy Moth

The gypsy moth (*Lymantria dispar*) is considered the most serious insect pest ever to invade West Virginia's forests. The first adult male gypsy moths were trapped in 1972 and the first caterpillars were found in 1978. Since then, this insect has continued to spread to the west and south through West Virginia (Map 7.3). The first suppression activities took place in West Virginia in 1983 when 16,735 acres were treated with *Bacillus thuringiensis* var. *kurstaki*. In 1985, the first defoliation was mapped when 3,004 acres were defoliated in Jefferson County. In 1988, West Virginia began a program called the Gypsy Moth Cooperative Suppression (GMCS) Cooperative State-County-Landowner Program (CSCL) to assist landowners in West Virginia with gypsy moth infestations. To date, 44 of West Virginia's 55 counties fall under the state gypsy moth quarantine and 34 counties participate in the CSCL Program. Additionally, West Virginia participates in the National Slow the Spread Program to reduce the rate of spread of this forest pest.

The West Virginia Department of Agriculture (WVDA) operates the gypsy moth cooperative suppression program between landowners, county commissions in infested counties, the West Virginia University (WVU) Cooperative Extension Service, WVDA, and the USDA Forest Service. In order to qualify for treatment, landowners must complete an egg mass survey request form. Forest land must have a concentration of at least 500 egg masses per acre to be considered for treatment and wooded developments must have at least 250 egg masses per acre in order to qualify. Consideration is also given to areas where significant risk exists for large numbers of windblown caterpillars.

Landowners are billed for treatment costs and must pay the cost-share portion, which varies from year to year. Based upon the available dollars, WVDA and the USFS normally offer cost share amounts up to 50%. Aerial treatments are conducted in the infested area to minimize the damage to forests and reduce the impact of gypsy moth in future years. Treatments are not done with the intent of eradicating the pest, but rather to keep it under control.



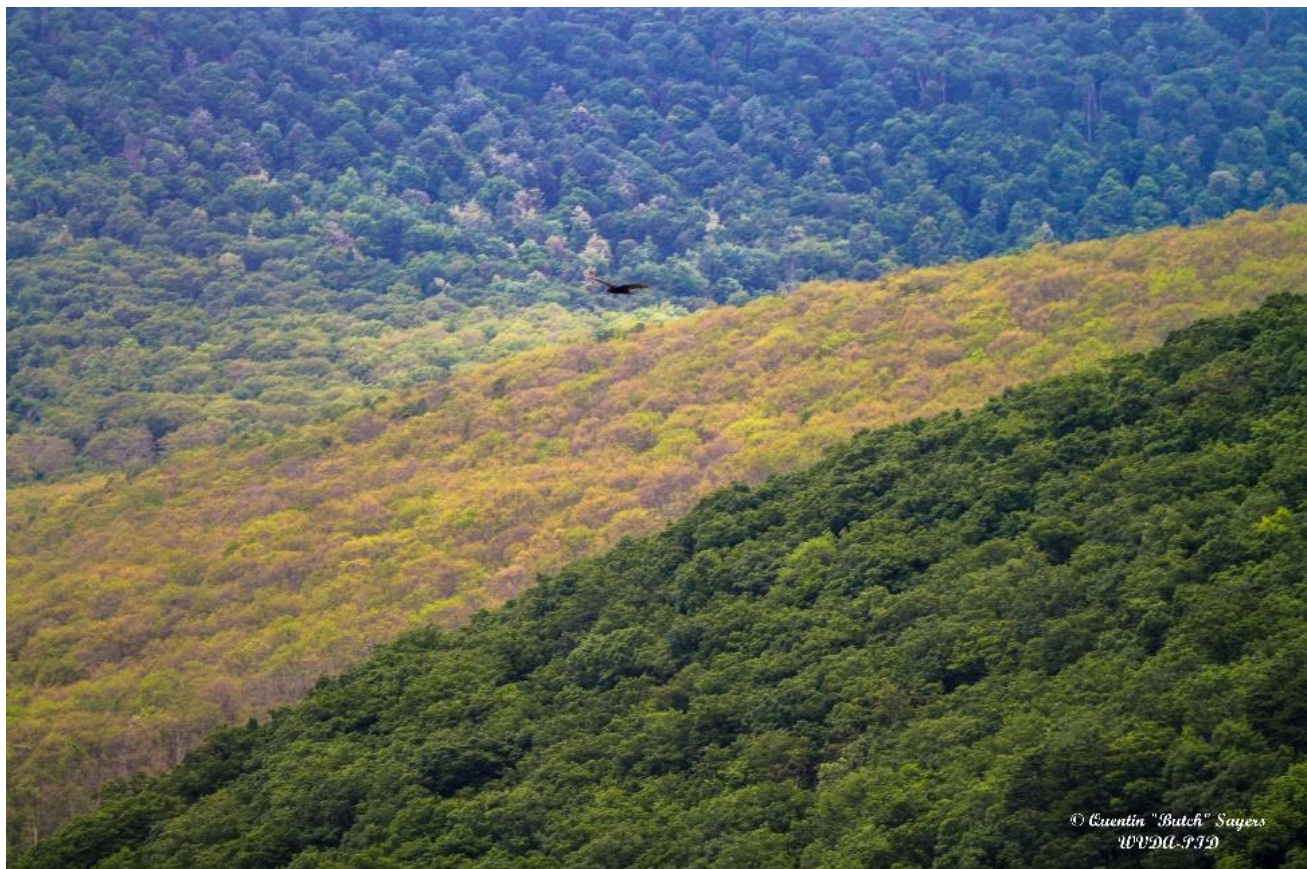
Map 7.3: West Virginia counties participating in the Gypsy Moth Cooperative Program (WVDA GIS, 2020).



WVDA's Quentin Sayers conducting Gypsy Moth Surveys

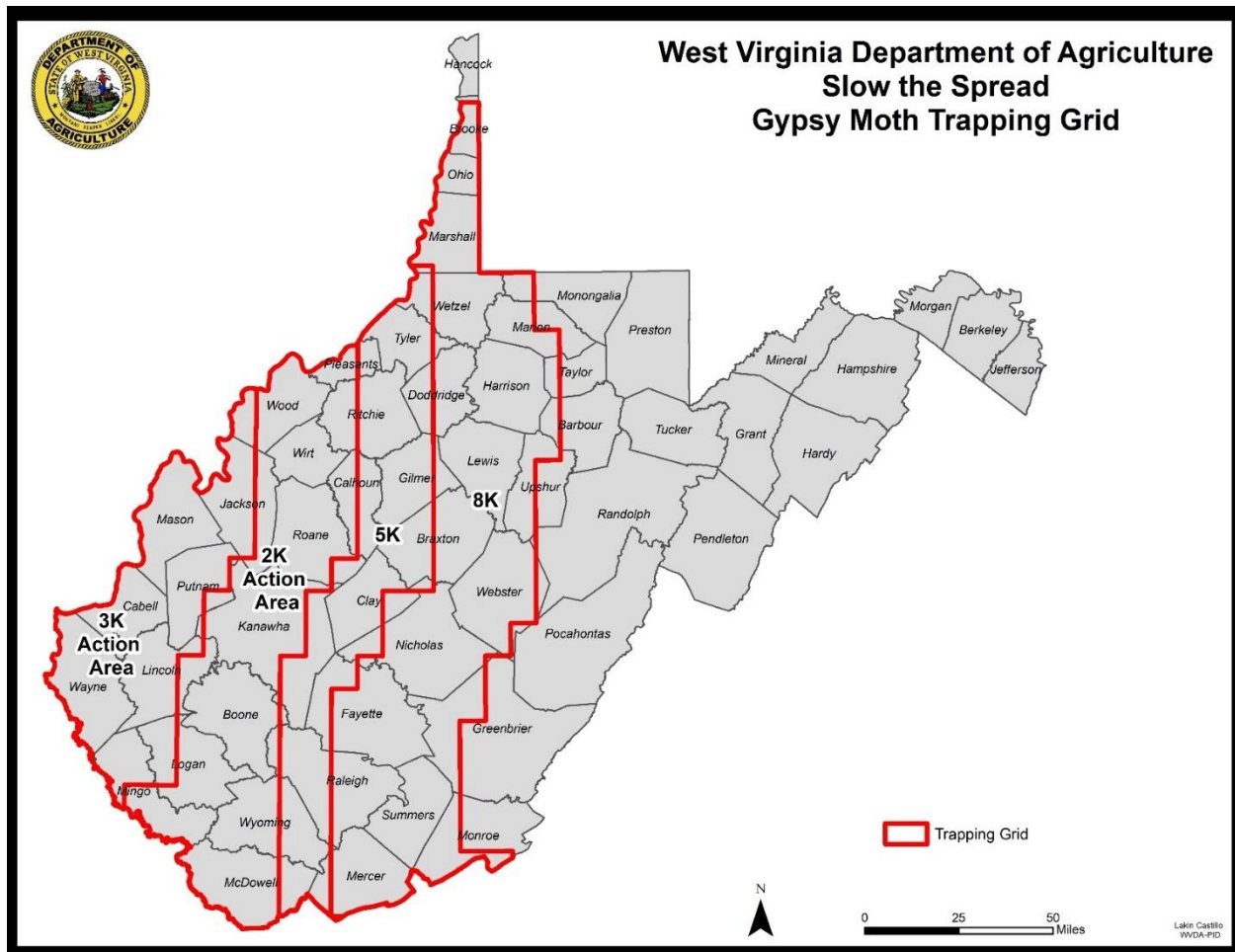


Slow the Spread GM trap



Contrast of area treated for GM and untreated area.

The National Gypsy Moth Slow the Spread Program is a combined federal and state effort to slow gypsy moth spread by detecting isolated colonies using grids of pheromone-baited traps placed along the expanding population front from Wisconsin to North Carolina, including several counties in West Virginia. Detected colonies are treated with *Bacillus thuringiensis* for mating disruption. Analyses indicate that this project has reduced spread by more than 50%, to approximately 3 miles per year.

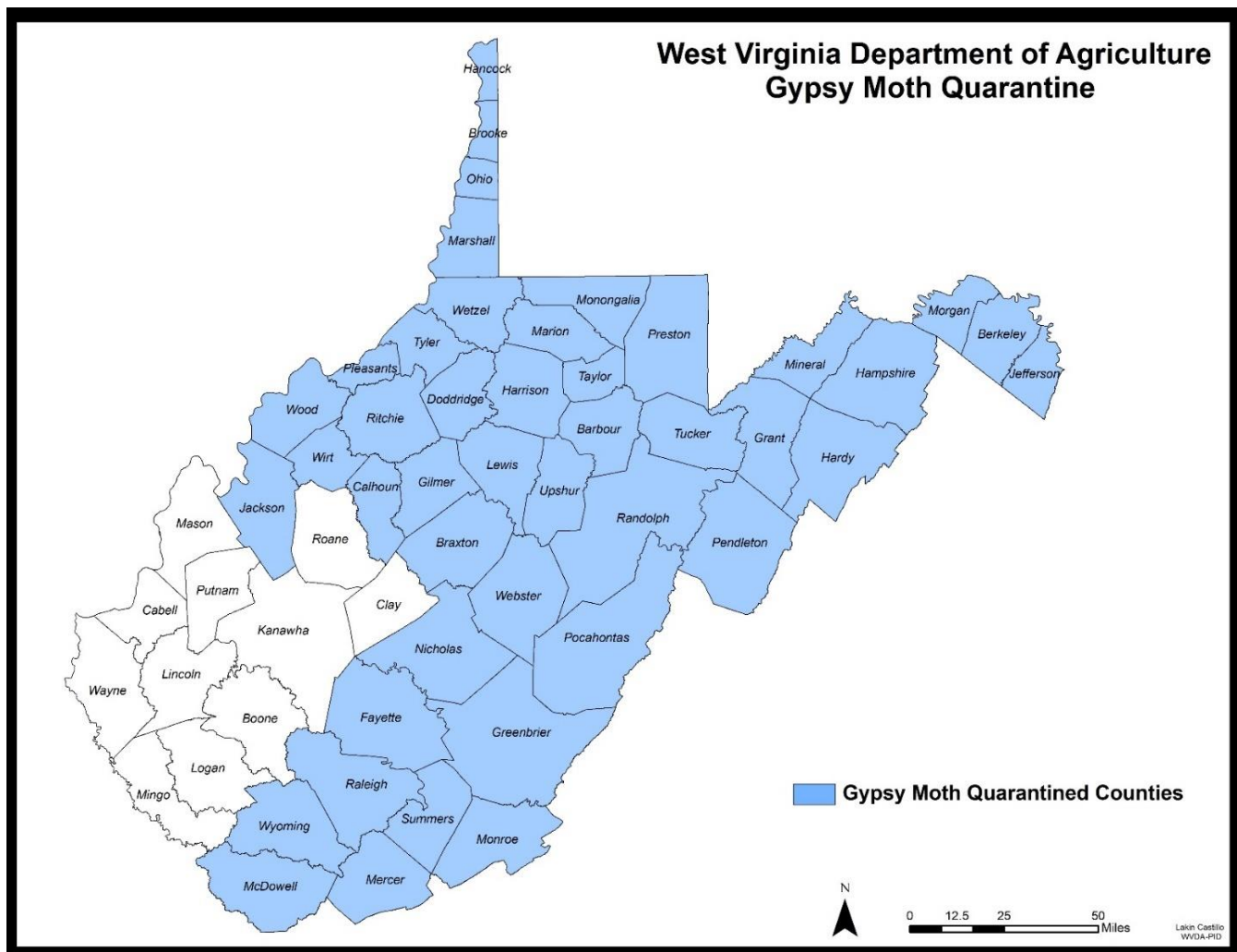


Map 7.4.: “Slow the Spread Program” gypsy moth trapping areas in West Virginia (WVDA GIS, 2020).

Since gypsy moth first caused major defoliation in West Virginia in 1985, it has historically been a problem in the eastern panhandle counties that are part of the greater Chesapeake Bay Priority Area. As gypsy moth has spread from the eastern panhandle region in westerly and southwesterly directions, it has become clear that counties bordering Virginia (Pocahontas, Greenbrier, and Monroe) have become infested and that gypsy moth will remain a problem in these areas. The WVDA GMCS CSCL Program is responsible for conducting treatments on state and private lands in the infested counties. The western

counties of West Virginia are part of the multi-state Slow the Spread Program that is responsible for slowing the movement of gypsy moth into non-infested areas.

The WVDA has enacted a quarantine to deal with the gypsy moth in West Virginia (Map 7.5.). The quarantine is enacted to prohibit the introduction of gypsy moths to areas within the state not already known to be infested. Quarantines are the first line of defense in efforts to combat exotic invasive species.



Map 7.5: Counties in West Virginia included in the WV Department of Agriculture gypsy moth quarantine (WVDA GIS, 2020).

Spotted Lanternfly

Spotted lanternfly (*Lycorma delicatula*) is an exotic and invasive insect with the potential to rapidly spread throughout West Virginia. This invasive hemipteran is known to severely damage both the forestry and agricultural industries in states with high infestations. Both the grape and fruit crop industry and timber production of our native forest trees are greatly impacted by the feeding habits of large populations of spotted lanternfly. Spotted lanternfly is a sap feeding insect, which stabs its proboscis mouth part into the tree or vine it is infesting and sucks out necessary water and sugars the tree needs to grow fruit and maintain a healthy canopy. When hundreds of spotted lanternflies all feed on one tree or vine, it can greatly reduce the yield and eventually the tree or vine will be so weakened that it can die if the spotted lanternfly population is not controlled. Additionally, the excretion of honeydew by the spotted lanternfly leads to large thick black mats of sooty mold on foliage under the infestation. The sooty mold can be so thick that understory branches of the host plant itself and additional understory shrubs can die from the lack of ability to perform photosynthesis. The monetary and ecological impacts of this insect are very high in the state of West Virginia.

Spotted lanternfly overwinters as eggs, in a gray putty-like egg mass. Egg masses are laid on smooth surfaces of host plants and also man-made items like vehicles, trailers, outdoor equipment and patio furniture. This habit of laying eggs on movable surfaces allows the insect to spread rapidly. Eggs hatch in spring. Nymphs (immature insects) are wingless and can be found in spring through early summer. Young nymphs are small and black with white spots. When the nymph matures and molts it becomes bright red with white spots. After two additional molts the red nymph will molt into a large (~1 inch) winged adult in late July. The adults congregate on trees, usually on its preferred host tree-of-heaven (*Ailanthus altissima*), to feed and mate from late July to October. There is one generation of this insect per year. Female spotted lanternfly on average lay 35 eggs at a time and will lay eggs three separate times as an adult during the months of September-October. Spotted lanternfly is known to feed on over 100 species of trees and has been seen with preferences to birch and maples species when tree-of-heaven populations are low or competently covered in spotted lanternflies, forcing the insects to move to other hosts.

In 2019, a small population of spotted lanternfly was found in Bunker Hill, WV in Berkeley County. In August of 2020, the West Virginia Department of Agriculture and the USDA APHIS discovered a population of around 100 spotted lanternflies near Interstate 81 in Inwood, WV: about 2 miles from the sighting last year. Currently, in October of 2020, West Virginia has two counties infested with spotted lanternfly: Berkeley and Mineral.

Current control methods for the spotted lanternfly are physical trapping with the use of sticky bands or circle traps, outreach to the public, expansive visual surveys across the state, mapping of the insect's preferred host tree-of-heaven and treatment with both systemic and contact pesticides depending on the time of the year. WVDA is working with USDA-APHIS to control this pest in West Virginia.

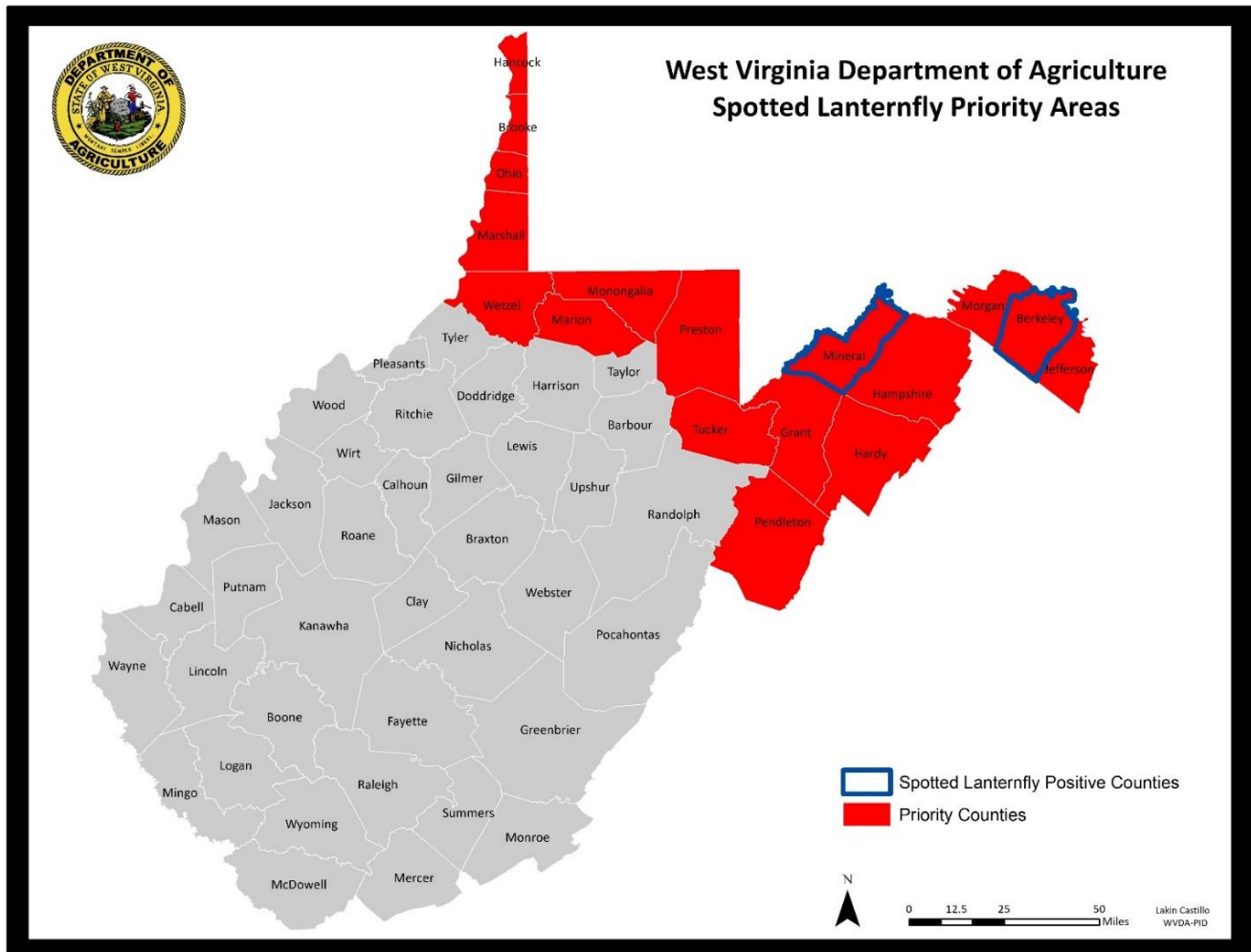


Top photo: Spotted Lanternfly (*Lycorma delicatula*).

Left photo: Spotted Lanternfly egg mass.

Right photo: Sticky band trap.

Photos courtesy of Kristen Wickert, WVDA.



Map 7.6: Counties in West Virginia at the highest risk for (WVDA GIS, 2020).

Hemlock Woolly Adelgid (HWA)

West Virginia's eastern hemlocks (*Tsuga canadensis*) are currently threatened by the hemlock woolly adelgid (*Adelges tsugae*). This small insect is native to Asia and feeds on sap at the base of hemlock needles. This eventually causes the loss of those needles, followed by branch dieback, and eventually death in both eastern and Carolina hemlocks (*Tsuga caroliniana*). Since the original 1992 survey for HWA in West Virginia, it has been confirmed in 52 counties (Map 7.7). Thousands of hemlock trees in the state have already been killed by HWA.

To manage this threat, the WVDA operates the Hemlock Woolly Adelgid Suppression Program. Under this program, WVDA field agents conduct year-round HWA surveys. The purpose of the surveys is to locate candidate trees on public lands having high importance for wildlife or aesthetics. Once located, the trees are flagged, diameters are measured, and coordinates are recorded. In addition, because

**West Virginia Department of Agriculture
Hemlock Woolly Adelgid
County Progression 1992-2020**

HWA Infested Counties

Year	Counties
1992	Pendleton, Hampshire, Hardy, Mineral, Morgan, Berkeley, Jefferson
1993	Pocahontas
1997	Greenbrier
1998	Monroe
2000	Summers, Raleigh, Mercer
2001	Tucker, Randolph
2002	Nicholas, Fayette, Greenbrier
2003	Webster
2004	Monongalia, McDowell
2005	Upshur
2006	Braxton, Clay, Kanawha, Boone, Lincoln, Wayne, Cabell
2007	Logan, Mingo, Putnam, Roane, Wirt, Wood
2008	Wayne, Lincoln, Mingo, Putnam, Roane, Wirt, Wood
2009	Lincoln
2010	Barbour
2011	Mason
2012	Taylor, Harrison, Tyler, Wetzel
2013	Ritchie, Doddridge, Pleasants
2014	Marshall
2019	Gilmer, Calhoun
2020	Putnam

Legend:

- 1992
- 1993
- 1997
- 1998
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2019
- 2020

Scale: 0 12.5 25 50 Miles

Neighboring States: Hancock, Brooke, Ohio

Source: Lavin, Castillo WVDMA-112

223

Hemlock trees selected for treatment are candidates for either biological control or treatment with the insecticide imidacloprid. WVDA has participated in several trials of biological control agents, including *Laricobius nigrinus*. Unfortunately, none of these has proven to be effective in controlling HWA to date. However, WVDA continues to partner with other agencies to explore biological control options.

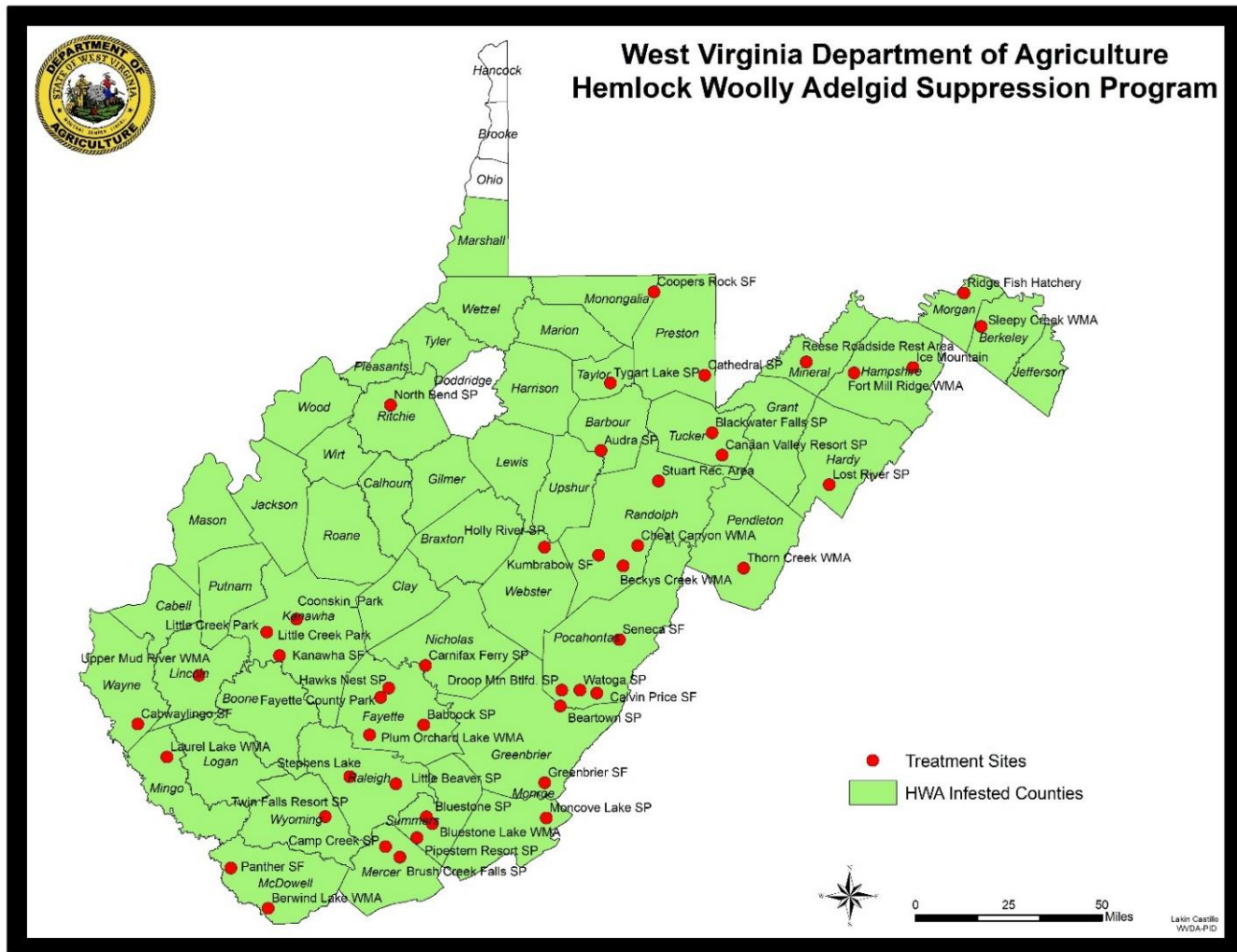


Left photo: Hemlock Woolly Adelgid treatment tree. (Clark Haynes, WVDA).

Right photo: HWA Infested Hemlock needles. (Clark Haynes, WVDA).

Most candidate trees have received insecticide treatment to reduce HWA populations (Map 7.8).

These treatments decrease the aesthetic, economic, and environmentally adverse impacts of defoliation, dieback, decline, and eventual mortality of high-value and high-profile hemlock trees. Though not practical for use in large scale forested settings, because application is limited to individual trees, insecticide treatment of selected hemlocks can enable some trees to recover from HWA infestation. This protects high value specimen trees, highly visible trees, or trees of wildlife value until biological control agents have a chance to increase, or until other HWA control measures become available.



Map 7.8.: Hemlock wooly adelgid chemical treatment sites in West Virginia from 2004-2020 (WVDA GIS, 2020).

West Virginia Hemlock Conservation Working Group

The hemlock resource in West Virginia is quickly being destroyed by the HWA. The damage does not stop at ownership boundaries and hemlock management needs to be conducted on a landscape level. In February 2008, the West Virginia Hemlock Conservation Working Group was formed and is conducted under the auspices of the West Virginia Invasive Species Council. Currently the working group consists of volunteers from the WVDA, WVDOF, USDA Forest Service (Forest Health Protection), Monongahela National Forest, National Park Service, US Fish and Wildlife Service, and The Nature Conservancy. The purpose of this group is to identify and prioritize critical hemlock conservation areas for HWA control, regardless of ownership, and to “make a stand” by pooling efforts and resources.



WVDA and Forest Service working together on a hemlock mortality survey at Blackwater Falls State Park.

Sudden Oak Death

Sudden oak death is caused by the oomycete (“water mold”) *Phytophthora ramorum*. The disease has resulted in the widespread dieback of several tree species in California and Oregon forests. Ramorum blight, also affects the leaves and twigs of numerous other plants in both forests and nurseries. Oaks and rhododendron are particularly susceptible to infestation by *P. ramorum*.

Due to the high oak and rhododendron component in West Virginia’s forests, as well as a significant nursery trade in the state, there is a risk of introduction and establishment of this pathogen. Surveys for this pathogen have been ongoing since 2003. Initially, this included a Forest Service national ground survey which involved sampling symptomatic plant material of susceptible species in sites located in high to moderate risk areas, including nurseries, campgrounds, and recreation areas. Currently, the WVDA is participating in a Forest Service early detection survey that involves using native rhododendron leaves to bait for *P. ramorum* from stream water collected in watersheds that encompass either Trace Forward Nurseries or nurseries that receive host material from California and Oregon.

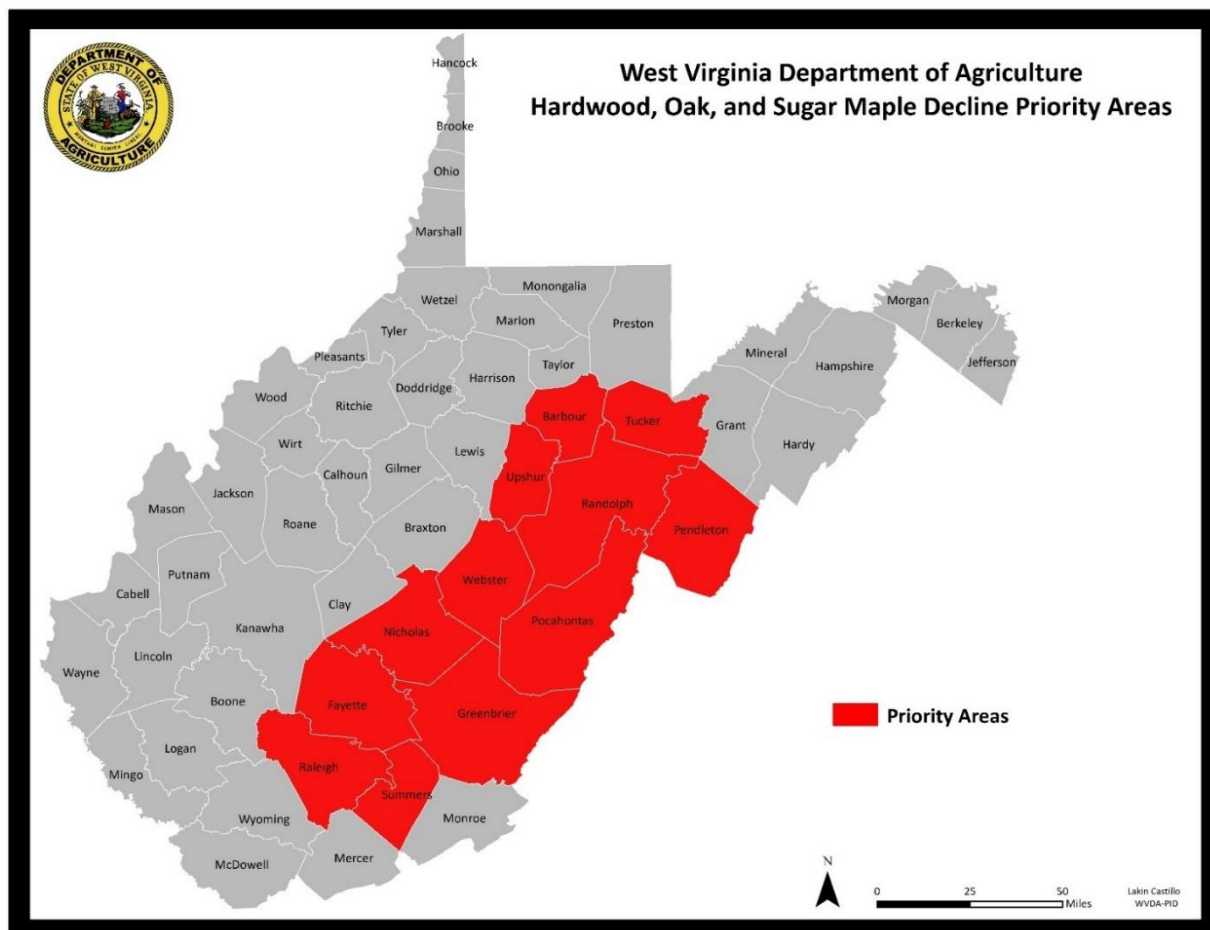
These survey areas are located throughout West Virginia, but the highest risk of pathogen establishment is in the eastern part of the state due to its high rhododendron and oak components. If any nurseries in the eastern part of the state are found to have received potentially infected host material, then watersheds around those nurseries will be surveyed immediately.

Oak and Other Hardwood Declines

Oak decline occurs statewide and has been a chronic problem in West Virginia for many years. Various factors seem to trigger the decline including drought, frost, defoliation, altered water tables, and compaction from equipment. Oak decline is one of the most widespread forest health problems encountered in West Virginia and little can be done to remedy the problem in the majority of cases.

Map 7.9 shows the areas of highest potential for loss of oak due to oak decline. Over seven million acres of forest land in West Virginia are thought to be at risk of experiencing basal area loss due to oak decline in the next 15 years, including over one million acres on public land. Losses over the next 15 years could be as much as 78 million square feet of basal area.

Hardwood decline has also been a chronic problem in West Virginia for many years due to a combination of various biological and human-caused impacts that causes stress on the trees. Map 7.9 shows the areas of highest potential for loss due to general hardwood decline over the next 15 years. Over five million acres of forest land in West Virginia are thought to be at risk of experiencing basal area loss due to general hardwood decline, including nearly one million acres on public lands. Losses over the next 15 years could be as much as 22 million square feet of basal area.



Map 7.9 Areas at highest risk for hardwood decline (WVDA GIS, 2020).

Historically, sugar maple decline has not been a major problem in West Virginia, but significant risk for this occurrence exists in areas shown in Map 7.9. Approximately 4.7 million acres of forest land in West Virginia are thought to be at risk of experiencing sugar maple basal area loss over the next 15 years, including nearly 900,000 acres on public land. Losses over the next 15 years could be as much as 17 million square feet of basal area. Causes of this decline are thought to be consistent with other hardwood decline. However, differences in general susceptibility to declines are apparent between various hardwood species, as well as among individual trees of the same species.

Strategy - Sub-Issue 7.3: Pest Management and Eradication

Long-term Strategy

1. Treat high priority areas and facilitate removal of infected/infested trees.
2. Reduce or eliminate interstate movement of firewood and other wood products in compliance with federal and state regulations.
3. Survey and monitor incidence and spread.
4. Protect hardwood timber from defoliation and other damage.
5. Protect high value trees.
6. Utilize Integrated Pest Management Strategies including biological controls when available.

Strategy Narrative

Pest management and eradication activities are continually conducted for gypsy moth, hemlock woolly adelgid, and Japanese barberry. These pests are considered major problems. West Virginia has initiated control measures for spotted lanternfly and has an active suppression program for gypsy moth and hemlock woolly adelgid. The gypsy moth program is conducted on public and private lands statewide, while the hemlock woolly adelgid program is also statewide but only on public lands.

Timeline

Annually.



Measure of Success

1. Increase in post-treatment tree survival.
2. Reduction or elimination of tree defoliation and other damage.
3. Reduction in the spread of forest pests.

Sub-Issue 7.4: Public Education

The primary objective of the West Virginia Department of Agriculture's public education program is to increase public awareness of invasive insects and diseases. Educational material is distributed via the following methods:

- News releases via newspaper, website, television, radio
- Annual forest health calendars distributed to the public
- Market Bulletin articles
- WVDA Pest Alerts and other literature sent to state parks and forests, landowners, and WVU Extension agents
- Pest Alerts published on the WVDA website
- Master Gardener/Naturalist programs
- Educational presentations for various school groups
- Participation in the WV State Fair, as well as local county fairs, the Mountain State Forest Festival, and Agriculture Day at the State Capitol
- Public meetings regarding gypsy moth and emerald ash borer
- Campaigns such as the "Don't Move Firewood" campaign
- Processing of specimens sent by landowners, and house calls by WVDA specialists to diagnose tree problems or assess hazard trees.

Strategy - Sub-Issue 7.4: Public Education

Long-term Strategy

Increase public awareness of the issues surrounding native and exotic pest species.

Strategy Narrative

The public education segment of the Forest Health Program exists to raise public awareness about issues surrounding native and exotic pest species. Information is disseminated via a variety of outlets such as



news releases, Market Bulletin articles, and Pest Alerts. Presentations are given to the Master Gardener classes, various school groups, and public meetings for gypsy moth. The WVDA also coordinates campaigns such as “Don’t Move Firewood” and prepares displays for fairs and festivals throughout the state, as well as Agriculture Day at the State Capitol.

Timeline

Annually.

Measure of Success

Increased public awareness of native and exotic forest pests.

Bibliography

Castillio, Lakin 2020 (WVDA GIS). Forest Health Protection Aerial and Ground Survey Data. West Virginia Department of Agriculture.

Forest Health Protection. 2019. National Insect and Disease Composite Risk Map, 2018 Update. Digital Data. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Forest Health Assessment and Applied Sciences Team.

West Virginia Invasive Species Strategic Plan and Voluntary Guidelines 2014,
http://www.midatlanticpanel.org/wp-content/uploads/2016/04/WV_ISSP_2014.pdf

State Issue 8: Utilization, Marketing and Economic Development

The development of West Virginia's forest products sector has been advanced by its abundant and diverse forest resource and its close proximity to a majority of the US population. Likewise, it is accessible to global markets through several close international ports. Our diverse and highly productive forests have supported a vibrant forest products industry for over 100 years, which has been very beneficial to the citizens of West Virginia.

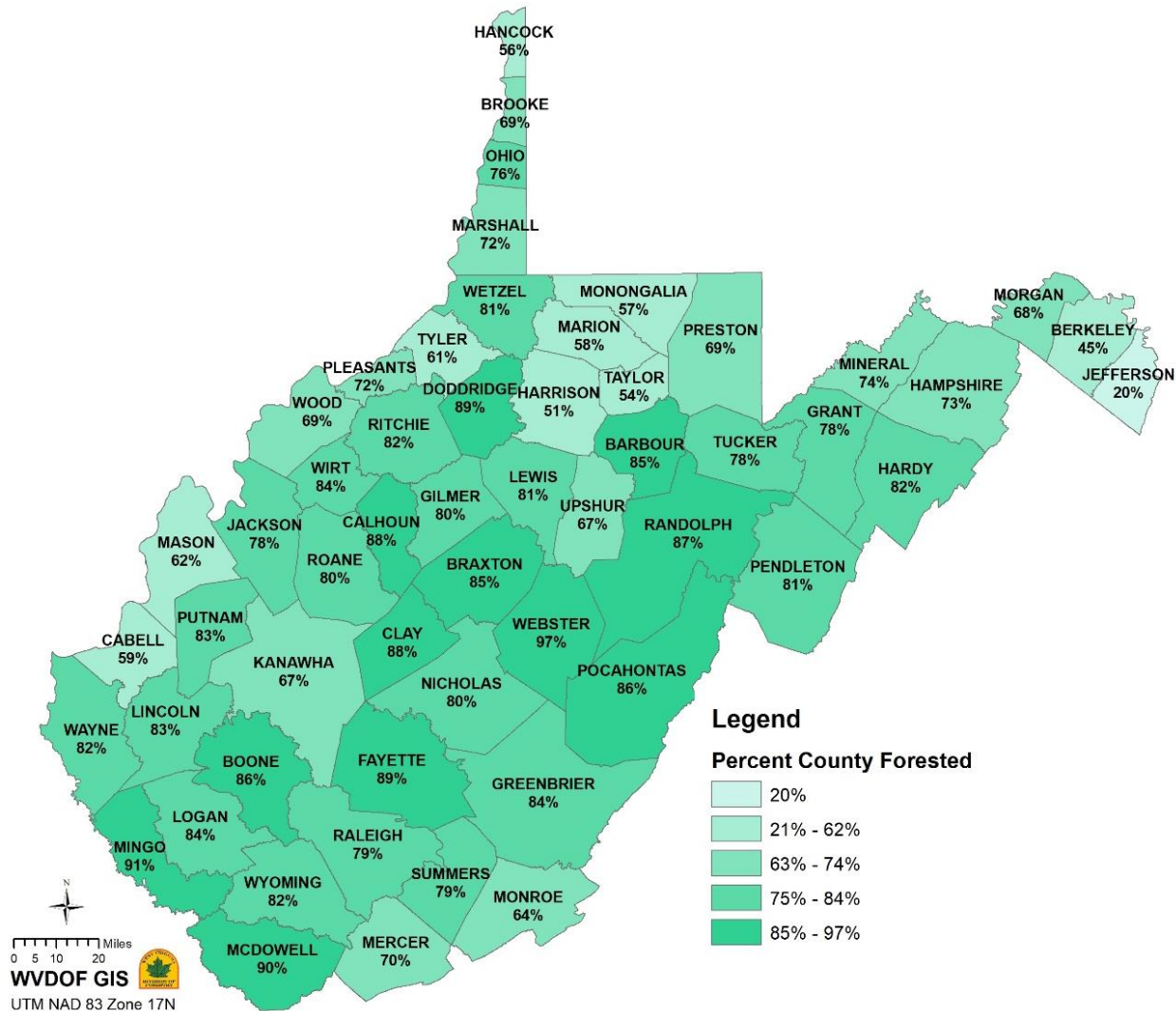
Forest-based industries are an integral part of West Virginia's economy. This sector accounted for approximately \$3.4 billion of the state's economy in 2017 and is responsible for the employment of more than 17,000 West Virginians. Each of the state's 55 counties lists at least one wood products company as an employer in that county. In some counties, the wood products sector accounts for almost 20% of the workforce and the wood products sector is considered the largest employer in a number of West Virginia counties. Due to the importance of this industry to West Virginia and many of its residents, it is vital that both the industry and our forest resources remain productive and healthy well into the future.

The WV Division of Forestry (WVDOP) recognizes the importance of the forest product sector. WVDOP is charged by statute with encouraging and assisting in the expansion of the forest industry in the state. The State Forestry Director is also charged with pursuing research and education related to forest resources and their multiple use, including management and utilization, the manufacture and marketing of forest products, protection and the organization of technical advisory committees to assist in all or any of these or any other parts of forestry. The Director is also charged with studying ways and advising the Governor and the Legislature on all aspects of what is needed to improve the business climate for forest industries and the general awareness of the economic potential of forestry in the State, improve the forest resource data and improve the transportation system for wood products.

West Virginia has an abundance of forest resources, as highlighted in Map 8.1 and Table 8.1. About 78%, approximately 12.1 million acres, of the state is classified as forestland. Forestland is all land that has at least 10% stocking in trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Timberland is forestland that produces and contains merchantable timber and West Virginia contains 11.723 million acres of land classed as timberland. Non-forestland is land that is either in farming, residential, or commercial uses and land in this category makes up only 3.4 million acres or 22% of the state (Morin, 2018).

Table 8.1 West Virginia Land Area by Land Use Type (Morin, 2018).

Land Use Type	Acres (x 1,000,000)	Percentage
Forestland	12.073	78.2%
Timberland	11.723	76.2%
Non-forestland	3.348	21.8%
Total	15.385	100.0%



Map 8.1: Percent of forest land by county, 2019 FIA accessible forest acres (Morin, 2020).

Trees are a predominant vegetation across the state. They are in our forests, along our rivers, and in our yards. On the forest land in West Virginia, there are an estimated 6.1 billion live trees that are at least 1 inch in diameter.

Figure 8.1 shows the change in productive forestland in the state since 1630, when the estimated acreage in timberland was about 14.5 million acres. With the domination of eastern forests by European settlers, we see that, by 1907, forested acreages had fallen to just about 9.0 million acres. As agriculture on the steep slopes of West Virginia proved unprofitable in the twenties and thirties, farmland was abandoned and gradually reverted back to forestland until, in 1989, the state's forested acreage had increased to about 12.1 million acres. Forested acreage has fluctuated between 12.0 and 12.1 million acres since then and the last survey of the state suggested that the were between 12.0 and 12.1 million acres of forest land in West Virginia. And given that West Virginia is comprised of 15.4 million acres in total, forests

currently dominate the state landscape, which is why WV is ranked second in terms of the percent of forestland in the state (Morin, 2020).

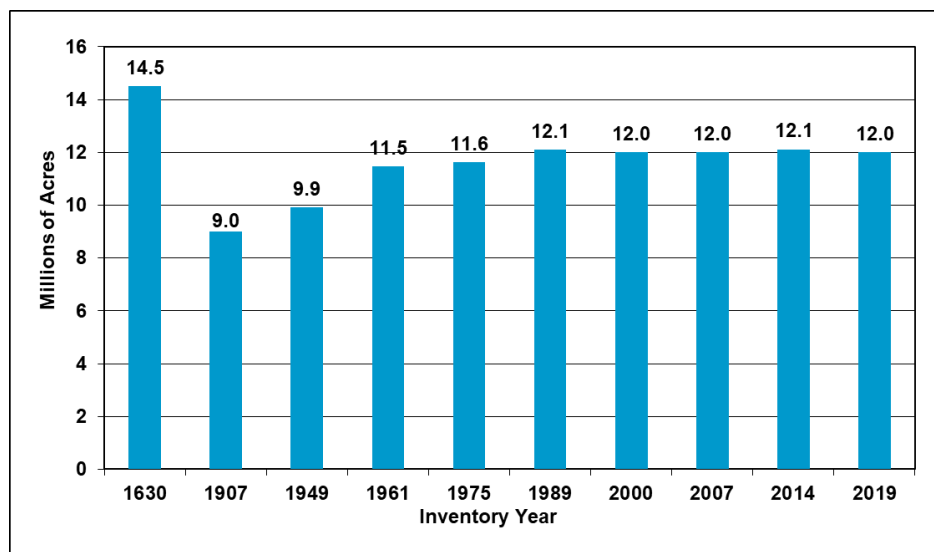


Figure 8.1: Acres of forested land in West Virginia from 1630 to the present (Morin, 2020).

As detailed in Figure 8.2, privately owned timberland is the largest component of forestland acreage in the state, totaling 10.41 million acres (87%), with corporate private land holding amounting to 4.14 million acres or 35% of the state forestland. In comparison, individual landowners control 6.15 million acres or about 51% of state forestlands, almost double the corporate ownership. National forests comprise an additional 1.23 million acres (10%), while state-owned forests make up 0.34 million acres or 3% of the state's forested lands. Finally, non-forestland area accounts for 3.4 million acres.

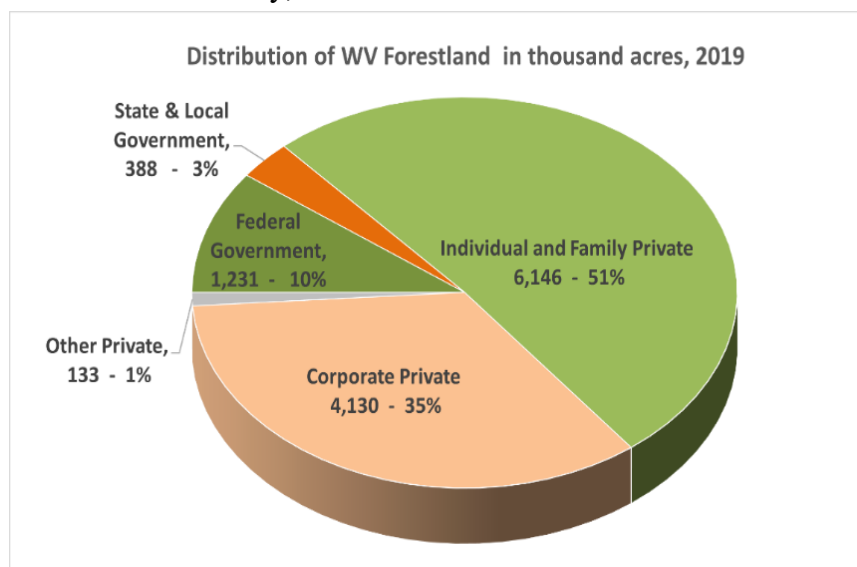


Figure 8.2: Distribution of forest land area (Morin, 2020).

While forestland acreage in WV has remained fairly constant, overall resource volumes, expressed as sawtimber volume in board feet (BF), have increased from 58 billion-BF in 1989 to almost 100 billion-

BF in 2019, doubling the sawtimber volume available for harvest in just thirty years (Figure 8.3). This increase in volume and value has helped drive the continued development of the forest-based industry in West Virginia.

The forest-based industrial sector has many segments including forest resource owners, loggers, primary processors, and secondary manufactures that are spread across the state (Map 8.2). The State Division of Forestry and their parent agency, the WV Department of Commerce, focus their efforts in the forest products sector to encourage development of forest-based industries, while continuing to encourage a sustained increase in forestland acreage and timberland volumes.

As noted earlier, the majority of West Virginia’s forestland is privately owned (86.5%). Only 10% of state forestland is in federal ownership, while only 3% is owned by state and local governments.

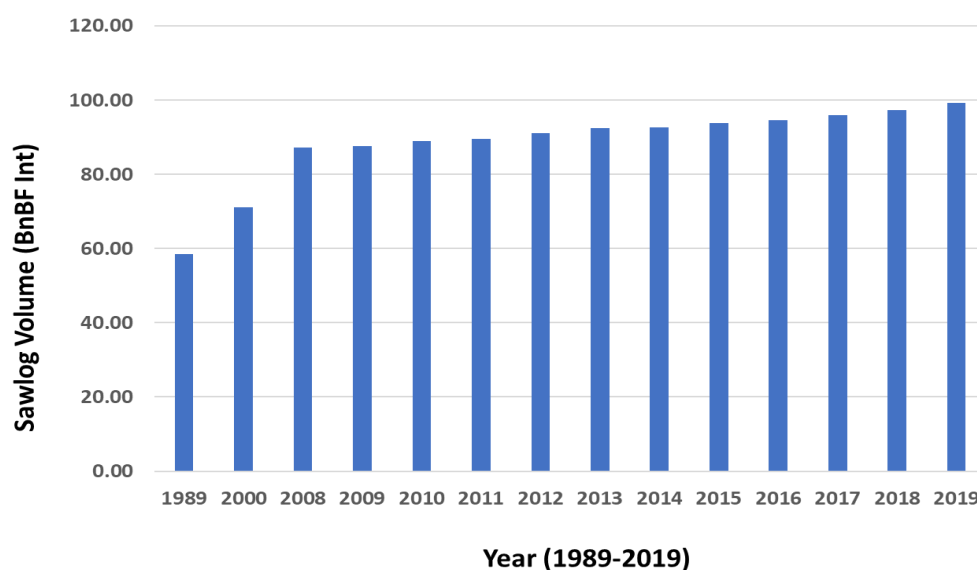
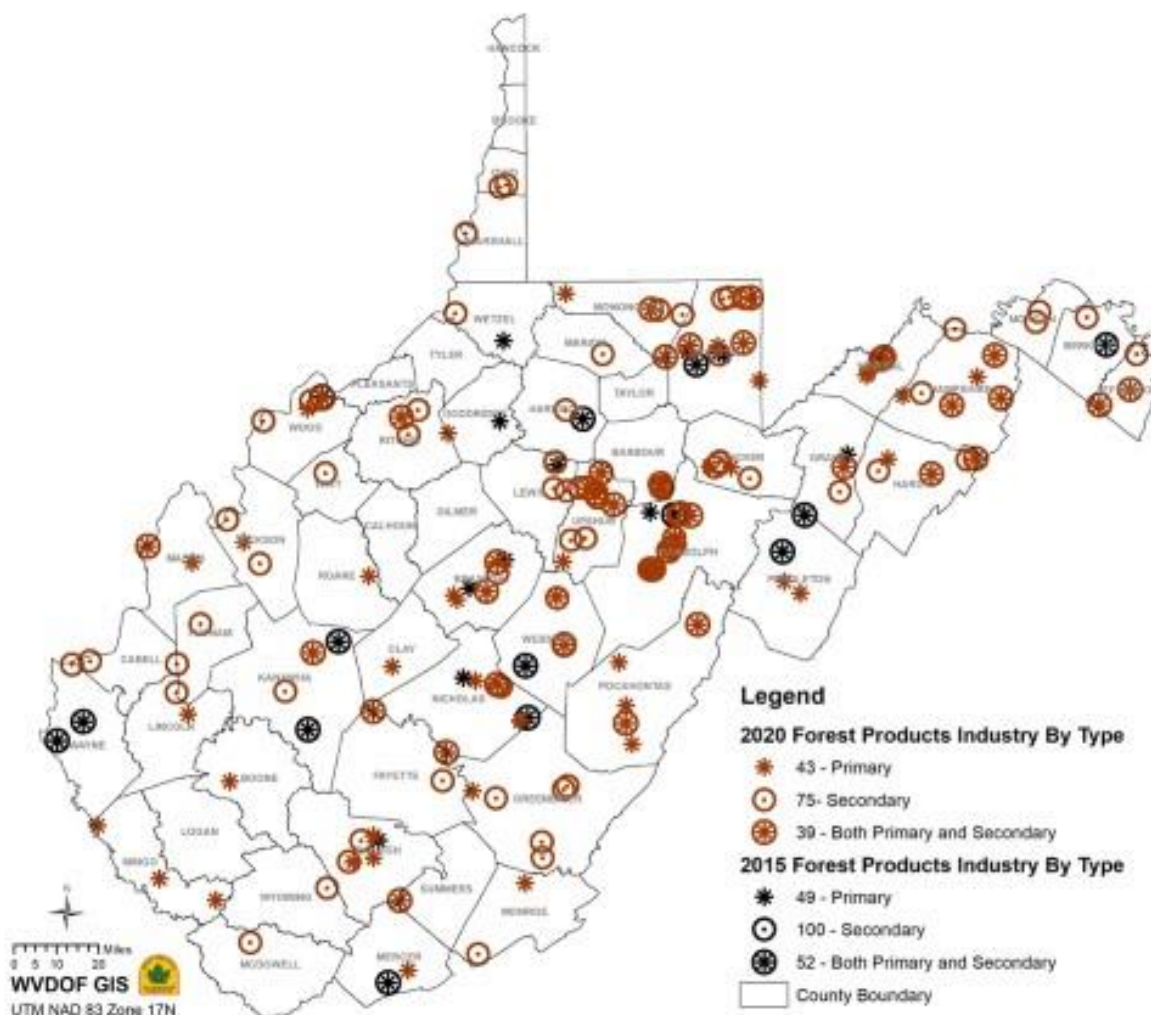


Figure 8.3: Total WV Board Foot (Int) volumes 1989-2019 in West Virginia (Morin, 2020).

As noted, forestland acreage in WV has remained fairly constant since around 1989; however, overall resource volumes have increased from 58 billion-BF in 1989 to almost 100 billion-BF in 2019, a doubling of the sawtimber volume over a thirty year period (Figure 8.3). This increase has helped drive the continued development of the forest-based industry in West Virginia. The forest-based industrial sector has many segments which include forest resource owners, loggers, primary processors and secondary manufactures and is spread across the state. Recent downturns within the industry have significantly reduced the number of processing facilities operating in West Virginia. Map 8.2 illustrates the changing industry landscape through a comparison of the number and location of primary and secondary mills in 2015 with mills in 2020. In just five years, the number of primary and secondary mills operating in the state fell from 201 facilities to 157 facilities, a 22% decline in the number of forest product related businesses in the state.

The State Division of Forestry and their parent agency, the WV Department of Commerce, focus their forestry sector efforts to encourage development of forest-based industries, while continuing to encourage a sustained increase in forestland acreage and timber volumes. However, rapidly changing economic and business-related factors will require more partnerships – between county, state, and federal agencies, industry, forestry based industry associations, and even schools and colleges in the state.



Map 8.2: Location and number of wood based primary and secondary manufacturing facilities in West Virginia for 2015 and 2020. Data from West Virginia Division of Forestry (WVDOF GIS, 2020).

Since 2006, the West Virginia Forest Products Industry has seen continued declines in employment and production (Figure 8.4). These declines can be mainly attributed to the decline in the health of the overall US and global economies and the related collapse of global markets for hardwood starting in 2016-2017.

Although traditional markets for hardwoods have struggled, new opportunities are developing that have the potential to increase the use of our forest resource. To counter the declines in economic output from the forest products sector, traditional forest products companies need access to new markets to ensure stronger economic growth in the sector and a continued reliance on West Virginia’s forest resource.

The data provided in this introduction lead to several possible conclusions. First, West Virginia has a large percentage of its total acreage in **productive forestland**. Second, the “**per acre**” volume associated with that forestland **continues to increase**, suggesting that the state’s forest products industry could expand substantially and still have more raw material at its disposal than necessary to support this expansion. Finally, the **state-wide employment numbers** for the forest products industry **continue to decline**, suggesting a shrinking industry across the state.

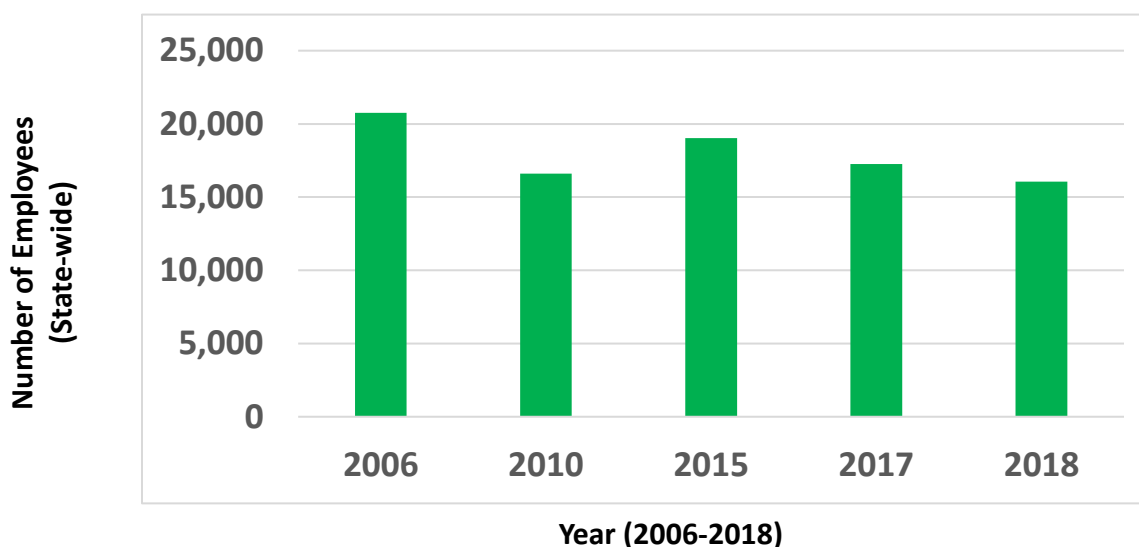


Figure 8.4: State-wide employment numbers in the forest products sector of WV between 2006 and 2018 (Gazal and McNeel, 2020; C. Gabbert, 2019).

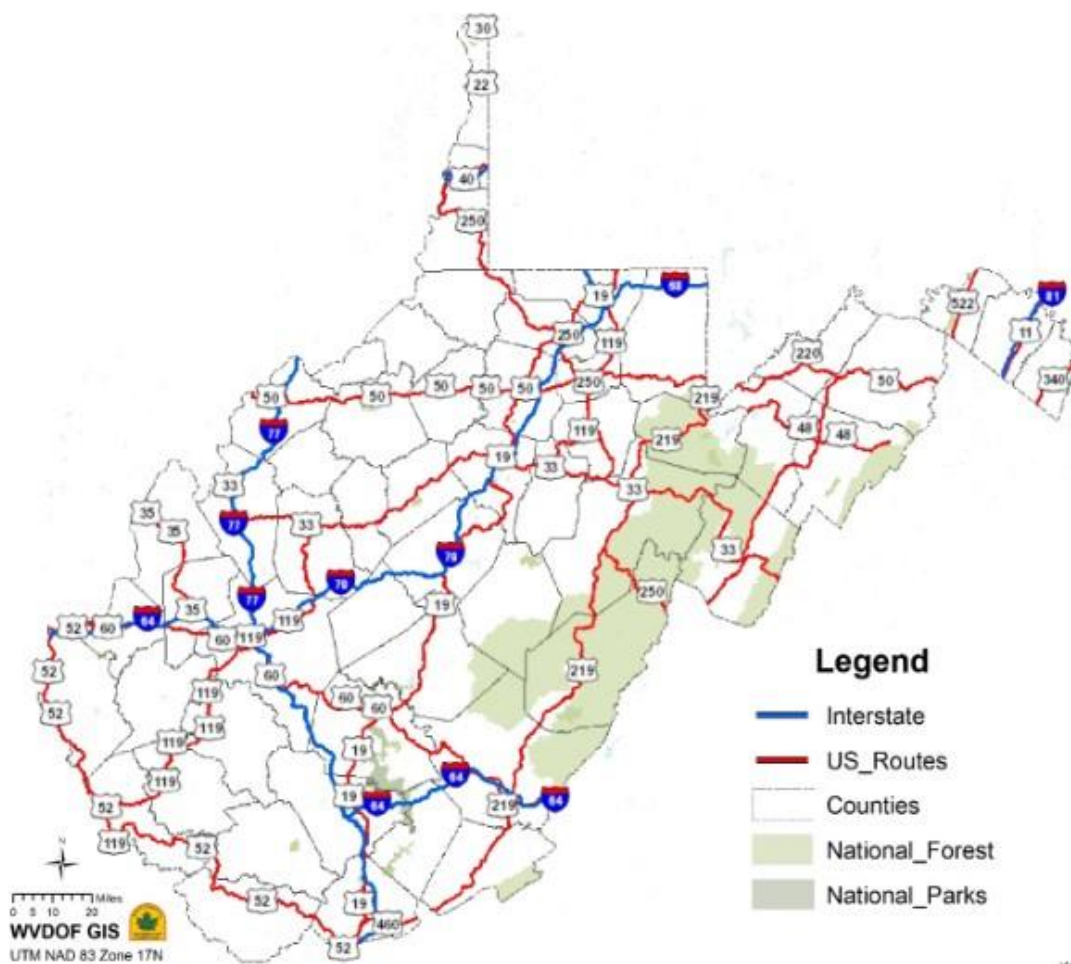
As a preface to further discussion, the forest products industry has an enormous raw material base in the forests of West Virginia, but the economic conditions over the last ten to twelve years have not promoted growth in the industry. In fact, we see continued declines on the horizon. By resolving at least some of the issues facing the industry that will be discussed in the following pages, the forest products industry could witness a revival of the industry. Only time will tell...

Six issues that have the potential to impact the utilization and marketing of West Virginia’s forest resource were identified as being of critically importance to the continued development of this industrial sector. The continued development of the forest-based industry will help ensure the importance of the forest resource to the citizens of West Virginia.

Sub Issue 8.1: Infrastructure/Transportation

The State of West Virginia has improved the transportation infrastructure in the state over the last fifty years, adding to the federal interstate system in some parts of the state, improving and expanding existing secondary highways, and creating new road systems where population growth has warranted this expansion of our road system (Map 8.3). However, the forest products industry in the state is often located in rural areas of the state where the transportation system is of limited quality and capacity. There are not enough capital resources within the state and county governments to improve all of the rural areas of the state that need improvement to support the various industries that would benefit from these improvements.

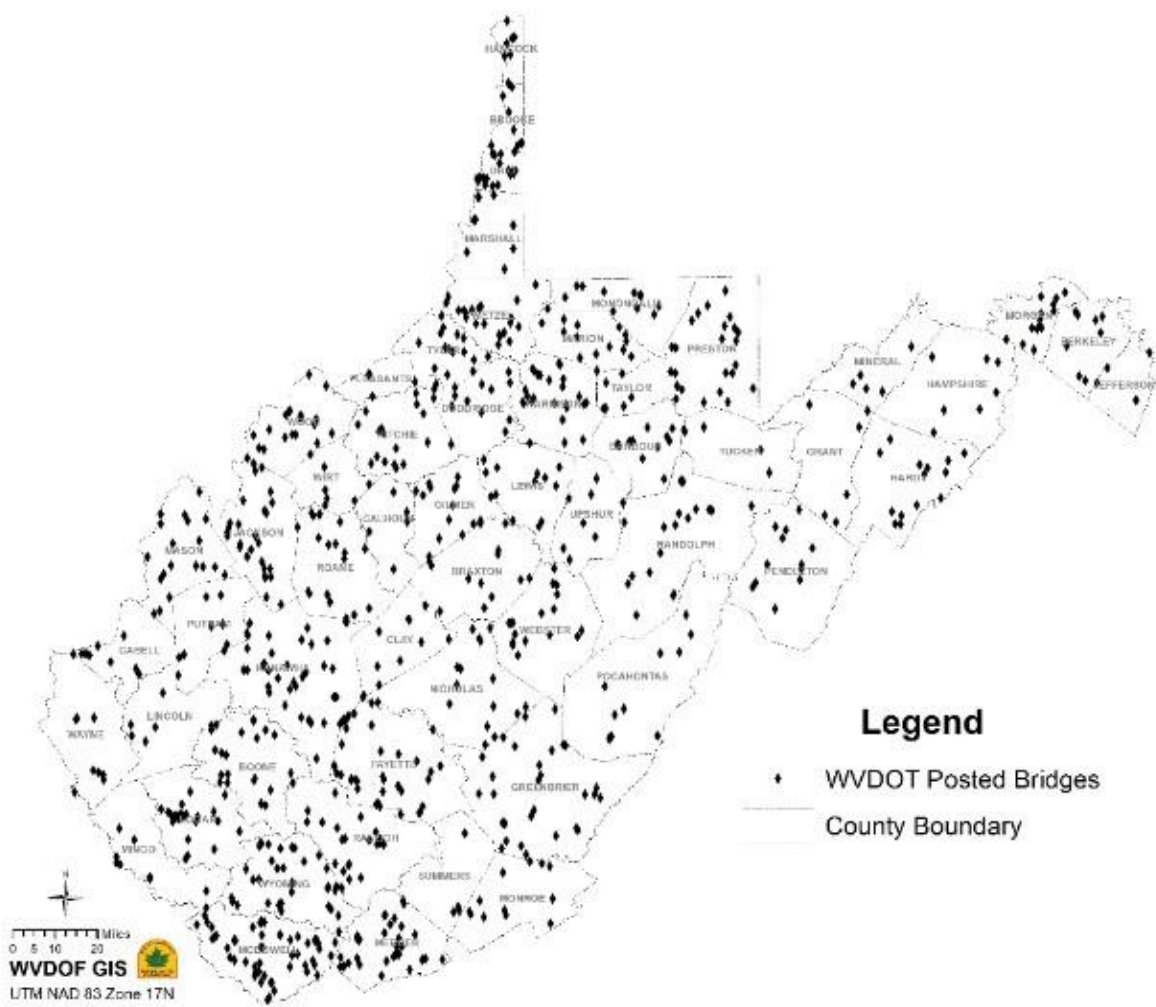
Road systems in West Virginia continue to limit the potential for growth of forest-based industries. As illustrated in Map 8.3, large areas of the state are not serviced by limited access or US federal highways. Even state roads are limited in many of the counties where forestry is a major component of the economy. Much of the transportation of raw logs to mills or concentration yards is done on county highways which have significant limits on weight and access.



Map 8.3: Highway transportation system of West Virginia, (WV DOT, 2020).

Being a rural state, West Virginia lacks upgraded roads capable of sustaining good transportation flow in many rural areas where the potential for industry expansion is already limited. In order to reduce transportation costs, forest-based industries must move large loads of product from the forest to processing facility and then on to market destinations. To help facilitate this process, the state DOF should certainly develop strong partnerships with the WV DOT to identify key highway concerns and issues faced by the forest products industry in the state and work with DOT and the WV Legislature to address these problems.

One of the most significant transportation related concerns faced by the forest products industry in WV is the number of poorly maintained and limited-weight bridges that reduce travel options for loggers and primary producers. Bridges with weight restrictions often force truckers to haul loads on slower, longer routes to avoid the overloading and eventually damaging those bridges. The WV DOF and DOT should consider working with the forest products industry to identify the most critical bottlenecks created by limited weight bridges and work to get these key structures upgraded or repaired to increase weight limits and allow truck access. Map 8.4 illustrates the number and location of county, state, and federal bridges that, as of 2020, have some limit on them relative to maximum allowed weight.



Map 8.4: Posted bridge locations with weight restrictions in WV (Gula, WV DOT, 2020).



WV Division of Forestry could address at least the more critical bottlenecks in our county road systems and work to minimize the impact of weight restricted bridges on raw material and finished product hauls.

The industry is also plagued by a severe lack of OTR haulers available for interstate hauling forest product loads out of West Virginia. The lack of product distribution centers and large industrial manufacturers outside the forest products industry limits the number of shipments coming into the state on a daily basis. Finally, weight limits on many of West Virginia's roadways hinder truck movement and force forest products industries to allocate more resources on transportation than those in other hardwood producing states.

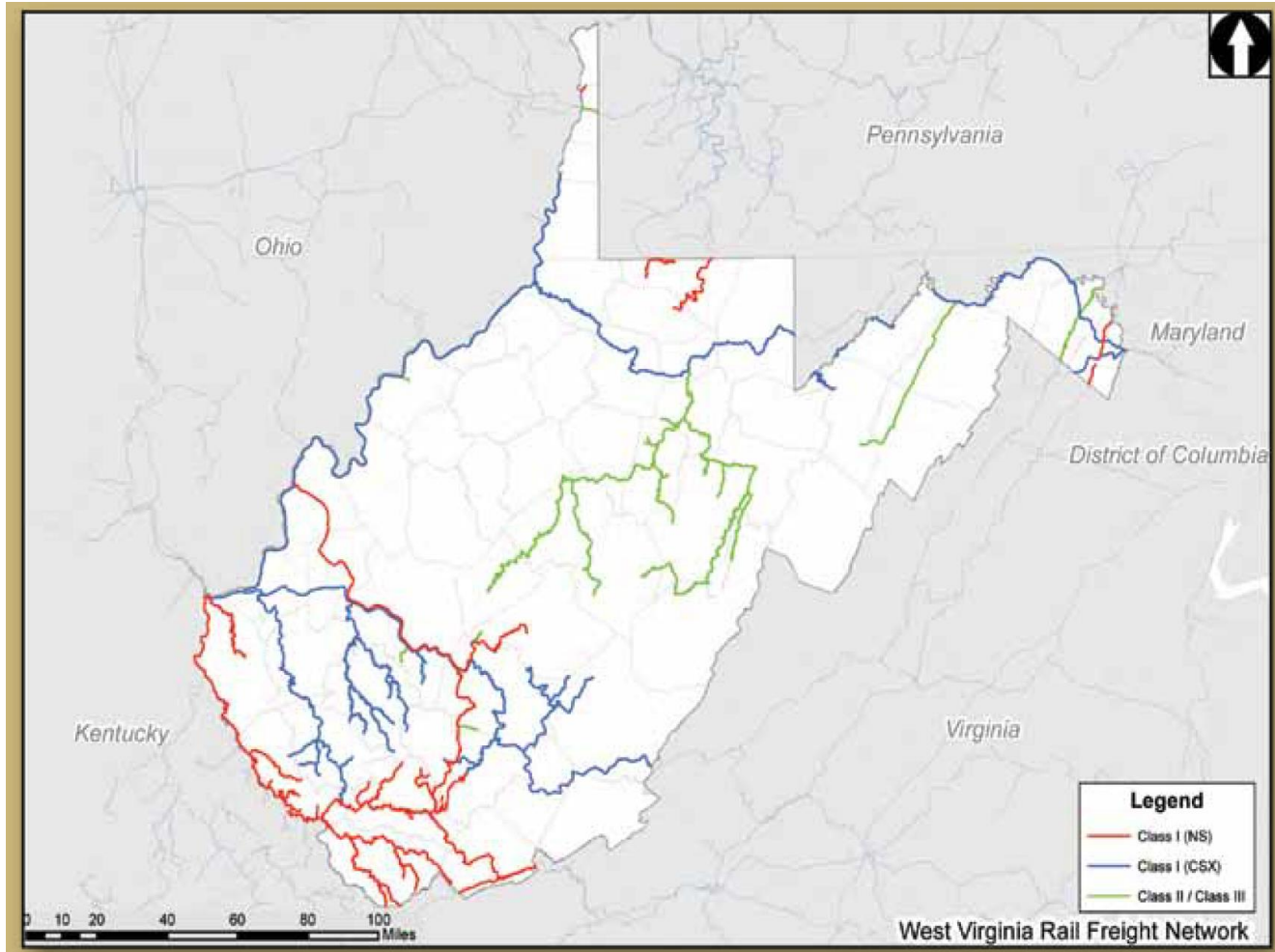
Efforts to bring industry into the state in the form of distribution centers or large manufacturing companies would be the most opportune approach to improving this situation, but that type of effort typically requires the effort of the WV Development Office.

Two positive changes that affected log trucking in WV occurred in 2019 when the West Virginia Forestry Association lobbied the WV state legislature to allow loggers to haul heavier loads on state highways. First, the legislature passed a bill that allowed heavier loads, up to 94,000 pounds, on key secondary highways in the state. A follow-up "companion" bill was also passed that allowed the use of pup trailers on log trucks which helped haulers distribute their load across more axles and reduce weight-based damage to the road surface.

The Commissioner of the Division of Highways, based on legislation passed in 2019, can issue permits for four-axle tractors with one steering axle and three axles in tridem in combination with dual axle pup trailers: Provided, that the maximum weight of each axle for pup-combination vehicles beginning with the steering axle commencing rearward respectively does not exceed 14,500 pounds, 16,613 pounds, 16,614 pounds, 16,613 pounds, 14,830 pounds, and 14,830 pounds (totaling 94,000 pounds GVW).

Another transportation issue that has become more visible in recent years is the lack of rail infrastructure, especially rail siding facilities for transporting finished wood products. While the forest products industry has not collaborated with the railroad industry much in the past, with the passing of the coal industry, there is an opportunity for these two major industries in West Virginia to work together more frequently. And, as West Virginia begins to compete in a more global market for forest products, rail infrastructure is of utmost importance for the efficient transportation of forest products to intermodal port facilities. Many producers in West Virginia cite rail infrastructure as a critical need to the future success of their endeavors.

Exiting freight rail service in West Virginia has been focused on servicing the coal industry over the past century and is in significant decline due to declines in the demand for coal (Map 8.5). The rail industry needs an incentive to expand service to other locations into the eastern and western sectors of the state, where the forest products industry is firmly established and in need of a stable, high capacity transportation system to established regional and national markets, as well as ports for international transport.



Map 8.5: Existing freight rail systems in West Virginia (WV Department of Development, 2020).

As noted in Table 8.2, there are about 13 different rail companies with systems in WV. Some, like CSX and Norfolk Southern, have hundreds or even thousands of miles of operating track. Others, like the Little Kanawha River Rail, operate with fewer than five miles of track in their system.

This is a hodgepodge of different systems and ownerships which will be extremely difficult to deal with. However, the potential payoff to the forest products industry is an existing and well-placed transportation system capable of moving large volumes of wood from key locations in WV to ports and other key destinations on the eastern seaboard with very little required investment.

Table 8.2: Railroad line ownership in West Virginia (WV DOT,2020).

Railroad	Miles Owned in WV
CSX Corporation	1,060
Norfolk Southern Corporation	759
Wheeling & Lake Erie Railway	6
Appalachian & Ohio Railroad	158
Beech Mountain Railroad	8
Elk River Railroad	64
Kanawha Rail Corp.	6
Little Kanawha River Rail	3
RJ Corman Railroad Co./WV lines	16
South Branch Valley Railroad	52
Vaughan Railroad Co.	18
West Virginia Central Railroad	132
Winchester & Western Railroad	28
TOTAL RAIL LINES IN WV	2,310

Strategy - Sub-Issue 8.1: Infrastructure/Transportation

Long-term Strategy

Develop infrastructure to encourage growth of primary and secondary forest industries.

Strategy Narrative

West Virginia lacks sufficient resources to expand the transportation system which would aid growth of the forest products industry. The state also lacks industrial sites suitable for development due to topography and a lack of adequate infrastructure. There is also unwillingness among some residents and the environmental community to accept expansion of forest-based industries or the transportation networks that serve them. The West Virginia forestry community must work together to ensure the continued development of transportation networks that serve the forest products sector.

Timeline

Maintaining and enhancing transportation efficiency will be an ongoing effort by the WVDOF and allied stakeholders. Performance will be measured over the next ten-year period.

Measure of Success

- 1) Establishment of new rail sidings or rail infrastructure for forest products and allied industries.
- 2) Expansion of the forest products industry.
- 3) Efficiency improvements in forest products transportation networks (shared trucking, efficient management, infrastructure improvement).

Sub-Issue 8.2: Ecological Services

Often, traditional forest management strategies do not address all aspects of the ecological management of forested landscapes. Important factors that contribute to the overall integrity of the forest are overlooked or inadequately considered during the planning and implementation phases, including wildlife, understory integrity, biodiversity, disturbance regimes, invasive species, forest health, long-term productivity, rare ecological systems, and other environmental and ecological benefits.

The management of the entire forest resource is important when it comes to diversifying and strengthening the state's forest-based industries. Ecological services that are not always included in forest-based industries portfolio must be incorporated in future development if the wood products industry is to remain vibrant. Many of these services are not well known by traditional industry executives or private landowners; however, their importance to the public cannot be understated.

One of the most visible of these services is the carbon sequestration capacity of hardwood forests. Carbon sequestration is the process through which carbon dioxide (CO₂) from the atmosphere is absorbed by trees through photosynthesis and stored as carbon in woody biomass (tree roots, trunks, branches, and foliage). Sequestration of carbon by forest ecosystems enhances the quality of soil, water, and air. This has become increasingly important due to the impacts of global warming on the world's environment. Sequestration of carbon by forested ecosystems can offset the amount of greenhouse gases released into the atmosphere, thus potentially reducing the global climate change.

The monetary relevance of sequestration to the forest-based industry is through carbon offsets or credits. Market mechanisms have been implemented that give forest landowners the opportunity to "sell" the CO₂ that their trees sequester to those that produce excessive amounts of CO₂ who need or want to "offset" their emissions. There are several forestry project types that qualify under offset programs. These include forestation (afforestation and reforestation), forest management, and avoided deforestation (preservation). Each of these project types has a number of criteria that must be met in order to qualify for the program. For instance, in forest management project, landowners must:



- Have a current forest inventory
- Use approved forest management practices
- Commit to positive sequestration of carbon and maintaining sustainability certification
- Maintain the integrity of inventory over time through re-inventory and reporting of removals and additions
- Willing to open land for verification process

All types of forest carbon credit transactions require certification through a third-party system such as the Forest Stewardship Council (FSC), Sustainable Forestry Initiative (SFI), and the American Tree Farm Program. Carbon credits are traded primarily on two exchanges: the Chicago Climate Exchange and the California Climate Registry. Credits are traded over the counter; this includes unmonitored transactions between two parties. Currently the market is highly variable and transactions among the different exchange types have ranged from \$1.80 to \$300 per ton CO₂ equivalent, with a 2018 article suggesting that an annual credit price of \$12 per acre per year is typical (Bullinger, 2018).

The use of carbon credits to provide annual returns to the landowner from their forestland investment should be explored and promoted within the state with particular emphasis on gaining access to this opportunity to landowners who own less than 500 acres to enroll in the program. Landowners might be more willing to participate in a carbon credit program if they were given the chance to participate with other landowners in the area in some type of cooperative effort that would promote more of an economy of scale than is typically available for an individual landowner with less than 500 to 1000 acres of forestland available for enrollment.

Forest Certification

Increased environmental awareness and consumer demand for more sustainable business models have increased the importance of Forest Certification Programs. The programs have also become a new way for forest products supply chains to differentiate their products. A number of programs exist and are differentiated mainly by the organization(s) that developed them and/or their verification process. The main goal of these programs is to use market-based incentives to encourage sustainable forest management.

In West Virginia, the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC) are the two most common international certification programs. West Virginia also has a Managed Timberland Program that offers tax reductions for lands that are certified under this program.

Requirements for Managed Timberland

- Minimum of ten (10) contiguous wooded acres,
- Management plan in place,

- No harvesting activities allowed until a management plan is in place, and
- All owners must be in agreement with the developed management plan prior to enrollment.

Only 12% of West Virginia's privately managed forestland (1.2 million acres of the eligible 10.4 million acres) is considered certified by SFI, FSC, or the Tree Farm program (Figure 8.5). One of the most widely accepted certification programs in the state is the Managed Timberland Program. Although not recognized outside state lands, this program may be a landowner's first experience with certification issues.

Management Plan Requirements

The contract states that the land is being used in a planned timberland management program and is devoted primarily to forest use. In compliance with the Law, the owner may:

- (1) File a notarized document that the land is being protected and managed - demonstration of the plan must be made available upon request.

or

- (2) Submit a plan prepared by a professional forester and display an intent to follow that plan. Most private timberland owners can receive up to 75% cost sharing assistance for plans, and in some cases, may receive a free plan. Information on cost sharing and management plans can be obtained from the West Virginia Division of Forestry.

If a plan does not exist when the contract is filed, then one could be developed by the end of the second year after filing the Contract. Until a plan has been prepared, harvesting activities cannot be conducted. This guarantees that regeneration is planned and that the harvest is carried out in a way that will provide regeneration.

Once land is placed under a Managed Timberland Contract, all management activities must be conducted as specified in the plan. This ensures that the land will produce continuous crops of timber on a perpetual basis. Using the forest management plan will maximize the productivity of the forest for the owner. If the County Assessor or the Tax Commissioner has cause to believe that a plan is not being followed, a request is made to the Division of Forestry for an inspection to determine if the land qualifies for the program and the plan is being followed. Falsification of certification or failure to follow a professionally prepared plan will result in loss of valuation as managed timberland.

Recent concerns have been raised about the associated county land tax reduction that is provided to forest acreages enrolled in the Managed Timberland Program in WV. The state and the county assessors who implement the Managed Timberland tax reduction program must reach consensus on the associated tax formula to ensure that this important program that taxes forestland under long term management at a

lower rate than unmanaged forest land. The WV DOF should work with groups like the West Virginia Forestry Association (WVFA) to maintain or even enhance the tax benefits in the coming years.

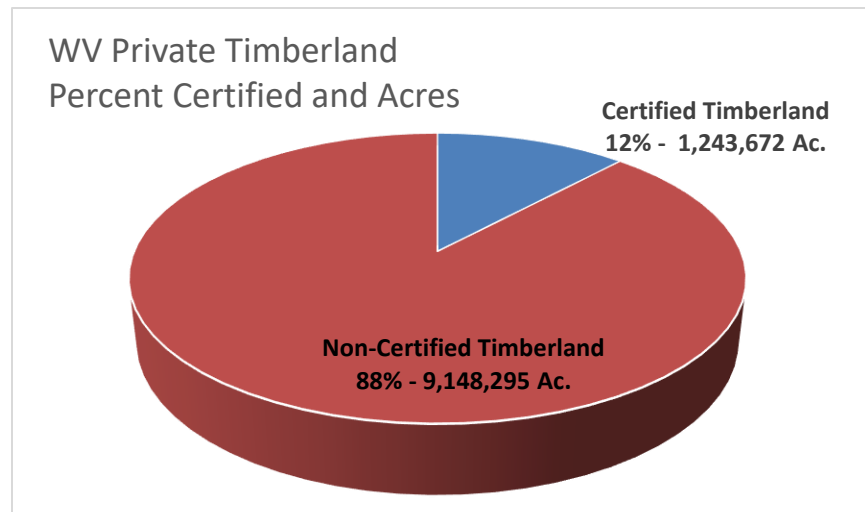
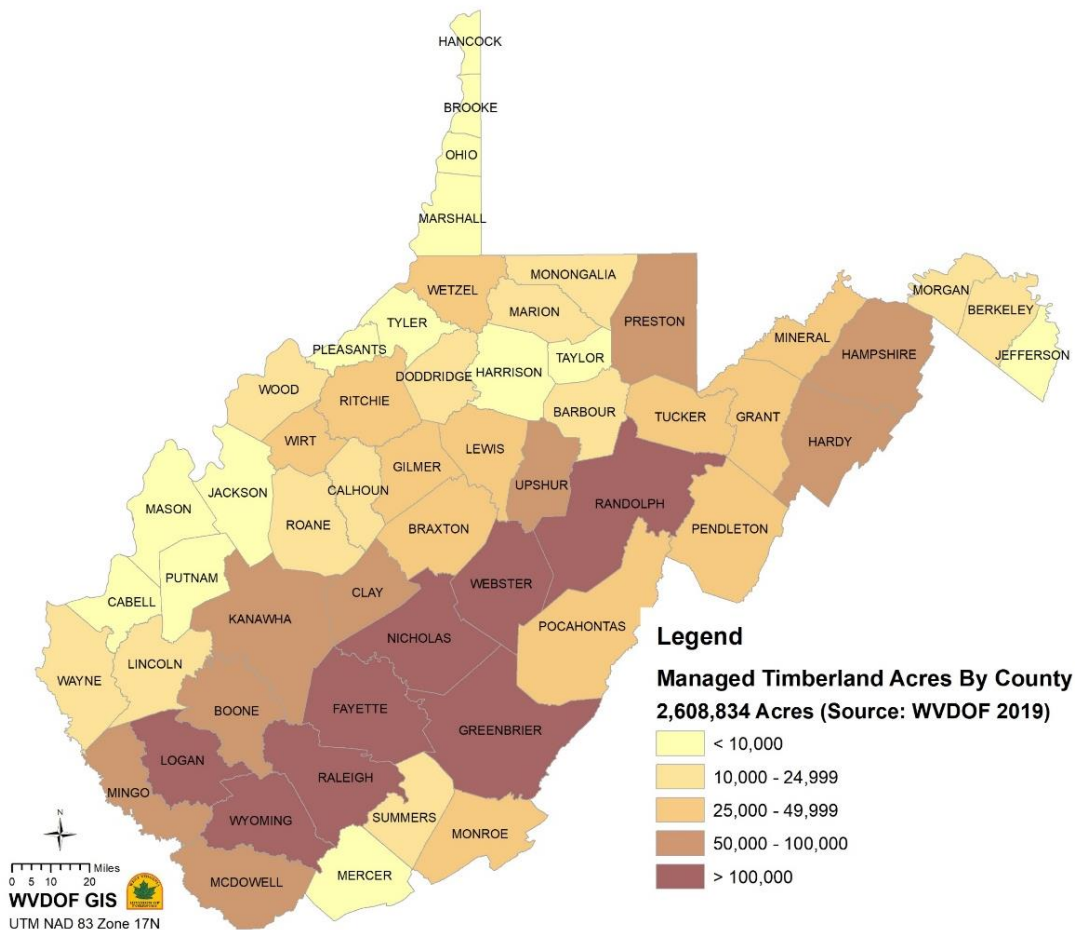
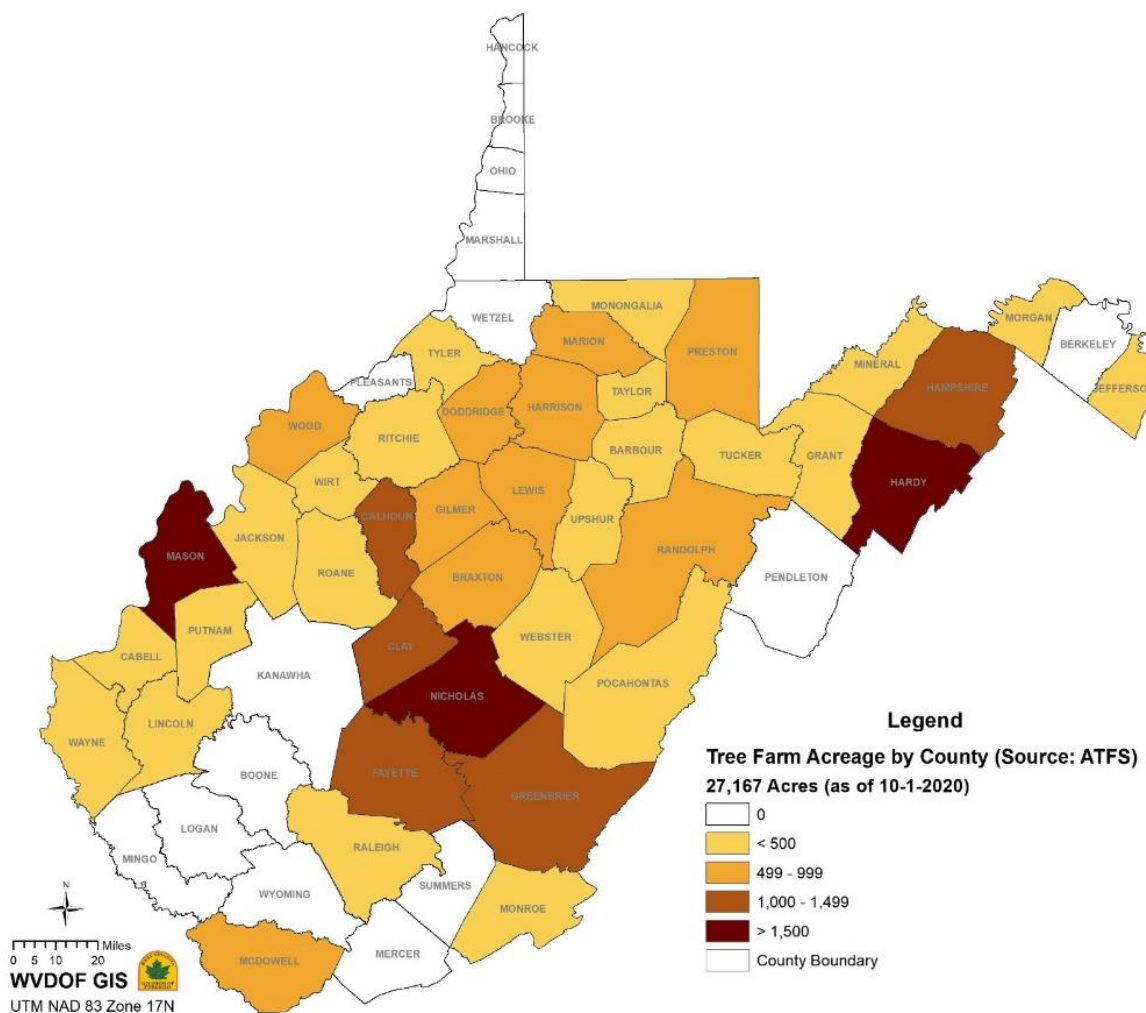


Figure 8.5: Private timberland acres certified under SFI and FSC 2020 (WVFA 2020 and US Forest Service FIA 2019).



Map 8.6: Acres enrolled in Managed Timber Program in 2019, by county (WVD OF GIS, 2019).



Map 8.7: Acres enrolled in the American Tree Farm System (AFTS) in West Virginia in 2020, by county (WVDOF GIS, 2020, with data provided by American Tree Farm System database).

Forest-Related Recreation

Forest-based recreation is another ecosystem service that can be provided by WV forest land base. The full quantification of this opportunity sector is difficult – the direct link between recreation and the forest resource is unclear. This is because the attribution of recreation and tourism activities to use of the forest is not straightforward, and data that might directly link recreation and tourism to forest-based activities are not available.

According to a 2019 study by the West Virginia Division of Tourism, in 2017 where data was available for analysis for the entire year, the economic impact of tourism in West Virginia, without gaming earnings, totaled \$3.9 billion (Table 8.3). The actual net earnings from tourism in 2017 was much lower at \$1.1 billion. Tourism based employment was estimated at 45 thousand jobs, although a substantial number of these positions were seasonal in nature. Finally, state and local tax revenue from tourism in 2017 totaled about \$517 million (Dean Runyan & Associates, 2018).

This data is impressive, and one should assume that, given this level of economic impact from tourism, there are opportunities for forest resource owners to increase the level of tourism amenities they provide. Data in figure 8.14 shows that only two major categories of recreational spending, as defined in the most recent report from the WV Division of Tourism, actually focus on outdoor based recreation – Day Travel (\$1,901 million gross spend) and Campgrounds (\$37 million gross spend). However, these are strong economic numbers and spending could be enhanced through advertising and the construction of new campgrounds and scenic areas in the state.

Table 8.3: West Virginia direct travel impacts, 2000-2018-partial yr. (Dean Runyan & Associates, 2018).

	Spending (\$Million)	Spending w/o Gaming (\$Million)	Earnings (\$Million)	Employment (Thousand)	Government Revenue (\$Million)		
					Local	State	Total
2000	2,450	2,083	610	36.0	15.1	280.8	295.9
2001	2,708	2,201	667	38.4	17.7	340.6	358.3
2002	3,010	2,374	734	40.8	20.7	396.1	416.8
2003	3,349	2,591	787	42.5	23.3	449.5	472.8
2004	3,594	2,759	815	42.9	26.2	525.7	551.9
2005	3,855	2,976	848	44.3	27.8	536.3	564.1
2006	4,088	3,173	874	44.6	30.5	552.4	582.9
2007	4,195	3,301	904	44.4	32.4	556.4	588.8
2008	4,499	3,584	931	44.7	42.2	557.0	599.2
2009	4,039	3,165	942	44.6	41.1	545.7	586.7
2010	4,324	3,482	998	45.0	45.5	534.6	580.2
2011	4,713	3,823	1,025	45.3	54.4	533.8	588.2
2012	4,836	3,929	1,065	46.2	58.6	543.4	601.9
2013	4,633	3,845	1,064	46.5	53.9	492.3	546.2
2014	4,505	3,797	1,075	46.2	49.9	477.6	527.5
2015	4,258	3,562	1,104	44.8	53.8	484.6	538.4
2016	4,142	3,484	1,118	44.9	51.6	474.5	526.2
2017	4,277	3,633	1,131	44.8	50.0	467.2	517.2
2018p	4,554	3,907	1,184	45.4	53.3	481.2	534.5

Wildlife-Associated Recreation

Perhaps the most important ecological service with the potential to diversify the forest industry economy is wildlife related recreation. Wildlife-associated recreation includes fishing, hunting, and wildlife-watching activities. In 2011, 447,000 people participated in hunting or fishing related recreation in West Virginia and spent over \$400 million on sports related activities and items in the state (Table 8.4).

The potential for WV's forest resource to continue to sustain and/or increase this activity is great. As more forest landowners manage their resource in a way as to encourage wildlife use, the more value the land will have for those participating in wildlife-associated recreation. This includes general wildlife viewing and nature tourism to leasing of hunting rights for game species.

Table 8.4: Hunting Expenditures in West Virginia for State residents and nonresidents 16 years old and older (Dean Runyan & Associates, 2018).

Hunting Related Activity	Expenditures
Trip-related	\$ 69 million
Equipment	\$ 308 million
Hunting	\$ 79 million
Auxiliary and special	\$ 229 million
Other	\$ 33 million
Total	\$409 million

Obviously, the WVDOF is not charged with promoting wildlife-based recreation in the state, since that responsibility is primarily in the hands of the West Virginia Division of Natural Resources. However, efforts should be made to develop collaborative efforts to enhance and develop wildlife and fishing opportunities in the state. Past efforts to create wildlife habitat areas within State Forests and to aid the WV DNR with enhancing wildlife habitat on DNR lands are laudable and should continue if possible.

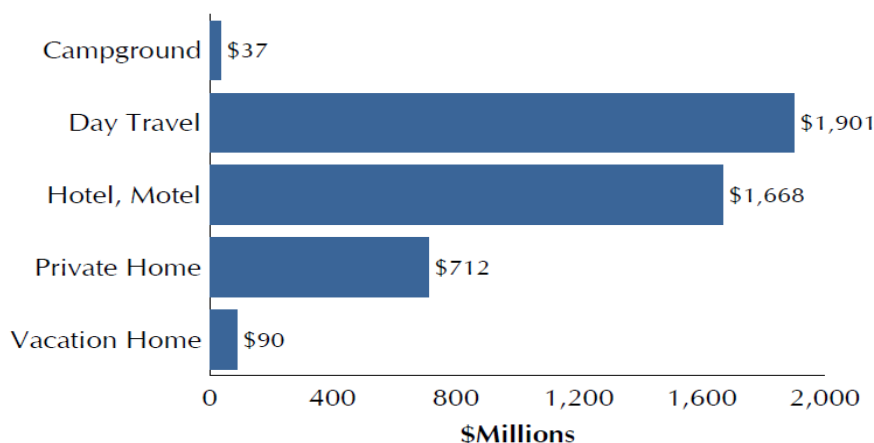


Figure 8.6: West Virginia visitor spending by type of traveler accommodation, 2018 (Dean Runyan & Associates, 2018).



Strategy - Sub-Issue 8.2: Ecological Services

Long-term Strategy

To diversify and strengthen forest-based ecological services and educate landowners about developing ecological services markets.

Strategy Narrative

The management of the entire forest resource is important for diversifying and strengthening the state's forest-based industries. Ecological services that are not traditionally included in forest-based industries' portfolios must be incorporated in the future if the wood products industry is to remain viable. Many of these services are not well known by traditional industry representatives; however, their importance to the public cannot be understated. The WVDOT will help identify and encourage the development of new markets related to ecosystem services to aid in the management of the state's forests.

Timeline

Greater understanding and use of ecosystem services and associated markets, where applicable, will occur by 2030.

Measure of Success

- 1) Increased certification of WV forest land by industry and non-industrial owners, as well as a greater focus on small, forested acreages of 50 acres or less.
- 2) Increased forest and wildlife recreational opportunities and economic development.
- 3) Improved application of the Managed Timberland program.
- 4) Increased understanding of carbon sequestration and potential carbon market and work to identify specific carbon sequestration projects for both public and private timberland.

Sub-Issue 8.3: Byproducts and Byproduct Markets

West Virginia’s forests are predominantly managed for solid wood products, not biomass. Most slash and delimbed material removed during harvest remains in the forest as debris or slash, as it commonly called. The most common “biomass” size products removed from our forests for sale are small sized logs destined for use in producing pulpwood and oriented strand board (OSB) wood.

Most biomass size material removed as part the harvesting process is actually given to the logging contractor as a “bonus”. The net value of biomass wood in the Appalachians delivered to the mill is probably less than \$10 per ton (less cutting and hauling costs) and is generally hauled only to pulp and paper mills and OSB plants as noted earlier. There is no real energy harvesting to speak of in West Virginia and the potential for the introduction of biomass harvesting in the state and even in the Appalachian region is very limited.

The cost of creating chips or ground material from harvested residues in the Appalachians is extremely high, much more expensive than the cost of coal or natural gas, which are abundantly available in the region. The bottom line is that the markets necessary to make a living from harvesting and trucking biomass energy wood do not exist in West Virginia or other parts of the Appalachian region.

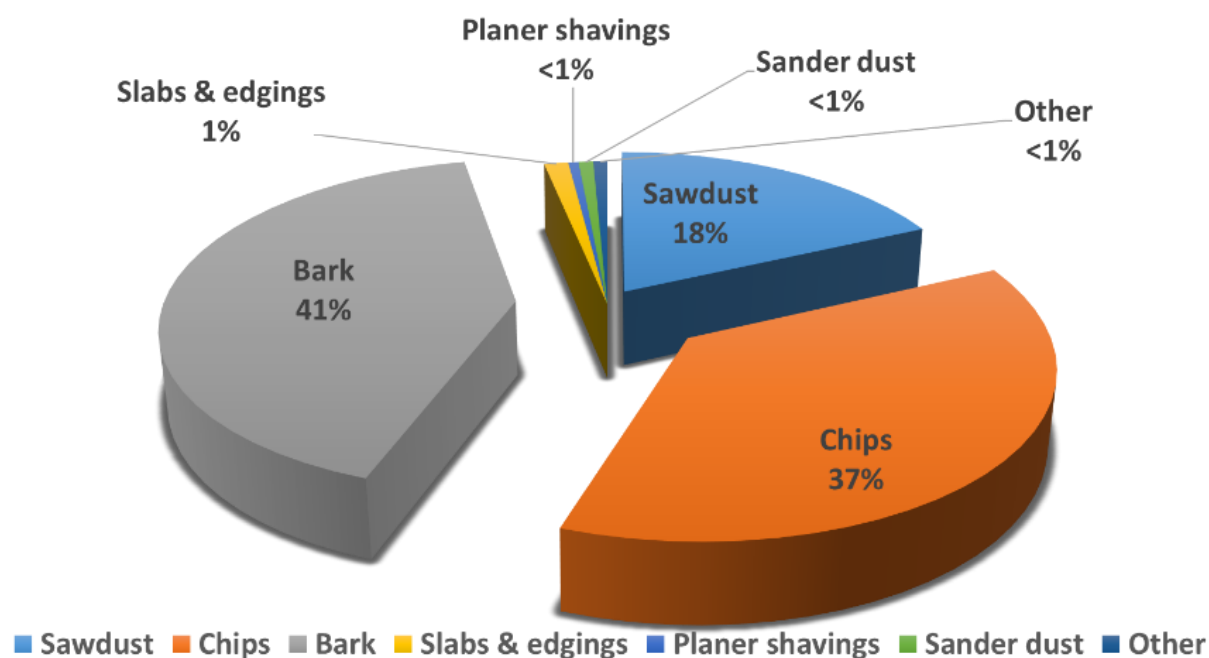


Figure 8.7: Residue production (percent of total production) by type of residue for 73 mills in 2017 from a survey of hardwood sawmills by the West Virginia University Appalachian Hardwood Center (AHC, 2018).

In contrast, the industry is, by necessity, involved heavily in the wood byproducts market. Wood byproducts are the waste products from manufacturing lumber and secondary wood products. Almost

exclusively produced as a byproduct of the manufacturing process, the chips, dust, bark, and other waste material created during the manufacturing process can be used to create “bio-energy”, paper, wood heating pellets, and other products focused on heat and energy production.

Byproducts were initially considered a waste material and often burned as waste at the sawmill or plant where the waste was created. Markets did not exist for the chips and other forms of wood waste and manufacturers generally ended up spending money and efforts to eliminate the build-up of waste wood at their mills and plants.

Now, sawmills and other wood-based manufacturing facilities rely on external demand for their waste residue to get rid of their byproducts profitably, rather than burning or landfilling the waste. Pulp mills generally comprise the bulk of the market for these wood residues.

And when a mill or plant that uses this wood shuts down, it can create a ripple effect in the market that takes a long time to calm down. For example, the Luke, MD paper mill owned by the Verso Corporation, shut down in 2019. Six months later, pulpwood prices were still affected by the loss of this high demand facility. As noted in a September, 2019 article in the Delmarva Farmer News, “...Verso’s absence has resulted in a less competitive market, and pulpwood prices have fallen by more than half from about \$42 per ton on the day Verso closed to about \$20...”

What happens when demand falls for mill byproducts? Mills are forced to sell material at a lower price or give it away. In some cases, they would be forced to store their produced waste at a cost and might eventually be required to pay for byproduct disposal. A 2017 survey conducted by the WVU Appalachian Hardwood Center asked companies about byproduct storage and the cost of disposing of waste wood if byproduct markets continue to decline, as it did between 2017 and 2020.

Figure 8.8 illustrates the amount of byproduct production can be stored onsite using days of production rather than volume. Over half of the 41 responding mills indicated that after 20 days (four work weeks), volume accumulation at onsite storage areas would adversely affect primary production, since the waste material created could no longer be stored onsite.

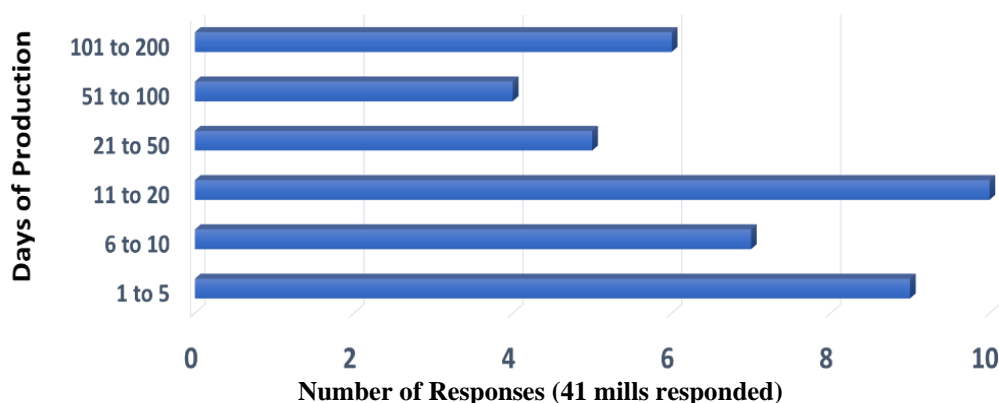


Figure 8.8: Maximum number days of daily byproduct production that can be stockpiled on site by the mill, from a survey of 41 Appalachian hardwood mills that responded in 2017 (AHC).

A follow-up question asked what the cost of waste or byproduct disposal would be incurred if the company had to dispose of their byproducts, rather than sell them. Figure 8.9 details the responses from 17 mills with some experience in disposing of their waste wood. Most of the responding mills indicated that a cost ranging between \$5 and \$20 per ton of produced byproducts would be incurred to dispose of this waste off-site.

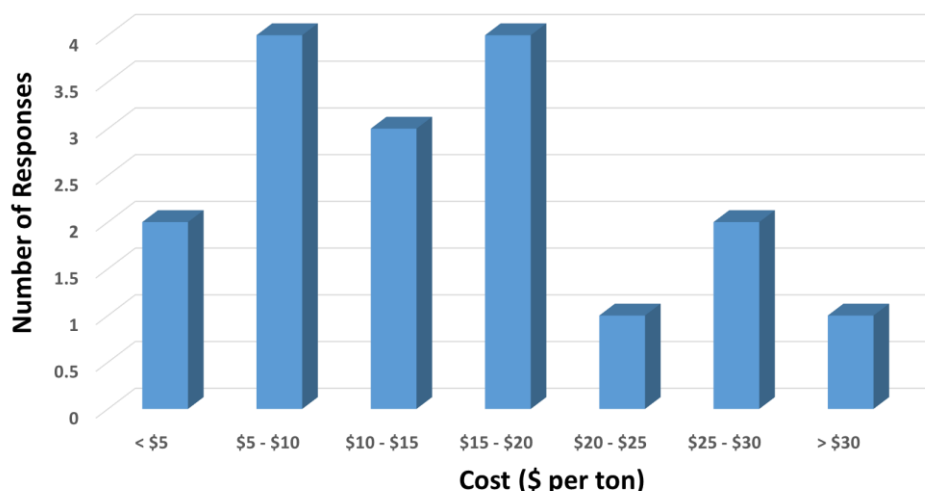
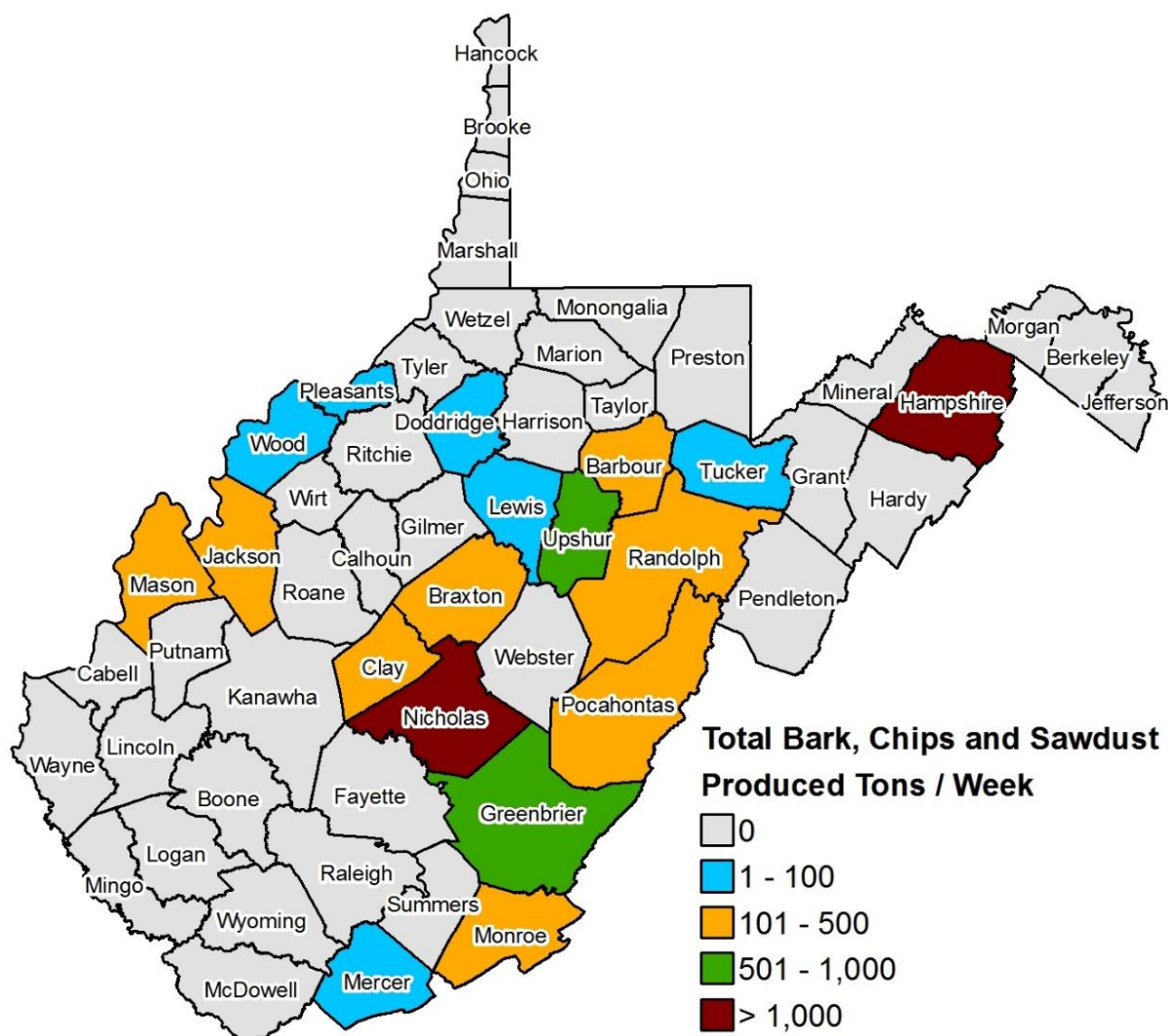


Figure 8.9: Estimated costs of off-site waste wood (byproduct) disposal by survey respondents in 2017 AHC survey (17 companies responding).

Map 8.8 provides an estimate of byproduct creation in the state on a county-by-county basis. Counties where byproduct production exceeds 500 tons per day could have issues with disposal. Additionally, the cost of disposal to mills with substantial byproduct creation could be staggering.

Two counties with large, engineered wood product mills were found to produce over 1,000 tons of waste wood each week. Clearly, when waste wood production reaches this level when demand for that waste is soft or non-existent, the cost of disposal to those companies would impact profitability and possibly create environmental issues through the disposal process. Table 8.5 provides some detail on what the forest products industry in Appalachia believed were critical problems in 2017. Most of these issues still have bearing on the market conditions in West Virginia in 2020 and should be used as references for activities associated with improving the byproduct market into the next decade.

Specifically, the focus of the WVDOP and other agencies in the state should be to assist the forest products industry in expanding the market potential of existing byproducts at higher prices. New consumers should be recruited and encouraged to settle in West Virginia and new waste-based products should be developed to help companies make a profit from their waste production, rather than face a breakeven or cost based situation with regard to disposal.



Map 8.8: Byproduct production rates in West Virginia in 2016 (WVU AHC Byproducts Directory 2016).

Table 8.5: Suggested changes in the byproduct markets significantly affecting demand for hardwood byproducts. Ranked by number of responses from surveyed companies across the Appalachian region in 2017 (WVU AHC).

Change	Number of Responses
Lower Fossil Fuel Prices	13
Warmer Winters	12
Pellet Fuel Production Down	6
Paper Production Down	6
Over Supply of Byproducts	6
User Markets/Business Closed	3



Strategy - Sub-Issue 8.3: Byproducts and Byproduct Markets

Long-term Strategy

Increase utilization of low value timber and wood byproducts for other production and improve byproduct energy marketing efforts.

Strategy Narrative

The recent loss of pulp and paper mills in adjoining states has dramatically impacted the demand for mill residues in WV. The forest products industry in the state, especially our solid wood manufacturers, needs to attract more byproduct consuming industries in the coming years. Increasing the number of manufacturing facilities in the state will directly increase the volume of wood byproducts available for consumption. Without companies in place to consume these byproducts, primary wood producers will be forced to pay for disposal, reducing their profitability in the process. Increasing the capacity of existing wood byproduct as well as increasing the number of new companies willing to consume the industry's byproducts will also help to strengthen and ensure the long-term sustainability of the forest products sector.

Timeline

This remains an ongoing effort and will continue through 2030.

Measure of Success

- 1) Attract woody biomass-based sustainable industries to the state.
- 2) Increase the utilization of mill residues produced in the state.



Sub-Issue 8.4: Timber Quality and Manufacturing Potential

West Virginia has seen significant shifts from the lower diameter ranges (small/non-stocked and small diameter size trees) to larger diameter classes that is consistent with the maturing nature of the states resource (Figure 8.10). Hardwood stands are rapidly shifting from small and mid-size diameters to larger diameters across West Virginia and throughout Appalachia. The greatest increases in volume across all species were in the 18- and 20-inch diameter classes, which saw 19% and 27% increases in volume.

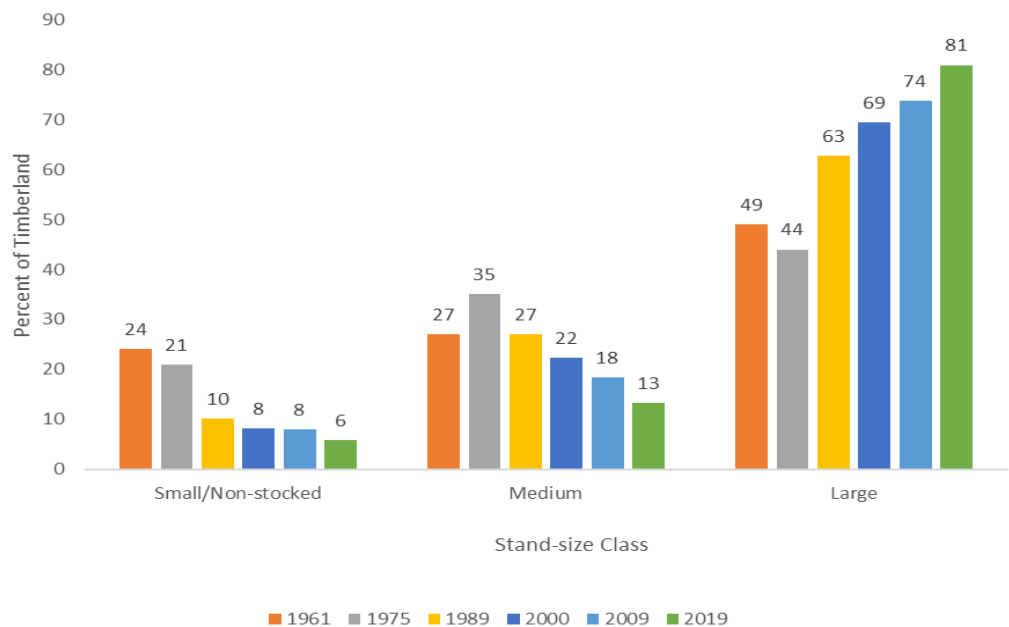


Figure 8.10: Size Class Distributions over time for timberland in WV, showing significant increases of stocking in the large diameter classes (Luppold, 2020).

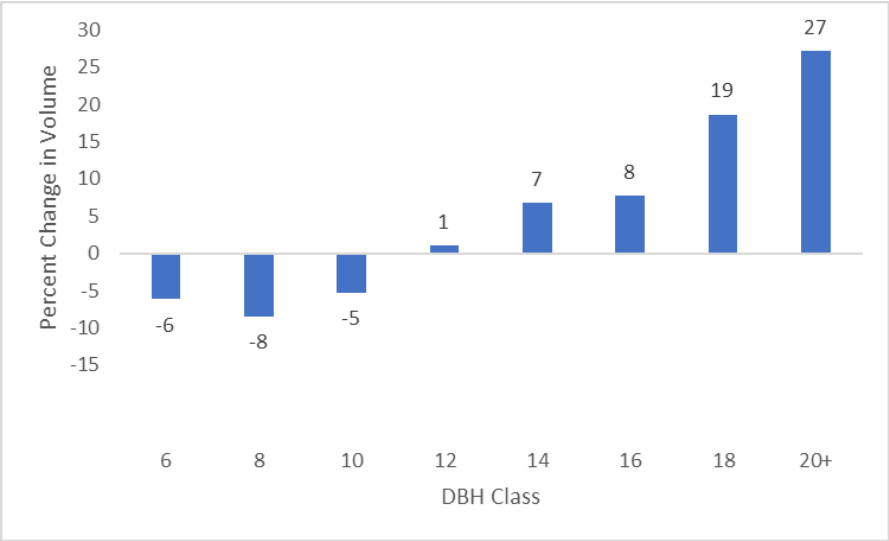


Figure 8.11: Percent change in gross volume by diameter class for all species in WV from 2009 to 2019 (Morin, 2020).

Between 2009 and 2019, the state witnessed an overall increase in standing volumes of about 9%, with important species like red oak, yellow poplar, and hard maple increasing as much as 15% over that period, suggesting that the available volumes of highly desirable species, like red oak, maple, and poplar, continue increase in the state. That fact, combined with the data presented in Figure 8.11, suggest that much of this increased volume is in large diameter (18- to 20-inch diameter classes) standing timber primarily harvested for lumber or veneer products.

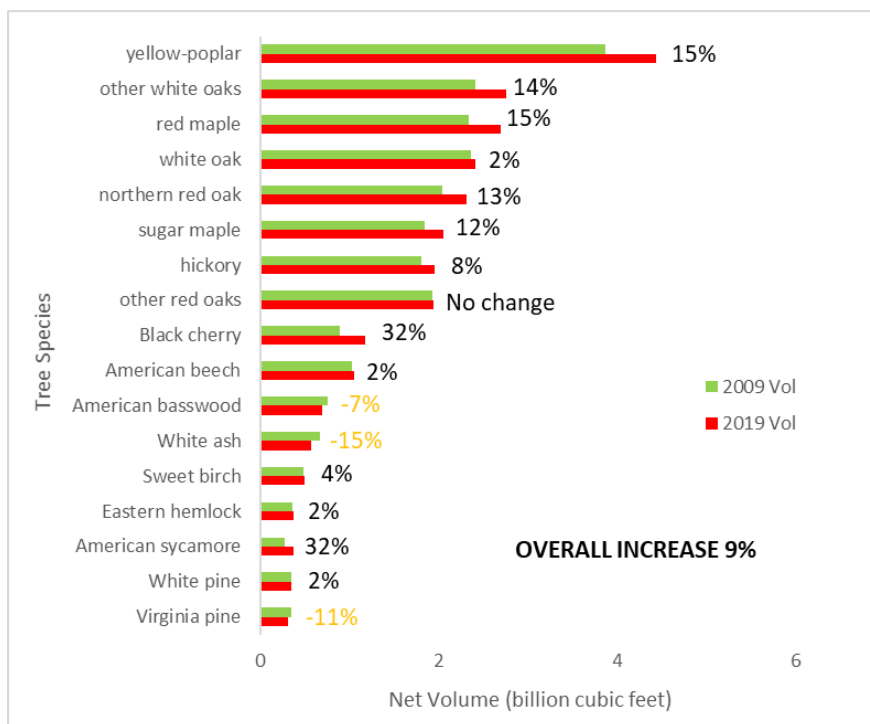


Figure 8.12: Percent change in gross volume by major species in WV 2009 to 2019 in billion cubic ft.

Even more representative of this shift in volume is the estimated change in average board foot volume per acre over time. Since 2000, there has been a 41% increase in the average board foot volume per acre, from about 6 MBF per acre to almost 8.5 MBF per acre (Fig. 8.13). This shift suggests that the state's timberland can support even more wood product production, since existing acreages contain larger, more valuable trees, many of which represent more desirable lumber and veneer products.

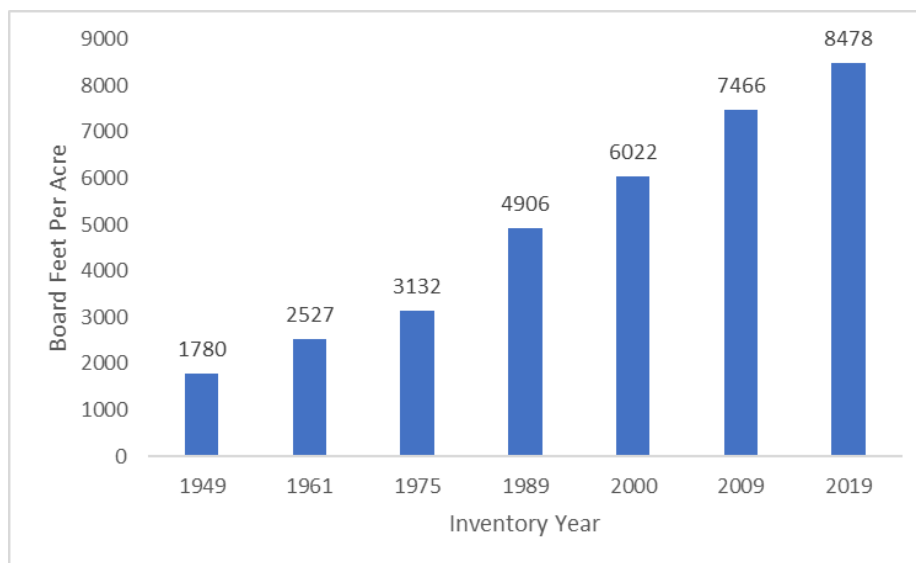


Figure 8.13: Percent change in gross volume by diameter class in WV for all species from 2009 to 2019 (Morin, 2020).



Figure 8.14: Percent change in gross volume of timberland in WV by diameter class for all species from 2009 to 2019 (Morin, 2020).

Figure 8.14 illustrates that, on average, stocking levels are not an issue on timberland in WV, with most of the state's acreage classed as either medium or fully stocked (9 million acres), although almost none of the state's forestland is now classified as overstocked. Additionally, a loss of about 0.5 million acres in the fully stocked category, from 4.5 million acres in 2009 to 4.0 million acres in 2019, is a bit disturbing. Much of this acreage actually shifted into the medium stocking class, possibly due to

harvesting or mortality, particularly with the wide-spread mortality of green ash growing stock from infestation by the emerald ash borer.

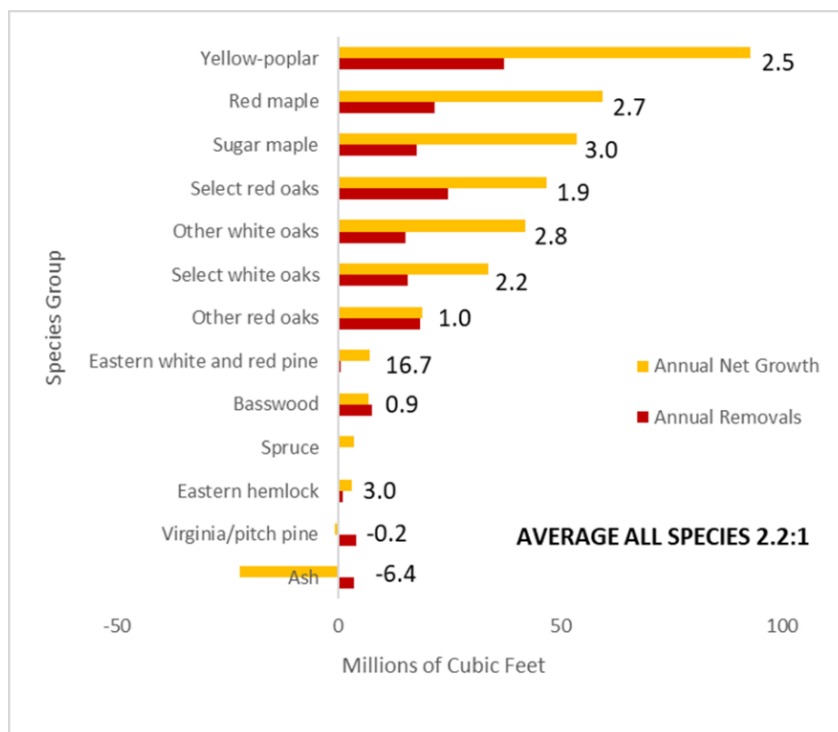


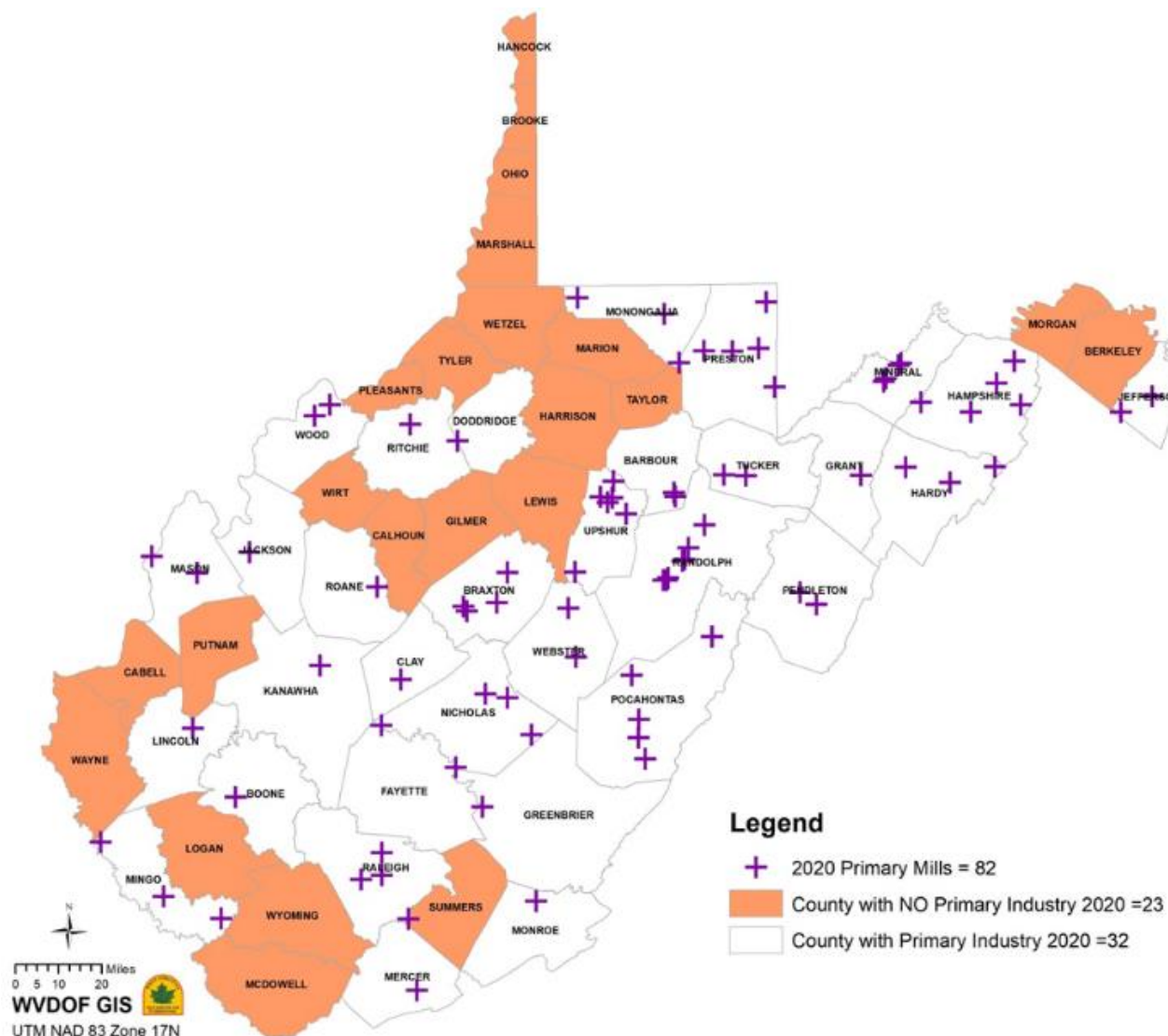
Figure 8.15: Growth to harvest (removal) ratio for various species in West Virginia in 2019 as estimated by the USDA Forest Service FIA Program (Morin, 2020).

A more detailed review of the growth to harvest ratios for key species in the state suggest that, generally, the more desirable species for lumber and veneer production all have a growth to harvest ratio exceeding 2:1, meaning that we are witnessing a growth rate in these species ranging from 2.0 to 3.0 times the removal rate.

So, in summary, there are very positive changes in the forests of WV. Large diameter trees are predominant in many stands. Higher value, desirable species have increased in volume in our stands by as much as 15% over the volumes measured in 2009. Most of the species used for lumber or veneer production seem to be increasing in volume in our stands. Growth to harvest ratios for these species in WV are all above 2.0, indicating that we are not even close to harvesting the growth being added each year.

These positives come at a cost, however. Economic analyses in the past several years for the state suggest that the forest products industry in the state saw two significant downturns, one from 2007-2011 and the latest downturn that started in 2018 and continues into 2020, that continues to significantly impact the number of mills and production facilities operating in the state.

A map of primary processing facilities in WV in 2020 shows what mills remained open in 2020 and where they are located (Map 8.9). In 2015, the WVDOF was able to identify and locate about 101 primary processing facilities in the state. A short follow-up survey at the beginning of 2020 indicated that only 82 mills continued to operate at that time, suggesting that nearly 20% of the primary mills in the state have disappeared (Map 8.9). While one can argue that these facilities may have had a host of issues that pushed them into failure, the key issue driving all of these mills into bankruptcy or closure has been the continuing decline in the hardwood solid wood product markets, particularly the export markets.



Map 8.9: Map of primary mills operating in 2020 in WV with highlighted counties having no primary mills in operation (WVDOF GIS 2020).

As illustrated in Map 8.9, large areas of the productive forest in WV are available for harvest and processing, particularly in those counties where primary sawmills are not operating, such as the seven



southern counties highlighted in the map. This resource could support the forest products industry far into the future in terms of raw material supply. But mills need to exist to utilize this material - using tools such as Map 8.9 can help the WVDof assist with development efforts and marketing efforts by the state to draw in new businesses.

Economic conditions, as well as corresponding economic downturns, have affected the potential for the industry in WV to fully capitalize on the availability of the existing forest resource. And, while the loss of 20% of the primary wood product mills in the state is substantial, we anticipate further losses into 2021 and perhaps even 2022.

The loss of so much of the industry in large areas of the state bodes poorly for the forest products industry in the near term. However, the presence of significant volumes of timber across the state combined with the lack of primary and secondary manufacturing facilities in various parts of the state suggest that investments can be made to promote new companies, new facilities, and new products for the forest products sector.

Continued efforts to gauge the economic viability of the industry in the state should be a key undertaking for the state and WVDof. Additionally, the WVDof must work with other state agencies like the WV Development Office and Workforce WV to promote the establishment of new mills and manufacturing facilities in key areas of the state to meet the potential demand for wood products in the coming years.

Strategy - Sub-Issue 8.4: Timber Quality and Manufacturing Potential

Long-term Strategy

Expanded harvest and use of low-grade species, with a focus on continued enhancement in the quality of major timber species.

Expansion of the industry in key counties of the state where resource availability does not match industry.

Work with the industry to promote hardwoods through advertising programs, such as those being developed through Appalachian Hardwood Manufacturers Inc. (AHMI), to showcase products being produced by our WV Hardwood industry.

Strategy Narrative

West Virginia's forests comprise a large percentage of trees in the larger diameter classes and have been losing trees in the lower diameter range, consistent with the maturing nature of the state's forests. The majority (80%) of WV forests are medium to fully stocked. More important, the state's forests saw a



40% increase in board foot volume per acre, from 6,022 BF in 2000 to 8,474 BF in 2019 (Fig. 8.13). This resource base has grown increasingly valuable and helps position WV as a leading producer of high-quality hardwood products. At the same time, there is considerable concern being voiced by professional foresters about the long-term effects of various types of diameter limit and “high-grading” harvest practices. Strategies to maintain quality and promote growth include:

- 1) Encourage the professional management of the timber resource.
- 2) Maintain the health and quality of the forest resource.
- 3) Discourage cutting practices that are not silviculturally sound.

Timeline

This remains an ongoing effort and will continue through 2030.

Measure of Success

- 1) Improved management of the timber resource.
- 2) Improved health and quality of the forest resource.
- 3) More acreage harvested using silviculturally sound and professional techniques.
- 4) More primary and secondary wood product facilities locating in the state.

Sub Issue 8.5: Markets for Primary and Secondary Manufacturing Products

Lumber prices have followed a general downturn for hardwood products since 2008. After a relatively strong recovery that started in 2013-14, the bottom again fell out starting in 2018. Currently, the Covid-19 pandemic and related shutdowns, combined with world-wide reductions in demand have generally reduced lumber prices across the board, with only the price of crossties showing any sustained increase in price since 2018 (Figure 8.16).

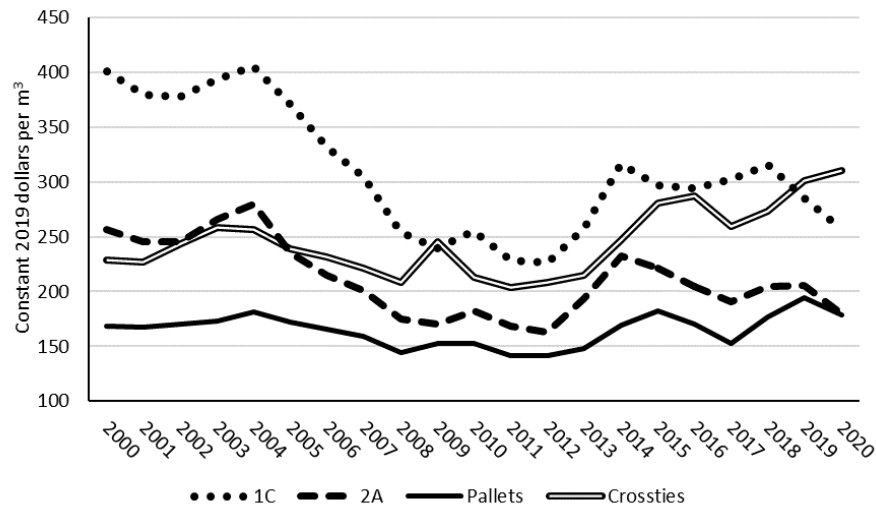


Figure 8.16: Value of green 1 common lumber, 2 common lumber, pallet, and crosstie hardwood products from 2000 to 2020 (Luppold and Baumgartner, 2020).

The 2010 WV Forest Action Plan stated that “The West Virginia forest products industry is in one of the worst economic situations in modern times. Prices for lumber and other end products have withered significantly, while raw material prices have not adjusted in-kind. Overall lumber production by the primary industry has suffered a dramatic decline. Many large mills have shut down or [are] running at reduced capacity. Several large mills have been liquidated and removed from locations.” Those statements are true today, although, from 2012 to 2017, forest products manufacturing saw improvement in almost every sector, such that economic data suggested that the total economic contribution by the industry to the state was about \$3.4 billion in 2017. Analysis for 2018 showed a significant reduction in this number, approximately 18%, with the total economic contribution from the forest products sector measured at only \$2.9 billion.

Specifically, the WV forest products sector contributed a total of \$832.7 million in labor income in 2018 compared to about \$870 million in 2017, a decline of 4%. Total value added in 2018 was \$1.1 billion, a decline of 18% from 2017. In terms of total output, the industry contributed a total of \$2.9 billion, which is a decline of about 11% from 2017 (Fig. 8.17). In both direct and total economic contributions, just like in previous years, the primary solid wood products sector remained the largest component of the WV forest products sector for 2018, followed by the secondary solid wood products sector.

The reduction in the economic contribution of the forest products industry in 2018 could be attributed to the multiple rounds of tariffs and counter-tariffs between China and the U.S. during that year, which resulted in a 43% reduction in hardwood exports (Moon, 2019). Domestic hardwood producers were negatively affected by these recent trade policies, particularly in rural communities like WV.

For example, lumber prices have hit all-time lows for many species, mills have reduced operation hours or have laid off workers and, in some cases, have closed their operations (Moon, 2019). While the WV FPI has started to show recovery since the economic recession in 2008, the current trade policies are

dampening this recovery as shown by the 2018 analysis. According to Moon (2019), “if this situation is not addressed, either by a trade deal or some sort of relief program, there is serious concern that the American hardwood industry will disappear...and with it all the related value-added production and spin-off jobs it supports.”

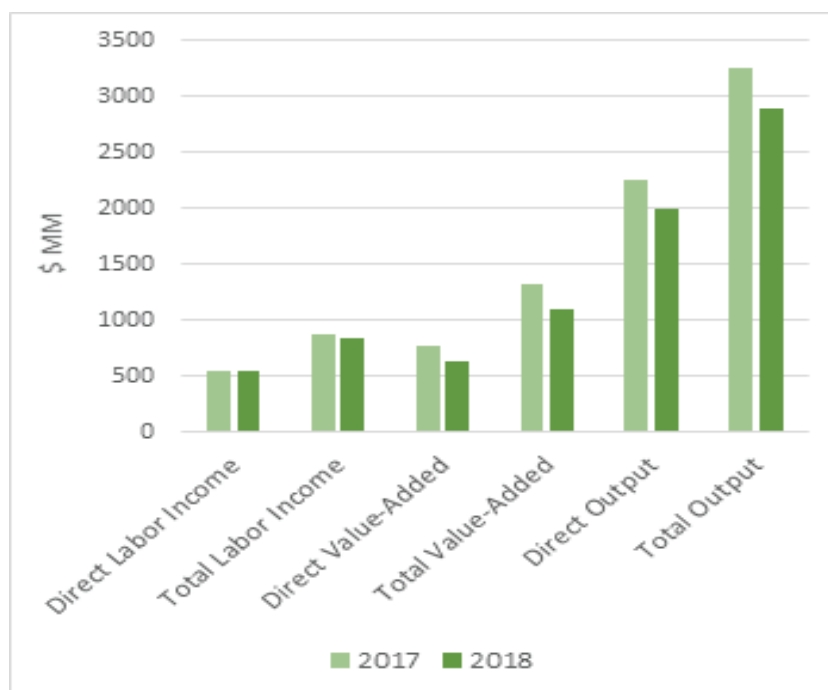


Figure 8.17: Direct and total economic contributions of the WV forest products sector in terms of labor income, value-added, and output in 2017 and 2018 (Gazal and McNeel, 2020).

In 2010, the Forest Action Plan mentioned the export market as a shining opportunity for those companies willing to retool their thinking about markets. As noted in the report, “The export market is very undependable but offers a broad market to many of West Virginia’s producers, especially since there is not a population base to support our resource locally.” At one point (2017), hardwood exports to the Asian market exceeded the value of all other wood product exports. However, softening international markets and trade tariffs imposed in 2019 dropped the export trade volume for hardwoods to pre-2013 levels and decimated the hardwood industry’s most lucrative market within a single year (Fig. 8.18). And the export market has yet to recover.

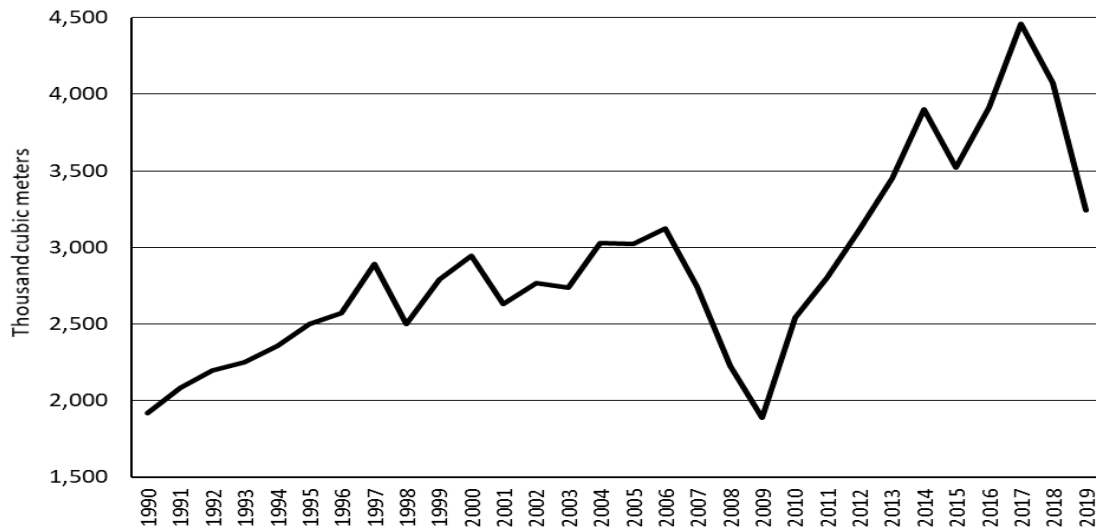


Figure 8.18: Volume of U.S. hardwood lumber exports, 1990 to 2019 (Luppold, 2020).

One concern that the industry has not entirely addressed is the problem of having a single dominant market for hardwood exports. Figure 8.19 illustrates the value by export region for the hardwood lumber products and illustrates quite starkly the impact that the China-Hong Kong-Vietnam export region currently has relative to hardwood exports. Since much of the lumber and logs being exported comes from mills in Appalachia, including West Virginia, any shift in this market sector can have a significant impact on mill production, profitability, and employment.

The shift in demand for hardwood exports from 2017 to 2019 was basically a downward spiral that continues today. Reasons include a softening overall global economy, tariffs and sanctions on trade, and obviously, the world-wide Covid-19 pandemic that started in at the end of 2019 and threatens to continue into 2021. The CHV export market demand fell by almost 50% in just under two years. And given that this market was the one export market that nearly every mill in Appalachia sold to, the loss of revenue and product demand was devastating. The industry has yet to recover from this market downturn.

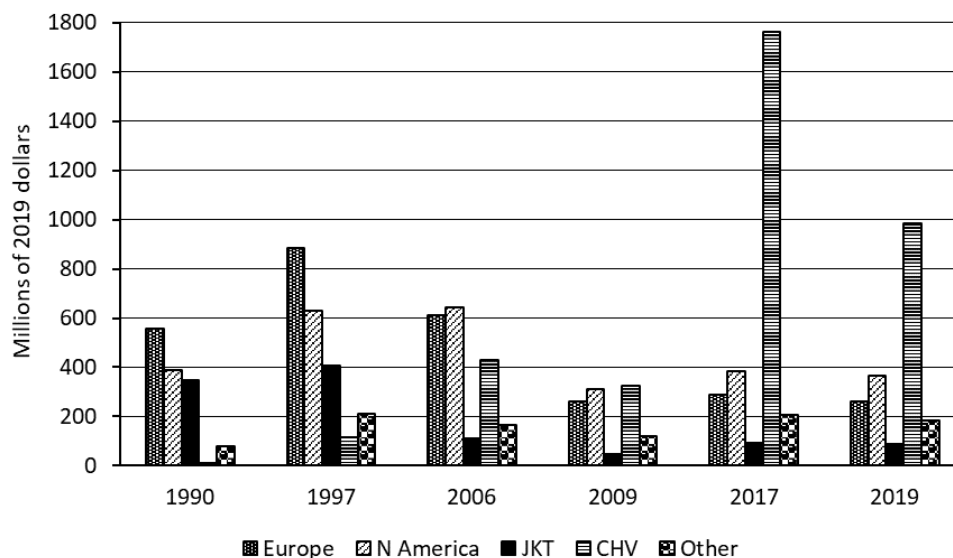


Figure 8.19: Value of U.S. hardwood lumber exported to Europe, North America, the Japan-Thailand-Korea (JKT) region, the China-Hong Kong-Vietnam (CHV) region, and all other regions in select years (Luppold and Baumgartner, 2020).

It is very important to encourage traditional forest products-based businesses to develop skill sets around technology and new market opportunities. Combining knowledge of traditional forest management and product development with background information on technology and new marketing concepts will help to ensure the future importance of a working forest landscape. Reducing our dependence on single markets, like the Chinese import market, must also be a future priority. And finally, balancing export market opportunities with more stable regional and national markets for industrial lumber is also critical for future growth.

The forest products industry in West Virginia must expand opportunities in the existing export and industrial markets, as well as develop new markets for our products. The raw material and manufacturing capabilities already exist, but without stable, lucrative markets with future growth potential, the industry will find it difficult to take advantage of our solid resource base and remain profitable in future years.

Strategy - Sub-Issue 8.5: Markets for Primary and Secondary Manufacturing Products

Long-term Strategy

Substantially increase production in the primary and secondary wood products sectors and expand the number of companies that produce solid wood products.

Work collaboratively to eliminate laws and regulations inhibiting industry growth through both retention of existing businesses and through efforts to attract new business startups.

Strategy Narrative

The West Virginia forest products industry is currently in one of the worst economic down turns in modern times, prompted by the loss of significant export markets and the ongoing Covid-19 pandemic. As markets have retracted, harvests designed to remove significant timber volumes have been put on indefinite hold in the hope that future years will bring better markets to hardwood mills in Appalachia. This, in turn, has increased the threat of forest land conversion to non-forest use.

Some portions of the wood products sector have remained strong during these challenging times. While many of the state's traditional forest products producers have taken an indifferent attitude towards new technology and new market opportunities, others have not. These companies have sought new markets and their businesses have expanded during the recent downturn. They have focused their model on innovation and delivering a product that multiple global consumers are interested in importing. This has been accomplished through the expanded use of technology, digital outsourcing, market exploration, and exporting.

It is important to encourage traditional forest products-based businesses to develop skill sets around technology and new market opportunities. By combining knowledge of traditional forest management and product development, with information on technology and new marketing concepts, the future of West Virginia's forest products industry will be ensured.

Timeline

This remains an ongoing effort and will continue through 2030.

Measure of Success

- 1) Increased production through the adoption of new technologies by existing forest products industry.
- 2) Development of new forest-based businesses in West Virginia.
- 3) Increased production from existing technologies in the current forest products sector.
- 4) A full-time forest utilization and marketing specialist position added to the WVDOF.

Sub-Issue 8.6: Workforce Development

West Virginia has a diverse and well represented wood products employment base. Data from two economic contribution analyses for 2017 and 2018 indicated that the forest products industry in West Virginia provided approximately 10,099 direct jobs in 2018, about 1% fewer positions than reported in 2017. The impact of the economic downturn that began in 2018 has not yet been quantified, although some indication of the impact was noted in the nearly 20% reduction in the number of companies that closed between 2015 and 2020 illustrated in Map 8.9 This reduction in employers suggests a related significant decline in the number of people employed by the forest products industry in WV in 2020.

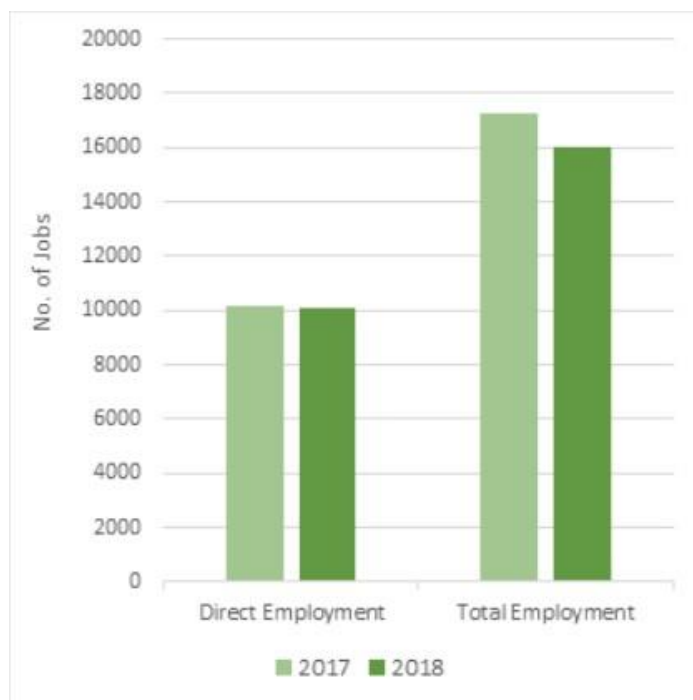


Figure 8.20: Comparison of total employment in the wood products industry in 2017 and 2018 based on annual economic contribution analyses conducted by the WVU Appalachian Hardwood Center using annual Implan data (WVU AHC, 2020).

The logging force in West Virginia is getting older. Spong and others (2011) surveyed WV loggers in 2009 and learned that the median age of logging company owners in WV in 2009 was 50.5 years. Limited capital availability, opportunities in other fields (like oil & gas), and the lower earning associated with logging in the last 10-15 years have limited the number of new entrepreneurs entering the logging field in WV, suggesting that the median age of a logging company owner has probably increased since 2009. Given this, the following forest-based occupations are projected to have significant employment demands in the future:

1. Logging equipment operators
2. Log graders and scalers
3. General logging workers

Additionally, sawmills require untrained as well as highly trained employees for their mills. Training programs are also needed to improve the skills of existing employees and managers. Together with Workforce WV, the WVDOF could play a significant role in driving employment opportunities in the logging and sawmill industries.

However, there are a host of issues associated with employment in WV. Unemployment compensation is higher than potential employee wages in some forest industry positions (green chain, etc.), discouraging potential employees from filling these positions. Drug use is also a significant issue in the state, particularly opioid addiction. Training opportunities, while available, are generally limited.

However, Workforce WV, as the premier employment program funded by the state, has a large number of excellent programs designed to promote hiring, employee training, and management training. State-wide programs are available for the forest products industry designed to promote the industry with potential hires and training programs can be tailored to fit individual company needs.

The biggest issue in terms of employment is the limited number of potential hires that meet the minimum requirements of the industry, specifically that new hires are drug-free, have the minimal education requirements (high school diploma), and have a good work ethic. Compounding the problem is the lack of a large pool of potential candidates in the state, to a point where major companies are required to attract and hire employees from as many as six to twelve surrounding counties to meet their employment needs.

The state needs to attract larger pools of potential employees, strong drug rehabilitation and assistance programs, and good training programs in key skills. Recent meetings with industry representatives as part of a Hardwood Alliance Zone Strategic Planning effort suggested that CDL training, basic math and communication skills training, mechanical, and electrical skills training, as well as training in other key skills would be of significant assistance to the industry.

Finally, logger training and assistance with getting young entrepreneurs into the business would be of substantial benefit to the industry, particularly the primary sawmill manufacturing sector. There are very significant barriers to becoming an independent logger in WV and other states in Appalachia. Training and skill development are particular issues. Business acumen is a requirement, as is access to capital. All of these barriers exist now and have for many years. More work should be done to develop structured opportunities for interested entrepreneurs to make logging a viable business choice. The WVDOF could take ownership of this effort by working with other state agencies and programs like the Appalachian Regional Commission to promote a structured and well defined program to produce young entrepreneurial logging company owners dedicated to a long-term business investment in WV.

Strategy - Sub-Issue 8.6: Workforce Development

Long-term Strategy

Increase the availability of quality employees in both the logging and forest products sectors, as well as develop a logger training academy.

Strategy Narrative

West Virginia has a diverse wood products employment base. The majority of employment is in primary and secondary wood products manufacturing. There are nearly 11,000 employees statewide directly employed by the forest products sector and over 16,000 employees when indirect employment is considered (Tables 8.6 and 8.7). That is not to say that employment in the industry is easy to find or retain. Drug issues, lack of any meaningful work ethic among many new employees, and the perennial competition from other industries for key employees, particularly in logging by gas and oil companies, continue to affect the industry in a very meaningful way. While there are a number of excellent employee development and new hire programs offered through Workforce WV, continued efforts to promote employment in the industry to high school, technical school, and college students must be a predominant goal of the industry and WVDOF in the coming decade. This is not a short-term effort and must be a consistent focus across all sectors of the forest products industry in the state.

Table 8.6: Direct employment by sector in the major sectors of the WV Forest Products Industry in 2018 (Gazal and McNeel, 2020).

Sector	Employment
Forestry	956
Logging	1,862
Primary solid wood products	2,799
Secondary solid wood products	2,533
Wood furniture	1,471
Pulp, paper, and paperboard mills	214
Secondary paperboard and other paper products	264
WV Forest Products Industry	10,099



Table 8.7: Total (direct and indirect) employment by sector in the major sectors of the WV Forest Products Industry in 2018 (Gazal and McNeel, 2020).

Sector	Employment
Forestry	1,174
Logging	3,310
Primary solid wood products	6,886
Secondary solid wood products	4,492
Wood furniture	2,165
Pulp, paper, and paperboard mills	814
Secondary paperboard and other paper products	489
WV FPI	16,058

Timeline

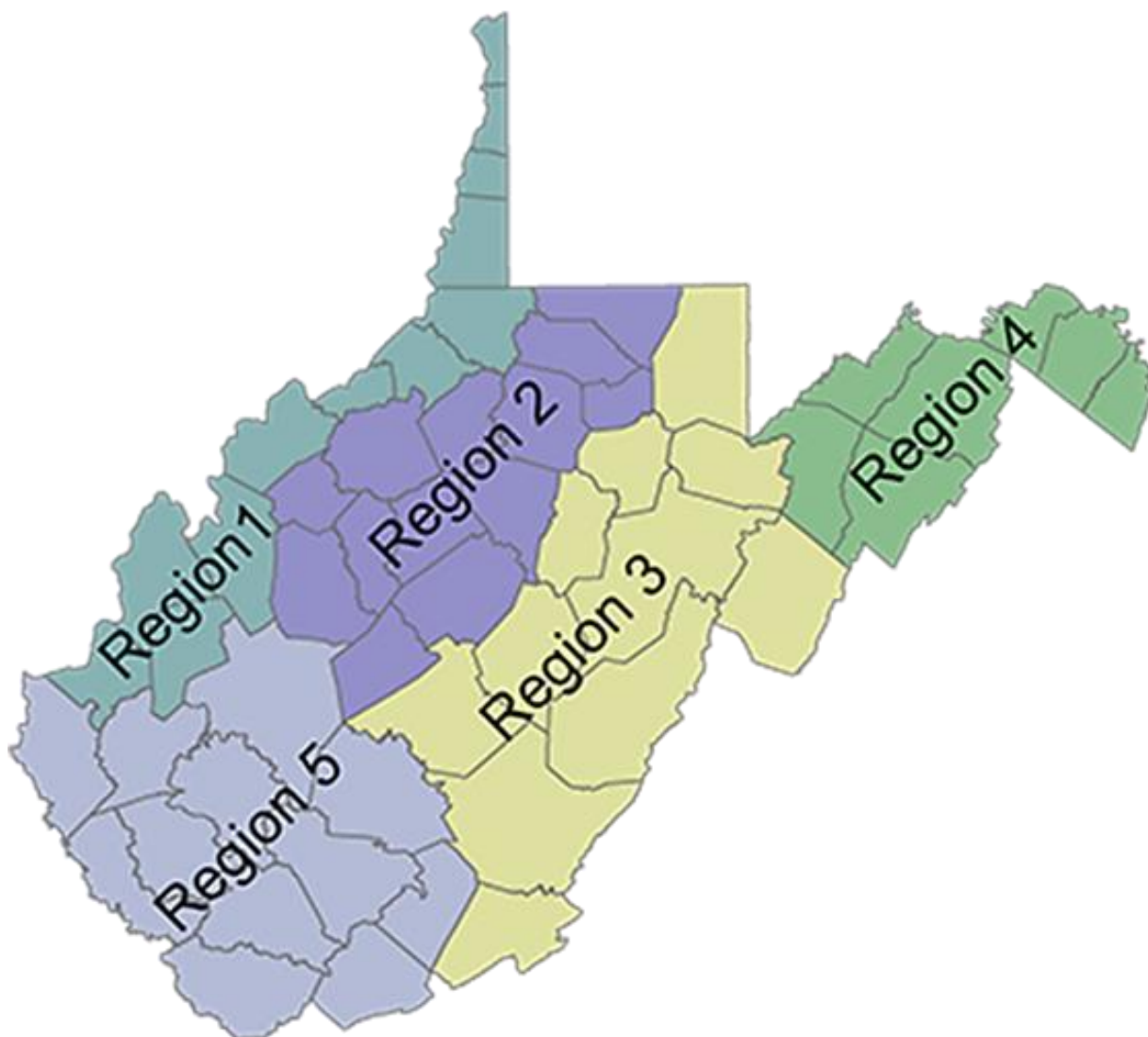
This remains an ongoing effort and will continue through 2030.

Measure of Success

1. Increased training opportunities for loggers.
2. The development of a training academy to teach logging to those lacking experience in the profession and promote the entrepreneurial opportunities available to establish contract logging companies.
3. Increased training opportunities for primary and secondary manufacturing employees.
4. Increased employment in the forest products sector.
5. Develop an expanded safety training program for all forest workers, particularly logging operation workers. Tie the establishment of that program to the development of a stronger workers compensation program specifically for the industry.

State Issue 8: Priority Areas

Priority areas were defined for this report using data developed from an economic comparison analysis of the forest products industry in the state by Gabbert (2018). The state was broken out into five regions (Map 8.10) and comparative economic analyses were conducted using appropriate Implan database data for each region for the periods 2006 and 2017. These analyses provide a clear comparative picture for the potential of the forest products industry in each region in terms of their economic contribution to the state. Just as important, these comparisons, conducted for two periods (2006 and 2017) when the forest products industry was expanding, can show the potential opportunities for future growth in those regions with adequate incentives and resources.



Map 8.10: The five regions of West Virginia defined for the comparison analyses of the forest products industry for 2006 and 2017, (Gabbert, 2019).

Perhaps the easiest way to compare the five regions in terms of their economic potential for growth is through *Total Output* which sums the direct and indirect contributions of the regional forest products industry economy to the state. In the analyses, there were several instances in which regional industries differentiated themselves from the statewide industry. The economic contributions of the separate regions' forest products industry for these years are listed in Table 8.8.

As noted in Gabbert's recent article in the West Virginia Forest Association magazine, the Highlands (R3) and Southern (R5) regions have the least amount of economic diversity. The Highlands region was and still remains the forest products industry hub for the state and contributed significantly to the WV economy in both 2006 and 2017. In 2006, the region was the source of over 50% of the direct contribution for both the secondary solid wood products and logging sectors to the state economy, and by 2017 it was also the source of over 50% of the direct contributions for the primary solid wood products sector in the state.

The Southern (R5) region was the only other region besides the Highlands region to have total contributions of sales and gross regional product increase from 2006 to 2017. Region 5 has faced severe economic hardships in recent decades, due to significant downturns in the coal industry. With coal production at a standstill in region 5, it is critically important to attract new economic activity in order to diversify the economic base of Region 5.

Some highlights should be noted for other regions of the state and perhaps acted on through efforts over the coming decade. Specifically, the secondary solid wood products sector continued to thrive in the Eastern Panhandle (R4) region and the North Central (R2) region actually saw growth in its wood furniture sector. Finally, the Ohio River (R1) region, the smallest regional industry analyzed, saw continued growth in the pulp, paper and paperboard sector and was the only region in 2017 to see substantial growth in the secondary paperboard and other paper products sector. These regions were able to sustain or grow forest product sectors that were, in all other regions of the state, in decline. Efforts should be made to support these unique industries in the noted regions to ensure continued growth where possible.

Table 8.8: Regional comparison of the Total Economic Contribution by the Forest Products Industry to the WV Economy for two key periods – 2006 and 2017 (Gabbert, 2019).

	R1 - Ohio River		R2 - N Central		R3 - Highlands		R4 - E Panhandle		R5 - Southern	
YEAR	2006	2017	2006	2017	2006	2017	2006	2017	2006	2017
Total Output (\$MM)	378	360	654	439	1185	1305	611	475	460	466
Employment	2,096	1,776	2,917	2,337	7,077	6,955	3,185	2,905	2,689	2,579
Value Added (\$MM)	117	117	197	181	440	526	194	175	177	197

Bibliography

- Bullinger, J. 2018. How to Make Millions While Saving a Forest. Outside Magazine, May 7, 2018. <https://www.outsideonline.com/2302446/native-foresters-getting-paid-keep-trees-standing>
- Dean Runyan & Associates, 2019. West Virginia Travel Impacts 2000 - 2018p. West Virginia Tourism Office Charleston, West Virginia. 47 p.
- Delmarva Farmer News. 2019. Verso Closure Impact. September 2019. <https://americanfarmpublications.com/the-delmarva-farmer/>
- Gabbert, Charles Clinton. 2019. The Economic Contribution of West Virginia's Forest Products Industry. West Virginia University Forestry and Natural Resources. Graduate Thesis. 135 p.
- Gabbert, C., K. Gazal and J. McNeel. 2020. The Contributions of the Forest Products Industry to West Virginia's Economy PART 2 – Regional Impacts. WVFA Mountain State Forestry Magazine, Winter, 2020, p. 12-13.
- Gazal, K. and J. McNeel. 2020. Economic Contribution of West Virginia's Forestry Products Industry 2018 update. WVFA Mountain State Forestry Magazine, Summer 2020, p. 10-13.
- Gula, J., 2020. Personal communications regarding geospatial data for posted bridges from WV Department of Transportation, Bridge Management Section.
- Luppold, W. J., 2020. USDA Forest Service. Personal communications regarding sawmill production in WV, fall 2020.
- McNeel, J., 2020. Personal communication on Appalachian sawmill byproduct storage and disposal costs.
- Moon, Carey. 2019. Trade and Tariffs Cut Deep into the Hardwood Industry. Appalachian Hardwood Export Council (AHEC). October 2, 2019. <https://www.fb.org/market-intel/trade-and-tariffs-cut-deep-into-the-hardwood-industry>
- Morin, Randall. 2020. Personal communications regarding FIA data for West Virginia. Fall 2020.
- Morin, Randall S. 2018. Forests of West Virginia, 2017. Resource Update FS-174. Newtown Square, PA. U.S. Department of Agriculture, Forest Service, Northern Research Station. 3 p. <https://doi.org/10.2737/FS-RU-174>.
- Spong, B., J. Wang., and D. Summerfield. 2011. Characteristics of West Virginia loggers during economically difficult times. Proceedings of the 17th Central Hardwood Forest Conference, April 5-7, 2010. Lexington, KY. GTR-NRS-P-78 (2011), p. 579-585.
- WVFA 2020 and USDA Forest Service FIA 2019. Private timberland acres certified under SFI and FSC 2020.
- WVDOF GIS, 2020. Historical Forest Products Industry Locations 2020, Managed Timberland acres by county 2019, Tree Farm Acres by county 2020.

IV. Existing and Potential Multi-State Projects

The 2018 Farm Bill and the enacted bill is P.L. 115-334. requires State Assessments to include “any multi-state areas that are a regional priority.” Furthermore, one of the desired outcomes of the S&PF Redesign approach is to identify the highest priority landscapes in states and regions and to develop focused strategies for addressing the forest resource challenges on those landscapes.

MULTI-STATE PROJECTS AND POSSIBILITIES

1. Chesapeake Bay – DE, MD, NY, PA, VA, and WV

Several natural resource and conservation efforts have been taking place for the past decade or more to clean up the Chesapeake Bay and restore it to its former condition. This has been recognized as a high national priority. Federal agencies, including the EPA, USDA, and USDI, are involved in this effort. The states noted above are involved in various efforts to reforest Chesapeake Bay tributaries, reduce sediment loads into those streams, minimize urban impacts, and restore the Bay to its former condition. Also, the 2008 Farm Bill established the Chesapeake Bay Watershed Initiative to help prioritize forestry projects in NRCS activities. The WVDOF has received a grant from the WVDEP for the preparation of forest Stewardship plans, with an emphasis on maintaining forest buffers. The WVDOF will continue to work with the FSA to implement the CREP program in the Bay. The WVDOF will continue to work with communities in the Bay to promote proper tree planting. The WVDOF is working closely with numerous state, local, and federal agencies on this project.

2. Upper Ohio River Valley Watershed – OH, PA, and WV

There is a growing recognition that focused conservation efforts in the states bordering the Ohio River would be highly beneficial to the overall environment along this major national waterway. Recently, a Congressional caucus was established to begin exploring ideas to assist with this effort. It is entirely possible that a Congressional effort could get directed toward this watershed, much the same as other conservation and environmental restoration efforts have been directed at the Chesapeake Bay, the Upper Mississippi River Watershed, the Lake Tahoe Basin, and others. Forestry would be a major part of any such wide-scale effort. It is likely that Kentucky, Indiana, and Illinois would also be part of such a project.

3. Development Issues Along the I-81 Corridor – MD, PA, VA, and WV

Rampant, unplanned development in West Virginia, especially along I-81 in the eastern panhandle, is causing a variety of natural resource problems. Among these are fragmentation and parcelization of forests, unplanned urbanization, water quality issues, and other problems. Most of these problems occur adjacent to and near interstates or other major highways, and likewise occur in adjacent states. The



WVDOF would like to work with adjacent states on ways to minimize impacts to forests and other natural resources, as well as to resolve related issues of mutual concern.

4. Oil & Gas Drilling (Marcellus-Utica Shale Region; Geothermal) – MD, NY, OH, PA, VA, and WV

The recent technological developments in the oil and gas industry, which allow the drilling of deeper wells to tap previously unreachable gas deposits, have had impacts on forests and other natural resources. This is anticipated to increase in the future as WV has been identified as having subsurface temperatures high enough for geothermal energy generation on a commercial scale. These deeper wells require as much as five acres for a well site. Since most of these wells are being drilled on forest land, it results in parcelization, fragmentation, invasive species introductions, and other potential impacts. Also, the large amount of water used in the process creates erosion problems and sedimentation and other types of water quality impacts to streams. The Marcellus Utica and geothermal region includes the states listed above, and together they will be able to explore possible joint solutions to problems associated with this activity.

5. Sustaining Traditional Timber Markets and Developing Non-Traditional Markets in the Appalachian Region – KY, MD, OH, PA, VA, and WV

The ability to effectively manage the region's forests in the future will be based in large part on sustaining existing markets in order to sell products economically. Without this, and without the development of new markets and new products, it will be extremely difficult to manage the forests in a sound, scientific manner. The WVDOF wants to explore solutions to these problems with adjacent states.

6. Slow-the-Spread (Gypsy Moth) – IA, IL, IN, KY, MI, MN, NC, OH, VA, WI, and WV

This is an on-going effort between the USDA Forest Service and the states listed above. The WVDOF will continue efforts and partnerships in the program, and work toward any possible improvements in the program, in order to lessen the impacts of gypsy moth infestations on valuable hardwood forests. Maintaining and/or increasing awareness of the problems associated with gypsy moth is essential to sustaining or increasing the funding levels necessary to keep this forest health pest under control. In West Virginia the Forest Health Program is administered by WVDA.

7. Mid-Atlantic Fire Compact Activities – DE, MD, NJ, OH, PA, VA, and WV

Numerous joint activities presently occur within this existing multi-state organization. These activities are encompassed by the federal grants in Firewise, State Fire Assistance, Volunteer Fire Assistance, and special grants, and typically involve efforts in fire prevention, detection, and suppression. Working together, these states often pool efforts and knowledge related to firefighting equipment, vehicles,

personal protective equipment, education, and training. It is likely that many of the future advances in the fire program will involve participation in the Mid-Atlantic Fire Compact.

8. Southeastern States Forest Fire Protection Compact – AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV

The purpose of this compact is to promote effective prevention and control of forest fires in the Southeastern region of the United States by the development of integrated forest fire plans, by the maintenance of adequate forest fire fighting services by the member states, by providing for mutual aid in fighting forest fires among the compacting states of the region and with states which are party to other Regional Forest Fire Protection compacts or agreements, and for more adequate forest protection. The WVDOF has sent resources to these southeastern states for fire suppression through the compact agreement.

9. Appalachian Forest Heritage – MD, VA, and WV

This is a regional effort to integrate central Appalachian forest history, culture, products, and forest management into a multi-state heritage tourism initiative. Some initial meetings and discussions have occurred at the local level. Multi-state grants to focus greater financial attention to this project and to broaden its scope are likely necessary in order to advance it in a timely manner.

10. Call Before You Cut – IA, IL, IN, MO, OH, and WV

Many landowners do not understand how to get proper information about how and when to sell timber or to conduct a proper timber sale. Thus, they often realize a lower than fair payment for their timber and they are often faced with a poor logging operation on their property. Call Before You Cut is an ongoing project initiated in Ohio that strives to:

- Encourage private landowners to contact professional foresters for advice and/or assistance with timber harvesting and forest management activities.
- Encourage landowners to seek reputable loggers for timber sales on their property and to provide information to landowners about proper timber sales contracts.

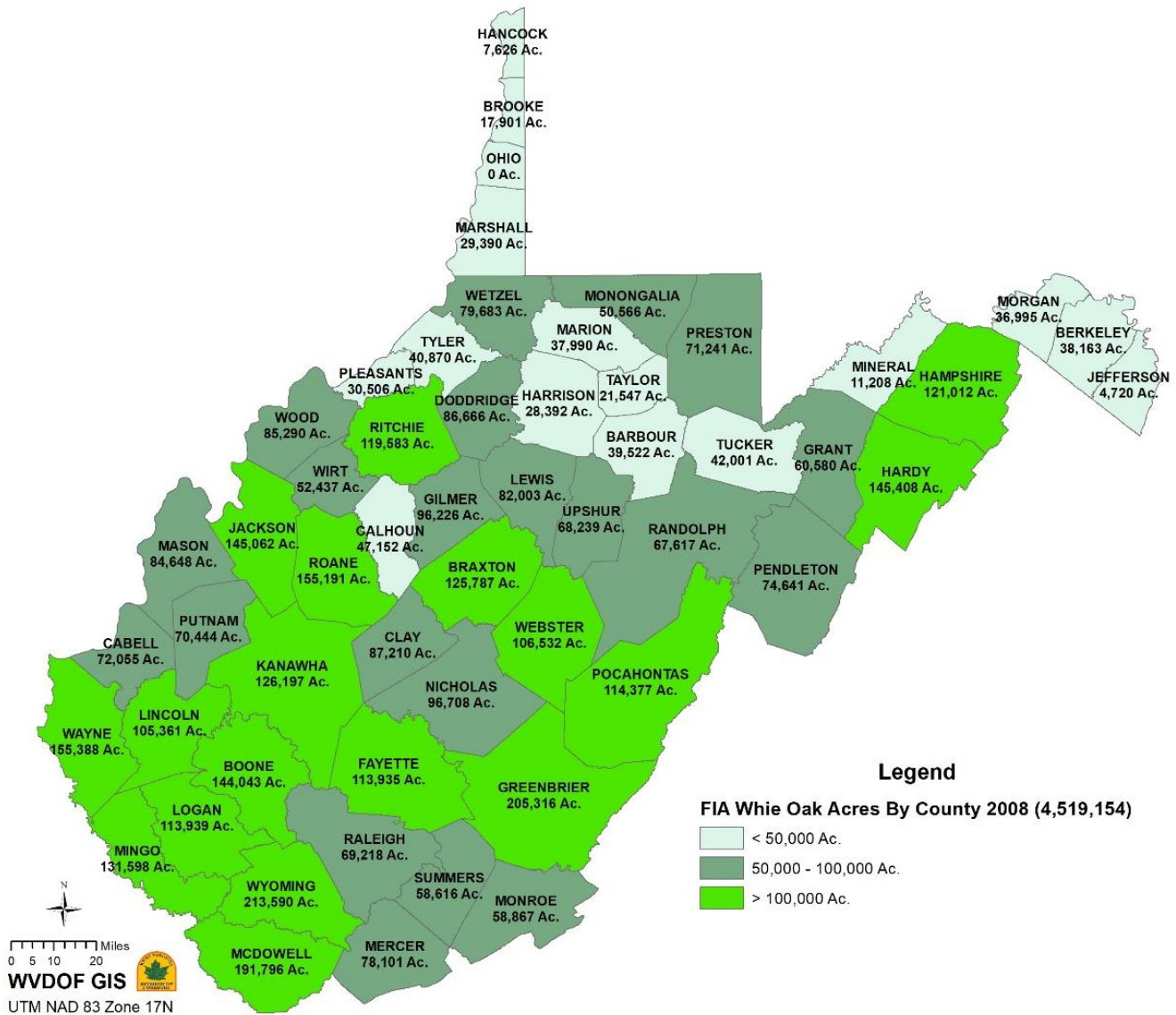
WVDOF is currently involved in this multi-state effort with the states listed above and would be open in the future to exploring further efforts along these lines.

11. White Oak Initiative - Eastern half of United States

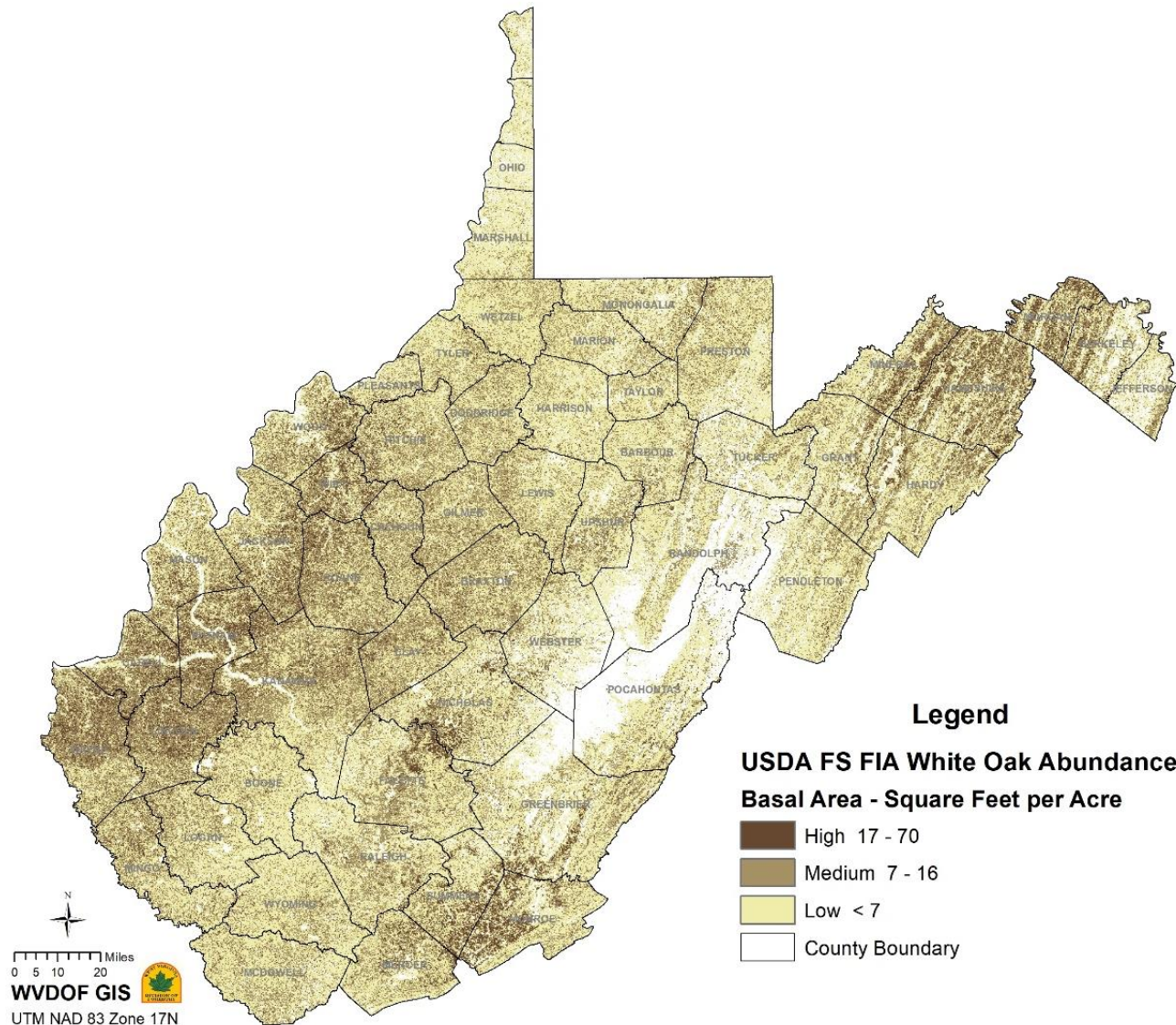
The White Oak Initiative (www.whiteoakinitiative.org) has formed over the last few years with the idea of promoting long-term sustainability of white oak. Currently white oak is sufficient for demand but in

the long-term problems may arise in producing enough high-quality regeneration. Proper education of landowners when selling timber should be a priority for this project. Multi-state grants to focus greater financial attention to this project and to broaden its scope are likely necessary in order to advance it in a timely manner.

The following are maps that the WVDOF will use to prioritize areas to work on the White Oak Initiative.



Map M1: Distribution of White Oak (*Quercus alba*) basal area acres by county 2008, (Source: USDA FS FIA, 2008).



Map M2: Abundance of White Oak (*Quercus alba*) across West Virginia, (Source: USDA FS FIA, 2019).

Multi-State Projects and the Interest Level of Participation of the Monongahela National Forest

The WVDOP solicited comments and input from the MNF, as well as asked for ideas about collaboration on future natural resource projects. Some ideas that initially were discussed for possible joint work in the future were: high elevation (red spruce/balsam fir) forest restoration; invasive species control; forest health (primarily beech bark disease, hemlock woolly adelgid, and gypsy moth); fire control/management; and conservation education activities. In addition, the MNF took the updated 2020 list of revised 11 potential multi-state projects with remarks indicating the level of interest (strong, moderate, or weak) in participating on those projects. It is shown below:



Table M1.1: Monongahela National Forest multi-state project interest level (MNF 2020).

No.	Name	States	USFS MNF Connection
1	Chesapeake Bay Watershed	MD, PA, DE, NY, VA, WV	Moderate , particularly from a water quality issue in our portion of the Potomac River watershed, which drains into Chesapeake Bay.
2	Upper Ohio River Watershed	PA, OH, WV	Moderate , though our main issue is air quality and impacts coming from the Ohio R. valley
3	Interstate 81 Corridor Development	PA, VA, MD, WV	Moderate , Corridor H, Sections 1 and 2 are in progress; MNF is collaborating with WVDOH and WVDEP relative to construction.
4	Oil & Gas (Marcellus-Utica Shales). Geothermal	OH, PA, MD, NY, VA, WV	Low to moderate , no inquiries on Marcellus exploration have occurred on the Forest since FY2011; complex geology and terrain on Forest not as desirable as that of central, western and northwestern portions of the State of WV. Low to moderate , potential for Geothermal exploration and development all along the Appalachian chain; MNF will continue to cooperate and collaborate with WVDEP Office of Oil and Gas and federal agencies as applicable, per laws, regulations and processes on all mineral projects.
5	Sustaining and Developing Timber Markets in the Appalachian Region	PA, MD, VA, WV, KY, OH	Strong , we have a growing and expanding vegetation management program and have an emphasis on expanding local economies and purchaser base.
6	Slow-the-Spread (Gypsy Moth)	NC, VA, WV, KY, OH, WI, IN, MN, IL, MI, IA	Weak to moderate , gypsy moth infestations have not occurred at intensity or frequency over past decade to warrant widespread treatments; however, we continue to coordinate with USDA State and Private Forestry to monitor this pest.
7	Mid-Atlantic Fire Compact	WV, VA, OH, PA, DE, NJ, MD	Weak , we coordinate annually but are not too involved. There is more potential to do so.
8	Southeastern States Forest Fire Protection Compact	AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV	Weak , the Forest recognize the compact, however, there is state government emphasis rather than federal involvement.
9	Appalachian Forest National Heritage Area	MD, VA and WV	Moderate to strong , we coordinate annually and engage in collaborate project; this effort is part of Forest's effort to recognize cultural heritage, conservation and support for rural community development.
10	Call Before You Cut	IA, IL, IN, MO, OH, and WV	Weak , we are involved on an as needed basis with adjacent landowners.
11	White Oak Initiative	Eastern US	Weak , white oak occurs in lower density and distribution on the Forest than other oak species; however, we will look for opportunity to engage in the initiative in the future.

Additional Multi-State Projects – Identified by the Monongahela National Forest

The MNF has also produced this list of potential multi-state projects or issues that are important from the national forest perspective. Some of these are similar to WVDOT-identified projects/issues and were initially identified in the 2010 assessment/strategy and are still relevant for this 2020 SFAP update. The WVDOT will work closely with the MNF to identify any areas, projects, issues, or activities where it would be beneficial to work jointly. The WVDOT looks forward to a closer working relationship with the MNF than has occurred in the past and is certain that there will be numerous joint efforts in the future. The WVDOT will also be working closely with other federal agencies and organizations on many of these efforts, including the NPS, USFWS, and USACE.

Table M1.2: Monongahela National Forest identified multi-state project additions (MNF 2020).

No.	Name	States	Description
1	Spruce and spruce-northern hardwood ecosystem conservation	WV, NC, TN, VA, NY, VT, NH, ME	The Central Appalachian Spruce Restoration Initiative has been established in WV and is spreading to other states with spruce ecosystems via partnerships with state and federal agencies, NGOs, and others.
2	Appalachian Mountains Joint Venture	WV and other Appalachian states from Maine to Alabama	Bird habitat conservation, particularly for migratory birds currently in decline.
3	Eastern Brook Trout Initiative	WV and other eastern states from Maine to Alabama	Promoting brook trout habitat restoration throughout the eastern states.
4	Early Successional Habitat Conservation & Management	WV, VA, TN, NC, KY, etc.	Efforts to create more ES habitat critical to game, non-game, and TES species. Partners include the Wildlife Management Institute, Ruffed Grouse Society, National Wild Turkey Federation, and Appalachian Mountains Joint Venture. Includes ruffed grouse and American woodcock Initiatives.
5	Central Appalachian Critical Biodiversity Area	WV, VA, MD, PA, TN, NC	Critical biodiversity hotspot to protect species and habitat diversity.
6	Appalachian Forest National Heritage Area	WV, VA, looking to expand	A regional effort to integrate central Appalachian forest history, culture, products, and forestry management into a multi-state heritage tourism initiative.
7	Cooperative Weed Management Areas	WV, VA, looking to expand	Coalition of groups (state, federal, NGOs) built around efforts to identify and control non-native or native invasive weeds.
8	White-Nose Syndrome	All states with bats	Disease continues to adversely impact bat populations across the east and is moving westward. Fewer bats mean more insects and more insect-related crop/vegetation damage.
9	Wetlands and Vernal Pools	WV, KY, VA	Growing movement to restore or provide more wetlands and vernal pools for a wide range of species habitat.



V. Collaboration with Others

The WVDOF collaboration network is quite extensive. WVDOF routinely works with a number of private and public interest groups. These same stakeholders were informed and involved in past implementation and current planning processes for the 2020 State Forest Action Plan. The WVDOF will continue to gather stakeholder input and comments leading up to the required revision year of 2030. In addition to the collaboration information contained in this section, please see a detailed coordinating committee members list of stakeholders that provided input to this strategic plan in Appendix Section under item two.

Additional Collaboration, Data Collection, Status Updates, and Process Sharing

Numerous contacts exist or were made with the following agencies and organizations as WVDOF personnel attend and share plan updates for input and feedback during the numerous national, regional, and statewide meetings WVDOF personnel attend regularly. There are also several statewide committees the State Forester, Assistant State Foresters and Program Managers are members of. Those committees the WVDOF participate in are found in item two in the Appendix Section and provides member contact lists.

I. Federal Agencies

- US Fish and Wildlife Service
- National Forests: Monongahela, George Washington, and Jefferson
- US Army Corps of Engineers (Huntington and Pittsburgh Districts)
- National Park Service
- US Department of Energy
- US Geological Survey
- US Environmental Protection Agency
- USDA Natural Resources Conservation Service
- USDA Farm Production and Conservation
- USDA Farm Service Agency (FSA)
- USDA Rural Development
- USDA Forest Service: State and Private Forestry; Northern Research Station



II. State Agencies

- Division of Natural Resources: Wildlife Resources
- Division of Natural Resources: Parks and Recreation
- Department of Transportation
- Property Tax Division
- Division of Homeland Security
- Conservation Agency
- Department of Education
- Department of Agriculture
- Development Office
- Commerce Department
- Farm Bureau
- Department of Environmental Protection
- Geologic and Economic Survey
- Glenville State College, Forestry Program
- West Virginia University: GIS Technical Center
- West Virginia University: Natural Resource Analysis Center
- West Virginia University: College of Law Land Use and Sustainability Law Clinic
- West Virginia University: Davis College of Agriculture and Natural Resources and Design
- West Virginia University: Appalachian Hardwood Center
- West Virginia University: Cooperative Extension

III. Forestry and Related Natural Resource Groups and Organizations

- NRCS State Technical Committee
- Forest Stewardship Committee



- Forest Legacy Sub-Committee
- Wildlife Sub-Committee
- Association of Consulting Foresters
- Christmas Tree Growers Association
- National Wild Turkey Federation
- WV Hardwood Alliance Zone (WVHAZ) - Barbour, *Fayette, *Grant, *Greenbrier, *Hardy, Lewis, *Pocahontas, Preston, Randolph, Tucker, Upshur, Webster counties of West Virginia
**added in 2018*
- WV Conservation Agency
- WV Forestry Association
- WV Invasive Species Working Group
- WV State Tree Farm Committee
- WV Woodland Owners Association
- WV Urban and Community Forestry Council
- WV Association of Conservation Districts
- Canaan Valley Institute
- The Nature Conservancy
- The Conservation Fund
- Project Learning Tree Steering Committee
- Envirothon Steering Committee

IV. *Adjacent States*

- Ohio Division of Forestry
- Kentucky Division of Forestry
- Pennsylvania Bureau of Forestry
- Virginia Department of Forestry
- Maryland Forest Service



V. *Land Trusts/Timber Companies*

- WestRock
- Haessly Hardwoods
- Penn Virginia
- Allegheny Wood Products
- Clonch Industries
- Nutall Heirs
- Jim C. Hamer Inc.
- Lyme Resources
- Coastal Lumber
- Weyerhaeuser
- Sun Lumber
- Pardee-Curtin
- The Forest Land Group

Consultation and Coordination with Existing State Plans

- Forest Legacy Assessment of Need 2003 (AON)
- State Stewardship Operating Plan (2018)
- State Comprehensive Outdoor Recreation Plan 2015-2020 (SCORP)
- State Wildlife Action Plan 2015 (SWAP)
- Community Wildfire Protection Plans 2010-2020 (CWPP)
- Potomac Highlands Cooperative Weed and Pest Management Area Strategic Plan 2015
- West Virginia Invasive Species Strategic Plan 2015

Additional Thoughts and Future Direction

The WVDOP will collaborate and gather additional information and ideas on a regular basis after this plan is approved. The implementation of this plan will be a dynamic process and the document will be amended if necessary, between January 1st, 2020 and June 30, 2030, at which time a revised action plan will be completed.

New and better data, new and emerging issues, budget and/or staffing problems, changing priorities, and new technologies are just a few examples of items that could necessitate amendments to this long-range plan before 2030. It is the intent of the WVDOP however, that this State Forest Action Plan be broad enough to cover all possible projects and activities for the next five years; thus, interim amendments should not be necessary.

VI. Appendix

1. *Strategy Matrix*

The following matrix contains key information for each of the state issues and sub-issues identified in this State Forest Action Plan. These are all the items that were required by the Farm Bill to be addressed as part of State strategy development. There is also a matrix of potential multi-state projects at the end of this section.

WV State Issue 1: Competing Land Uses					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Protect Significant Forest Land by Completing Forest Legacy Projects	Forest Legacy Areas	Forest Legacy Competitive Grants	Forest Legacy Administrative Funds, FLP Acquisition Funds, Non-Federal Funds	Completion of Approximately 3 Forest Legacy Projects prior to 6/30/2030	1.1, 1.2, 2.2, 3.1, 3.2, 3.4, 3.5, 3.7
Sub-Issue 1.1: Fragmentation, Parcelization, and Loss of Forest Land					
Sub-Issue 1.2: Development					
Sub-Issue 1.3: Population and Housing Density					
Sub-Issue 1.4: Conversion to Non-Forestry Use					
Sub-Issue 1.5: Mineral Extraction					
Sub-Issue 1.6: Agriculture					
Sub-Issue 1.7: Property Taxes					

NOTE: The seven sub-issues listed above are shown so that the reader will have an idea of what considerations went into formulating the one basic, long-term strategy that WVDOF employs in its current Forest Legacy program. This is discussed in more detail on the following five pages.



WV State Issue 2: Communications and Education

Sub-Issue 2.1: Lack of forestry education in public schools

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Attempt to reach each elementary school with forestry information.	County schools/boards of education	WVDOF, USFS, CBP-NOAA grant opportunities	DOF personnel in all program areas, coordinate other agency personnel	Every school visited in 3-5-year rotation.	3.6, 3.5, 3.3
2. Contact pre-service teaching colleges/universities to establish partnering with Environmental Education.	Teaching colleges throughout the State	Project Learning Tree, Project WET, Project WILD, WVDEP, Competitive grants	PLT Steering Committee, Personnel from USFS, WVDOF, WVDNR, WVFA	Contact every teaching college and work on partnership with them.	3.6, 3.5, 3.3
3. Utilize new WVDOF Assistant State Forester for Communication and Education position to expand education programs across the state.	Statewide	WVDOF, USFS, CBP-NOAA grant opportunities Project Learning Tree, Project WET, Project WILD, WVDEP, Competitive grants	DOF personnel in all program areas, coordinate other agency personnel	Continue to grow the Project Learning Tree facilitator and student outreach across the state by hosting online and in-person trainings around the state keeping a focus on counties with less conservation education awareness. Also provide workshops to groups such as 4-H and scouting leaders, non-formal and formal educators, and other specialized groups as requested.	1.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
4. Provide detailed record of PLT educational standards alignment.	Statewide	WVDOF, grant opportunities Project Learning Tree, WVDE	DOF personnel in all program areas, coordinate other agency personnel program coordinator	Write up a breakdown of what educational standards are met by the PLT curriculum lesson by lesson to serve as a tool for teachers to incorporate environmental education into classrooms and meet yearly state teaching requirements utilizing pre/post surveys to measure changes in attitude and knowledge.	3.1, 3.4, 3.5, 3.6, 3.7



Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
5. Incorporate newest PLT modules into regular workshop agendas.	Statewide	WVDOF, USFS, CBP-NOAA grant opportunities Project Learning Tree	PLT State Coordinator, National PLT, WVFA, Forest Industry. coordinate other agency personnel	Create online and in classroom materials for the newest p-K through 8 module, Climate Science, Green Schools and other PLT modules as they are released. These materials can be used standalone workshops or added into standard workshop agendas.	1.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
6. Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.	Statewide	WVDOF, USFS, CBP-NOAA grant opportunities Project Learning Tree	DEP, USFS, DOF, WVDOA, coordinate other agency personnel	Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.	1.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
7. Continue Environmental Literacy efforts with partnership agencies and area educators.	Chesapeake Bay eight Counties	WVDOF, USFS, CBP-NOAA grant opportunities Project Learning Tree	Chesapeake Bay partners, DOF personnel, PLT Trained and facilitators, educators, coordinate other agency personnel	Attend Chesapeake Bay partner meetings for planning MWEEs in the eastern panhandle and participate in trainings when available. Keep an open-door policy for teachers seeking resources and trainings to further enrich MWEEs for students.	3.1, 3.4, 3.5, 3.6, 3.7



Sub-Issue 2.2: Public perceptions of forestry					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Provide Forestry Interpretive / Interaction area on all State Lands.	State Land areas throughout the state	State Lands, Competitive grants	Grants, Inmate personnel, WVDOF	Identify and Implement educational segments within State Forests.	3.6
2. Provide Forestry interpretation within the Chesapeake Bay Watershed Area.	Chesapeake Bay Watershed area of WV	Chesapeake Bay Program, NOAA CBP Grants, Competitive grants	Grants, CBP Implementation Group, WVDOF, WVDEP	Identified and Implemented educational segments within CB Watershed.	3.6
3. Increase education and outreach overlap with state lands projects	Statewide	WVDOF-All, Competitive grants	WVDOF, WVFA, WVDNR	More emphasis on educational trails, pollinator zones, red spruce release efforts, and interpretive signage on state lands to be enjoyed by patrons of the state forests.	1.1, 1.2, 2.2, 3.6, 3.7
4. Promote public awareness at the WV Clements State Nursery by hosting public tours of the facility.	Statewide	WVDOF-All, Competitive grants	WVDOF Personnel, Nursery. Extension, Local schools	Provide the public an opportunity to take advantage of the services at the state nursery. More public awareness and community involvement could help generate seedling sales.	3.6
5. Create outdoor education centers for public use	Statewide	WVDOF-All, Competitive grants, DEP Grants	WVDOF Personnel	Open outdoor learning opportunities such as a learning center, interpretive trail loop, interpretive literature and forestry centered festival days for the public to get actively involved with environmental education if funds allow.	3.6, 3.7

**Sub-Issue 2.3: Lack of internal formal training**

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Train those forestry personnel that would like to learn Project Learning Tree.	Statewide	PLT, Competitive grants	PLT Steering Committee	Have 2-3 PLT facilitators / trainers in each region throughout the state	3.1, 3.4, 3.5, 3.6, 3.7
2. Coordinate opportunities for different educational delivery of forestry program materials.	Statewide	WVDOF-All, Competitive grants	WVDOF	Continue the in-person workshops but prepare a virtual platform for online workshops.	3.1, 3.4, 3.5, 3.6, 3.7
3. Coordinate online stewardship trainings for foresters and landowners	Statewide	WVDOF-All, Competitive grants	WVDOF - Stewardship Committee, Tree Farm, Woodland Stewards, WVU	Prepare a virtual platform for stewardship training. Increase participation by foresters and landowners.	3.1, 3.4, 3.5, 3.6, 3.7
4. Train current PLT Facilitators to utilize technology-based education	Statewide	SFI, PLT Grant opportunities. WVDOF-All, Competitive grants	PLT Coordinator	Encourage current facilitators to take advantage of online platforms such as PowerPoint, video conferencing programs, and polling sites to reach a wider audience for workshops. Give guidelines for making educational videos for use on the WVDOF website and with other education-based opportunities.	3.1, 3.4, 3.5, 3.6, 3.7


Sub-Issue 2.4: Taking advantage of current / future technologies

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Continue to explore opportunities to communicate with existing and new technologies.	Statewide	WVDOF-All, Competitive grants	WVOT, DHHR, WV Library System, WVDOF, USFS, USFWS, WVDNR	Use of better technology webinars, podcasts, surveys, and other communication outlets.	3.1, 3.4, 3.5, 3.6, 3.7
2. Adapt CWPMA 5-week invasive species curriculum to a fully online format.	Within CWPMA Boundary counties for bot Rivers and Gorges and Potomac Highlands	WVDOF-All, Competitive grants	PHCWPMA, RGCWPMA, WVDOF, AFNHA AmeriCorps, USFS, WVDA, WVDEP, WVDNR	Move established lessons and activities to an easily accessible online format. Make the lessons available to a broader teacher audience and to more schools across the state.	2.2, 3.1, 3.4, 3.5, 3.6, 3.7
3. Continue upward trend in community engagement with online media content.	Statewide	WVDOF-All, Competitive grants	WVDOF Personnel, Commerce Communications	Provide engaging online content for the website, Facebook, Twitter, and social media blogs. Take initiative to create education and public outreach centered informational posts that encourage interaction and dialogue with online following.	3.1, 3.4, 3.5, 3.6, 3.7
4. Continue to explore and utilize new technologies within agency.	Statewide	WVDOF-All, Competitive grants	WVDOF personnel, UAS program	Provide continued support for special operations and drone technology for support of DOF core programs.	3.1, 3.4, 3.5, 3.6, 3.7
5. Include additional informative education-based videos on social media platforms	Statewide	WVDOF-All, Competitive grants	WVDOF	Make videos from West Virginia PLT facilitators available for the public to access through WVDOF website, blog, and Facebook to promote public engagement with environmental education.	3.1, 3.4, 3.5, 3.6, 3.7



Sub-Issue 2.5: Future Issues that will affect the WVDOF					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Include future forester centered social media material.	Statewide	WVDOF-All, Competitive grants	WVDOF, WVU, Commerce Communication	Include posts, blogs and informational segments geared toward public knowledge of the personal, economic, environmental successes of green jobs. Promote awareness of younger reader audience to pursue forestry related opportunities.	2.2, 3.1, 3.4, 3.5, 3.6, 3.7
2. Re-establish a residential camping opportunity to educate high school students with focus on forestry education and related sciences.	Statewide	WVDOF-All, Competitive grants	WVDOF, Extension, WVDNR, Glenville State College, WVDE	Encourage the future of forestry by enabling them the opportunity to attend a camp that would be focused on forestry. Students will pursue a career in the natural resources field.	2.2, 3.1, 3.4, 3.5, 3.6, 3.7
3. Establish rapport with Vocational Technical Schools teachers and patrons.	Statewide	WVDOF-All, Competitive grants	WVDOF, WVDE, High Schools, WVU, Glenville	Maintain dialogue with Vocational Technical schools about new educational resources available to students seeking a forestry related career. Supply information about the PLT Green Jobs module for use in the classroom. Keep up to date with teaching practices utilized at Vo-Tech centers.	2.2, 3.1, 3.4, 3.5, 3.6, 3.7
4. Continue to contract AmeriCorps Member to serve as an Outreach and Education Aide.	Statewide	AFNHA, State lands, WVDOF	WVDOF and AFNHA AmeriCorps	Allow for even more educational awareness and program growth around the state. The AmeriCorps member will be in charge of creating online educational materials, as well as materials for the newest Project Learning Tree curriculums for use in workshops and by other West Virginia PLT facilitators.	2.2, 3.1, 3.4, 3.5, 3.6, 3.7
5. Stay current on activities related to Environmental literacy plan and No Child left Inside.	Statewide	PLT, grant opportunities	USFS, WVDOF personnel	WVDOF and USFS having input on Env. Literacy plan/Coordinate our activities to the current State CSO's and curriculum (where could we fit in).	3.1, 3.4, 3.5, 3.6, 3.7



WV State Issue 3: Sustainability of Forest Resources					
Sub-Issue 3.1: Growth, Yield, and Management					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Gather data and information from FIA on forest growth and yield so as to monitor forest conditions in WV and make sound management recommendations.	Statewide	Stewardship, Forest Health, Competitive Grants, Fire, Conservation Education, Research	State DOF staff, FIA staff, grants, consulting foresters, WVU grants	Accurate and complete data will be available in order to make informed management recommendations and decisions.	1.1, 1.2, 2.2, 3.4, 3.5, 3.6, 3.7
2. Accurately locate in a GIS database all NIPF lands and all "managed" forest lands in the state, including Stewardship, Tree Farm, Managed Timberland, corporate forests, public lands, and others.	Statewide	Stewardship, Competitive Grants, Conservation Education	DOF staff, FIA, Tree Farm System, State Tax Department, County Auditors	All forest lands in the state will be identified, located and placed into GIS. Management type will be broken down by category, as well as those areas not being "managed." And updated on an annual basis.	1.1, 1.2, 2.2, 3.4, 3.7
3. Bring more NIPF lands into the Stewardship Program at a faster rate and retain these lands as "current" stewardship plans.	NIPF lands statewide	Stewardship, Competitive Grants, Conservation Education,	DOF staff, consultants, WVU Extension/Forestry staff	Improvement in retention rates of "stewardship plan" landowners and increase in rate of new plans being prepared.	1.1, 1.2, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
4. Employ the full range of cost share and financial assistance programs to enable NIPF landowners to actively manage their forests.	NIPF lands statewide	Stewardship, Competitive Grants, Conservation Education, USDA Farm Bill Programs	DOF staff, consultants, USDA agencies, WVU Extension/Forestry staff	Increase in acres of NIPF lands with pre-harvest silvicultural and forest health treatments.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7



Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
5. Work more closely with Family Forest Owners (of the estimated 243,000 in WV, about 70% of them own 20 acres or less of forest land) to better understand their concerns and priorities.	Family Forest lands in the state (Approximately 7 million acres)	Stewardship, Competitive Grants, Conservation Education, Fire, Urban & Community Forestry, Forest Health, Utilization & Marketing	DOF staff, consultants, USDA agencies, WVU Extension/Forestry staff, WVDNR	Increase in number of stewardship plans for Family Forest Owners	1.1, 1.2, 2.1, 2.2, 3.1, 3.3, 3.4, 3.5, 3.6, 3.7
6. Work to ensure appropriate opportunities available for professional foresters, technicians, loggers, mills, and others in education, training, and jobs in order to adequately "manage" the state's forests.	Statewide	Stewardship, Conservation Education, Competitive Grants, Economic Development	DOF staff, WVU Extension/Forestry staff, consultants	Adequate numbers available of trained foresters, technicians, loggers, as well as product markets, in order to "manage" the state's forests	1.1, 1.2, 2.2, 3.4, 3.6, 3.7



Sub-Issue 3.2: Fire and Forest Health					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Work with Fire Program to reduce negative impacts of wildfires to the state's forests.	statewide, but concentrate on 14 "hot" counties in southern WV	Stewardship, Fire, Conservation Education, Competitive Grants	DOF staff, VFD's and other cooperators, public agencies, large private landowners	Fewer wildfires on fewer acres.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7
2. Work with Forest Health Program to keep forest health issues under control.	statewide, but focus on NIPF lands and state forests	Stewardship, Forest Health, Conservation Education, Competitive Grants, Urban & Community Forestry	DOF staff, WVDA staff, USDA agencies, Research	Forest health issues remain "manageable."	1.1, 1.2, 2.1, 2.2, 3.4, 3.5, 3.6, 3.7
3. Identify those invasive plants most likely to negatively impact WV's forests and begin control measures as becomes practical.	statewide, but focus on NIPF lands where habitat diversity and important ecosystems occur	Stewardship, Forest Health, Conservation Education, Competitive Grants, Urban & Community Forestry	DOF staff, WVDA staff, USDA agencies, Research, WVU Extension/Forestry staff, other public agencies, consultants	Invasive plants remain manageable and under control.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7

**Sub-Issue 3.3: Reforestation of Vacant Lands**

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Reforest old farms and pastures, riparian areas, and other lands as opportunities arise under various state and federal programs.	reverting farmlands, riparian and wetland restoration areas, and other similar reforestation opportunities	Stewardship, Conservation Education, Competitive Grants	DOF staff, other state and federal agencies, state tree nursery, consultants	Adequate tree seedlings available to plant on all areas needing tree planting and for all landowners desiring tree plantings.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5, 3.6, 3.7
2. Maintain a viable nursery to produce seedlings compatible for planting in West Virginia.	Clements Nursery is in Mason County, but planting efforts would occur statewide	Stewardship, Conservation Education, Competitive Grants, Special Programs	DOF staff, state tree nursery, state and federal agencies, Research, universities, NGO's	Clements Nursery will need to be overhauled in order to operate proficiently.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5, 3.6, 3.7

Sub-Issue 3.4: Forest Regeneration

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Work to identify, understand and resolve, where possible, the forest regeneration issues in the state	statewide	Stewardship, Conservation Education, Competitive Grants, Utilization & Marketing	DOF staff, state and federal agencies, NGO's, consultants, WVU Extension/Forestry staff, Research	Forest regeneration issues are well understood, and measures are available to resolve any concerns that arise.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7



Sub-Issue 3.5: Habitat Diversity and Conservation

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Increase efforts to identify, protect, and restore high priority conservation forest ecosystems, unique native ecological communities, and other significant habitats; will include invasives control in CWPMA's.	statewide, with emphasis in the habitat diversity and conservation priority areas; will include focused efforts in the Potomac Highlands Cooperative Weed and Pest Management Area and other CWPMA's as they are established	Stewardship, Conservation Education, Fire, Competitive Grants, Forest Health, Special Programs	DOF staff, public agencies, NGO's, consultants, Research, WVU Extension/Forestry staff, adjacent state agencies	MOU's, increased acreages protected and restored Work closely with the newly formed Rivers and Gorges CWPMA.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5, 3.6
2. Participate in Fire Learning Network to better understand the importance of and uses for prescribed fire in certain types of silvicultural and ecological habitats.	statewide, when used to achieve specific silvicultural, habitat, and ecological goals	Stewardship, Conservation Education, Fire, Special Grants, Forest Health, Competitive Grants	DOF staff, public agencies, NGO's, public agencies, Research, WVU Extension/Forestry staff	Prescribed fire benefits are well understood and used to achieve specific goals when applicable.	1.1, 1.2, 2.1, 3.5, 3.6, 3.7

Sub-Issue 3.6: Public Lands

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Add to the area available to demonstrate forestry	Existing state forests & area west of I-77 and north of I-64 for an additional state forest	Forest Legacy, Competitive Grants	Governor's support, funding from the Outdoor Heritage Conservation Fund	Add to the state forest system.	1.1, 1.2, 2.2, 3.4, 3.5, 3.6, 3.7
2. Cooperate with other public agencies to achieve management goals.	Public Land	Forest Health, Competitive Grants	Interagency MOU's	Pool resources to meet three interagency goals.	1.1, 1.2, 2.1, 2.2, 3.4, 3.5, 3.6, 3.7
3. Continue to update forest mgt. plans.	State Forests	Competitive Grants	Interagency MOU's	All plans updated every 10 years.	1.1, 1.2, 2.2, 3.4, 3.5, 3.6, 3.7



Sub-Issue 3.6: Public Lands (continued)					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
4. Maintain boundaries.	State forests	Competitive Grants	State land managers, contractors, funds to pay workers, buy paint and signs	All boundaries repainted every 10 years.	1.1, 1.2, 2.2, 3.4, 3.5, 3.6, 3.7
5. Invasive species control.	Public land	Forest Health, Competitive Grants, Conservation Education	Competitive grants, CWMA, Statewide Invasive Species Plan, contractors, and summer intern program	Identify, prioritize, and treat areas on state forests.	1.1, 1.2, 2.2, 3.4, 3.5, 3.6, 3.7
6. Encourage natural regeneration.	Public land	Forest Health, Competitive Grants, Conservation Education	Competitive grants	Each new silvicultural Rx provides conditions for some regeneration.	1.1, 1.2, 2.1, 2.2, 3.4, 3.5, 3.6, 3.7
7. Provide diverse wildlife habitat.	State forests	Forest Health, Competitive Grants	Project funding help from NWTF, RGS	Each new project provides 10% of area specifically for wildlife.	1.1, 1.2, 2.1, 2.2, 3.4, 3.5
8. Provide for RT&E species.	State forests	Forest Health, Competitive Grants	Competitive grants	Identify potential habitat, protect existing and expand where possible.	1.1, 1.2, 2.2, 3.4, 3.5
9. Develop carbon offset projects.	State forests	Forest Management	State land managers, contractors	Carbon offset projects in place on all state forests in next 5 years.	1.1, 1.2, 2.1, 2.2, 3.4, 3.5, 3.6, 3.7
10. Implement prescribed fire as a management tool on state lands.	State forests	Forest Management, funding, and resources from partners	State land managers, assistance from partners and other agencies	Implement prescribed fire on state lands to promote natural regeneration and diverse wildlife habitat.	1.1, 1.2, 2.2, 3.4, 3.5



WV State Issue 4: Water Quality					
Sub-Issue 4.1: Sedimentation from Silvicultural Operations					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Continue to improve/enforce LSCA.	Statewide	LSCA, UCF, CBP, Competitive grants	WVDOF staff/ Federal & State funding, Legislation	Reduce number of LSCA complaints/Increase in BMP compliance.	1.1, 2.2, 3.1, 3.5, 3.6
Sub-Issue 4.2: Protection of Riparian Areas					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Increase riparian planting / wetlands protection efforts.	Potomac Basin Managed Timberland Parcels	Managed Timberland, LOA, Stewardship, Competitive grants	WVDOF staff/ Federal & State funding, Cost share	Increased number of stream feet planted or restored.	1.2, 2.2, 3.1, 3.5, 3.6
Sub-Issue 4.3: Protection of Public Drinking Water					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Protect forested headwaters in watersheds with public intakes.	Potomac Basin Managed Timberland Parcels	LOA, LSCA, Fire, Managed Timberland	WVDOF staff/ Conservation easements, Federal & State funding	Number of acres/plans added or lost to Managed Timberland	1.2, 3.1, 3.5, 3.6
Sub-Issue 4.4: Chesapeake Bay Program.					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Continue participation in the Chesapeake Bay Program.	Potomac Basin	Managed Timberland, LOA, Stewardship	WVDOF staff/ Federal & State funding, Cost share	Number of meetings and contacts.	1.2, 2.2, 3.1, 3.5, 3.6



WV State Issue 5: Wildfire

Sub-Issue 5.1: Prevention

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Key Stakeholders	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Continue to deliver prevention education to children in elementary schools. 2. Continue to participate in local and state fairs and festivals to deliver prevention education to children and adults. 3. Maintain fire danger signs to provide wildfire risk information at the local level 4. Use local media to provide wildfire risk information. 5. Continue investigation and law enforcement measures to reduce arson fires.	Statewide	Forest Protection, Forest Stewardship, Conservation Education, Urban and Community Forestry, Investigation	City, County, State, and Federal agencies; Other cooperating partners, Landowners, Schools	DOF employees, State funds, Federal funds (State Fire Assistance (SFA) grants), VFDs, Other trained partners	Fewer fires and less acreage burned.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6



Sub-Issue 5.1: Prevention (Continued)						
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Key Stakeholders	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
<p>6. Continue to deliver prevention education to children in elementary schools.</p> <p>7. Continue to pursue the installation of mitigation measures on burning coal seams and refuse areas.</p> <p>8. Work with electric companies to reduce wildfires caused by power lines.</p> <p>9. Increase prevention efforts in areas where most fires occur due to debris burning.</p>	Statewide	Forest Protection, Forest Stewardship, Conservation Education, Urban and Community Forestry, Investigation	City, County, State, and Federal agencies; Other cooperating partners, Landowners, Schools	DOF employees, State funds, Federal funds (State Fire Assistance (SFA) grants), VFDs, Other trained partners	Fewer fires and less acreage burned.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6



Sub-Issue 5.2: Preparedness						
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Key Stakeholders	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Continue suppression and safety training programs, focused on volunteer fire departments. 2. Continue equipment acquisition programs to increase capacity for response and suppression. 3. Maintain RAWS network to meet required standards. 4. Replace outdated radio communication equipment. 5. Continue to maintain and improve GIS mapping and data analysis. 6. Increase the development and implementation of CWPPs. 7. Continue interaction with cooperating agencies and neighboring states for mutual aid and jurisdictional issues.	Statewide	Forest Protection, Fire Competitive grants, Conservation Education	City, County, State, and Federal agencies; Other cooperating partners, Landowners, Schools	WVDOF employees, State, and federal funds (State Fire Assistance (SFA) grants & Volunteer Fire Assistance (VFA) grants), VFDs, Other trained partners	Decrease number of volunteer fire departments that have not received training within past 5 years. Maintain or increase assistance to VFDs for equipment acquisition. Replacement of outdated radio equipment. RAWS installations upgraded to meet national standard. Increase the number of communities with a CWPP and implementation of a CWPP.	1.1, 1.2, 2.1, 2.2, 3.1, 3.3, 3.4, 3.5, 3.6



Sub-Issue 5.3: Suppression						
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Key Stakeholders	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Increase DOF personnel to 2016 level at minimum 2. Continue to train and equipment volunteer fire departments to provide more effective wildfire suppression. 3. Secure additional funding to replace DOF frontline vehicles. 4. Identify means and methods to increase wildfire detection. 5. Increase communication capabilities on wildfires. 6. Acquire transport vehicles for dozers and train operators. 7. Maintain relationship with landowners of large acreages to aid with hiring of temporary personnel for increased suppression capacity.	Statewide	Forest Protection, Landowner Assistance, State Forests, Fire Competitive grants, Conservation Education, Investigation	City, County, State, and Federal agencies; other cooperating partners, landowners, schools	WVDOF employees, State, and federal funds (State Fire Assistance (SFA) grants & Volunteer Fire Assistance (VFA) grants), VFDs, Other trained partners	Increase in field staff. Increase in wildfire detection capability. Increase fireline communication capability. Heavy equipment transports acquired. Support for temporary employees maintained. Reduced average fire size.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6



Sub-Issue 5.4: Prescribed Fire						
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Key Stakeholders	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
1. Complete certified prescribed fire manager (CPFM) training and certification process. 2. Develop a means to track training and certification as a CPFM. 3. Expand the use of prescribed fire to private land.	Statewide	Fire, Competitive grants, Conservation Education	State and Federal agencies, landowners, other cooperating organizations	WVDOF employees, State and federal funds (State Fire Assistance (SFA) grants, cooperating state and federal agencies	Increase number of CPFMs, certification and training program created, increased use of prescribed fire for hazard mitigation and resource management.	1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7



WV State Issue 6: Sustainability of Urban Forests

Sub-Issue 6.1: Sustain Program Capacity at the Community Level

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Target TC USA and developing communities with technical and financial assistance to sustain and build successful urban forestry programs	Statewide in 36 priority communities and others that commit to developing the infrastructure needed for successful urban forestry programs	Urban and Community Forestry, Technical & Financial Assistance, Conservation Education	WV Urban and Community Forestry Staff, U.S. Forest Service, non-profit partners, WVU and WVSU	Increase in the number of communities achieving 'Developing' and 'Managing' status in 'CARS.'	1.2, 3.1, 3.2, 3.4, 3.6, 3.7

Sub-Issue 6.2: Mitigate Climate Change and Enhance Ecosystem Services

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Support community efforts to increase urban canopy cover and sustaining existing forest lands to maximize public benefits	Statewide in 36 priority communities and others that commit to developing the infrastructure needed for successful urban forestry programs	Urban and Community Forestry, Community Grants, Forest Legacy	WV Urban and Community Forestry Staff, U.S. Forest Service, WV GIS Specialist, WV Chesapeake Bay Forester, non-profit partners, WVU and WVSU	Increase in the number of communities managing urban canopy cover and long-term canopy cover increases and associated ecosystem services.	1.1, 1.2, 2.2, 3.1, 3.2, 3.4, 3.6, 3.7

Sub-Issue 6.3: Promote Urban Tree Canopy Cover Management within the Chesapeake Bay Watershed

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Partner with Cacapon Institute and other entities to implement tree plantings, UTC assessments, smart growth policies, education, and outreach to increase urban canopy cover	The Potomac Watershed spanning 8 counties in WV which drain into the Chesapeake Bay	Urban and Community Forestry, Project CommuniTree, Community Grants, Cacapon Institute programs	WV Urban and Community Forestry Staff, Cacapon Institute, Project CommuniTree, U.S. Forest Service, WV Chesapeake Bay Forester and multiple government and non-profit partners	Increase in community urban canopy cover assessments, plans and goals and priority driven planting efforts.	1.2, 1.2, 2.2, 3.1, 3.2, 3.4, 3.6, 3.7



WV State Issue 7: Forest Health					
Sub-Issue 7.1: Major Native and Exotic Diseases and Pests of Concern					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Develop Survey and Monitor Methods/Establish effective biocontrol	Statewide	CFHP CFHM Forest Health	Federal and State Funding	Effective survey and monitoring procedures and biocontrol established.	1.1, 2.2, 3.4, 3.7
Sub-Issue 7.2: Survey, Monitor and Evaluate					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Beech Leaf Disease					
Survey, detect, and monitor	Hancock, Ohio, Marshall, Monongalia, Marion, Tucker, Randolph, Pocahontas, Greenbrier and Hardy	CFHP CFHM Forest Health	Visual Surveys and Laboratory Analyses, Federal and State Funding	Detecting presence and/or absence.	1.1, 2.2, 3.4, 3.7
Beech Bark Disease					
Survey and Monitor Priority Areas	Barbour, Braxton, Preston, Mineral, Hampshire, Taylor, Tucker, Grant, Hardy, Lewis, Upshur, Randolph, Pendleton, Webster, Pocahontas, Nicholas, Greenbrier Counties	CFHP CFHM Forest Health	Visual Surveys, Federal and State Funding Sources	Measure Amount of Spread in Acres.	1.1, 2.2, 3.4, 3.7
Exotic Wood Borer / Bark Beetle Survey					
Survey and Monitor using Lindgren Funnel Traps	Wood product industries, and other high-risk sites	CFHP CFHM Forest Health	Trapping Methods and Surveys, Taxonomic Expertise, Federal and State Funding	Detecting presence and/or absence.	1.1, 2.2, 3.4, 3.7



Spotted Lanternfly					
Survey and Monitor	Statewide	USDA-APHIS-PPQ, WVDA-CAPS Forest Health	State and Federal Funding	Detecting presence and/or absence.	1.1, 2.2, 3.4, 3.7
Sudden Oak Death					
Survey and Detect	Statewide	CFHP CFHM Forest Health	State and Federal Funding	Detecting presence and/or absence through lab analyses.	1.1, 2.2, 3.4, 3.7
Oak and Other Hardwood Decline					
Survey, Monitor and Detect	Statewide	CFHP CFHM Forest Health	State and Federal Funding	Detecting presence and/or absence.	1.1, 2.2, 3.4, 3.7
Sub-Issue 7.3: Pest Management and Eradication					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Gypsy Moth					
Protect hardwood timber from defoliation/Reduce interstate firewood movement	Statewide	GMCS, CSCL and Forest Health	State and Federal funding	Reduction or elimination of defoliation in treated stands	1.1, 2.2, 3.4, 3.7
Hemlock Woolly Adelgid					
Protect hardwood and other high value trees, utilize IPMs	Public Lands Statewide	CFHP, CFHM and Forest Health	State and Federal Funding, Private Landowner Involvement	Increased post-treatment survival/reduction in defoliation and spread	1.1, 2.2, 3.4, 3.7
Sub-Issue 7.4: Public Education					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Raise public awareness of issues surrounding native and exotic species.	Statewide	CFHP CFHM Forest Health	Public Literature, Fairs and Festival Displays and Media Outlets, Federal and State Funding	Increased Public Awareness of native and exotic forest pests.	3.3, 3.4, 3.6



WV State Issue 8: Utilization, Marketing and Economic Development

Sub-Issue 8.1: Infrastructure/Transportation

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Develop infrastructure to encourage growth of primary and secondary forest industries.	Regions 3 & 5 for rail transport opportunities, state-wide for infrastructure improvement/ highway development	U & M, Economic Development, WERC and competitive grants	ARC, Federal and state DOH, WV Port Authority, WVDO. DOF Staff, HAZ	Expansion of the forest industry and new rail sidings and infrastructure, improvements in forest products transportation networks.	3.4

Sub-Issue 8.2: Ecological Services

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
To diversify and strengthen forest-based ecological services and educate landowners about developing ecological services markets.	Statewide, public lands, and Regions 1, 2 & 5	Conservation and Education, stewardship, U&M, Competitive grants, Urban	DOF Staff, WVU-AHC, SFI, FSC, Tree Farm, WVDNR Staff	Increased certification of forest acres, forest and wildlife recreation opportunities, Managed Timberland acres and understanding of carbon projects and work to identify projects both private and public.	1.2, 3.2, 3.4

Sub-Issue 8.3: Byproducts and Byproduct Markets

Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Increase utilization of forest resources for biomass energy production and improve biomass energy marketing efforts.	Regions 2, 3, & 4	Conservation and education, Urban, U&M, stewardship, Competitive grants, Fire	DOF Staff, WVU-AHC, NRCS, FSA, WVMA Wood Committee, Hardwood Alliance Zone	Attract woody biomass-based sustainable industries for increased utilization of mill residues produced.	1.2, 3.2, 3.4



Sub-Issue 8.4: Timber Quality and Manufacturing Potential					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Expanded harvest and use of low-grade species and Expansion of the industry in key counties. Work with industry to promote hardwoods through AHMI advertising programs.	Regions 2, 3, 4, & 5.	Stewardship, U&M, Fire, Competitive grants, Conservation and Education, NRCS	Consultant Foresters, DOF staff, USFS, Company Foresters, WVU-AHC	Improved management, health and quality of forest resource and more acreage harvested using silviculturally sound and professional techniques. More Prim./Sec. Industry.	1.1, 1.2, 3.4
Sub-Issue 8.5: Markets for Primary and Secondary Manufacturing Products					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Substantially increase production in the primary and secondary wood products sectors and expand the number of companies that produce solid wood products.	Regions 2, 3, & 4	U & M, Economic Development, WERC and competitive grants	DOF staff, HAZ, WVU-AHC, WVFA, SBA, WVMA Wood Committee, WVDO	Development of new forest-based businesses with increased production through existing and new technologies and fulltime UM Forester in DOF.	3.4, 1.2
Sub-Issue 8.6: Workforce Development					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Increase the availability of quality employees in both the logging and forest products sectors, as well as develop a logger training academy.	Statewide, with emphasis on Regions 2, 3, 4, & 5.	Conservation and Education, WV and Federal Dept of Labor, U&M	Workforce WV Staff, DOF Staff, WVU-AHC, WERC, VVWTC	Training academy developed for increased training opportunities for loggers and mill employees resulting in increased employment. Develop expanded safety training and tie to improved workers compensation program.	3.4, 1.2



WV Multi-State Issues					
Issue M1: Chesapeake Bay – MD, PA, DE, NY, VA, WV					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Target riparian areas for restoration and target forested tracts for conservation based on recommendations of Chesapeake Bay plans.	Chesapeake Bay watershed, specifically those lands along Potomac River tributaries	Forest Legacy, LOA, CE, LSCA, UCF, Forest Health	Federal & State Funding/Cost share, Private Conservation funding, landowner buy in	Increase number of miles of riparian buffers and number of acres of forestland conserved.	1.1, 3.1, 3.4, 3.5, 3.6, 3.7
Continue to employ a forestry specialist in the Chesapeake Bay to provide targeted professional input.	Chesapeake Bay Watersheds in the Potomac tributaries.	Forest Legacy, LOA, CE, LSCA, UCF, Forest Health	Federal & State Funding/Cost share, Private Conservation funding, landowner buy in	Increased quality and survival of riparian plantings by better planning. Increased communication among stakeholders.	1.1, 3.1, 3.4, 3.5, 3.6, 3.7
Issue M2: Upper Ohio River Valley Watershed – PA, OH, WV					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Target floodplains for restoration using floodplain assessments of partner agencies.	Counties bordering Ohio River	UCF, LOA, LSCA, Conservation Education	WVDOF personnel/ Federal & State funding, Cost share, Private conservation funding, Landowner support	Increase in acres of conserved, functioning floodplains.	1.1, 1.2, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
Establish priority watersheds for possible funding and projects.	Ohio Valley Watersheds	WVDOF Urban Forestry, LOA, LSCA	WVDOF staff/ Federal & State funding, Cost share, Private conservation funding, Landowner support	Priority Watersheds identified.	1.1, 2.2 3.1, 3.4, 3.5, 3.6, 3.7



Issue M3: Development Issues Along the I-81, Corridor – PA, VA, MD, WV					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Identify and protect large, contiguous blocks of working forest land, managed by professional foresters	Areas bordering these four interstate corridors, Portions of Forest Legacy Areas within the interstate Corridors	Forest Legacy, Competitive grants within FLAs, Other special grants, CE, LSCA, Stewardship, Fire, UCF, Forest Health	Forest Legacy Programs (state and federal)/County farmland protection boards, Other state land and federal protection programs (OHCF) and conservation program funds (LWCF)	Protection and forest management for priority forest tracts.	1.1, 1.2, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
Issue M4: Oil & Gas Drilling (Marcellus-Utica Shale Region, Geothermal) – MD, NY, OH, PA, VA, WV					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Minimize forest, soil, ecological, water, and other ecosystem impacts caused by deep gas drilling into shale plays or for geothermal.	Areas overlaying the Marcellus-Utica shale formation and geothermal potential	Forest Legacy, Stewardship, Forest Health, Special grants, CE, LSCA	WVDOP personnel/ State and federal resources	Minimize impacts on forest, soils, or water; site size is limited; roads/gas lines well planned; restoration efforts occur in a timely manner.	2.2, 3.1, 3.5, 3.6,
Issue M5: Sustaining Traditional Timber Markets and Developing Non-Traditional Markets in the Appalachian Region – PA, MD, VA, WV, KY, OH					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
To diversify and strengthen the state forest-based industry and educate landowners on developing markets.	Statewide, public lands	Conservation Education, Stewardship, U&M, Competitive grants, UCF	WVDOP staff, WVU-AHC/ SFI, FSC, Tree Farm, WVDNR staff	Diversity of forest resources, acres certified, increased forest and wildlife recreation, and economic development.	1.2, 3.2, 3.4, 3.6, 3.7
See WV Issue 8 Strategies	See Priority Area Map in Section III, Issue 8	CE, U & M, Economic Action program, WERC, Competitive grants, Stewardship	WVDOP staff, HAZ, WVU-AHC/ WVFA, SBA, WVMA Wood Committee, WVDO	See WV Issue 8 Strategies Measures of Success.	1.2, 3.4, 3.6



Issue M6: Slow-the-Spread (Gypsy Moth) – NC, VA, WV, KY, OH, WI, IN, MN, IL, MI, IA					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Slow the Spread of Gypsy Moth	STS treatment areas in NC, VA, WV, KY, OH, WI, IN, MN, IL, MI, IA	CE, Stewardship, LSCA, UCF, U&M, STSP, Forest Health	WVDA staff/ Federal and State funding sources	Reduction in spread rate.	1.1, 2.2, 3.3, 3.4, 3.5, 3.6, 3.7
Issue M7: Mid-Atlantic Fire Compact Activities – WV, VA, OH, PA, DE, NJ, MD					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Enhance the training and education of wildfire suppression personnel in the Mid-Atlantic Compact/ Strengthen the inter-compact mobilization of suppression resources/Continue the availability of the Wildland Fire Academy.	Personnel and equipment supplied as requested for suppression activities in the following states: WV, VA, OH, PA, DE, NJ, MD, as well as nationally	CE, Stewardship, Forest Health, Fire, Competitive grants, Special project grants	WVDOF staff/ State and Federal agency personnel and resources	Increased awareness and knowledge of Wildland Fire effects, suppression techniques and nationally acknowledged Wildland Fire Resources.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6



Issue M8: Southeastern States Forest Fire Protection Compact – AL, FL, GA, KY, MS, NC, SC, TN, VA, and WV					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Enhance the training and education of wildfire suppression personnel in the Mid-Atlantic Compact/ Strengthen the inter-compact mobilization of suppression resources/Continue the availability of the Wildland Fire Academy	AL, FL, GA, KY, MS, NC, SC, TN, VA, WV and National	CE, Stewardship, Forest Health, Fire, Competitive grants, Special project grants	WVDOF staff/ State and Federal agency personnel and resources	Increased awareness and knowledge of Wildland Fire effects, suppression techniques and nationally acknowledged Wildland Fire Resources.	1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
Issue M9: Appalachian Forest Heritage Area - WV, MD, VA					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Integrate forest restoration and conservation into the Appalachian Forest Heritage Area initiative.	16 counties falling within defined Appalachian Forest Heritage Area	UCF, LSCA Stewardship, Forest Health, Conservation Education, Special grants, Forest Legacy, U&	Wide variety of local, state, federal, private resources -- including Forest Legacy, Central Appalachian Spruce Restoration Initiative, etc.	Appalachian Forest Area Initiative that incorporates forest restoration and conservation as priorities.	1.1, 1.2, 2.1, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7



Issue M10: "Call Before You Cut" - WV, OH, IN, IL, IA, MO					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Encourage landowners to manage their family forests with a long-term goal.	NIPF Priority areas as identified in Issue 3	UCF, Stewardship, LOA, LSCA, CE, Forest Health, U&M	WVDOF personnel/ Federal & State funding, Cost share, Private conservation funding, Landowner support	Increase numbers of Forest Management plans.	1.2, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
Encourage landowners to seek reputable and responsible companies to harvest their timber	NIPF Priority areas as identified in Issue 3	Stewardship, LOA, LSCA, CE, U&M	WVDOF personnel/ Federal & State funding, Cost share, Private conservation funding, Landowner support	More Timber Sales done under solid contracts.	1.2, 2.2, 3.1, 3.4, 3.6
Issue M11: White Oak Initiative - Eastern half of United States					
Long-term Strategy	Priority Landscape Area(s)	Program Areas that Contribute	Resources Available/ Required to Implement	Measure of Success	Supports National Objective
Encourage landowners to manage their family forests with a long-term goal.	NIPF Priority areas as identified in Issue 3	UCF, Stewardship, LOA, LSCA, CE, Forest Health, U&M	WVDOF personnel/ Federal & State funding, Cost share, Private conservation funding, Landowner support	Increase in the amount of white oak regeneration	1.2, 2.2, 3.1, 3.4, 3.5, 3.6, 3.7
Encourage landowners to seek reputable and responsible companies to harvest their timber	NIPF Priority areas as identified in Issue 3	Stewardship, LOA, LSCA, CE, U&M	WVDOF personnel/ Federal & State funding, Cost share, Private conservation funding, Landowner support	More timber sales completed with the assistance of a professional forester	1.2, 3.1, 3.4, 3.6, 3.7



2. Coordinating Committees Member Lists

The following tables contain lists of coordinating members from various agencies, stakeholders, and private individuals involved with the 2020 State Forest Action Plan. The coordination efforts among these committee members below helped to provide much of the data, stakeholder input, feedback, and discussion on collaboration that supports this plan. These coordinating members are organized by Committees represented statewide who meet monthly or at least quarterly in WV listing the various agency/organizations represented and member titles.

State Forest Action Plan (SFAP) Committee Member List		
Agency / Organization	Contact	Title
West Virginia Division of Forestry	Tom Cover	Director/State Forester
	Tony Evans	Deputy State Forester
	Chuck Copeland	Assistant State Forester – Forest Management
	Walt Jackson	Assistant State Forester - Forest Protection
	Jeremy Jones	Fire Staff Assistant/FEPP Coordinator
	Jeremy McGill	Assistant State Forester - LSCA & Water Quality
	Bob Hannah	Urban Forestry Program Coordinator
	John Rowe	Forest Legacy Program Coordinator
	Travis Miller	Assistant State Forester – State Lands
	Linda Carnell	Assistant State Forester - Education & Communication
	Steve Harouff	GIS Manager
West Virginia Department of Agriculture -Plant Industries	Quentin “Butch” Sayers	Assistant Director
	Kristen Carrington	CFHP Coordinator
	Lakin Castillo	GIS Analyst
WVU-Appalachian Hardwood Center	Joe McNeel	Director Appalachian Hardwood Center



Stewardship Committee Member List		
Agency / Organization	Contact	Title
West Virginia Division of Forestry (WVDOF)	Tom Cover	Committee Chairman - Director / State Forester
	Charles Copeland	Committee Liaison - Assistant State Forester – Stewardship / Forest Management
	John Rowe	Sub-Committee Liaison - Forest Legacy Program Coordinator
USDA NRCS	Kyle Aldinger	Resource Conservationist
USDA FSA	David Gardner	County Executive Director
WVU Division of Forestry	Sheldon Owen	Wildlife Resources Extension Specialist
	Dave McGill	Forest Resources Extension Specialist
WV Farm Bureau, Inc	Steve Butler	Director of Government Affairs
Weyerhaeuser Corporation	Jimmy Jenkins	Forester
Non-Industrial Private Forest Landowners	Ed Grafton	Landowner
WVDNR Wildlife	Keith Krantz	Wildlife Biologist
Consulting Forester	Russ Richardson	Consulting Forester
Canaan Valley Institute (CVI)	Jennifer Newland	Stakeholder Services & Assessment Director
WV Association of Conservation Districts	Bill Stewart	Member
Consulting Forester	John Bell	Consulting Forester
USDA Forest Service	Amy Hill	Forest Stewardship Program Coordinator
WV Conservation Agency	Cindy Shreve	Conservation Services Manager
WVFA	Eric Carlson	Executive Director
WV Department of Agriculture	Kristen Carrington	Cooperative Forest Health Protection Programs Coordinator
Consulting Forester	Chris Cartwright	Consulting Forester



State Technical Committee Member List		
Agency / Organization	Contact	Title
Appalachian Mountains Joint Venture	Todd Fearer	AMJV Coordinator
Berkley Co. Farmland Protection Board	Mark Schiavone	Executive Director
Environmental Defense	Suzy Friendman	Agriculture Policy Analyst & Organizer
Jefferson County Farmland Protection	Elizabeth Wheeler	Board Member
National Wild Turkey Federation	Cully McCurdy	Regional Biologist
The Nature Conservancy	Beth Wheatley	Director of External Affairs
Trout Unlimited	Bryan K. Moore	VP - Volunteer Operations & Program Development
	Dustin Wichterman	Potomac Headwaters Manager
	Gary Berti	Director-Eastern Home River Initiatives
US Environmental Protection Agency	Beth Garcia	Region 3 Coordinator
USDA Farm Production and Conservation	Walter Whitcomb	FPAC Belfast, ME
USDA Farm Service Agency- WV	Kevin Hinkle	Supervisory Agriculture Program Specialist
	Audrea Lambert	Chairperson, State FSA Committee
	Roger Dahmer	State Executive Director (acting)
USDA Fish & Wildlife Service	Callie McMunigal	Partners for Fish and Wildlife
	John Schmidt	Field Office Supervisor
	Nick Millett	Private Lands Biologist
USDA Forest Service - Monongahela National Forest	Cathy Johnson	Wildlife Biologist
	Cynthia Sandero	District Ranger
	Kelly Bridges	Public Affairs Officer
	Adrienne Nottingham	Assistant Forest Soil Scientist
USDA Forest Service State and Private Forestry	Amy Hill	Forest Stewardship Program Coordinator
	Chuck Reger	Assistant Director
USDA Natural Resource Conservation Service	Andy Diechert	State Conservation Engineer
	Becky Haddix	Public Affairs
	Damarys Mortinson	State Resource Conservationist
	Isaac Wolford	Plant Materials Center Manager
	Jared Beard	State Soil Scientist
	Jason Bladow	State Biologist
	Jon Bourdon	State Conservationist



State Technical Committee Member List (Continued)		
Agency / Organization	Contact	Title
USDA Natural Resource Conservation Service	Kathy Allen	Agricultural Engineer
	Kyle Aldinger	Natural Resources Specialist - Forestry
	Laura Smith	Assistant State Conservationist - Programs
	Louis Aspey	State Conservationist
	Matt Oliver	Acting Easement Specialist
	Nicole Viars	Management Analyst
	Pam Yost	Agricultural Economist
USDA Rural Development	Susan Newcomer	Acting State Director
	Lisa Sharp	Business Programs Manager
West Virginia Division of Forestry	Charles Copeland	Assistant State Forester
	Tom Cover	State Forester
WV Agricultural Land Protection/Authority	Lavonne Paden	Director
	Rod Graves	FRPP Ranking Subcommittee
	Bob Baird	Chairman
WV Association of Conservation Districts	Gary Sawyers	President
WV Conservation Agency	Brian Farkas	Executive Director
	Jean Conley	Supervisor Monongahela Conservation District
WV Department of Agriculture	Joe Hatton	Deputy Commissioner
	Kent Leonhardt	Commissioner of Agriculture
	Matt Monroe	Environmental Programs
	Norm Bailey	Chief of Staff
WV Department of Health and Human Resources	Rick Hertges	Onsite Sewage Program Coordinator
WV DEP-Division of Water & Waste Management	Scott Mandirola	Director
WV Division of Natural Resources	Danny Bennett	Coordination Biologist
	Dave Truban	Commissioner (Past)
WV Farm Bureau	Charles Wilfong	President
	Denis Funk	Board Member
	Steve Butler	Administrator- Secretary-Treasurer
	Michael Morris	President Board of Directors
WV House of Delegates	Evan Hansen	Delegate Monongalia County
WV Poultry Association	Dale Walker	President
	Emily Funk	Executive Secretary
WV Resource Conservation & Development Association	Joe Gumm	Representative



State Technical Committee Member List (Continued)		
Agency / Organization	Contact	Title
WV Rural Water Association	Lewis Baker	Source Water Protection Specialist
WV Division of Environmental Protection - Division of Water & Waste Management	Teresa Koon	Assistant Director
WVU College of Law Land Use and Sustainability Law Clinic	Jason Walls	Land Conservation Attorney
	Kat Garvey	Director
WVU Davis College of Agriculture and Natural Resources and Design	Dr. David W. McGill	Extension Specialist Forest Resources Mgt.
	Mike Strager	Professor of Resource Economics
WVU Extension Service	Ronnie Helmondollar	Program Director -Agriculture & Natural Resources
	Tom Basden	Extension Specialist
WVU Natural Resource Analysis Center	Jackie Strager	Assistant Director for Technical Services
	Paul Kinder	Director

State Urban and Community Forestry Council Member List		
Agency / Organization	Contact	Title
WV Division of Forestry	Director, Tom Cover	State Forester
	Bob Hannah	Urban Forestry Coordinator
	Sam Adams	Urban Forester
	Andy Sheetz	Partnership Coordinator
Appalachian Power	Chair, Phil Ross	Regional Forestry Manager
Morgantown Tree Board	Vice-Chair, Dan Brown	Certified Arborist
West Virginia University	Greg Dahle	Arboriculture Professor
West Virginia State University	Liz Moss	Urban Forestry Extension Agent
Cacapon Institute	Frank Rodgers	Executive Director
Allegheny Power	Todd Revello	Forester
Trees 101	Shawn Walker	Consulting Arborist
Parkersburg Tree Commission	Craig Minton	Chairman/Forester
Parkersburg Tree Commission	Turner Sharp	Forester
City of Morgantown	Scott Cline	Municipal Arborist
USDA Forest Service	Julie Mawhorter	Mid-Atlantic Urban & Community Forestry Coordinator



State Tree Farm Committee Member List		
Agency / Organization	Contact	Title
WV Division of Forestry	Bill Pownell	Regional Forester
Private Landowner	Gary Young	Landowner
WV Division of Forestry	Charles Copeland	Assistant State Forester
Private Landowner	Cinda Francis	Landowner
Pixelle Specialty Solutions	Joseph Garrett	Forestry Technician
WVU Appalachian Hardwood Center	Dave McGill	Forest Resources Extension Specialist
Consulting Forester	Terry Jones	Consultant
WestRock Corporation	Randall Johnson	Forester
Sentinel Forestry	James Mitchell	Forester
USDA Forest Service	Amy Hill	State and Private Forestry
WV Forestry Association	Eric Carlson	Executive Director
WV Division of Forestry	L. R. "Rudy" Williams, II	Regional Forester
Weyerhaeuser Corporation	Jimmy Jenkins	Forester
Consulting Forester	Rick Persinger	Forester
Private Landowner	John Cobb	Landowner
Consulting Forester	Russ Richardson	Consulting Forester
USDA NRCS	Kyle Aldinger	Resource Conservationist
Coastal Timberlands	Ed Kraynok	Forester
Am. Forest Foundation	Kaytlyn Brinkman	Northeast Tree Farm Manager

3. Acronyms

AFHA	Appalachian Forest Heritage Area	CVNWR	Canaan Valley National Wildlife Refuge
AFT	American Farmland Trust	CWPMA	Cooperative Weed and Pest Management Area
AHC	Appalachian Hardwood Center	CWPP	Community Wildfire Protection Plans
ALB	Asian Long-horned Beetle	CWS	Community Water Systems
AON	Assessment of Need	DBH	Diameter Breast Height
APCW	Ability to Produce Clean Water	DC	District Conservationist (NRCS)
APHIS	Animal and Plant Health Inspection Service	DOH	Division of Highways
ARC	Appalachian Regional Commission	DOT	Department of Transportation
ARRI	Appalachian Regional Reforestation Initiative	EAB	Emerald Ash Borer
ATFS	American Tree Farm System	EBI	Environmental Benefits Index
BA	Basal Area	EI	Erosion Index
BBD	Beech Bark Disease	ELP	Environmental Literacy Plan
BLS	Bacterial Leaf Scorch	EO	Executive Order
BMPs	Best Management Practices	EPA	Environmental Protection Agency
BTU	British Thermal Unit	EQIP	Environmental Quality Incentives Program
CAPS	Cooperative Agricultural Pest Survey Program	ESRI	Environmental Systems Research Institute
CARS	Community Accomplishment Reporting System	FCC	Federal Communication Commission
CBP	Chesapeake Bay Program	FCIC	Farm Crop Insurance Corporation
CBSA	Core Based Statistical Area	FFA	Future Farmers of America
CBYC	Call Before You Cut	FFO	Family Forest Owners
CDP	Census Designated Place	FFY	Federal Fiscal Year (October 1 - September 30)
CE	Conservation Education	FHTET	Forest Health Technology Enterprise Team
CEAP	Conservation Effects Assessment Project	FIA	Forest Inventory and Analysis (USDA Forest Service)
CEC	Conservation Education Council	FIP	Forestry Incentives Program
CFFP	Cooperative Forest Fire Protection	FLA	Forest Legacy Area
CFHM	Cooperative Forest Health Management	FLEP	Forest Land Enhancement Program
CFHP	Cooperative Forest Health Protection	FLIS	Forest Legacy Information System
CFM	Cooperative Forest Management	FLN	Fire Learning Network
CIG	Conservation Innovation Grants	FLP	Forest Legacy Program
CNC	Computer Numerical Control	FMRC	Forest Management Review Commission
CO2	Carbon Dioxide	FOTG	Field Office Technical Guide
CP	Conservation Practice	FRA	Forest Resource Assessment
CREP	Conservation Reserve Enhancement Program	FRPC	Forest Resource Planning Committee
CRP	Conservation Reserve Program	FRPP	Farm and Ranch Lands Protection Program
CSCL	Cooperative State-County-Landowner Program	FSA	Farm Service Agency (USDA)
FSC	Forest Stewardship Council	GIS	Geographic Information System
FWAP	Forest Water and People	GMCS	Gypsy Moth Cooperative Suppression
FY	Fiscal Year	NGO	Non-Governmental Organization



GRP	Grasslands Reserve Program	NHD	National Hydrography Dataset
GPRA	Government Performance and Results Act	NHLA	National Hardwood Lumber Association
GSC	Glenville State College	NHP	Natural Heritage Program
GWNF	George Washington National Forest	NIC	National Information Center
HAZ	Hardwood Alliance Zone	NICE	Nature Watch, Interpretive Services, and Conservation Education Database
HELC	Highly Erodible Land Conservation	NIDRM	National Insect and Disease Risk Map
HFRP	Healthy Forest Reserve Program	NIPF	Non-Industrial Private Forestland
HML	High / Medium / Low	NLCD	National Land Cover Database
HUC	Hydrologic Unit Code	NNIS	Non-Native Invasive Species
HWA	Hemlock Woolly Adelgid	NNL	National Natural Landmark
IITF	International Institute for Tropical Forestry	NOAA	National Oceanic and Atmospheric Administration
IMPER	Impervious Percent	NPS	National Park Service (USDI)
IPM	Integrated Pest Management	NRA	National Recreation Area
ISA	International Society of Arboriculture	NRCS	Natural Resources Conservation Service (USDA)
ISEP	Invasive Species Eradication Program	NRI	National Research Initiative
JNF	Jefferson National Forest	NRS	Northern Research Station (USDA Forest Service)
kWh	Kilowatt-hour	NVC	National Vegetation Classification
LBAM	Light brown Apple Moth	NWCG	National Wildfire Coordinating Group
LFW	Local Fire Warden	NWI	National Wetlands Inventory
LOA	Landowner Assistance	NWR	National Wildlife Refuge
LSCA	Logging Sediment Control Act	NWTF	National Wild Turkey Federation
LWG	Local Working Group	ORBCRE	Ohio River Basin Consortium for Research and Education
MACE	Mid-Atlantic Conservation Education Cooperative	ORINWR	Ohio River Islands National Wildlife Refuge
MCF	Thousand Cubic Feet	SGCN	Species of Greatest Conservation Concern
MMBF	Million Board Feet	STC	State Technical Committee
MNF	Monongahela National Forest	TIMO	Timberland Investment Management Organization
MORWOOD	Mid-Ohio River Valley Woody Biomass Project	TMDL	Total Maximum Daily Load
MOU	Memorandum of Understanding	TNC	The Nature Conservancy
MP	Management Prescription	TRI	Toxic Release Inventory (EPA)
MRLC	Multi-Resolution Land Characteristics Consortium	TSI	Timber Stand Improvement
NMWSA		TSP	Technical Service Provider
NAD	North American Datum	U&M	Utilization and Marketing
NASF	National Association of State Foresters	UCF	Urban and Community Forestry
NASS	National Agricultural Statistics Service	UFORE	Urban Forest Effects
NCLB	No Child Left Behind	UFS	Urban Forest Sustainability
NCLI	No Child Left Inside	US	United States
USACE	United States Army Corps of Engineers	USFS	United States Forest Service (USDA)
USDA	United States Department of Agriculture	USFWS	United States Fish and Wildlife Service (USDI)
USDI	United States Department of Interior	USGS	United States Geological Survey



UTC	Urban Tree Canopy		
UTM	Universal Transverse Mercator (coordinate system)		
VFA	Volunteer Fire Assistance		
VFD	Volunteer Fire Department		
WC	Wetland Conservation		
WebDET	Website Data Entry Tool		
WERC	Wood Education and Resource Center		
WFSI	Wildland Fire Susceptibility Index		
WHIP	Wildlife Habitat Incentives Program		
WinDET	Windows Data Entry Tool		
WMA	Wildlife Management Area		
WOA	Woodland Owners Association		
WRA	Wildfire Risk Assessment		
WREP	Wetlands Reserve Enhancement Program		
WRP	Wetlands Reserve Program		
WTC	Wood Technology Center		
WUI	Wildland Urban Interface		
WVCA	West Virginia Conservation Agency		
WVCEC	West Virginia Conservation Education Council		
WVDA	West Virginia Department of Agriculture		
WVDE	West Virginia Department of Education		
WVDEP	West Virginia Department of Environmental Protection		
WVDHHR	West Virginia Department of Health and Human Resources		
WVDNR	West Virginia Division of Natural Resources		
WVDO	West Virginia Development Office		
WVDOF	West Virginia Division of Forestry		
WVDOP	West Virginia Division of Personnel		
WVDOT	West Virginia Department of Transportation		
WVEEA	West Virginia Environmental Education Association		
WVFA	West Virginia Forestry Association		
WVGES	West Virginia Geologic and Economic Survey		
WVHAZ	West Virginia Hardwood Alliance Zone		
WVMA	West Virginia Manufacturers Association		
WVOT	West Virginia Office of Technology		
WVSU	West Virginia State University		
WVU	West Virginia University		
WVWF	West Virginia Wildlife Federation		
YEP	Youth Environmental Program		

4. Documentation of the Public Involvement Process, Issues Identified by WV Forest Stewardship Committee and in the Public Involvement Process, Analysis of the Issues Raised, and Explanation of How the Issues were Addressed.

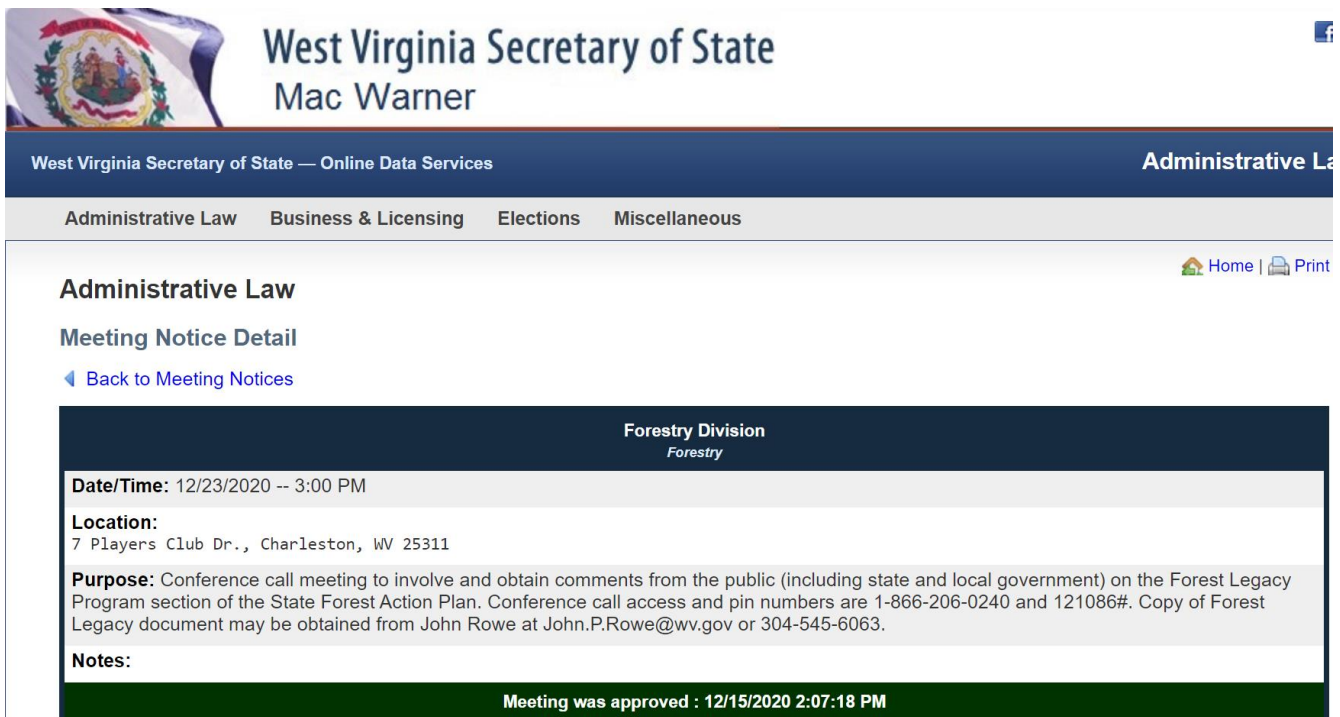
The Forest Legacy Program Assessment of Need for West Virginia that incorporated into the State Forest Action Plan was sent to the WV Forest Stewardship Committee and the WV State Technical Committee for Review and Comment.

Public comments including but not limited to State and Local government were solicited using the WV Secretary of State's (WVSOS) website public meeting notice tool and procedures from the West Virginia Open Governmental Proceedings Law and the WVSOS Procedural Rule on Meeting Notice, .

The meeting notice that was posted on the Secretary of State's website is included below.

The WVSOS website, WVSOS Procedural Rule, and The Open Governmental Proceedings Law provided the mechanism for public involvement, as a result NEPA was not needed.

The Issues that were identified by the US Forest Service are also included.



The screenshot displays the official website of the West Virginia Secretary of State, Mac Warner. The header includes the state seal and the text "West Virginia Secretary of State Mac Warner". Below this is a navigation bar with links to "Administrative Law", "Business & Licensing", "Elections", and "Miscellaneous". The "Administrative Law" section is active, showing a "Meeting Notice Detail" for the Forestry Division. The notice is dated 12/23/2020 at 3:00 PM and is located at 7 Players Club Dr., Charleston, WV 25311. The purpose of the meeting is to involve and obtain comments from the public on the Forest Legacy Program section of the State Forest Action Plan. The notice also provides contact information for John Rowe and a link to the Forest Legacy document. The meeting was approved on 12/15/2020 at 2:07:18 PM.

West Virginia Secretary of State — Online Data Services

Administrative Law | Business & Licensing | Elections | Miscellaneous

Administrative Law

Meeting Notice Detail

[Back to Meeting Notices](#)

Forestry Division
Forestry

Date/Time: 12/23/2020 -- 3:00 PM

Location:
7 Players Club Dr., Charleston, WV 25311

Purpose: Conference call meeting to involve and obtain comments from the public (including state and local government) on the Forest Legacy Program section of the State Forest Action Plan. Conference call access and pin numbers are 1-866-206-0240 and 121086#. Copy of Forest Legacy document may be obtained from John Rowe at John.P.Rowe@wv.gov or 304-545-6063.

Notes:

Meeting was approved : 12/15/2020 2:07:18 PM



The Issues that were identified are listed below in black. Analysis and explanations of how the issues were addressed are listed below in red.

1. Need Original Assessment of Need Approval Date of December 2003. – **Added**
2. Need to clarify that WVDOF uses the State Grant Option and is the sole holder of lands and interests in lands – **Added to State Project Evaluation and Prioritization Process**
3. The Chesapeake Conservation Partnership Conservation Atlas could provide Beneficial Information – **Landowners could use the information when completing applications – It was added to the State Project Evaluation and Prioritization Process in the Landowner application section.**
4. Forest Legacy cannot by itself address the many competing land uses – **Clarification was needed - The Forest Legacy Program Assessment of Need that has been incorporated into the State Forest Action Plan explains how the Forest Legacy Program can do its part to address the Competing Land Uses issue while keeping significant Forest Land from being converted to non-forest uses, as well as keeping tracts from being parcelized and subdivided, within the priority areas identified. Competing Land uses has been included as an issue in the State Forest Action Plan because of threats to West Virginia's Forest Resources that are associated with it. - The second and third paragraphs of the AON were modified.**
5. National Forest Proclamation Boundaries - **Standard procedure is to obtain letters of support from National Forest Supervisors', when properties are located within Proclamation Boundaries of National Forests, as required by USFS Forest Legacy Program Staff. These letters are submitted along with FLIS Project Briefs when WVDOF competes for federal Forest Legacy Funding. - No change was made to the document.**
6. TIMO / REIT out sales / Diverse funding Streams / Lack of Reforestation on Mined Land (see quotes below) – **The information is beneficial. – The Conversion to Non-Forestry Use and Mineral Extraction Sub-Issue sections were modified.**

“My observation on the TFG/Heartwood out-sales should not be unique to that one company. Similar entities that have 8-12-year investment fund horizons roll out to return investment capital on predictable cycles. If the timber and other land leases (e.g. hunting) are not providing yield in a portfolio sale then the investment funds traditionally look to enhance that return by sorting through and finding HBU/retail out-sales that can improve the residual managed timber portfolio value (by culling out poor site index or hard to harvest parcels for example) or by selling to retail buyers (commercial, recreational or second home buyers) at a higher per acre price that bumps up the average fund yield. Either way fragmentation can occur.

The conservation community is not perfect here. We have tried to address the fragmentation and carrying cost issue by acquiring large portfolios, placing non-development working forest easements, and then pivoting back to conservation agency or private timberland investors at a reduced cost. But we

cannot buy everything, and we are often also selective in our projects by picking up the best habitat or best stocked forests, leaving behind in some cases the cats and dogs to the private market.

I think the main issue here is finding and developing diverse revenue streams that can align and help to carry the value of large working forest projects. Outdoor recreation, renewable energy, carbon, overlanding trails, watershed protection, mitigation ... it's better to have a mix of these to provide financial resilience.”

“Timber companies, TIMOs, REITs, land companies, etc. are looking for conservation outcomes as part of exit strategies on properties. The economics are changing fast. We need to recognize that land ownership patterns are changing and evolving. There are new non-traditional partners such as surface mining and energy companies now looking at recreational development, solar development, etc. The threat of breaking up forest blocks is changing now that value of coal is going away. Timber, solar, recreation, communications towers, etc. will play a more important role in the future. Diversification is needed for revenue in the future. Some large landowners developing trail heads. We should try to connect them together. Wind and solar and leasing don't change the property for the long term. If the parcels get broken up, it changes the property for the long term. It costs the state money when the infrastructure is in place and it does not get used. When new buildings go up on newly parcelized properties, existing buildings sit unused. There are a lot of post mined land uses. Currently it is easy to walk away from reforestation commitments. Solar conversion of agricultural land seems to be a problem in Virginia. Hopefully in WV, solar will be focused on flat mined land. Carbon may provide an economic incentive for reforestation on mined land to occur. It can be very expensive to reforest mined land. Heartwood Forest Land Fund sells some of its land off for development / subdivision (about 10% of it) to get part of their money back. Some of the fragmentation on corporate lands may be from gas wells as well as a lack of reforestation of mined land.”

7. What about aggregating large parcels into Forest Legacy Projects? – **Multi-tract Projects are allowed by the Forest Legacy Program and are allowed by the AON. – No changes were made to the document.**
8. How do we handle unrecorded timber deeds and carbon agreements? Unrecorded carbon agreements usually run with the land. – **WVDOF's attorney handles this on a project specific basis. – No changes were made to the document.**
9. Would the amount of unrecorded carbon agreements affect the GIS Analysis – **WVDOF does not have and has not been able to obtain any GIS data for unrecorded carbon agreements. – No changes were made to the GIS analysis and the document.**
10. A CoreLogic data set for large landowners with parcels or contiguous tracts that were at least 1,000 acres in size was provided for possible inclusion in the GIS analysis. – **The CoreLogic data set wasn't as current when compared to actual 2020 WV State Tax Department data. – No changes were made to the GIS Analysis or the document**

11. Natural Gas pipeline Rights-of-Way result in loss of core forest – Additional explanation needed in the Fragmentation and Parcelization Sub-Issue. – **A reference to Natural gas Pipeline rights-of-way was added to help explain the loss of core forest on corporate lands.**
12. Clarification of B Ranks needed in GIS data layer explanation and FLA Data Comparison Table (Table 1.4) – **Clarification provided by WVDOF GIS Manager.**
13. Reference to Surface Mining Control and Act Needed. – An Explanation that post mining reforestation is not mandatory is needed. – **Reference and Explanation added to Mineral Extraction Sub-issue.**
14. FLA 1 – Need to reference to federally endangered flat spired three tooth land snail and rust batched bumble bee – **Added**
15. FLA 3 Allegheny Mountains – Add explanation that FLA 3 is of significant importance to federally listed and imperiled bats, as it contains both known summer use areas as well as numerous significant hibernacula. Federally endangered candy darter streams and designated critical habitat are also present in this FLA. - **Added**
16. FLA 3 Allegheny Mountains – Should mention golden winged warbler and should mention private lands partnerships (Working Lands for Wildlife, etc.) – **A reference to golden winged warbler was added to the FLA description. An FLA goal was added for golden winged warbler. Private lands partnerships such as Working Lands for Wildlife should be compatible with the FLP but were not specifically mentioned because project specific legal reviews appear to be necessary to make sure that they are compatible with the FLP.**
17. FLA 4 Greenbrier / New River – same comment on golden winged warbler as for FLA 3 – **same edits made to FLA 4 as were made to FLA 3.**
18. FLA 4 Greenbrier / New River – Diamond back rattlesnakes do not occur in WV. WV has Timber Rattlesnakes. WVDNR does not recommend mentioning metapopulation of rattlesnake and green salamander. – **The references to metapopulations of the Eastern diamondback rattlesnake and green salamander were deleted.**
19. FLA 5 Southern Coalfields – This FLA is home to the WV endemic, federal endangered Guyandotte River crayfish and the federally threatened Big Sandy crayfish. Proposed habitat for both species has been proposed by the US Fish and Wildlife Service to provide forest land cover suitable for maintaining water quality for these two species. – **A reference to both species and the proposed critical habitat were added to the FLA description.**
20. FLA 5 Southern Coalfields - Should mention cerulean warbler and should mention private lands partnerships (Working Lands for Wildlife, etc.) - **A reference to cerulean warbler was added to the FLA description. An FLA goal was added for cerulean warbler. Private lands partnerships such as Working Lands for Wildlife should be compatible with the FLP but were not specifically mentioned because project specific legal reviews appear to be necessary to make sure that they are compatible with the FLP.**
21. WVDOF FLP Fee acquisition projects could provide public recreation opportunities in Southern and Central WV to for motorized recreation. – **Motorized recreation is permitted by the FLP. – No changes were needed to the document.**

22. Use the combined well site and road footprint of 15 +/- acres in Mineral Extraction – **Change Made**
23. Forest Legacy projects that provide motorized recreation benefit more than just tourism, they can positively impact economic development – **FLP fee acquisition purchases that are used for motorized recreation provide incentive for businesses such as restaurants, gas stations, convenience stores, and motels to open. These businesses in turn could potentially provide jobs for those who have become unemployed because of Covid 19. Forest management and Forest harvesting that is conducted in accordance with multi-resource plans on FLP Fee acquisitions and conservation easements also provide employment opportunities in the forest products industry. – No changes had to be made to the document.**
24. It is possible for motorized and non-motorized recreation to co-exist on the same properties. - **No changes had to be made to the document. Motorized and non-motorized recreation, if conducted on the same property would need to be part of the Multi-Resource Plan.**
25. Allowing projects that include small tracts that fit together strategically gives us more options. - **The document allows us to seek funding for smaller tracts that that adjoin or strategically fit as well as for large tracts. – No changes had to be made to the document.**
26. Staff and funding are needed to maintain trails. Volunteers can normally only maintain small sections of trail. – **The document does not prevent WVDOF from partnering with the Hatfield and McCoy and Rimfire Trail Systems that will have staff, heavy equipment, and provisions for law enforcement. It also does not prevent WVDOF from developing its own recreational staff, acquiring equipment, and provisions for law enforcement. If public motorized and / or non-motorized recreational access is provided by WVDOF on a fee acquisition project or if it is voluntarily provided by private landowner on an FLP conservation easement, then the WVDOF FLP will need to develop specific policies, procedures, and requirements that include but are not limited to trail maintenance and law enforcement. - The project readiness section was modified to clarify that if public motorized and / or non-motorized recreational access is provided by WVDOF on a fee acquisition project or if it is voluntarily provided by private landowner on an FLP conservation easement, then WVDOF FLP will need to develop specified policies, procedures, and requirements.**
27. Clarify that it is working forests that are being protected in the FLA 3 description. Is there a conflict with increasing the scale and pace of management on NFS lands? - **Clarification is provided. - There is not a conflict with increasing the scale and pace of management on NFS lands. Since only 46.3 % of the FLA is in private ownership, the AON actually demonstrates the need for increasing the scale and pace of management of NFS lands. Increased management of NFS lands and increased protection of private working forest land can occur at the same time.**
28. Delete Lake Sherwood from the FLA 3 description and add the Snowshoe Highland IMBA Ride Center. – **The changes were made.**
29. Add Lake Sherwood, Blue Bend Recreation Area, Big Draft Wilderness and Spiced Run Wilderness to the FLA 4 description were made – **The changes were made.**



30. Who in the US Forest Service is responsible for review of proposed Forest Legacy Projects? -
The USFS FLP Staff review proposed FLP projects. - Clarification is provided in the State Project Evaluation and Prioritization Process.
31. Obtain additional citations or references. Make the AON more like a scientific journal article. –
A review of the USFS requirements was conducted to determine if additional references were needed or if the AON had to be prepared like a scientific journal article. No such requirements were found. - No changes were made to the AON.
32. Climate Change – A carbon storage layer was added to the GIS Analysis.
33. ***Stakeholders are involved in forest certification programs. Are stakeholders involved in the same way for Forest Legacy Projects? – There is not an FLP requirement for forest certification so stakeholders would be involved in the same way if landowners voluntarily choose certification.***