WEST VIRGINIA STATEWIDE FOREST RESOURCE ASSESSMENT

Prepared by the West Virginia Division of Forestry
June 14, 2010

WEST VIRGINIA STATEWIDE FOREST RESOURCE ASSESSMENT
A comprehensive analysis of the state's forests and related natural resources
June, 2010

Produced by:
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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.

The following WVDOF employees and Clark Haynes of the West Virginia Department of Agriculture (WVDA) had primary responsibility for taking stakeholder and WVDOF input, gathering best available data and information, and identifying issues and sub-issues for this Assessment:

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Dan Kincaid…...Assistant State Forester (Issue 3)
Jeremy McGill...Assistant State Forester (Issue 4)
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Linda Carnell ……Forestry Specialist (Issue 2)
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Greg Cook……...Deputy State Forester, and
Shawn Grushecky...West Virginia University (Issue 8)

The Geographic Information System (GIS) analysis for this document was completed by **Steve Harouff**, WVDOF GIS Specialist, with the exception of the Forest Health GIS analysis, which was done primarily by WVDA GIS Specialist, **Shawn McCauley**.

The Conditions and Trends section was compiled by Jeremy McGill; the Multi-State Projects and Collaboration with Others sections by Dan Kincaid; and the Appendix items by Steve Harouff. Additional input for Issue7: Forest Health was provided by Jill Rose, Forest Pathologist, WVDA, and Tim Tomon, Forest Entomologist, WVDA.

Editing responsibilities were completed by West Virginia University (WVU) employees Shawn Grushecky, Stuart Moss, Larry Osborn, and Christopher Stewart, and WVDOF employees Dan Kincaid and Steve Harouff. Leslie Fitzwater, WV Department of Commerce, assisted with editing of Issue 2: Communications and Education.

Coordination responsibilities for completion of this document were handled by Dan Kincaid and Steve Harouff.

Oversight of this Assessment project was accomplished by State Forester, **Randy Dye**.

Cover photo: ***Fall Scene in Summers County, West Virginia*** – Steve Shaluta, WV Department of Commerce.

See Appendix for a list of the most frequently used acronyms and abbreviations used in this document.

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.

USDA United States Department of Agriculture | Forest Service | Washington Office | 1400 Independence Avenue, SW Washington, DC 20250

File Code: 3000-4
Date: AUG 2 0 2010

C. Randall Dye
State Forester
WV Division of Forestry
1900 Kanawha Boulevard, East
Charleston, WV 25305

Dear Randy,

I want to personally congratulate you and your staff on delivering your statewide forest resource assessment and strategy. On behalf of Secretary Vilsack and Chief Tidwell, I officially approved your documents as meeting the requirements of the Farm Bill on August 6, 2010.

Collectively, the assessments and strategies provide a blueprint for the future of forest management in the continental United States and its associated islands and territories. Identifying forest conditions and trends, along with priority issues and landscapes, sets the stage for states and partners to leverage resources on strategic investments that will benefit the public and the nation's forests today and in the future.

Approval of the assessments and strategies is the beginning. The implementation phase will be ripe with opportunities for the Forest Service to work with you and your partners in exciting and innovative ways. As we proceed together to put your strategy in to action, I look forward to your thoughts on how we can continue to improve and refine our delivery of state and private forestry programs on the landscape.

Sincerely,

JAMES E. HUBBARD
Deputy Chief, State and Private Forestry

cc: Kent Connaughton, Kathryn P. Maloney

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View from Spruce Knob, highest elevation in West Virginia, looking east towards the Virginia border. (Steve Shaluta, WV Department of Commerce).

Seneca Rocks National Recreation Area, Monongahela National Forest, Pendleton County, WV. (Steve Shaluta, WV Department of Commerce).

I. Introduction / Executive Summary

This West Virginia Statewide Forest Resource Assessment (FRA) provides a general overview of forestry, forests, and related natural resources in the state. The 2008 Farm Bill requires that all states which receive federal forestry funding complete a FRA by June 30, 2010. It also requires that a statewide strategy document be prepared that will outline the general strategies to be undertaken in addressing the issues identified in this FRA.

Although each state forestry agency has considerable latitude in how its FRA is prepared, a certain amount of guidance has been provided by: the language in the 2008 Farm Bill; the National Association of State Foresters (NASF); and the Northeastern Area-State & Private Forestry branch (NA) of the USDA Forest Service.

It is important to note that this document is very much an overview. While there is considerable information provided in this FRA, 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 FRA and the strategy document that follows will provide a framework within which to do more specific planning on an annual basis.

It is also important to understand that 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 FRA 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) 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 2010. 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 assessment is very fluid and can be amended as necessary to reflect new conditions. At a minimum, the Farm Bill requires that FRAs be revised once every five years. It is expected that new items and better information will be incorporated into the assessment and strategy from time to time.

"Data gaps" have also been identified and discussed in this document. These are areas where better or more complete information is needed, or where information does not currently exist. This information will be necessary in order to adequately assess certain issues in the future.

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

- National priorities will be addressed. These include:
    - Conserving and managing working forest landscapes for multiple values and uses.
    - Protecting forests from threats.
    - Enhancing public benefits from trees and forests.

- The FRA will include a discussion of the conditions and trends of forest resources in the state, across all ownerships. (The FRA includes an entire section on this topic, based on the criteria and indicators that resulted from the Montreal Process).
- Geographic Information System (GIS) analyses will form the basis of the Assessment, but there will be considerable narrative accompaniment.
- Threats and opportunities will be identified. These are the major issues identified and addressed in the FRA.
- Priority areas for work in the state will be identified, using where possible a geospatial analysis of data and information.
- Potential multi-state projects will be identified.
- The State Forester will coordinate, communicate, and collaborate with:
    - The State Forest Stewardship Committee.
    - The State wildlife agency.
    - The State Technical Committee for the Natural Resources Conservation Service (NRCS).
    - Applicable federal land management agencies.
    - The Forest Legacy program.
    - The State Urban & Community Forestry (UCF) Council.
    - Other groups, organizations, and agencies as deemed necessary.

A section in this FRA goes into detail about the ongoing collaboration process.

- Other existing plans will be incorporated into the FRA or consulted during its compilation. Among these are:
    - Statewide Comprehensive Outdoor Recreation Plan (SCORP).
    - WV Wildlife Conservation Action Plan (WVWCAP).
    - Community Wildfire Protection Plans (CWPP).
    - State management plans. This includes integration with the new Strategic Forest Plan, which was required by West Virginia's Forest Management Review Commission (FMRC).
    - State Urban & Community Forestry Plan
- Data gaps will be identified in order to focus future information needs.
- The Assessment/Strategy will be revised by 2015.
- And, finally, the Strategy that follows this FRA will:
    - Address the issues that have been identified.
    - Describe the resources needed to carry out the strategies.

Within this FRA, 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:

- Issue 1: **Competing Land Uses (Forest Legacy)**
- Issue 2: **Communications and Education**
- Issue 3: **Sustainability of Forest Resources**
- Issue 4: **Water Quality**
- Issue 5: **Wildfire Management, Resource Protection, and Public Safety**
- Issue 6: **Sustainability of Urban Forests**
- Issue 7: **Forest Health**
- 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 third in the nation in the percentage of its total land area covered by forests (78 percent). 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 7 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 is for this assessment and accompanying strategic plan 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 WVDOF 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 WVDOF 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.

West Virginia photos, Steve Shaluta, WV Department of Commerce and Shawn Grushecky, WVU Appalachian Hardwood Center.

II. Forest Conditions and Trends

Base Indicators (and Metrics) of Forest Sustainability

The criteria, indicators and metrics in this section are outlined by the Montreal Process and are commonly used by forestry agencies as standard measures of forest sustainability. The Montreal Process came from the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. This was all a result of the original 1992 United Nations Conference on Environment and Development that was held in Rio de Janeiro, Brazil.

The most recent criteria and indicator data readily available for West Virginia forests was used in developing the charts, tables, maps, and write-ups in this section. In some cases there are significant data gaps or a lack of historical or current information. This section is only intended to introduce a general overview of the criteria. Additional information is found in Section IV of this document. More complete information should be available by 2015.

Criterion 1. Conservation of Biological Diversity

As a state with about 12 million acres of forest land, West Virginia is fortunate to have extremely varied and diverse forests, including the fauna and flora that live within these forests. The state benefits from a diverse ecology, including the red spruce, balsam fir, northern hardwoods, glades, and bogs at higher elevations; the oak hickory forests throughout the state; the white pine dominated forests of the Greenbrier River Valley and various other southern counties; and the bottomland ecosystems along major rivers including the Ohio, Monongahela, Kanawha, Potomac, and others. It is important to protect this forest resource through sustainable management. Sustainability and ecological diversity are highly intertwined. A diverse and managed forest enhances the ability of an ecosystem to respond to external influences, to recover after disturbance, and to maintain essential ecological functions. Some of the many direct benefits include:

- Sustainability of flora and fauna, and associated habitats.
- Production of clean air and water and other related environmental benefits.
- Woodland recreation and aesthetics.
- Production of over 5,000 wood products.

Landscape level assessment and planning is a key step in making sure to effectively conserve biodiversity, species, and sites. Landscapes must be assessed and managed to maintain viable

populations of all species, with a balanced and well-distributed array of habitat conditions (e.g., forest developmental and successional stages).

The indicators and metrics for Criterion One show the extent of forests and major forest types in West Virginia; trends in tree species abundance, size, and age; trends in forest developmental and successional processes; the general representation of forest habitat and species of concern; and the impacts of forest land conversion, fragmentation, and parcelization. It is important to remember that these are not exact numbers and that they come from data collected by the Census Bureau, the NRCS, and the USDA Forest Service. While based on sound scientific sampling methods, these are primarily estimates. More specific studies and in depth evaluations will be done to provide better data for future planning purposes.

1. Area of total land, forest land, and reserved forest land.

As of the year 2000, West Virginia is comprised of 15,415,400 acres of land with approximately 11,749,872 acres of timberland. Reserved (non-timber) forest land increased slightly from 2000 to present with the signing of the Wild Monongahela Act, which added 47,128 acres of Wilderness Area in the state to bring the total reserved area to 257,028 acres (Figure 1).

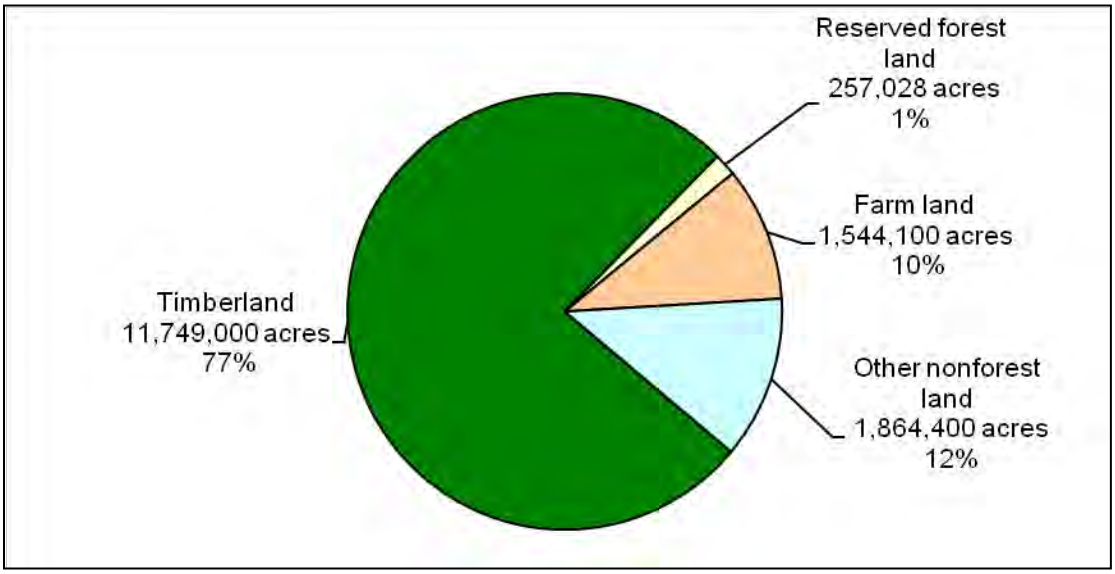
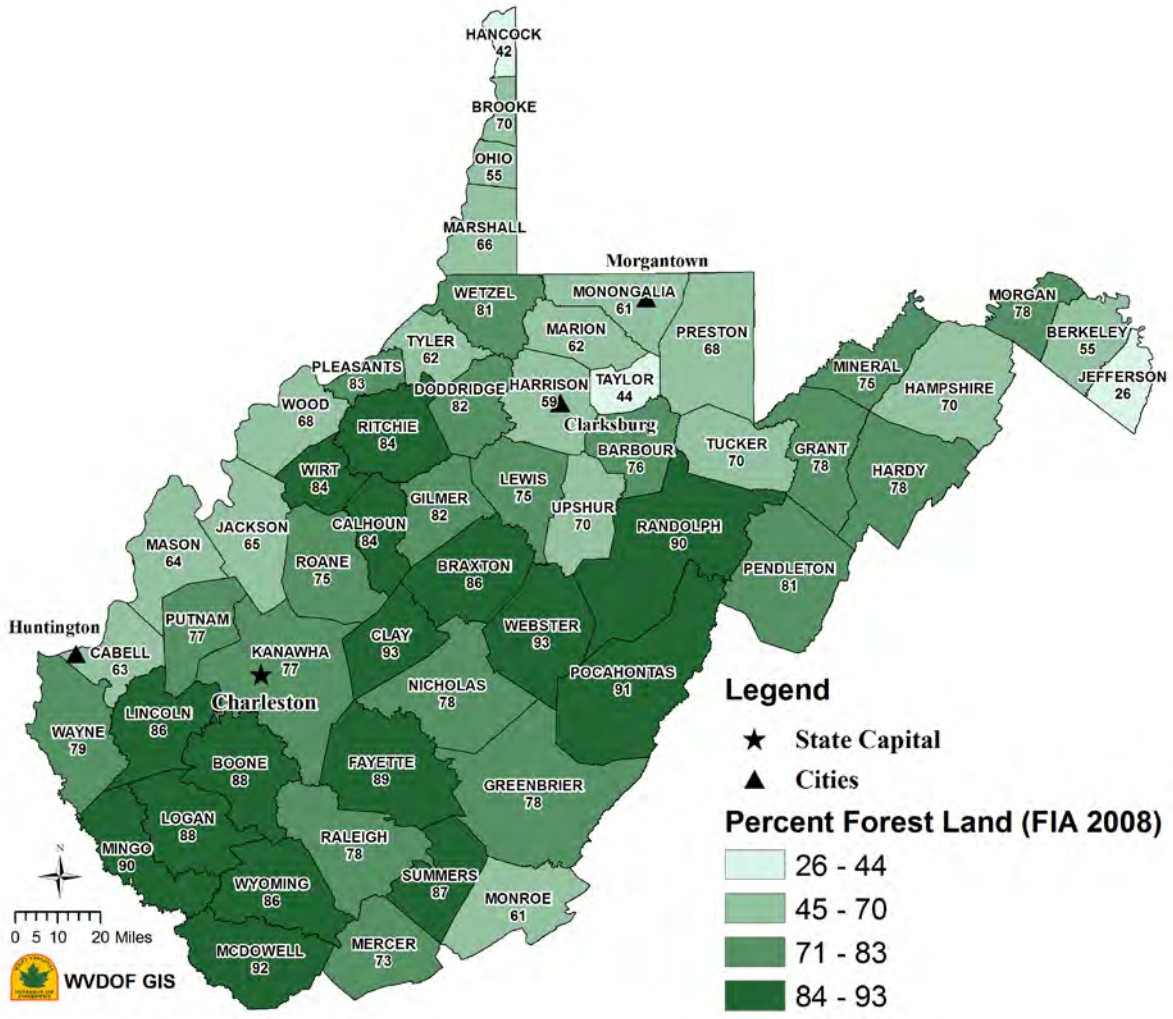


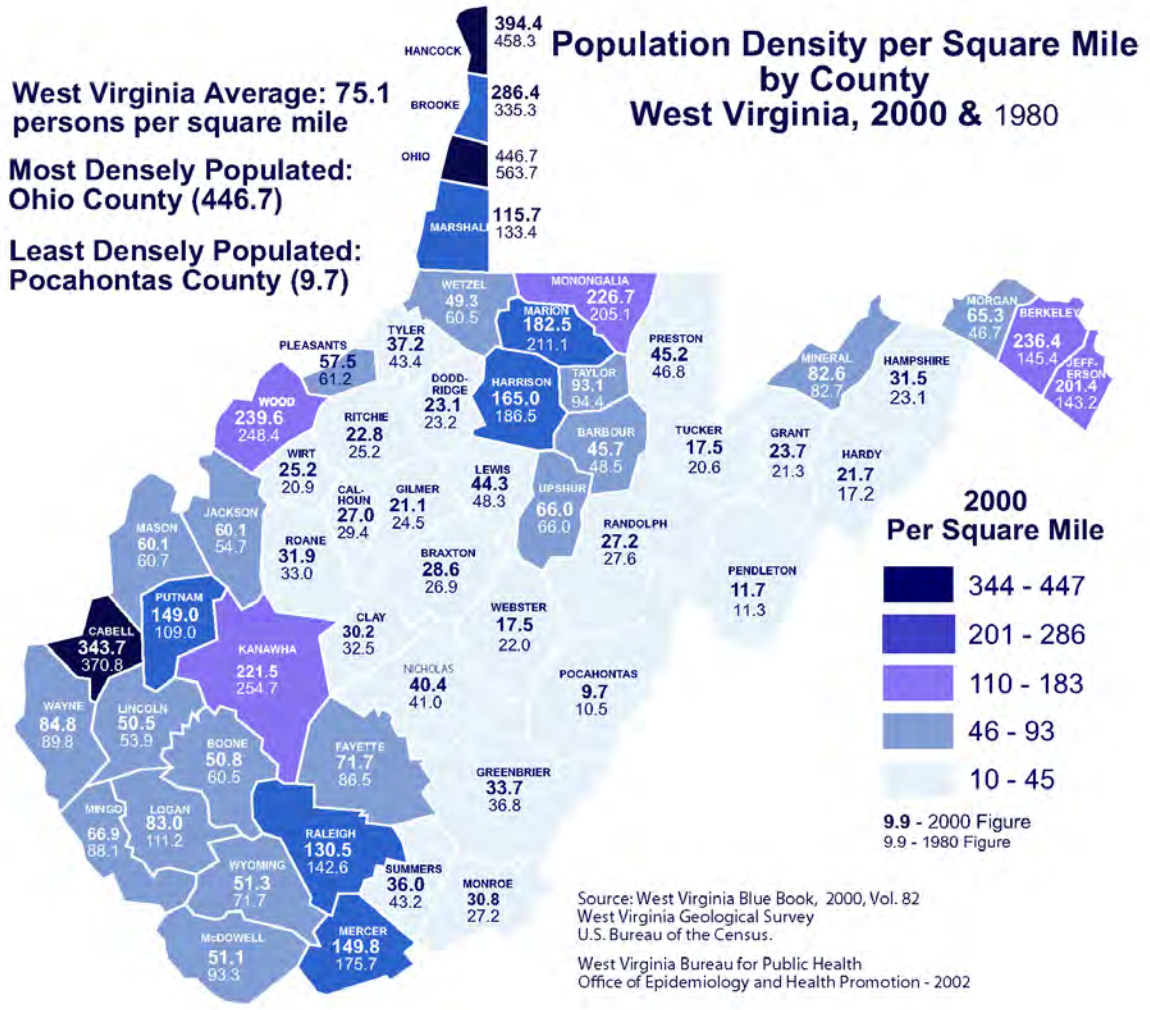
Figure 1: Area of total land, forest land, and reserved forest land (Widmann et al., 2007).

West Virginia is 78 percent forested. The counties with the highest percentage of forested land occur in the east-central and southern portions of the state (Map 1). Areas with higher urban development, and thus a lower percentage of forest land, occur in the north central counties, as well as the northern and eastern panhandles (Map 1).



Map 1: Percentage area of forest by county based on USDA Forest Service FIA 2008.

West Virginia's population has remained stable over the last 10 years. The current census estimate is approximately 1,814,468, which is a slight increase from the 2000 population of 1,808,344. The highest population densities are found in the eastern and northern panhandles, the Kanawha and Ohio River Valleys, the I-79 corridor from Morgantown to Clarksburg, and the I-64 corridor between Charleston and Huntington (Map 1). In general, with the few exceptions noted above, the state's population is sparse enough to have little impact upon the forest land base (Map 2).



Map 2: Population densities per square mile for Counties in West Virginia.

2. Forest type, size, age class, and successional stage.

The state has many different forest types. The most common are oak/hickory, northern hardwoods, oak/pine, and elm/ash/red maple. A smaller percentage of other types found in the state are the loblolly/shortleaf pine, spruce/fir, white/red pine, hemlock, and the aspen/birch groups. Most types have been stable over the last few decades with slight declines in aspen/birch, loblolly/shortleaf pine, and spruce/fir. Increases have been seen in the elm/ash/red maple, northern hardwoods, white/red pine, and hemlock forest types (Figure 2). **Note:** In West Virginia for the loblolly/shortleaf pine forest type, only shortleaf pine occurs.

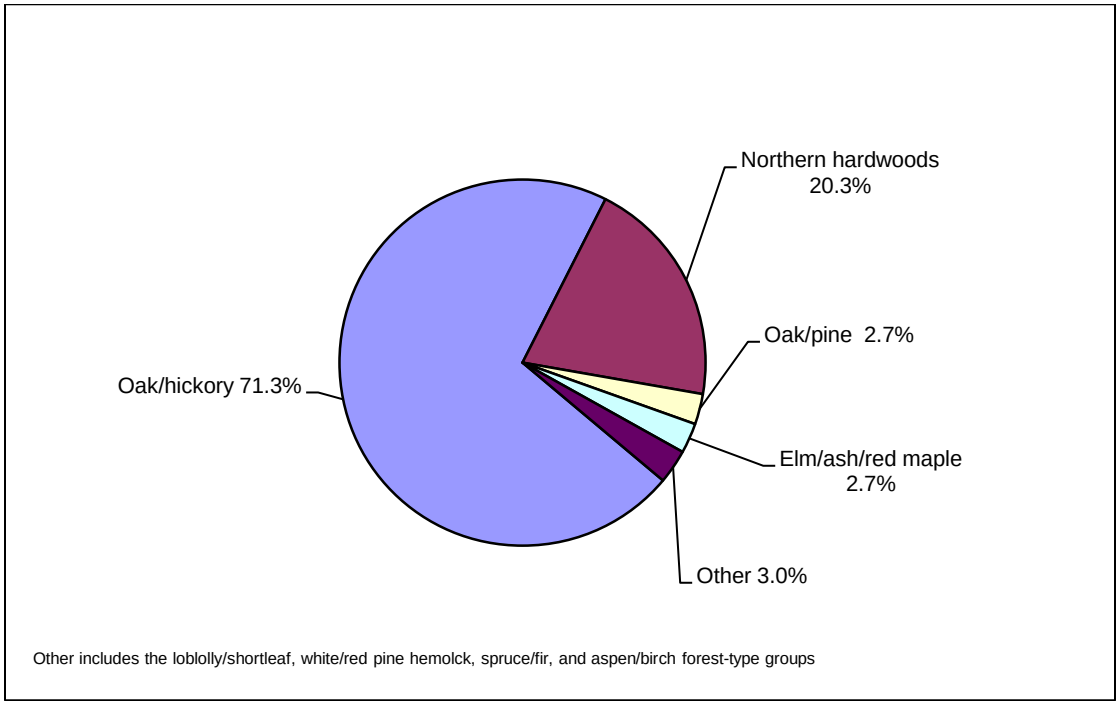


Figure 2: Composition of West Virginia's forests (Widmann et al., 2007).

Historically, the size classes in West Virginia forests have remained stable. However, since the late 1980's, forests have been moving towards larger size classes. This can be attributed to many things, but the primary reason for change is the evolution in harvest practices from more even-aged management techniques to selective harvesting and high grading. The 2009 data is not completely available at this time, but early indications are that size classes have remained similar to those found in 2000 (Figure 3).

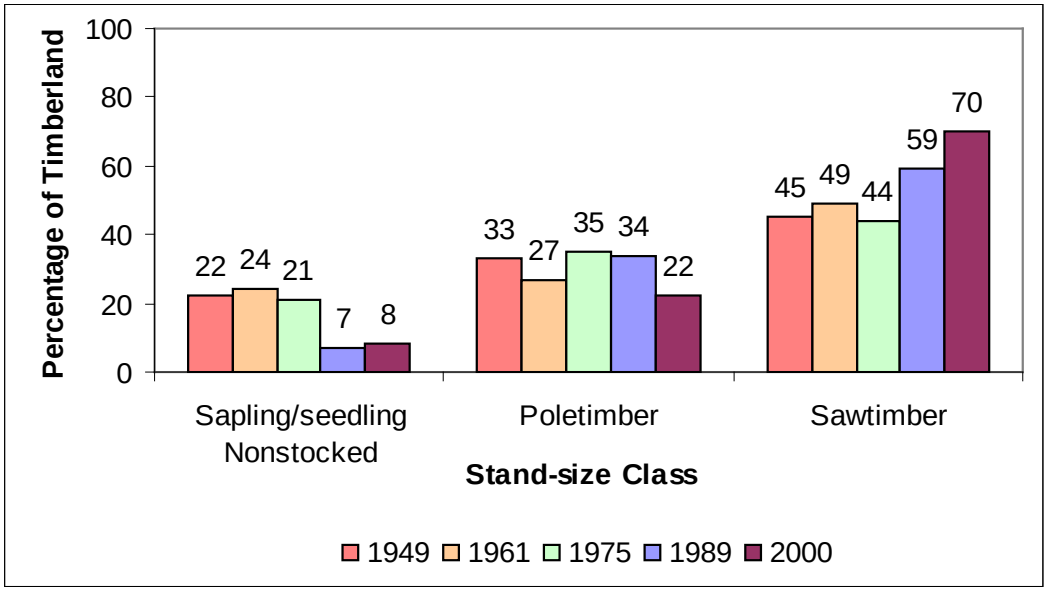


Figure 3: Summary of the percentage of WV timberland in three stand-size classes between 1949 and 2000 (Widmann et al., 2007).

The exact age class composition of West Virginia forests is difficult to estimate. In general, based on anecdotal evidence and increasing forest size classes, there are now more acres of mature forests than during the large scale harvesting at the turn of the century. A more significant trend may be developing in regards to even-age versus uneven-age stands in the forest. Traditionally, due to large scale fires and clearcut harvests the forests were primarily even-aged; but due to a shift in harvesting practices that favors shade tolerant species, more stands are becoming uneven-aged. This is also evidenced by the increase in red maple in the state. This is an area of concern many foresters and more attention will be directed toward gathering detailed data on age class distribution in West Virginia.

3. Extent of forest land conversion, fragmentation, and parcelization.

There are areas of special concern in relation to forest fragmentation due to increased development of the mineral fields within the state. There has been a significant increase in well permits to drill and develop the extensive natural gas deposits beneath the land. Well site size has increased, with some locations now requiring as much as five acres of land. Also more roads and pipelines are required to support these well sites, which further fragment the forest.

Likewise, while not new to West Virginia, the extraction of coal through surface mining poses the continued risk of conversion to non-forest use, if these areas are not properly reforested. These issues are important to the future of West Virginia and will be considered carefully in the coming years.

Development pressure in West Virginia has had more overall impact on farmland than forest land. Also, a considerable portion of agricultural land has reverted to forests over the past several decades. West Virginia gained forest land from 1949 until 1989 (Figure 4). From 1989 to present, total forested acreage has remained about the same.

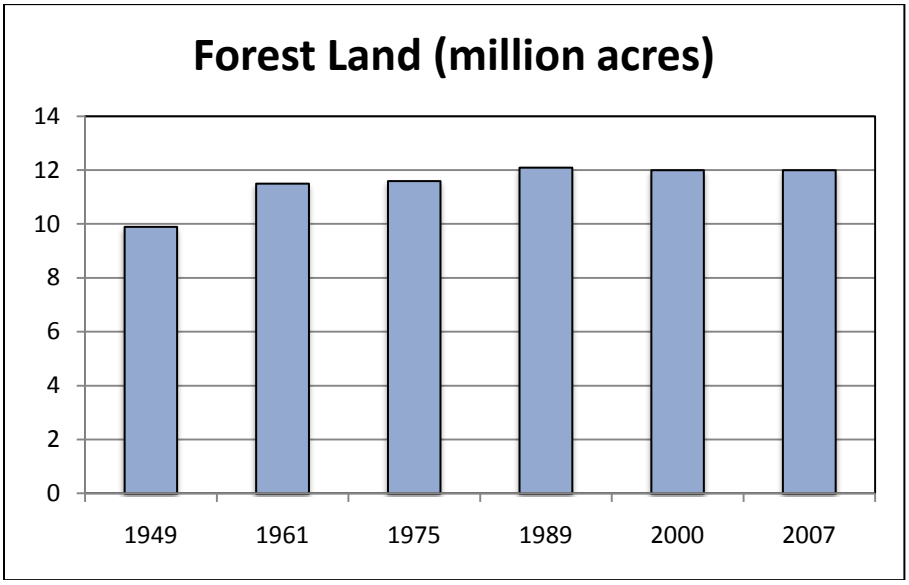


Figure 4: Total forest land acres in West Virginia as developed by USDA Forest Service FIA.

Currently, parcelization is having a significant impact on forest land in West Virginia. Of the 243,000 family forest owners in West Virginia, it is estimated that 70 percent of those own 20 acres or less of forest land (Figure 5). This is most evident in the eastern panhandle and near interstate corridors. However, there is also a trend in certain rural areas of the state where lands are being purchased by single owners to form larger contiguous parcels. So, West Virginia seems to be experiencing forest fragmentation and parcelization in some areas, while forest consolidation is occurring in other areas of the state.

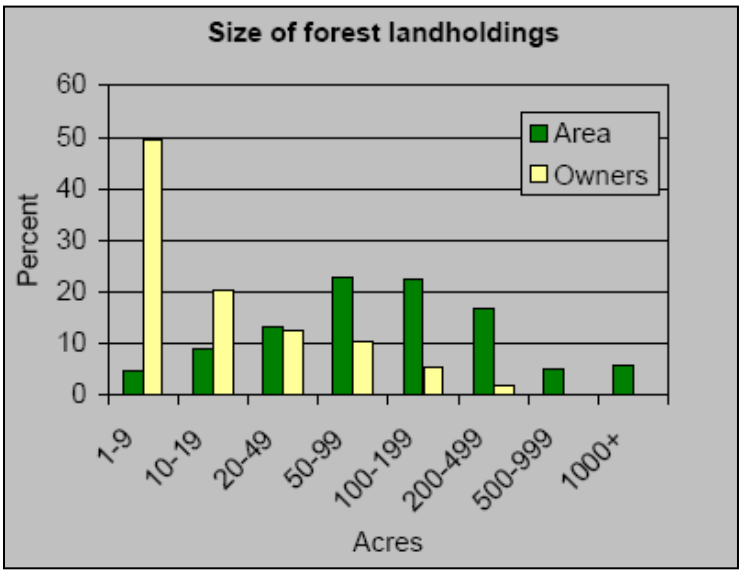


Figure 5: Forest land holdings in West Virginia by size class and by ownership percentage (WV Tax Department, 2006).

Despite the parcelization that is occurring in many areas of the state, the majority of West Virginia forests are still over 100 acres in size. By 2015, more accurate data will be available on the forest parcelization issue, as well as better information on the consolidations that are occurring in the more rural areas of the state.

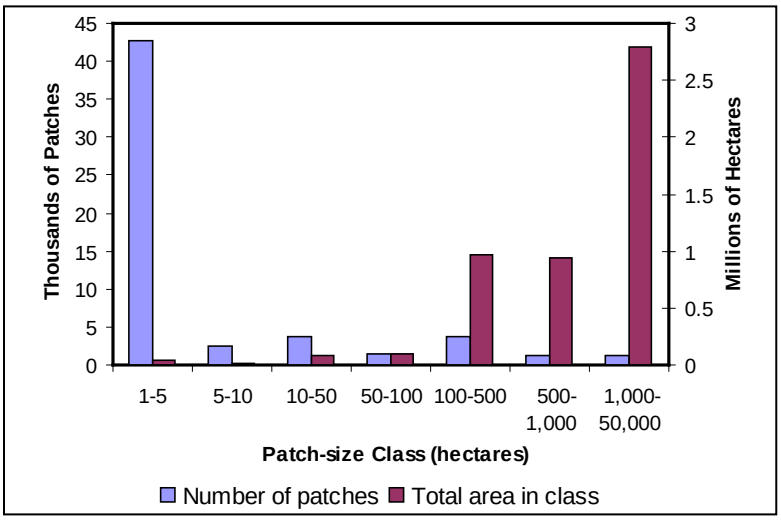
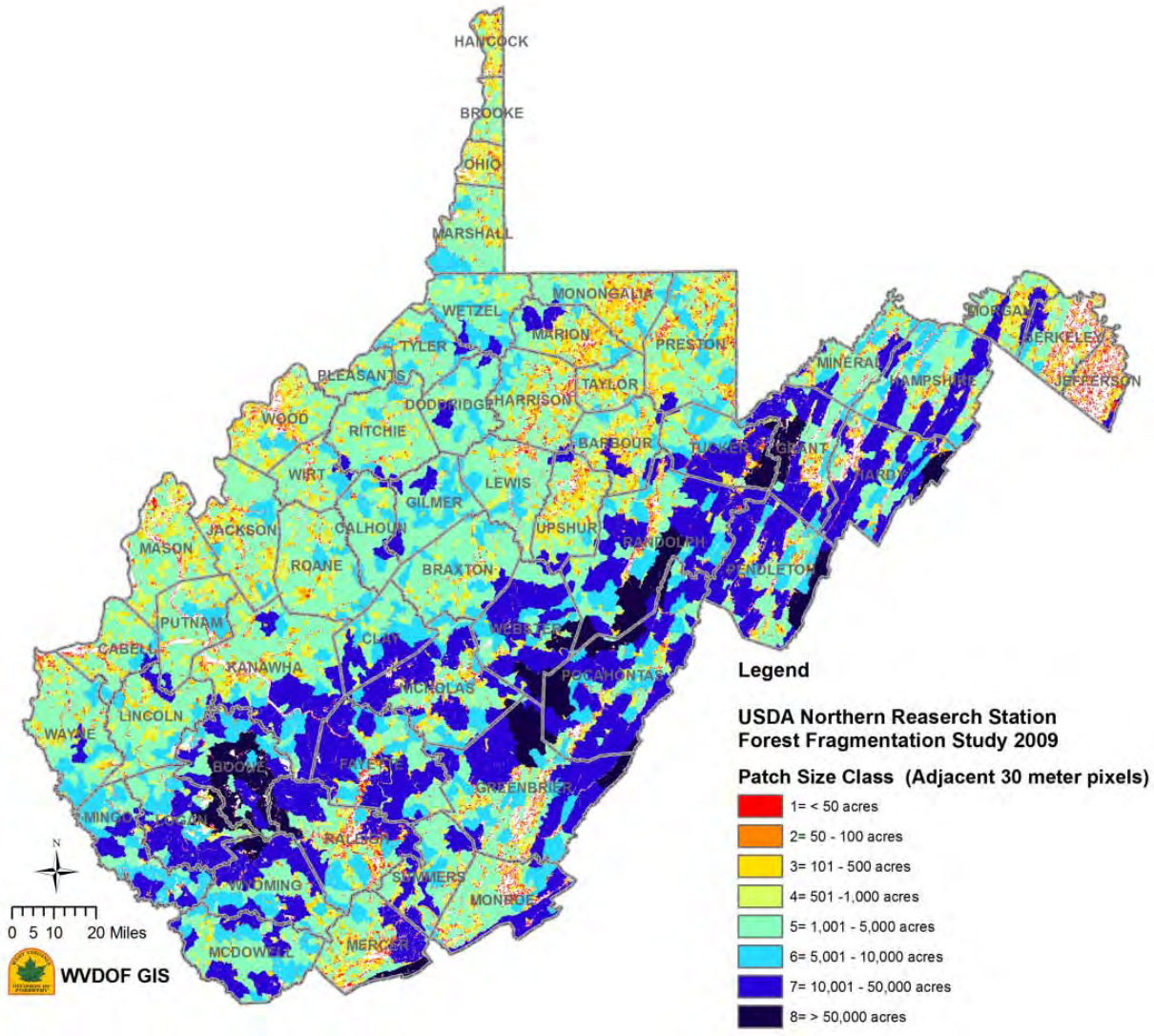
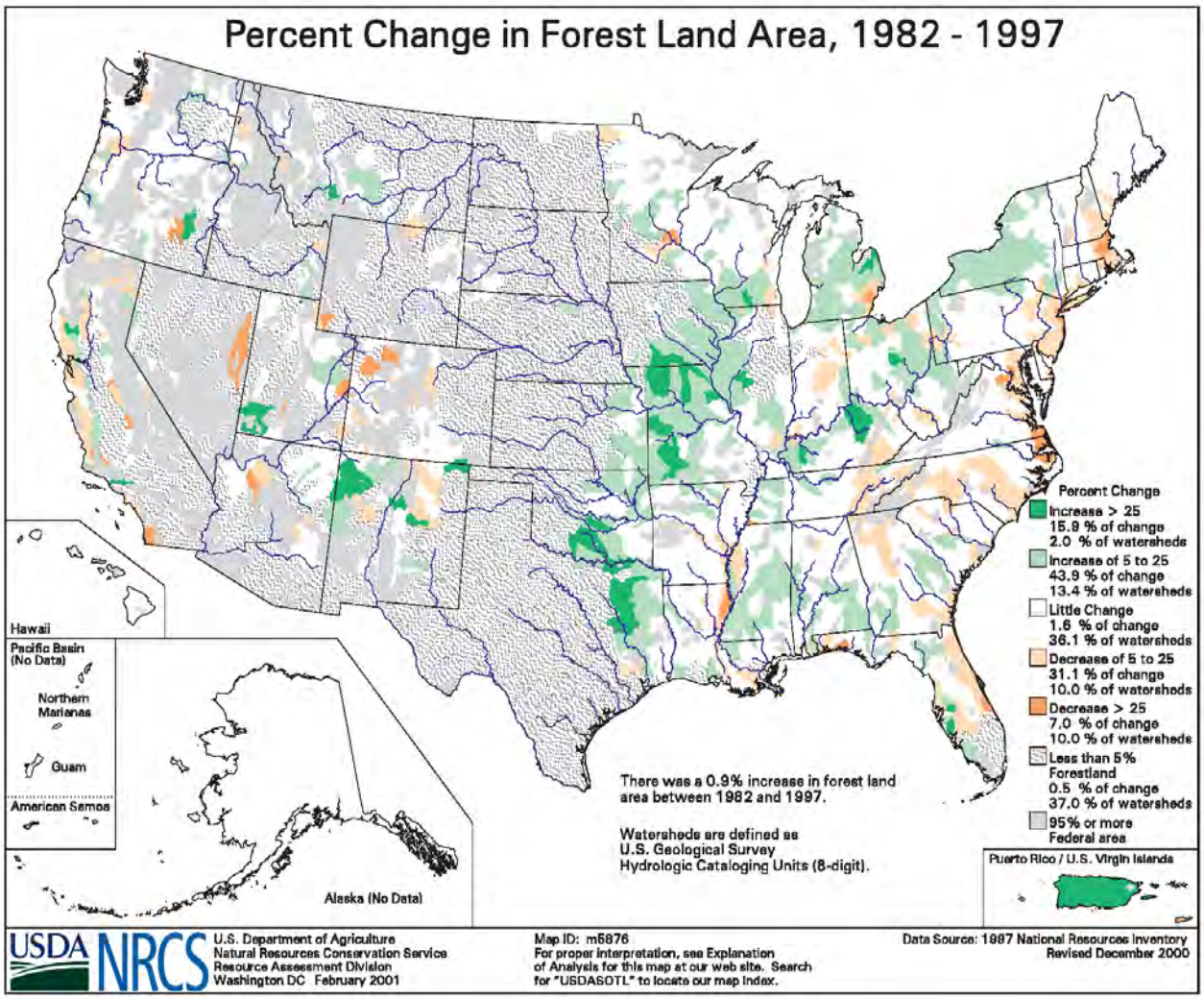


Figure 6: Forest patch size in 1990 (Widmann et al., 2007) – Note: 1 hectare = 2.47 acres.



Map 3: Forest Patch Size in West Virginia (Riemann et al., 2009).

Map 3 provides a visual illustration of forest patch sizes and their relative locations in West Virginia, and is complementary to Figure 6. Although there are many large patches of contiguous forests in the state, these most often consist of numerous, separately owned parcels adjoining each other. Because of this ownership situation, it is unknown whether or not the large forest patch sizes will continue over time. (One exception is public land ownerships, i.e. national forests, state forests, national parks, etc.). Also, it should be noted that even within a large forest patch area, individual parcel owners may have widely differing management objectives.



Map 4: Percent change in forest land area between 1982 and 1997 in the United States.

West Virginia is consistent with most other states in the east in that there has been little change in the total forest land base in recent decades.

4. Status of forest/woodland communities and associated species of concern.

The West Virginia Division of Natural Resources (WVDNR) developed a comprehensive Wildlife Conservation Action Plan (WVWCAP) in which 11 habitat areas of concern were identified. More significant details about these habitats and the species associated with them can be found later in this document in Section IV, Issue 3: Sustainability of Forest Resources in West Virginia, Sub Issue 5: Habitat Diversity and Conservation. The habitats of concern identified were:

- red spruce forests
- calcareous forests and woodlands
- shale barrens
- limestone barrens and glades
- sandstone glades
- hemlock forests
- all wetlands
- all streams
- floodplain forests
- talus outcrops
- caves and karst geology

All of these habitats are important ecosystems for hundreds of identified species of concern, including the 18 federally listed threatened or endangered plant and animal species below which occur in West Virginia. These areas also provide potential habitat to four animal species that are considered candidates, but not yet afforded threatened or endangered status.

Threatened or endangered animals occurring in the state:

1. Cougar, eastern
2. Indiana bat
3. Virginia big eared bat
4. Mussel, clubshell
5. Mussel, fanshell
6. Mussel, pink mucket pearly
7. Mussel, northern riffleshell
8. Mussel, James spiny
9. Mussel, tubercled-blossom pearly
10. Madison Cave isopod
11. Cheat Mountain salamander
12. Flat spired three toothed snail

Of these animals; two are bats which are currently impacted by White Nosed Syndrome, which is a fungus that poses significant risk to the bat colonies found in West Virginia cave systems. Six species are freshwater mussels reliant on clean fresh water from the state's forests.

Threatened or endangered plant species occurring in the state:

13. Northeastern bulrush
14. Running buffalo clover
15. Harperella
16. Small whorled pogonia
17. Shale barren rock cress
18. Virginia spirea

Candidate species occurring in the state:

1. Diamond darter
2. Mussel, rayed bean
3. Mussel, sheepnose
4. Mussel, spectacle case

In addition to the above species and their habitat associations, there are several species of neo-tropical and other migratory birds that use the forests as highways or feeding grounds during their migrations or as part of their summer range. The exact impact of land use changes on these bird species is not known; however, several scientific studies are underway to determine these impacts.

Criterion 2: Maintenance of Productive Capacity of Forest Ecosystems

The sustainability of the forest resource is a more pressing concern than ever before. Forest threats are occurring from development pressure, invasive species, and introduced pests and diseases. It is important to monitor the forest's ability to produce both traditional wood products and the many non-consumptive products that come from the forest. This section is a brief overview of the indicators of productive forest capacity. More detailed information is presented in Section IV, Issue 3: Sustainability of Forest Resources in West Virginia.

5. Area of timberland.

As evidenced in the USDA Forest Service - Forest Inventory and Analysis (FIA) data presented in Criterion 1, West Virginia has approximately 11,749,872 acres of timberland theoretically available for harvesting. Due to landowner preference and an approximate 60 percent ownership by private individuals, it is unlikely that all of this acreage is actually available for harvesting. General trends over the last century saw a gradual increase in timberland until about 1989. Since that time the total timberland base has remained about the same.

6. Annual removal of merchantable wood volume compared to net growth.

West Virginia has been and continues to be a net timber growth state. Standing inventories of timber continue to increase and the forests continue to mature. West Virginia's growing stock inventory has increased steadily over the last 60 years with a moderate leveling trend over the past 20 years (Figure 7).

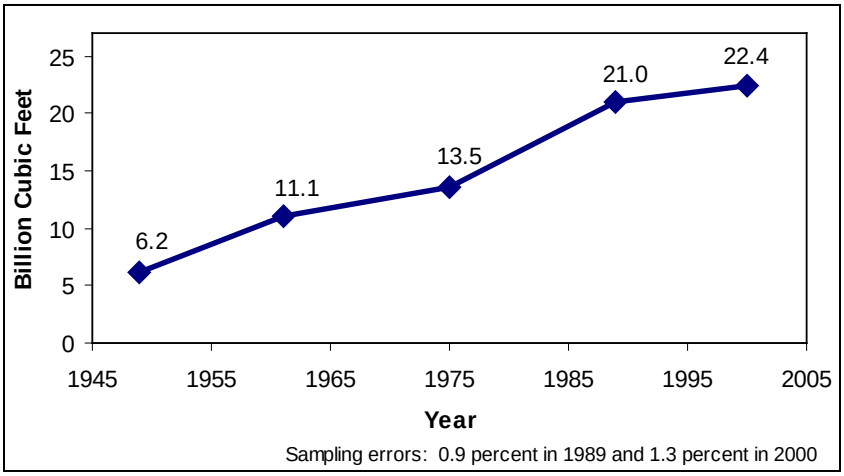


Figure 7: West Virginia growing stock inventory (Widmann et al., 2007).

The largest source of removal of wood volume from the forests is through timber harvesting (Figure 8). Approximately 228 million cubic feet are removed by harvests followed by 160 cubic feet by natural mortality. Land use change is taking a smaller toll, but is a potentially more serious problem, since forest land lost to development is less likely to be reforested.

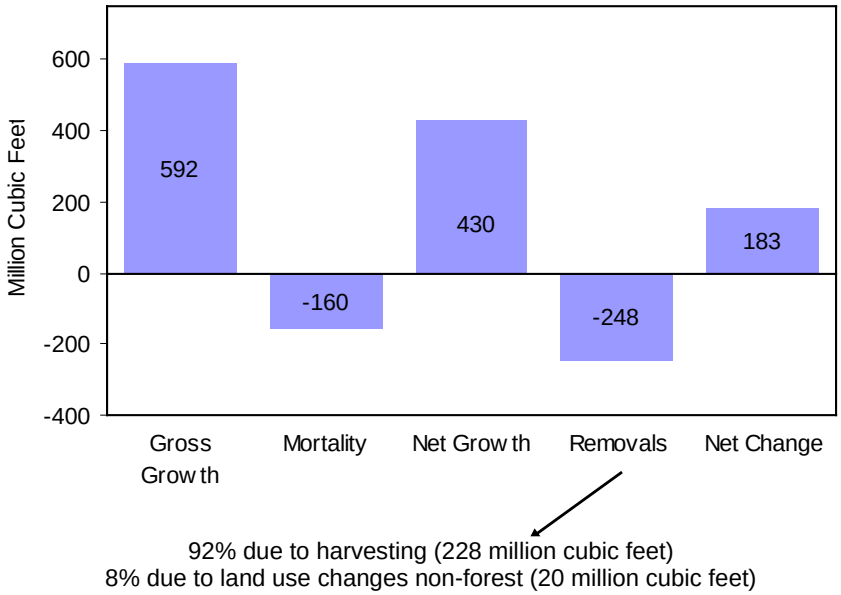


Figure 8: West Virginia growth and removal of growing stock volume (Widmann et al., 2007).

Criterion 3: Maintenance of Forest Ecosystem Health and Vitality

In 1905 the chestnut blight was discovered in the United States, and within a couple of decades had nearly eradicated the American chestnut tree in West Virginia. The numerous chestnut stump sprouts and saplings that remain in today's forests that soon die after reaching reproductive age are a graphic reminder of what blight can do to the forests. Even today, certain threats have no effective treatments and the best course of action is prevention. As a state comprised mostly of forest land, and centrally located near so many urban areas, there exists a high risk of mortality for many component tree species from introduced pathogens. Current species of concern include; white and green ash, eastern hemlock, flowering dogwood, and American beech, among others. A more in depth discussion of this criterion is provided in Section IV, Issue 7: Forest Health.

7. Area and percent of forest land affected by potentially damaging agents.

Approximately 651,000 acres of forests in West Virginia have been identified as "at risk" on the National Insect and Disease Risk Map for potentially reaching a 25 percent mortality rate over the next 15 years. The largest single risk agent in West Virginia forests is the gypsy moth. This defoliating pest is well established in eastern and northern West Virginia and continues to move steadily westward. Though the gypsy moth will feed on many tree species, mortality is usually most severe in red and white oaks. There are also several other existing pests in West Virginia that have the potential to cause high mortality rates in the state's forests. In addition to the gypsy moth, foresters are most concerned about:

- hemlock woolly adelgid
- beech bark disease
- emerald ash borer

Other mortality threats of concern include:

- white pine blister rust
- bacterial leaf scorch
- dogwood anthracnose
- oak wilt
- butternut canker
- balsam wooly adelgid
- common pine shoot beetle
- southern pine beetle

There are also several emerging pest species that are not yet known to exist in West Virginia, but which could potentially cause significant damage to the state's forests. For a full listing of these and the monitoring programs associated with them refer to Section IV, Issue 7: Forest Health.

Wildfire also poses a threat to the mortality of certain tree species. Primary areas of concern occur within a 14 county area in the southwestern portion of West Virginia (Map 5). The WVDOF refers to these as the "hot counties" and more details about the wildfire management and control program can be found in Section IV, Issue 5: Wildfire Management. Mortality most often occurs after exceptionally hot burns or in areas with a repetitive burn history. Wildfires can also result in reduced tree growth and vigor, as well as create wounds and which can serve as entry ways for certain pathogens. While unplanned wildfires are almost always harmful to forests and other natural resources, there is a growing recognition that "prescribed" fires, under carefully planned and controlled conditions, can be beneficial to forest ecosystem health and vitality in certain areas. For more information about this topic, refer to sub-issues 7 and 8 in Section IV, Issue 5: Wildfire Management.

Map 5: Counties where the majority of wildfires, repeat burn areas, and total burned acreage occur in West Virginia (WVDOF GIS, 2009).

Competition from invasive species also poses a potential threat to the forests of West Virginia, including native annual and perennial plants, as well as regeneration of certain tree species. Of the 19 most problematic current invasives identified in Section IV, Issue 7: Forest Health, Japanese stilt grass is perhaps of most concern because of its seed longevity, ease of dispersal, and the ability to form a monoculture under a closed canopy. It is also quite wide spread in West Virginia.

Criterion 4: Conservation and Maintenance of Soil and Water Resources.

8. Area and percent of forest land with diminished soil quality.

Soil quality is a very important factor in forest management; however, there is very little historical data available on forest soils within the state. Only two years of the last data collection cycle were collected within West Virginia and only 58 plots of an estimated 150 were examined. The new cycle is due to begin in 2011 and there will be better data at the end of five years, as well as comparative data on the 58 plots that were previously sampled. There is a need for both data collection and data analysis to provide information on normal and abnormal forest soil conditions.

Examining the data from the 58 plots, these averages were obtained for West Virginia soils:

- 0.98 grams per cubic centimeter
- 20.8 percent of soil is organic carbon
- 4.8 percent PH
- 677 mg/kg of exchangeable Ca
- 211 mg/kg of exchangeable Al

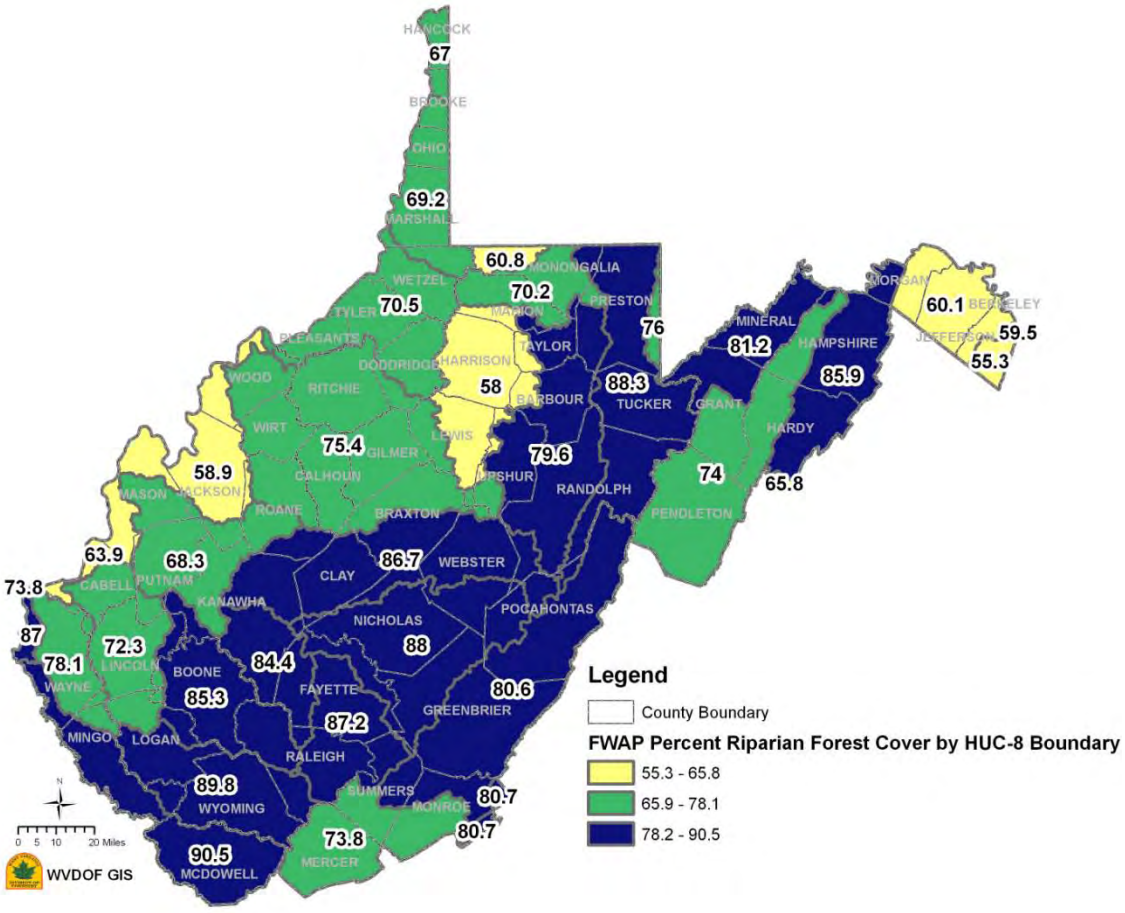
All of this data appears to be fairly close to what would be expected to be normal, but trying to do a statewide evaluation on partial data is very difficult. This topic needs considerably more attention in the future and is identified as a data gap in this assessment.

Left photo – Soil pH testing, (Shawn Grushecky, WVU AHC).

Right photo – Shavers Fork River, Pocahontas, County, WV. (Steve Shaluta, WV Department of Commerce).

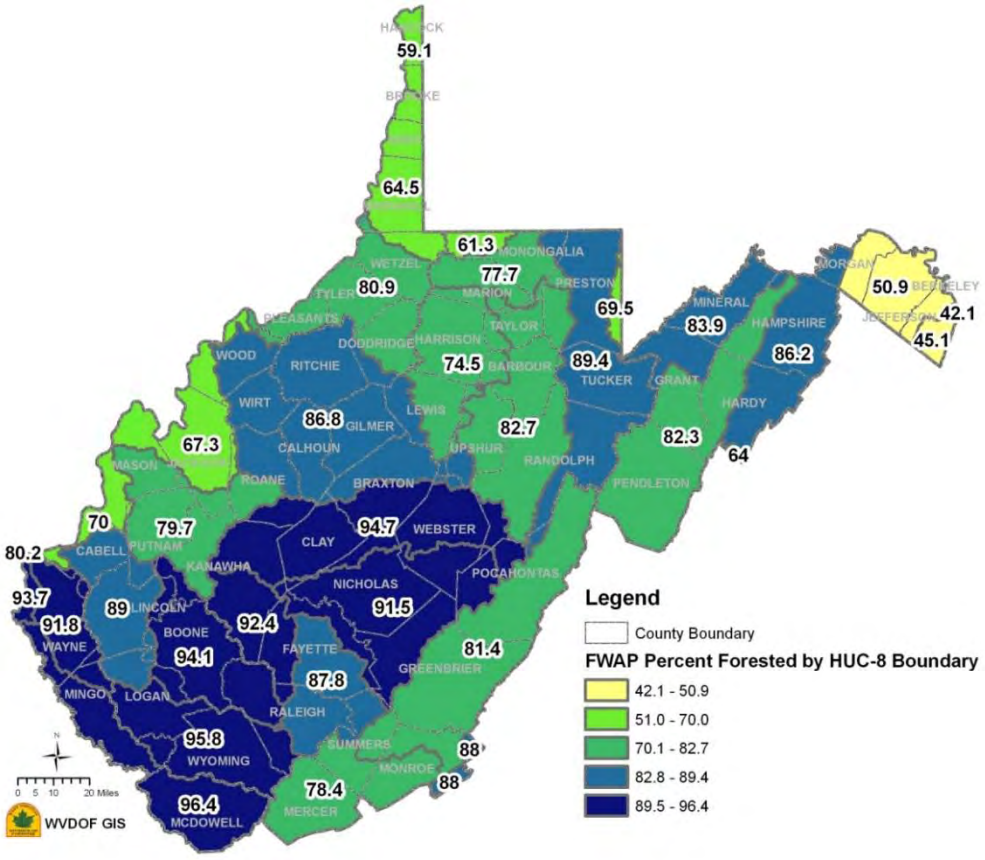
9. Area and percent of forestland adjacent to surface water and area of forestland by watershed.

As one of the most forested states in the nation, West Virginia has little problem with lack of forest cover in watersheds or adjacent to waterways. The vast majority of West Virginia streams have more than 65 percent riparian cover (Map 6). Only the eastern panhandle, a few areas in Mid-Ohio River Valley, and the corridor from Morgantown to Clarksburg show less streamside forest cover. Even these three areas of the state have between 55 and 65 percent riparian forest cover.



Map 6: Riparian forest cover in West Virginia (Barnes et al., 2009).

West Virginia's watersheds are mostly forested; the majority of major watersheds are at least 70 percent forested. The rapidly developing area of the eastern panhandle is the only area in West Virginia with less than 50 percent total forest cover in its watersheds (Map 7). Of course, there are small pockets of urban areas within other watersheds with inadequate forest cover, but those areas are offset by the large areas of forest cover in the other portions of those watersheds. However, it remains important to enhance adequate riparian cover in urban areas in the future. See Section IV, Issue 6: Sustainability of Urban Forests for more information.



Map 7: Forest Cover in HUC-8 watersheds (Barnes et al., 2009).

10. Water quality in forested areas.

In general, due to the state's extensive forests, West Virginia enjoys relatively clean water with high quality streams. However, there are still many non-point source water quality issues, including heavy metal and iron deposition from mining activities; sediment and chloride loading from oil and gas activities; highway and roadway runoff; agricultural operations; and biological impairment from improper or failing septic systems and waste treatment facilities. In addition, of course, there are many point source water quality problems around the state, but these are largely addressed outside the realm of forestry. For more information on the threats to state waters, refer to Section IV, Issue 4: Water Quality.

Criterion 5: Maintenance of Forest Contribution to Global Carbon Cycles

11. Forest ecosystem biomass and forest ecosystem and forest products carbon pools.

a) Recent estimates on the carbon dioxide (CO_2) sequestration potential of West Virginia forests, according to the WVU Appalachian Hardwood Center (AHC) in January, 2010 include:

- ~ 85 million tonnes of CO_2 are released from power plants in West Virginia per year (US Energy Information Administration)
- During growth, forests sequester about 4 tonnes C/ha/year (range 3.5-10 tonnes/ha)
- Converting to CO_2 :1 tonnes C ≈3.7 units CO_2 = 6 tonnes CO_2/acre/year
- Total uptake ~ 72 million tonnes CO_2 per year

These uptake numbers would be under a best case scenario. Four tonnes C/ha/year can be used in areas where forests are just being established. Young forests sequester more CO_2 than older forests (Range can be 3.5 -10 tonnes/ha in an afforestation scenario).

Best estimates from the AHC are that CO_2 sequestration potential for West Virginia forests is approximately 20 million tonnes of CO_2 per year. In the latest year for which estimates are available (2009), WV emitted 116.4 million tons of CO_2 from the commercial, industrial, residential, transportation, and electric power sectors (data sourced from: http://www.epa.gov/climatechange/emissions/state_energyco2inv.html).

Using the above emissions estimates, West Virginia's forests sequestered approximately 24 percent of CO_2 produced at state power plants. Further, it is estimated that 59 percent of the CO_2 emitted from in-state power plants is sequestered by West Virginia's 12 million acres of forest land.

At present, CO_2 sequestration numbers are very loose estimates because of the number of parameters that must be estimated. In addition, standard errors associated with these estimates can be significant. The calculation of theoretical CO_2 sequestration by West Virginia forests must be taken in context. It should be understood that, even though there is significant potential for CO_2 offsets, only the uptake that is over and above what is currently being released can be accounted for when looking at carbon offset programs.

This topic has been identified as a data gap in Section IV, Issue 8: Utilization, Marketing, and Economic Development of this Assessment, and WVDOF will be working to gather additional and more accurate estimates in the future.

b) According to the USDA FIA data, nearly 1 billion dry tons of potential biomass is present on West Virginia timberlands. However, it is unclear how much could realistically be recovered. Currently with logging residues, processing byproducts, and urban tree residues, approximately 2.4 million dry tons of woody biomass is available per year from forest sources (Wang et al. 2006). This number could easily be exceeded, but the cost of harvesting is the limiting factor. With West Virginia's topography, climate and present logging methods, it is not feasible to harvest wood specifically for biomass at current market rates. As demands and prices change, so could the feasibility of harvesting these products. Depending upon what happens with CO_2 markets in the future, the most valuable use for many of these carbon pools may simply be to let them grow as offsets to meet other needs.

Criterion 6: Maintenance and Enhancement of Long-term Multiple Socio-economic Benefits to Meet the Needs of Societies

The socioeconomic benefits of West Virginia's forests include:

- Forest product utilization
- Research potential
- Recreation, including hunting, camping, hiking, and fishing
- Aesthetics
- Clean air and water
- Wildlife habitat
- Other ecological benefits for society

12. Value and volume of wood and wood products production, consumption, and trade.

The forest products industry is a major component of West Virginia's economy with a contribution in excess of four billion dollars annually. It also contributes over $45 million in taxes to the state. (Childs, 2005) This is a significant contribution that has seen steady growth over the last 20 years, though the recent recession and housing market collapse took a heavy toll on the wood products industry with decreases in logging activity of 30-40 percent over the last three years. It is unclear yet as to what extent and how quickly traditional markets will recover, especially with emerging markets, such as biomass, generating more and more interest. For a more detailed look at recent trends and conditions on this topic refer to Section IV, Issue 8: Utilization, Marketing, and Economic Development.

13. Outdoor recreational facilities and activities.

Just as important as wood products to West Virginians are the non-consumptive uses of the forest for such activities as recreation, hunting, and other outdoor related tourism. Wildlife associated recreation in West Virginia, such as hunting, fishing, and wildlife-viewing, generated approximately $803 million for the state from nearly 850,000 participants. Other forestry-related recreation is more difficult to define because the link between it and tourism is difficult to ascertain; data that link the two are not available. Tourism contributed approximately $4.86 billion to the state's economy and contributed to as many as 78,702 jobs in 2001. All of these tourism dollars may not be forest-related; however a recent annual report indicates that 72 percent of all activities directly or indirectly rely on West Virginia's forests (Childs, 2005).

About 13 percent (approximately 1.6 million acres) of West Virginia's forests are publically owned. This includes three national forests, two national parks, and several properties managed by the US Fish and Wildlife Service, the Department of Defense, and the US Army Corps of Engineers. In addition to the federal lands, there are also approximately 300,000 acres of state lands, including state parks, state forests, wildlife management areas, hiking trails and various other state lands around West Virginia. For more information on public lands in the state see Section IV, Issue 3, Sub-Issue 6: Public Lands.

14. Public and private investments in forest health, management, research, and wood processing.

The following table shows investments over the last five years broken out by source and type. This data was sourced from "*Advice to the States from the Northeastern Area Association of State Foresters"*, the WV State Budget, personal communications from Robin Morgan with the USDA Forest Service and Chuck Peterson from the WV Development Office. Data was tabulated by Steve Meester, WVDOF January, 2010.

Table 1: Investments in Forest Health, Management, Research and Wood Processing (2005-2009).

Investments in forest health, management, research, and wood processing					
	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
14.1 Northeastern Area State & Private Forestry	$2,714,152	3,146,240	1,732,140	2,642,585	6,230,986
14.2 Division of Forestry funding	$6,724,773	7,373,144	7,275,482	7,857,694	7,816,157
14.3 Forest research at Universities	$431,783	779,308	613,428	549,008	808,879
14.4 Forest Service Research funding	$6,775,509	6,296,480	5,838,342	5,838,339	5,748,760
14.5 Capital expenditures by manufacturers of wood-related products (Development Office & EDA)	$8,546,000	2,812,906	19,313,070	2,000,000	156,900,000

Photos courtesy of Shawn Grushecky, WVU, AVC.

15. Forest ownership and land use (including acres of specially designated land).

Sixty percent of woodlands in the state, about 7,174,000 acres, are held by private individual landowners and are considered family forests. This forest ownership category is by far the largest category in the state. Public lands consist of about 13 percent of the forestland (Figure 9). TIMOs and REITs are the fastest growing categories of ownership as more and more corporations and private individuals sell their forest land to these investment organizations and trusts.

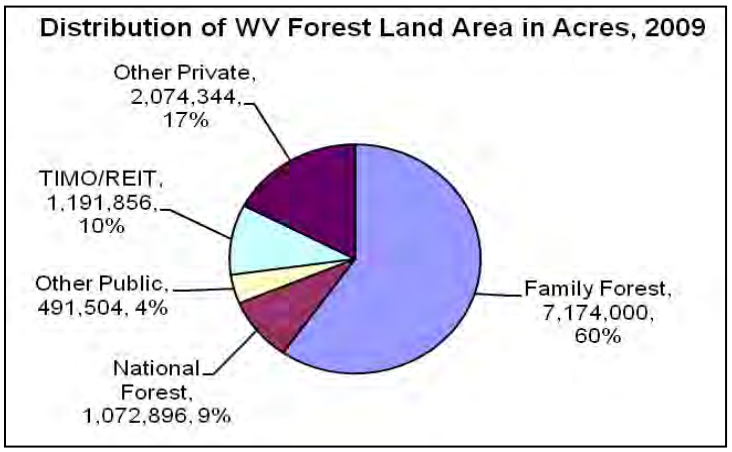


Figure 9: Distribution of forest land area (Butler, 2008). TIMO/REIT acreage developed from WVDOF data sources 2009.

16. Employment and wages in forest-related sectors.

The forest industry in West Virginia is important, as stated in Indicator 12 and is discussed further in Section IV, Issue 8. Even though the capacity of this industry sector has declined in the last 2 years, as recently as 2002 the industry employed approximately 30,000 people and provided around $703 million in employee compensation (Table 2).

Table 2: Economic impact of forest industry sector in West Virginia (Childs, 2005).

Type of Impact	Direct Impact	Indirect and Induced Impact	Total Impact
Business Volume	2,032,861,000	1,982,027,000	4,014,888,000
Employment per Year (Jobs)	15,600	14,200	29,800
Employee Compensation	382,619,000	320,842,000	703,461,000
Assorted State Taxes	$25,696,000	$19,695,000	$45,391,000

Notes: Employment is reported in average annual jobs. Totals may not sum due to rounding. Assorted state taxes include consumer sales taxes, personal income taxes, corporate net income taxes, and business franchise taxes.

Also important to consider is the WVDOF employee base. There are 114 permanent full time employees, as well as 22 seasonal employees (mainly used for wildland fire control). In addition to WVDOF personnel, there are also 247 full time and seven temporary or part time USDA Forest Service employees working to manage the forests of West Virginia.

Even though employment in the forest sector is currently at a low point, West Virginia is committed to a revitalization effort which will help provide sustainable jobs in both traditional and emerging forest industries. For more detail refer to Section IV, Issue 8: Utilization, Marketing, and Economic Development.

Criterion 7: Legal, Institutional, and Economic Framework for Forest Conservation and Sustainable Management

17. Existence, type, and monitoring of forest management standards/guidelines.

West Virginia has no Forest Practices Act or laws specifically governing forest management activities. However, West Virginia code **§30-19** establishes a Board of Registration, as well as procedures by which to license and regulate foresters and forestry technicians who will be practicing within the state.

The Logging and Sediment Control Act of 1992, found in West Virginia code **§19-1B**, establishes mandatory guidelines for logging operations in the state, including licensing, notification, certification of loggers, training, and enforcement of best management practices to reduce or limit erosion and sedimentation from logging operations. The WVDOF is tasked with implementing and enforcing this section of code.

18. Existence, type, and frequency of forest-related planning, assessment, and policy review.

The Forest Management Review Commission (FMRC), a statutory body created by the state legislature, directed the West Virginia Division of Forestry in the fall of 2008 to complete a new strategic plan for forestry in West Virginia. The FMRC specifically requested that the following topics be addressed:

- Forest Inventory in West Virginia
- Taxation of West Virginia Forest Land
- Primary Forest Industry
- Secondary Forest Industry
- Forest Ecology in West Virginia
- Dangerous Factors Affecting Forestry – Historic, current and future
- Reclamation of Damaged Lands to Forestry
- Urban Forestry
- Regeneration of Forests in West Virginia
- Silviculture and Tree Marking Guides for Managing West Virginia's Forests
- Forest Management and Wildlife
- Usefulness of Wood Biomass from West Virginia's Forests

This initiative directly involved over 67 foresters and natural resource specialists from various agencies, companies, and organizations from across the state and is due to be completed by July 2010. This strategic plan updates the last FMRC plan which was prepared in 1987. In addition, the WVDOF prepared a strategic plan about its forestry programs for the USDA Forest Service in the year 2001.

This Statewide Forest Resource Assessment and subsequent Strategy will also serve as formal forest planning efforts for the WVDOF and its programs. These documents will be updated every five years. Also, annual work plans will be prepared to address the issues and implement the strategies developed in these documents.

A considerable amount of planning occurs in regard to management of the seven state forests, including for silviculture, inventory, harvest prescriptions, wildlife management, invasive species control, recreation use, fire management, forest health issues, boundary line maintenance, and various important ecosystem considerations. Numerous public meetings have been held to gather public input, and provide information about upcoming state forest management activities. In addition, frequent field trips and conservation education sessions are held for schools, youth groups, and other organizations.

This assessment includes pertinent information from the Monongahela National Forest (MNF) Plan, as well as some information from the forest plans for the George Washington (GWNF) and Jefferson National Forests (JNF). For purposes of this assessment, WVDOF consulted the West Virginia Wildlife Conservation Action Plan (WVWCAP), the State Comprehensive Outdoor Recreation Plan (SCORP), the Statewide Urban and Community Forestry (UCF) Plan, the Statewide Forest Stewardship Operating Plan, existing Community Wildfire Protection Plans (CWPP), and also consulted with various other agencies about their plans. This includes the National Park Service (NPS), the US Fish and Wildlife Service (USFWS), the USDA Natural Resources Conservation Service (NRCS), the USDA Farm Service Agency (FSA), the US Army Corps of Engineers (USACE), the US Department of Defense (USDOD), and all applicable state agencies. In addition, the Forest Legacy Assessment of Need (AON) was consulted and incorporated by reference into the assessment and strategy.

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Photos courtesy of Barb Breshock, WVDOF; Shawn Grushecky, WVU, AHC; and Cinda Francis, WV Forestry Association.

III. Considerations in Identifying Issues

The Forest Conditions and Trends in Section II, the National Priorities and Objectives in this Section (III), and the Collaboration Process detailed in Section VI were used as a basis for identifying threats and opportunities, as well as determining the eight primary issues to be dealt with in the assessment/strategy. Subsequently, GIS analyses were done to establish priority areas for each issue. Details about the issues and priority areas are discussed in Section IV. Identification of issues was 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, Priority Areas

As described in the opening paragraph of this section, eight primary issues were identified that encompass the major forestry threats and opportunities in West Virginia. These eight broad issues are dealt with in considerable detail in Section IV. They are:

- Issue 1: Competing Land Uses (Existing Forest Legacy AON is incorporated by reference)
- Issue 2: Communications and Education
- Issue 3: Sustainability of Forest Resources in West Virginia
- Issue 4: Water Quality
- Issue 5: Wildfire Management – Resource Protection and Public Safety
- Issue 6: Sustainability of Urban Forests
- Issue 7: Forest Health
- Issue 8: Utilization, Marketing and Economic Development

There are a total of 48 sub-issues addressed within the eight primary issues listed above. These cover the major forest threats and opportunities that will be 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 five-year period.

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:

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

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

Portions of these items have not fully evolved in the forestry discipline. 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 80 percent of this state is forested, whatever recommendations arise in the future, West Virginia will be well positioned to adequately deal with these emerging issues.

IV. Issues, Sub-Issues, and Priority Area Identification

This section includes identifying and discussing issues, threats and opportunities, and determining priority areas within each issue.

Issue 1: Competing Land Uses

The WVDOF's existing Forest Legacy Program (FLP) addresses this issue through its current Assessment of Need (AON). Portions of the AON are presented in the Statewide Forest Resource Assessment and Strategy to provide a background understanding of this issue.

The WVDOF has concluded that the FLP will be implemented according to the current AON approved on December 2nd 2003, which is hereby incorporated into this document by reference. A copy of the State Lead Agency designation letter dated April 23rd 2001; the AON; and the AON approval letter are on file in the state office of the Director of the WVDOF.

Non-forest uses are currently competing with traditional forest land uses in West Virginia. Residential and commercial development pressure is most intense in the eastern panhandle of the state. The likelihood of future traditional forest management activities decreases as population density increases. Management of forests for timber, recreation, wildlife, and water quality will not occur if land does not remain forested. Increased attention is being given to intergenerational transfer, since conversion to non-forest uses and/or reduction in forest parcel size often occurs when land is passed from older family members to younger family members.

Seven sub-issues are discussed within the Competing Land Uses issue. These sub-issues include fragmentation and parcelization, urbanization, population growth, conversion to non-forestry use, mineral extraction, agriculture, and property taxes. A detailed discussion of each sub-issue is included below. 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 is included in this section. Moreover, in 2009, an overlay analysis was conducted to determine if any changes to the FLAs were needed. It was determined that no change in Forest Legacy Areas was necessary at this time.

Sub-Issue 1: Fragmentation and Parcelization

Fragmentation refers to breaking up the forest cover with other uses, such as development, so that forested habitats become more disconnected. Parcelization refers to the process of dividing land into smaller and 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. Each year in the United States, the present population of nearly 10 million ownerships increases by about 150,000. By the end of 2010, if present trends continue, 95 percent of the private forest ownerships and 38 percent of the private forest land in the U.S. will be in parcels smaller than 100 acres (Sampson and

DeCoster, 1997). In West Virginia, the trend in parcelization has remained fairly stable in recent years, with around 35 percent of the forest held in parcels smaller than 100 acres (Figure 1.1).

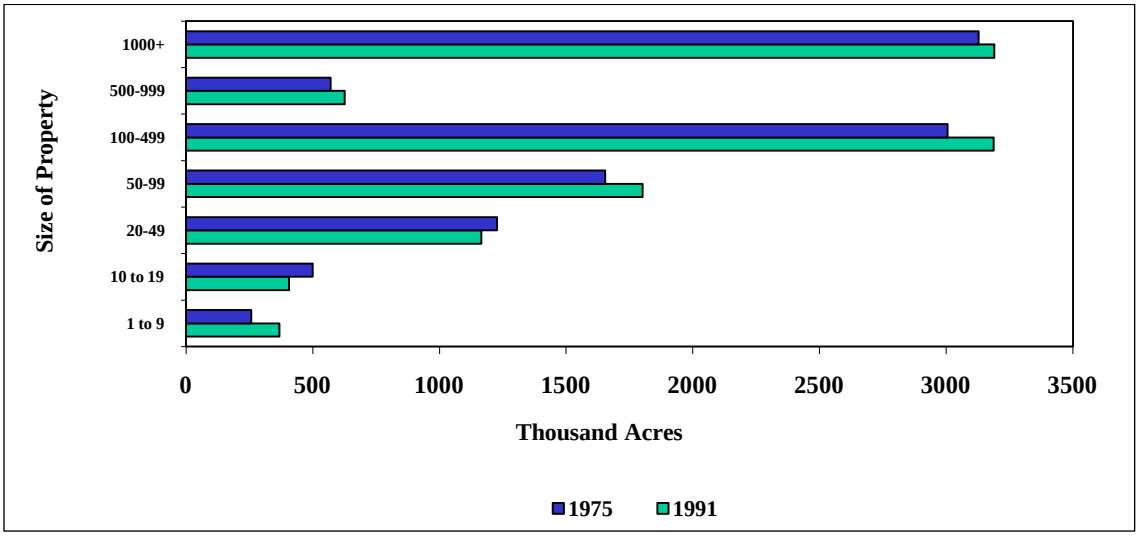


Figure 1.1: Acreage in private forest holding by size of ownership in acres, from 1975 to 1991 in West Virginia.

The number of forest landowners holding less than 100 acres increased by almost 50,000 between 1978 and 1991 (Table 1.1).

Table 1.1: Forest Landowner Statistics, 1975 and 1991, West Virginia. Sources: 1975 – Birch and Kingsley (1978); 1991 – Birch (1996).

West Virginia Forest Landowner Statistics				
1975				
West Virginia	Owners		Acres	
Size Class	*Number*	*Percent*	*Number*	*Percent*
1 to 9	82,900	40.0%	257,000	2.5%
10 to 19	39,800	19.2%	500,300	4.8%
20 to 49	40,800	19.7%	1,227,400	11.9%
50 to 99	24,600	11.9%	1,654,000	16.0%
100 to 499	18,000	8.7%	3,005,500	29.1%
500 to 999	900	0.4%	570,900	5.5%
1000+	500	0.2%	3,127,800	30.2%
Total	**207,500**		**10,342,900**	

West Virginia Forest Landowner Statistics (cont.)				
1991				
West Virginia	Owners		Acres	
Size Class	Number	Percent	Number	Percent
1 to 9	142,600	54.7%	369,000	3.4%
10 to 19	30,600	11.7%	406,000	3.8%
20 to 49	40,300	15.5%	1,165,000	10.8%
50 to 99	26,600	10.2%	1,802,000	16.8%
100 to 499	18,900	7.3%	3,187,000	29.7%
500 to 999	1,000	0.4%	626,000	5.8%
1,000+	500	0.2%	3,190,000	29.7%
Total	**260,500**		**10,745,000**	
Change -- 1975 to 1991				
West Virginia	Owners		Acres	
Size Class	Number	Percent	Number	Percent
1 to 9	59,700	72.0%	112,000	43.6%
10 to 19	-9,200	-23.1%	-94,300	-18.8%
20 to 49	- 500	-1.2%	-62,400	-5.1%
50 to 99	2,000	8.1%	148,000	8.9%
100 to 499	900	5.0%	181,500	6.0%
500 to 999	100	11.1%	55,100	9.7%
1,000+	-	0.0%	62,200	2.0%
Total	**53,000**	**25.5%**	**402,100**	**3.9%**

These parcelized forests are often becoming personal green spaces maintained for their amenities, rather than being managed as working forests dedicated to sustainable forestry and timber production. 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.

While population growth and increased density are pressures that force the fragmentation of forest lands, there are other economic pressures at work that can result in the parcelization of rural forests as well. 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 or lakes. In these places, the financial pressure to divide and sell blocks of forest land may be too great for owners to resist. Whether they are families seeking retirement security or companies seeking profitable returns, the result is the same for future forest management. Conservation easements can provide some financial assistance in these situations for landowners who are interested in maintaining sustainable forests and forest management in West Virginia.

As ownership size decreases, forestry is less often seen as relevant and professional assistance or approaches to forest management less often used. New landowners often bring a more urban-developed ownership strategy than the people from whom they purchased the land. Fragmentation and parcelization also lead to increased risks of soil erosion and sediment pollution (largely from roads).

Sub-Issue 2: Urbanization

The most significant land use change in recent years has been a near doubling of urban lands in West Virginia between 1982 and 1997 (Table 1.2).

Table 1.2: Non-federal land us patterns, West Virginia, 1997 and 1982. Source: USDA NRCS 2000. *Farmsteads, farm structures, field windbreaks, barren land, and marshland.

Land Class	1997		1982	
	Acres	Percent	Acres	Percent
Forest	10,581,500	74.0%	10,412,600	72.3%
Pastureland	1,526,500	10.7%	1,892,700	13.1%
Non-cultivated cropland	698,300	4.9%	793,500	5.5%
Urban	653,400	4.6%	366,200	2.5%
Rural transportation	279,400	2.0%	276,800	1.9%
Other land*	220,200	1.5%	194,100	1.4%
Water	171,400	1.2%	163,700	1.1%
Cultivated cropland	166,100	1.2%	301,300	2.1%
Total non-federal land and water	**14,296,800**		**14,400,900**	

Over half of the growth in urban lands (178,300 acres) was from forests (USDA NRCS, 2001). The average annual rates of conversion of working rural lands to development have doubled in every NRCS Natural Resources Inventory since 1982. Between 1982 and 1987, conversion averaged about 7,500 acres per year; between 1987 and 1992, it had climbed to just over 15,000 acres per year, and between 1992 and 1997 it was averaging 34,880 acres a year (Figure 1.2).

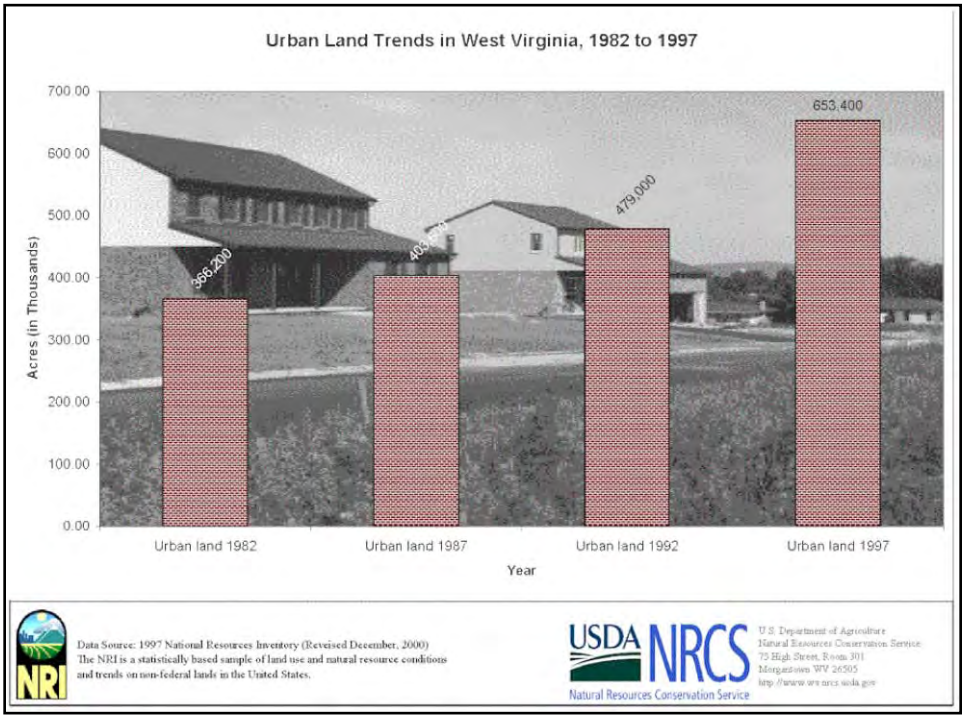


Figure 1.2: Urban land development trends in West Virginia, 1982-1997, as measured by the National Research Initiative (NRI).

If this trend continues, and forests continue to provide half or more of the land converted, the implications for the future of private forestry are significant.

Although firm data is not available to demonstrate the impact that land use changes may have had on the state's working farm and forest lands in recent years, it is logical to draw some conclusions. Urban development usually takes place on flatter slopes with deeper and more productive soils. Crop and pasture abandonment usually takes place on steeper, less productive areas which have often been significantly damaged by soil erosion during cultivation over the years. Thus, it is reasonable to conclude that the forests emerging from crop and pasture abandonment are on soils of lower quality and productivity than those that are being taken for development. While non-federal forest areas have risen slightly during the past 15 years, it is likely that the overall productivity of the forest acreage has been diminished in the process.

The direct impacts of population growth, including suburban sprawl, rural housing, roads, and other land-using activities are relatively easy to measure, particularly if one uses land use (rather than land cover) data as a basis. Differences in survey techniques become apparent when comparing Forest Inventory and Analysis (FIA) data (Table 1.3) which shows a small decline, with National Research Initiative (NRI) data (Table 1.4), which shows a significant decline in forest acres. In FIA, "forest" is defined as a unit one acre or larger that has more than 10 percent tree cover. Thus, a large-lot rural subdivision that retains most of its tree cover might continue to be classified as "forest," even when the ownership pattern is one of tracts far too small to be maintained as a forest unit, and where the introduction of roads, domestic pets, and other intrusive wildlife may degrade the habitat significantly for many native species. In the NRI data, the lands are classified more on a land use basis and those subdivisions would likely end up being included in the "developed lands" category.

Table 1.3: Forest and land statistics, West Virginia, 1989 and 2000. Source: 2000 FIA.
* 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.

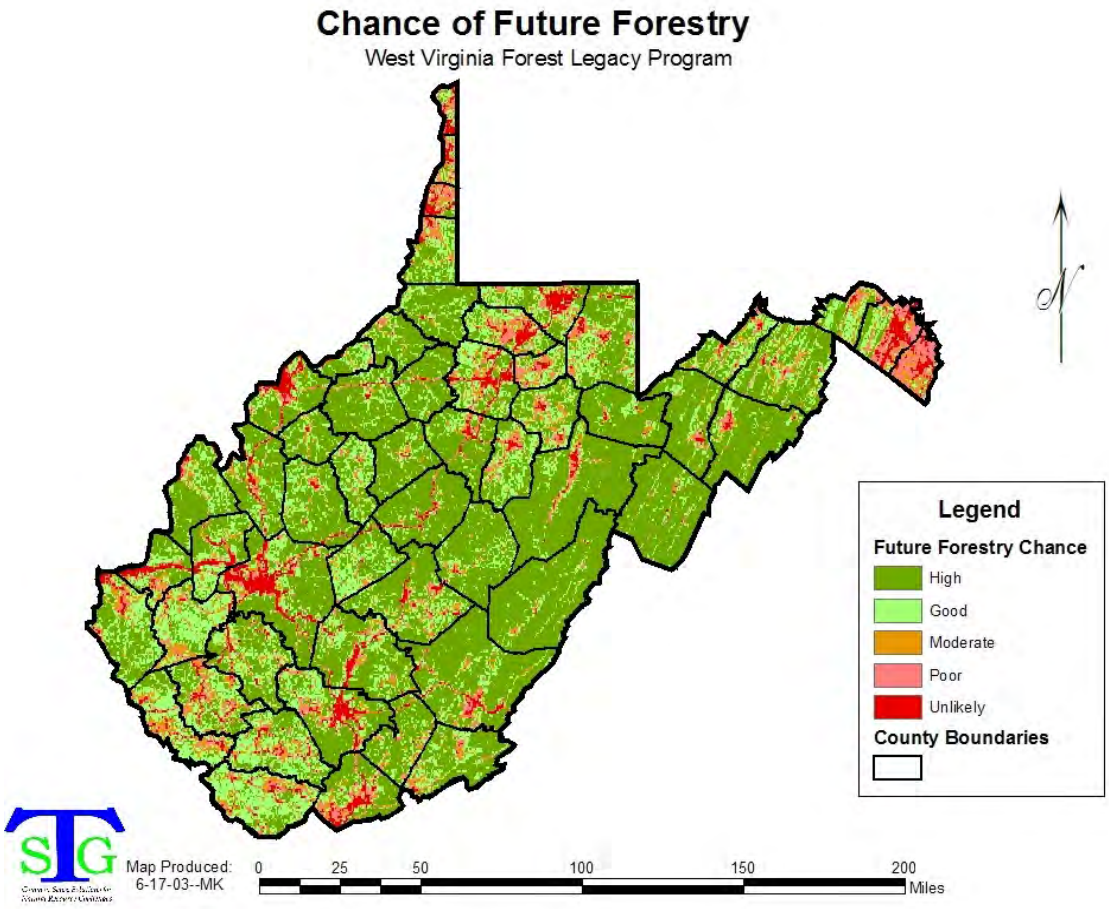
Land Class	**2000**		**1989**	
	Acres	***Percent***	***Acres***	***Percent***
Timberland*	11,791,700	76.5%	12,010,000	77.9%
Productive reserved	174,000	1.1%	66,100	0.4%
Other forest land	35,900	0.2%	17,600	0.1%
Total forest land	**12,001,500**	**77.9%**	**12,093,700**	**78.5%**
Cropland	536,000	3.5%	561,300	3.6%
Pasture	1,010,200	6.6%	1,065,500	6.9%
Other	1,816,000	11.8%	1,663,100	10.8%
Noncensus water	51,700	0.3%	31,700	0.2%
Total nonforest land	3,413,900	22.1%	3,321,600	21.5%
Total land area	**15,415,400**	**100.0%**	**15,415,400**	**100.0%**

Table 1.4: Land Use Patterns, West Virginia, 1997 and 1982. Source: USDA NRCS 2000.
* Urban, rural transportation, farmsteads and other rural built-up lands.

Land Class	1997		1982	
	Acres	***Percent***	***Acres***	***Percent***
Non-federal rural lands	12,972,400	83.6%	14,237,200	88.0%
Federal lands	1,211,400	7.8%	1,107,300	7.1%
Developed lands*	1,153,000	7.4%	583,900	3.8%
Permanent water	171,400	1.1%	163,700	1.1%
Total	**15,508,200**		**15,508,200**	**100%**

As urbanization encroaches onto rural land, and smaller forest parcels drop out of forest management, businesses such as farming, logging, tree farming, and milling, 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. A ground-breaking 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 percent at densities of 70, 50 percent at 45, and 75 percent at 20 people 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 will 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 is becoming evident in some areas (Map 1.1).



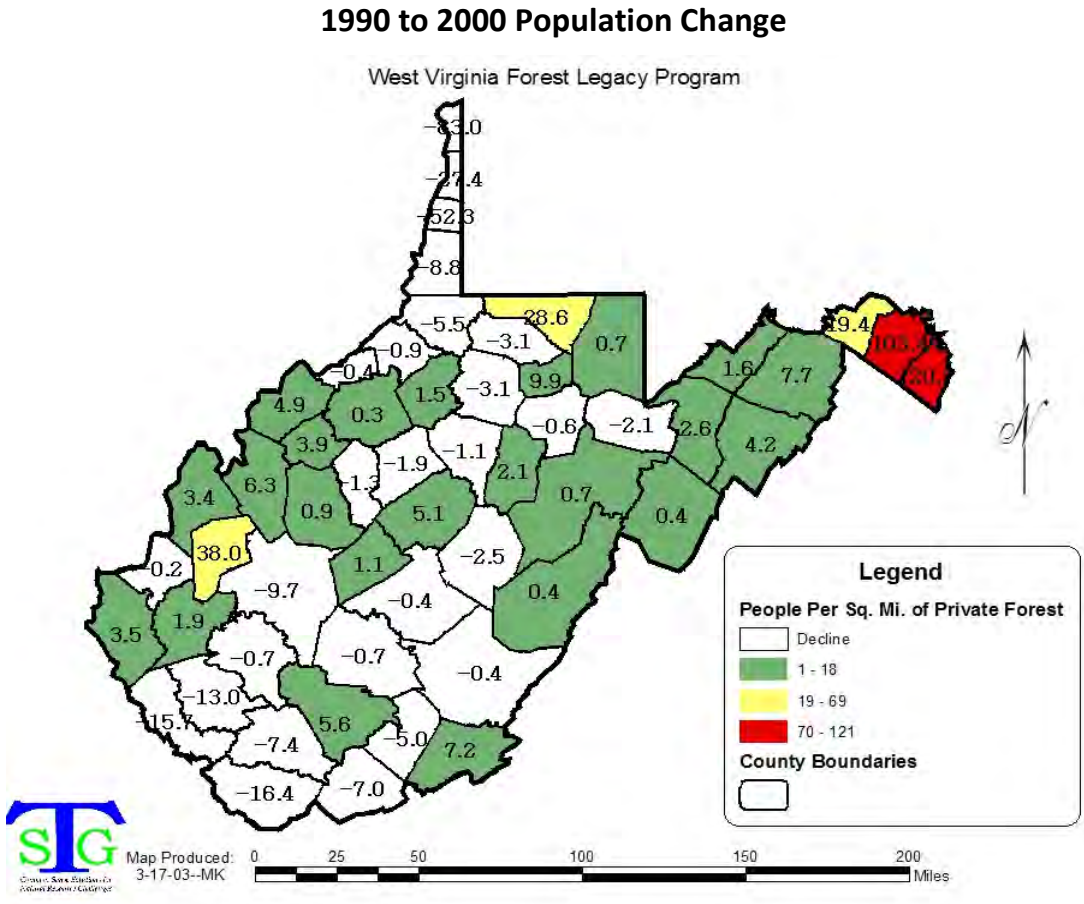
Map 1.1: Chance of future forestry based on population density. Source: LandScan, 2000.

For the analysis of future forestry potential based on population estimates, mountainous areas were not 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 are likely to continue to be managed for sustainable forestry.

In many areas, forest economies will be compromised as forest managers encounter increased local opposition to forest management practices such as thinning, aerial application of chemicals, prescribed fire, and timber harvests that 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.

Sub-Issue 3: Population Growth

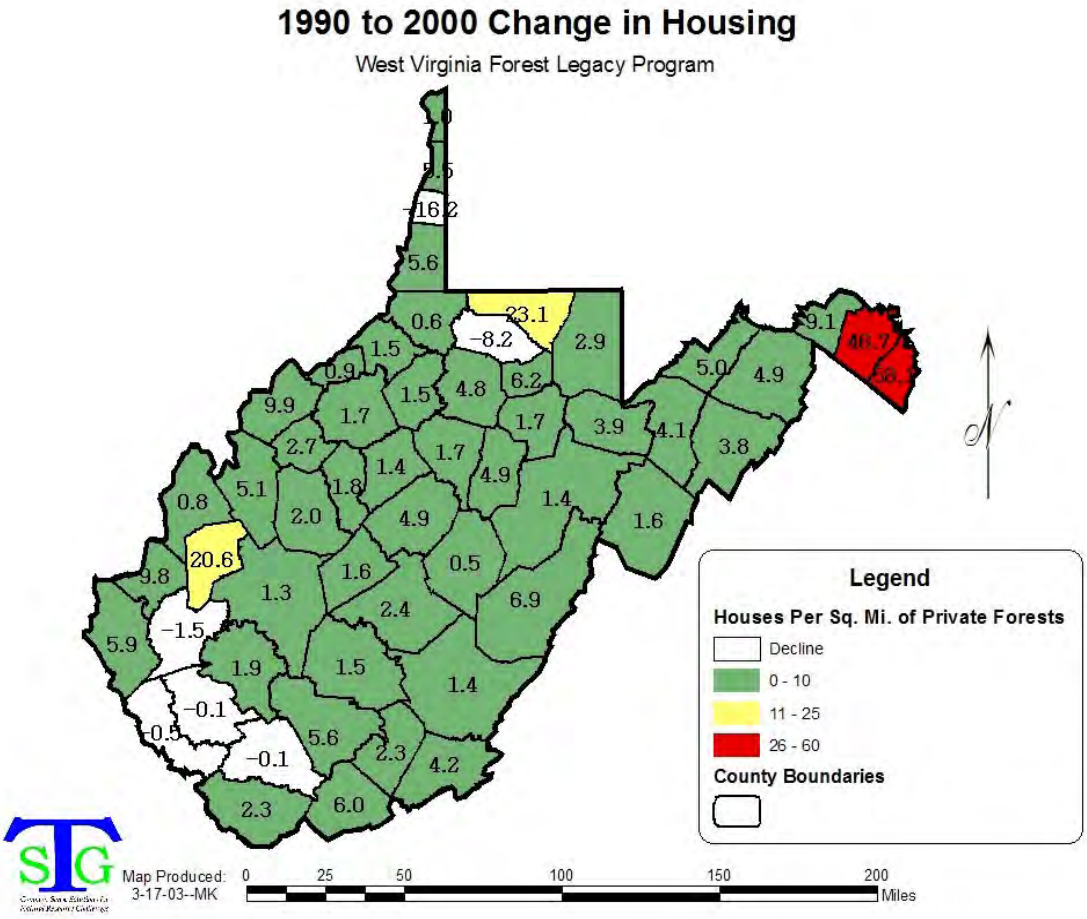
One measure of the impact of population growth on working forests is the increase in population density per square mile of private forest land in each county (Map 1.2).



Map 1.2: Population density change in West Virginia between 1990 and 2000. Source: US Census.

By comparing the recent population change (1990 to 2000) on a normalized basis, the impacts of population growth on forest cover can be estimated, as opposed to simply featuring the largest or fastest-growing counties. Note that between 1990 and 2000, twenty-seven West Virginia counties lost population.

Another indicator of the impact of population growth and development on forests can be found in the housing data produced by the U.S. Census. Analysis of 2000 census data by West Virginia University economists shows that the state had the nation's second largest increase in seasonal housing and the sixth largest increase in second homes (Randy Childs, pers. comm. 2003).



Map 1.3: Change in housing density in West Virginia between 1990 and 2000. Source: US Census.

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 1.3). Note that of the 27 counties with population declines (Map 1.2), 22 show housing density increases (Map 1.3). 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.

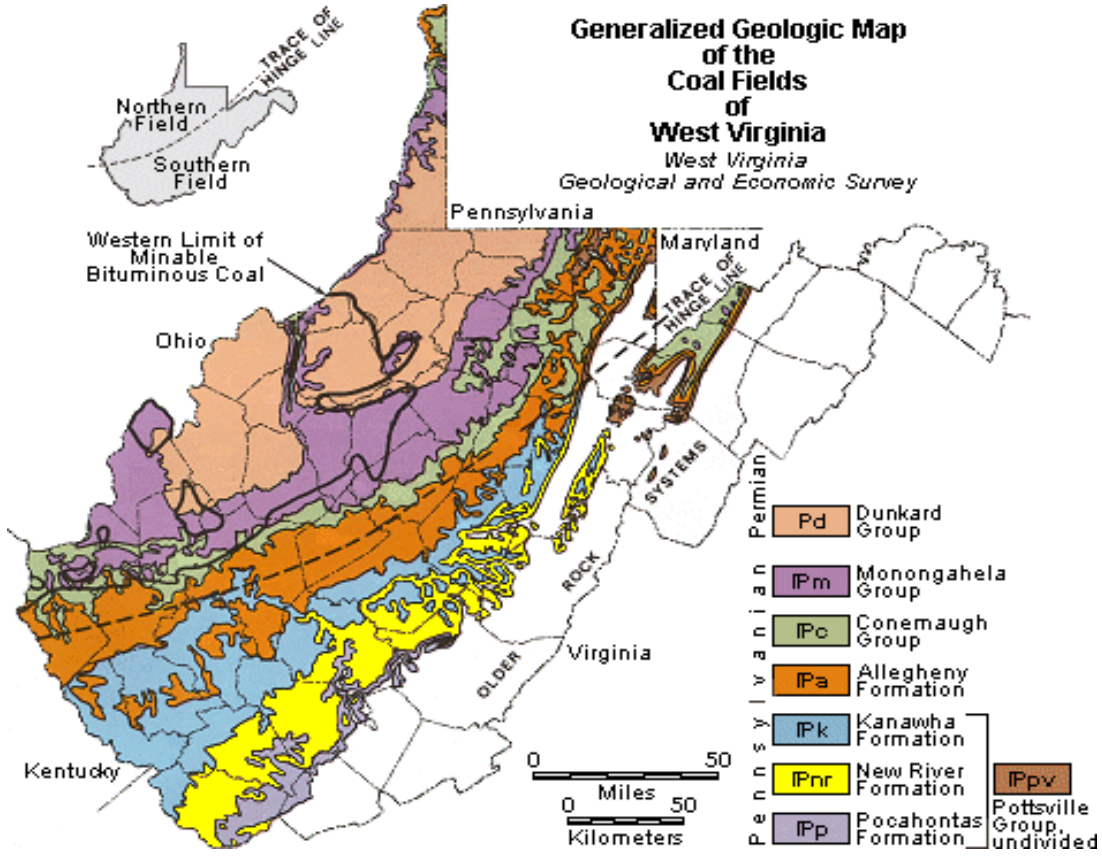
What may still be missing from these indicators are the indirect effects of the population growth and fragmentation issues on forest management. For example, as populations grow, air pollution emissions increase, and so do the potential damages to West Virginia's forests.

Sub-Issue 4: Conversion to Non-forestry Use

Forests can only be managed for sustainable forestry 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 farms. Agriculture, which was once a competitor with forest land, is now threatened by similar competition. When and where agriculture as an industry and a working land use is threatened, forestry will likely be impacted as well.

Sub-Issue 5: Mineral Extraction

Coal has been an important economic resource in West Virginia since the late 1800s. As the coal industry grew, mining methods changed rapidly. Large-scale surface mining started in the 1940s and is now a major method of mining coal in West Virginia. Obviously, land that is to be surface mined must be stripped of its vegetation and topsoil to expose the coal. Post-mining reclamation methods have improved in recent years, but whether or not reclaimed areas will ever regain the soil and forest productivity of the pre-mining condition remains largely uncertain. As mining areas expand, the opportunities for sustainable forest management shrink accordingly. The potential for future coal mining is indicated in Map 1.4.



Map 1.4: General geologic map of West Virginia. Source: WV Geologic and Economic Survey.

Geographically, the forested areas in Eastern WV will have the least conflict with coal extraction activities. Oil and natural gas producers have shown increased interest in coalbed methane, as well as the Trenton Black River and Marcellus Shale formations in WV. Recently, the Marcellus Shale has become very important in West Virginia. The Marcellus shale is a Devonian age fine grained sedimentary rock unit. Marcellus Shale occurs in much of West Virginia and varies in thickness. Deep wells are being drilled to extract natural gas from the Marcellus Shale by oil and gas producers. Also see Issue 4: Water Quality and Section V, Item 7 for additional information.

Deep wells have potentially larger drill sites (as much as 5 acres) compared to shallow gas wells, with 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 so that surface disturbance is minimized.

For the Forest Legacy Program, one important aspect is the ownership of subsurface mineral rights. Where the forest landowner does not control subsurface rights, and significant surface disturbance is a possibility, it may preclude participation in the Forest Legacy Program.

Photos clockwise from upper left representing FLAs 1-4: Scenes from Preston, Hampshire, Pocahontas, and Fayette counties in West Virginia. (Steve Shaluta, WV Department of Commerce).

Sub-Issue 6: Agriculture

Conversions from forest into cultivated cropland in West Virginia have not occurred very often since 1982, according to data from the National Resource Inventories (USDA NRCS 2000). Cultivated cropland represents a little over one percent of the non-federal rural land in West Virginia, down 45 percent from 1982 as marginal croplands have been abandoned, prime farmlands developed, and other land use changes have occurred (Table 1.5).

Table 1.5: Non-federal land use patterns in WV between 1982 and 1997. Source: USDA NRCS 2000. *Farmsteads, farm structures, field windbreaks, barren land, and marshland.

Land Class	1997		1982	
	Acres	Percent	Acres	Percent
Forest	10,581,500	74.0%	10,412,600	72.3%
Pastureland	1,526,500	10.7%	1,892,700	13.1%
Non-cultivated cropland	698,300	4.9%	793,500	5.5%
Urban	653,400	4.6%	366,200	2.5%
Rural transportation	279,400	2.0%	276,800	1.9%
Other land*	220,200	1.5%	194,100	1.4%
Water	171,400	1.2%	163,700	1.1%
Cultivated cropland	166,100	1.2%	301,300	2.1%
Total non-federal land and water	**14,296,800**	**100%**	**14,400,900**	**100%**

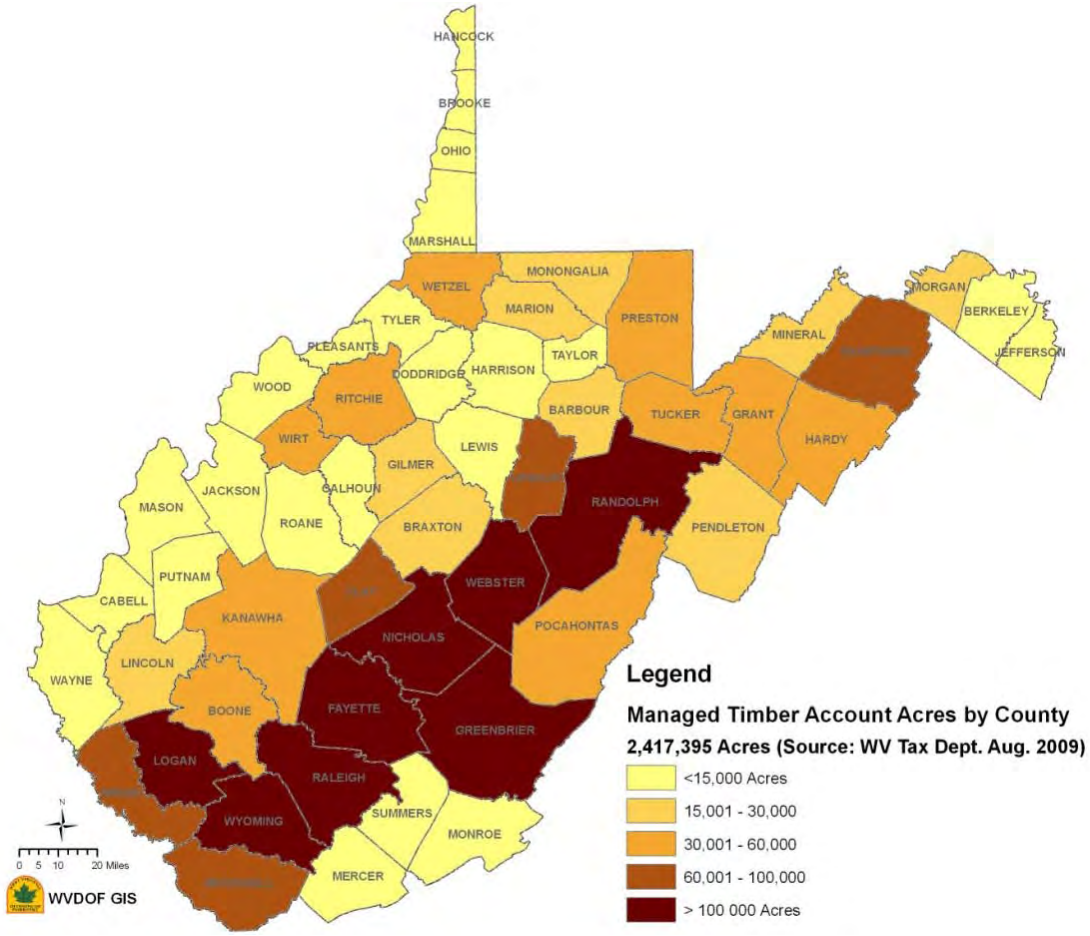
Agricultural land uses declined in the state between 1982 and 1997, with a reduction of approximately 231,000 acres of cultivated and non-cultivated cropland along with a reduction of over 366,000 acres of pasture. Most of this decline was associated with an increase in forest lands, as nearly 600,000 acres of crop and pasture land were allowed to grow back to woody vegetation in the 15-year period (USDA NRCS 2001).

There is a growing concern about the loss of prime farmland to development. The American Farmland Trust estimates 16,000 acres of prime farmland were lost between 1982 and 1997, primarily to development (AFT 2002). In a state where much of the best farm land lies in valley bottoms, the conflicts between working lands and developed land uses are severe. The development of prime farmland (and all working farm lands) represents a threat to sustainable forestry as well. This may not be due to forests being cleared for farming to replace the lost farmland (which is very unlikely, given the recent trend data), or from having forests adjacent to developed farmland cleared for development, although that may occur in some places. 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.

Sub-Issue 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 timber 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 2.4 million acres of forest land are currently under the Managed Timberland Program in West Virginia (Map 1.5).



Map 1.5: Managed timber account acreage by county 2009. (WVDOF GIS, 2009 with data provided by WV Tax Department).

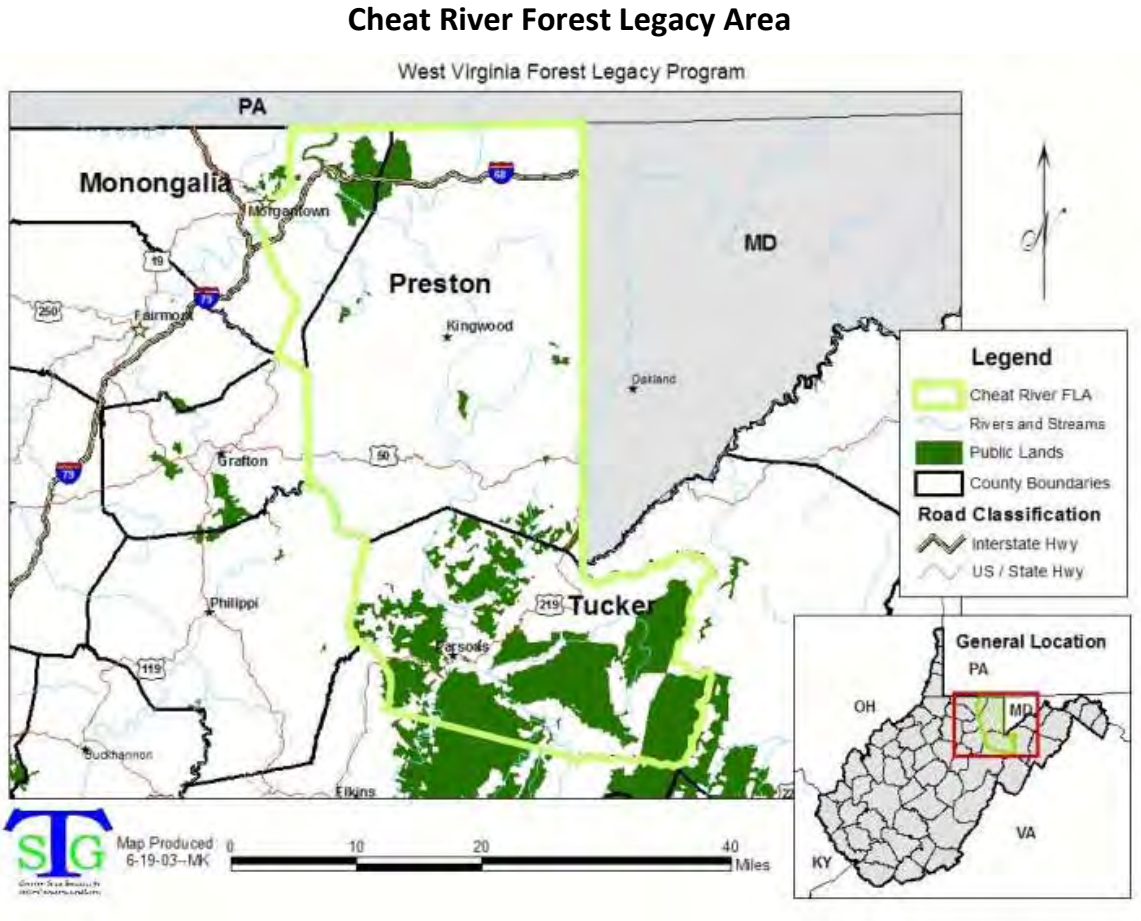
In Managed Timberland, the appraised value is based on what the land is capable of producing. Moreover, lands under conservation easements are to be taxed as agricultural lands. Although state law allows for these two tax breaks on forest land, they are not implemented consistently in each county.

Issue 1: Priority Areas

The priority areas developed for the Competing Land Uses section correspond to the Forest Legacy Areas (FLA) established in the 2003 West Virginia Forest Legacy Program Assessment of Need (WVDOF, 2003). These four areas include the Cheat River, Potomac Highlands, Allegheny Mountains, and Greenbrier / New River Forest Legacy Areas. The WVDOF is following the advice of the US Forest Service Forest Legacy Program and incorporating by reference the four existing Forest Legacy Areas into this Assessment.

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 1.6). 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 1,067 square miles in total area, with about 836 square miles of forest land, about 76 percent 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 1.6: Forest Legacy Area 1 – Cheat River (WVDOF, 2003).

Development pressure on the Cheat River FLA is primarily through second home development. The FLA experienced no growth in population between 1990 and 2000, but the growth in the number of houses within the FLA during that decade was nearly 13 percent. This addition of around 3.2 houses per square mile of private forest suggests that the region is experiencing significant second home expansion. This expansion is creating pressure to parcelize forest lands and makes sustained forest management more difficult.

Timber harvests in 1996 produced just under 7.6 million cubic feet of wood, primarily (almost 85 percent) from private lands, where the harvest levels averaged about 11.9 thousand cubic feet of roundwood per square mile of private forest, which is slightly above the state average. In 2001, forest products manufacturing accounted for 6.7 percent of the jobs and 6.3 percent of the wages in the area—which was more than four times greater than the state average.

The Cheat River FLA contains over 229 miles of high quality streams, primarily in Tucker County. 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. Six different federally listed threatened and endangered species are found in this FLA, with 101 separate occurrences of these species recorded. Important features found in this FLA that support high levels of rare, endangered, and threatened species include the Cheat Gorge and Canaan Valley Ecologically Important Areas. The canyon in the Cheat Gorge has numerous mesic rock outcrops, which provide habitat for the many species. One of these species, the flat-spired three-toothed land snail, occurs only in this FLA and nowhere else in the world. 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; it is home to over 40 species of plants considered rare in West Virginia. 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 as the federally threatened Cheat Mountain salamander, the federally endangered West Virginia northern flying squirrel, and many other state rare species. As well, 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, Canaan Valley National Wildlife Refuge, Canaan Valley State Park, Blackwater Falls State Park, 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.

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 Cheat River FLA should provide the following public benefits (and potential projects should be evaluated on these goals):

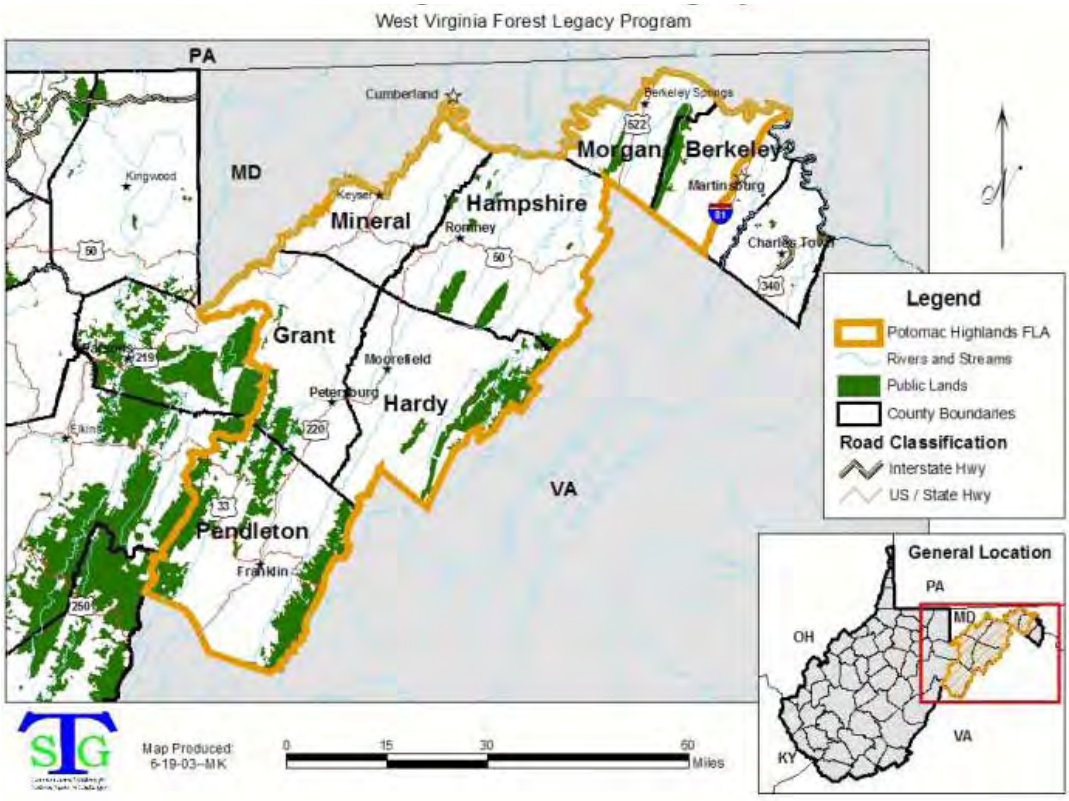
- Maintain large and intact forest land properties.

- Investment in areas with a high likelihood of future forestry and low susceptibility to surface mining.
- 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 important recreational areas.
- Protect and enhance high quality streams and the Cheat River watershed by conserving adjoining working forests, wetlands, and riparian buffers.
- Buffer and strengthen Cheat Canyon and Canaan Valley Ecologically Important Areas and existing protected lands by conserving adjoining working forests.

Forest Legacy Area 2-Potomac Highlands

The Potomac Highlands FLA consists of Grant, Hampshire, Hardy, Mineral, Morgan, and Pendleton counties and that portion of Berkeley County west of Interstate 81, encompassing almost all the area of the eastern panhandle of the state (Map 1.7). As there is no current way to separate data for those areas of Berkeley County not included in the FLA, the following data reflect forestry totals for all seven counties. For population and housing trends, Berkeley County data are excluded, as it is much more highly developed than the remainder of the FLA.

Potomac Highlands Forest Legacy Area



Map 1.7: Forest Legacy Area 2 – Potomac Highlands (WVDOF, 2003).

The Potomac Highlands FLA contains about 3,278 square miles, of which some 2,470 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 2,470 square miles of forest in the FLA, most of the forest (2,447 square miles) is classified as timberland, with the majority (85.6 percent) in private ownership.

Population in the Potomac Highlands showed the highest growth of any of the FLAs between 1990 and 2000. The region saw population increase by almost 10,000 people (an 11.3 percent increase) in the decade, excluding Berkeley County. Housing increases of 20.2 percent were almost double the population growth rate in the six counties, showing significant development of vacation and second homes in the FLA, bringing increasing pressure on its resources.

Based on 1996 timber harvest data, this FLA was the least-intensively harvested of the four FLAs, with an annual harvest of around 15.4 million cubic feet of roundwood, or about 7.3 thousand cubic feet per square mile of private forest land (slightly below the statewide average). However, 2001 data indicates that forest products manufacturing accounts for 3.9 percent of the jobs and 3.5 percent of the wages in the area— over two times more dependent on the forest products industry than the state average.

The Potomac Highlands FLA is home to a variety of important landscape features that support many rare, threatened, or endangered species, and provide for dramatic scenery. There are 10 federally listed threatened and endangered species that occur on this FLA, with 83 separate occurrences of these species recorded. The FLA contains the Smoke Hole and Shenandoah Mountain/Cow Knob Ecologically Important Areas, as well as parts of the Laurel Fork Ecologically Important Area, and adjoins the Savage River and Green Ridge Ecologically Important Areas in Maryland.

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 define the scenic landscape in portions of this region, and provide 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. Over 35 state rare, threatened and endangered plants and animals and 5 globally rare plant communities are found in the North Fork Mountain/Smoke Hole areas. 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, and the shale barren communities found in the Potomac Highlands are globally significant. Significant karst features also found in this area's limestone geology, with a high number of caves and associated rare, threatened, and endangered species such as bats and endemic cave invertebrates. Caves in North Fork Mountain support some 40 percent of the Virginia big-eared bat populations. 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 endangered WV northern flying squirrel, the federally threatened Cheat Mountain salamander, and the rare northern goshawk.

The Potomac Highlands are also home to important freshwater resources. The FLA contains 264 miles of high quality streams, for a density of about 0.08 miles per square mile. A large portion of the Potomac Highlands is dominated by the Cacapon River Watershed and the headwaters of the Potomac River. The Cacapon River Watershed has 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, and 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), Berkeley Springs State Park (SP), Cacapon Resort SP, Short Mountain WMA, Lost River SP, Smoke Hole Caverns, and Seneca Caverns. Important portions of the Monongahela National Forest include the Spruce Knob and Seneca Rocks National Recreation Areas.

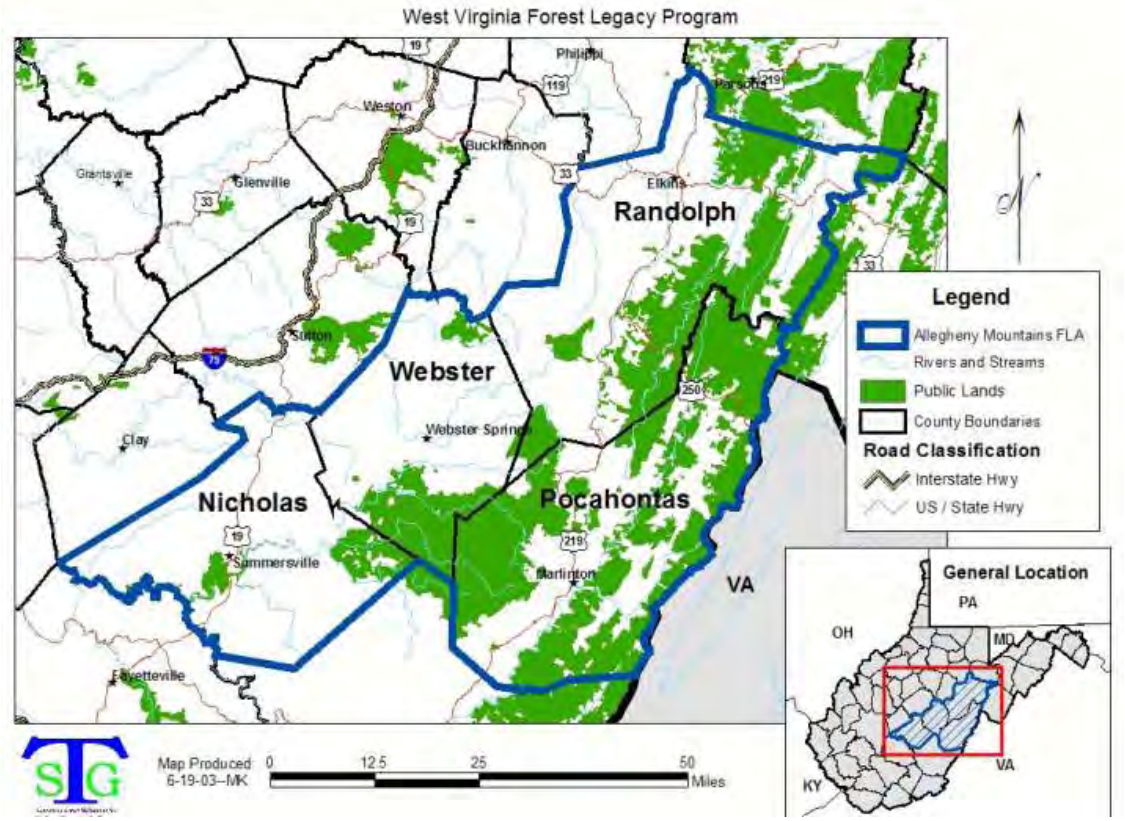
For all of the Forest Legacy Areas, the primary means for protection will be the acquisition of conservation easements from willing sellers. Participation in the FLP for the Potomac Highlands FLA should provide the following public benefits (and potential projects should be evaluated on these goals):

- Maintain large and intact forest land properties.
- Investment in areas with a high likelihood of future forestry and low susceptibility to surface mining.
- Conserve tracts with moderate-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 important recreational areas, such as the Potomac River, Seneca Rocks, and Spruce Knob.
- Protect and enhance high quality streams and the Cacapon and Potomac watersheds by conserving adjoining working forests, wetlands, and riparian buffers.
- Buffer and strengthen Smoke Hole, Shenandoah Mountain, Laurel Fork, Green Ridge, and Savage River Ecologically Important Areas and existing protected lands by conserving adjoining working forests.

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 3,185 square miles of which 2,726 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 1.8). Despite this fact, some 67.5 percent 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 selected private forest lands could be key in protecting the quality of these high-priority forests in West Virginia.

Allegheny Mountains Forest Legacy Area



Map 1.8: Forest Legacy Area 3 – Allegheny Mountains (WVDOF, 2003).

Population change from 1990 to 2000 reflected a small decrease in these four counties, but the number of houses continued to increase during that time, at a rate of 2.35 houses per square mile of private forest. Those trends suggest that recreation and second home developments are continuing at a modest rate, and that maintaining working forests may require efforts such as Forest Legacy conservation easements to maintain large and unbroken areas of manageable forest.

Many of the corporate timberlands in the state are found in this FLA. Companies such as MeadWestvaco, Plum Creek, Coastal Lumber, and many smaller local timber companies own large tracts of timberland in the northwestern and southern portion of the Allegheny Highlands. This ownership pattern makes this area of the FLA very important to the West Virginia timber industry. Timber harvests on the private lands in 1996 were the most intensive of any of the FLAs, with nearly 18 thousand cubic feet (MCF) per square mile of private forest. Forest Service records indicate that the harvest in that year came largely from non-industrial private lands (59.5 percent), with forest industry at 25.5 percent, and the National Forest at 15 percent of total harvest.

In addition, 2001 data indicates that forest products manufacturing accounts for 12.3 percent of the jobs and 12.6 percent of the wages in the area — seven to nine times more dependent on the forest products industry than the state average. These figures suggest that protecting private lands for traditional forest uses in this region is extremely important to the future of the forest-based economy in the area. See Issue 8: Utilization, Marketing, and Economic Development for more information.

The Allegheny Mountains FLA is extremely significant for its concentrations of high quality streams and important watersheds. It contains over 989 miles, or 0.3 miles per square mile of high quality streams. Many of these are trout streams with native brook trout populations, with some areas being stocked with brown and rainbow trout. These high quality streams and the fishing they provide bring thousands of anglers to the region each year. 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. There are 6 different federally listed threatened and endangered species in this FLA, with 170 separate occurrences of these species recorded in this FLA. 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 that can be found on Cheat Mountain, Canaan Valley, and Cranberry Ecologically Important Areas host the premier landscapes for suitable habitat for the federally threatened Cheat Mountain Salamander and federally endangered WV northern flying squirrel. 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. 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. Important areas for recreational and scenic importance and/or protected lands recognized for ecological value are almost too numerous to mention, but would have to include Cranberry, Otter Creek, and Laurel Fork Wilderness Areas; Gauley River National Recreation Area; Snowshoe and Silvercreek Resorts; Lake Sherwood; and Highland Scenic Highway. Kumbrabow, Seneca, and Calvin Price state forests are all located in this FLA.

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 these goals):

- Maintain large and intact forest land properties (this FLA has perhaps the greatest opportunity to conserve landscape-scale working forest ownerships).
- Investment in areas with a high likelihood of future forestry and low susceptibility to surface mining.
- Conserve tracts with 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.
- Protect and enhance the state's highest concentration of high quality streams and the Cheat, Tygart, and Greenbrier watersheds by conserving adjoining working forests, wetlands, and riparian buffers.
- Buffer and strengthen the eight Ecologically Important Areas and numerous existing protected lands by conserving adjoining working forests.

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 1.9). The data presented below includes the entire 6 county area, as those areas not included in the FLA within Mercer and Raleigh Counties could not be separated from the data sets. The FLA covers 3,551 square miles, of which 2,670 are forest. Over 90 percent of the forest (2,414 square miles) is in private ownership.

Map 1.9: Forest Legacy Area 4 – Greenbrier / New River (WVDOF, 2003).

Population in the Greenbrier/New River FLA was virtually unchanged from 1990 to 2000 (0.3 percent increase), but new housing grew at a rate of 3.15 houses per square mile of private forest land. This suggests that second and vacation home development in these areas is driving land parcelization and fragmentation of forested areas in the areas.

This FLA also has large corporate timberland holdings, with large areas managed for pulp and lumber. Timber harvests in 1996 averaged almost 13 thousand cubic feet (MCF) of roundwood per square mile of private forest. Virtually all (96.3 percent) of that harvest came from private lands. 2001 data indicates that forest products manufacturing accounts for 1.7 percent of the jobs and 2.0 percent of the wages in the area—slightly more dependent on the forest products industry than the state average.

The FLA contains several important aquatic resources. The Greenbrier River is one of the last undammed, high quality mountain streams in West Virginia with some of the best examples of the federally listed Virginia spirea in the state. 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 288 miles of high quality streams. 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. Ten different federally listed threatened and endangered species are found in this FLA, with 33 separate occurrences of these species recorded. 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, has some of the largest cave systems in North America, which also supports a very rich diversity of cave fauna. Along the New River, the steep gorges and sandstone cliffs of red oak forest and hemlock/yellow-poplar coves are important to the metapopulation protection of the eastern diamondback rattlesnake and the rare green salamander.

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, numerous smaller state parks and wildlife management areas, Greenbrier State Forest, and the world famous Greenbrier Resort.

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 Greenbrier/New River FLA should provide the following public benefits (and potential projects should be evaluated on these goals):

- Maintain large and intact forest land properties.
- Investment in areas with a high likelihood of future forestry and low susceptibility to surface mining.
- Conserve tracts with 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, in particular the three rivers with National Recreation Areas.
- Protect and enhance high quality streams and the Greenbrier, Middle New, Upper James, and Upper Kanawha watersheds by conserving adjoining working forests, wetlands, and riparian buffers.
- Buffer and strengthen the five Ecologically Important Areas and expand the limited protected lands by conserving adjoining working forests.

Issue 1: Overlay Analysis

An overlay analysis was conducted in 2009 to determine if the four Forest Legacy Areas identified in 2003 are still valid by using current data. Seven input data layers were established and 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. The following is a description of the layers and Boolean classification used in the overlay:

Layer 1: Housing density on private land data. Theobald, 2010 estimate was used. Housing density classes ≤82 units/ha were classified as one and the rest as zero.

Layer 2: Percent managed timberland account acreage by county. Counties with greater than 4 percent of the area in Managed Timberland were classified as one and the remaining counties as zero.

Layer 3: Coalfields of West Virginia. The coalfields were classified as zero while the rest of the state was classified as one.

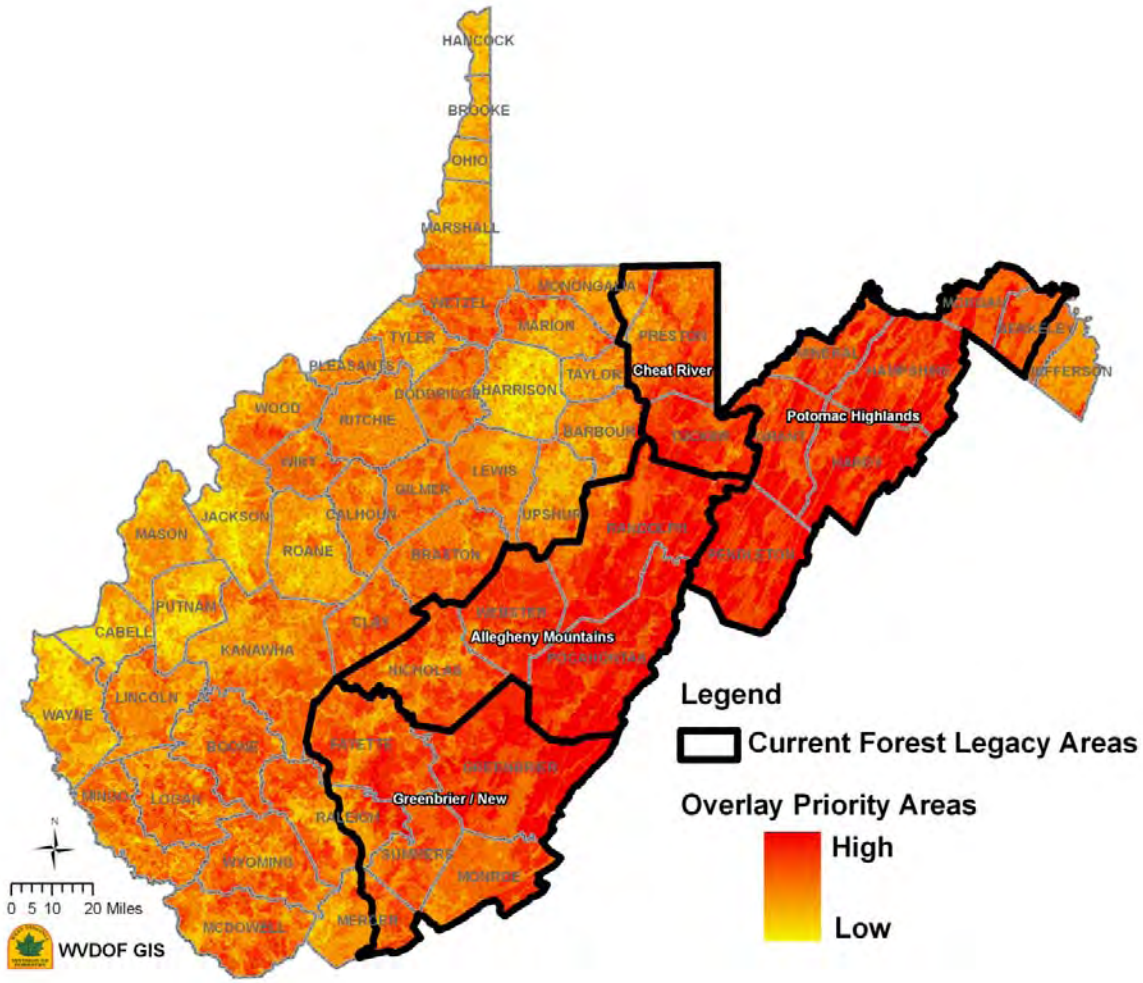
Layer 4: Forest Patches. Forest patches (contiguous forested areas) greater than 1,000 acres were classified as one and the remaining patches as zero.

Layer 5: Forest Interior Edge. Forested areas at least 90 meters from a developed edge were classified as one and the remainder as zero.

Layer 6: Appalachian Basin Proven Oil and Gas fields. Areas without oil and gas field potential were classified as one and the remainder zero.

Layer 7: Mining Permit Boundaries. Mining permit boundaries were classified as zero and the remainder as one.

Once the data input layers were established and classified, a composite map was produced which shows the results of the overlay analysis (Map 1.10). On the map, the pixels that represent the presence of the most data input layers have the darkest red color. The highest concentration of pixels with the darkest red color is within the original Forest Legacy Areas. Therefore, no changes will be made to the original Forest Legacy Areas and the 2003 AON is incorporated by reference into this assessment.



Map 1.10: Competing land use issue overlay results showing majority of highest scores within current Forest Legacy Areas (WVDOF GIS, 2009).