

Vegetation Diversity

Introduction

Vegetation diversity was a driving issue in Forest Plan revision and it is emphasized in portions of Chapters II and III of the 2006 Forest Plan. We consider vegetation diversity important not only for the variety of wildlife habitats it may provide, but also for the resilience it can offer the forest in the face of major disturbances such as insect or disease infestations or fire.

The Forest has taken a two-pronged approach to address vegetation diversity. First, we have assigned Management Prescriptions (5.0, 5.1, 6.2, 8.1 SPNM, 8.2, 8.3, 8.4, and portions of 4.1) that would retain many areas in an undeveloped condition where diversity would be allowed to evolve through natural processes of succession and disturbance. Second, we have assigned other Management Prescriptions (3.0, 6.1, and portions of 4.1) where we plan to actively treat vegetation to enhance diversity. For those areas where we are planning active management, we have specific goals and objectives for treatment, and we can track our progress for achieving those goals and objectives by monitoring our management activities.

2007 Accomplishments

Vegetation diversity accomplishments for FY 2007 included:

- Budget and work planning for diversity projects, including out-year (5 years) planning.
- Planning and analysis efforts for several projects that should contribute to increasing diversity in the next few years, including the Little Beech Mountain project on the Greenbrier Ranger District, the Lower Williams project on the Gauley Ranger District, the Hogback project on the Cheat Ranger District, and the Middle Mountain Savannah project on the Marlinton/White Sulphur Springs Ranger District.
- Completing scheduled harvest, TSI, and site preparation for natural regeneration work:
 - 187 acres of regeneration harvest (4 acres were converted to wildlife openings),
 - 491 acres of intermediate harvest,
 - 1,004 acres of pre- or post-harvest site preparation for natural regeneration,
 - 23 acres of (research/wildlife habitat improvement),
 - 103 acres of timber stand improvement, and
 - 450 acres of prescribed fire.

Monitoring and Evaluation

FOREST PLAN MONITORING FOR VEGETATION DIVERSITY

The Monongahela National Forest Land and Resource Plan (2006) outlines vegetation diversity monitoring on pages IV-11.

37. *To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?*

38. *To what extent is the Forest meeting vegetation composition and age class desired conditions and goals for MPs 3.0, 4.1, and 6.1?*

Monitoring results for these questions are reported below.

Monitoring Question 37. To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?

This monitoring item or question is trying to track changes that are occurring to vegetation diversity across the Forest in the form of composition and structure. There are three main influences on these changes: 1) Forest vegetation management, 2) natural disturbances, and 3) recovery through natural succession and growth.

Forest Vegetation Management

Forest vegetation management can change composition and structure through such activities as timber harvest, timber stand improvements, wildlife habitat improvements, reforestation, and prescribed fire. Even-aged or regeneration harvests create more change than intermediate harvests because they immediately alter the age class and structure of a timber stand.

Timber stand improvements (mostly tree thinning) do not typically change the age class of a stand, but they can affect composition through selective thinning of certain species, or by allowing more light and air movement into a stand, which can affect ground vegetation and regeneration. Thinning can also affect stand structure by creating partial canopy openings that encourage the growth of understory herbs, shrubs, and saplings.

Wildlife habitat improvements can be similar to timber stand improvements in that the composition of a stand may change by girdling or cutting individual trees that would allow more light to reach the forest floor and encourage regeneration of shade-tolerant species such as maple and beech. Other wildlife habitat improvements such as the creation of wildlife openings or savannahs cause a land use classification change, from a forested stand to a grassy clearing within a forested area. This land use change can be semi-permanent if the grassy clearings are maintained as openings by mowing or prescribed fire.

Reforestation can take the form of planting desirable tree species or creating conditions that favor the natural regeneration of desirable tree species.

Prescribed fire can affect forest overstory structure if the fire produces abundant tree mortality, but more commonly it affects only the structure of the understory by favoring herbaceous vegetation and fire-tolerant tree seedlings over shrubs and fire-intolerant seedlings. Long-term effects can be seen in overstory species composition, as fire tolerant seedlings/saplings have an advantage in reaching the overstory. Prescribed fire is also used on the Forest to maintain existing openings.

Vegetation management activities in FY 2007 included 187 acres of regeneration harvest, 491 acres of intermediate harvest, 1,004 acres of pre- or post-harvest site preparation for natural regeneration, 103 acres of timber stand improvement, 8 acres of seeding wildlife grasses, 4 acres of wildlife opening creation, and 450 acres of prescribed fire.

Natural Disturbances

Natural disturbances can change both vegetation structure and composition. Disturbance events such as fire or windstorms can produce tree mortality to the point where patches of timber are “reset” to an earlier structural stage or age class. Insects and diseases typically affect only certain species of vegetation, which can alter stand composition, although large infestations in areas dominated by one species could affect stand structure and age class.

There were no large wildfires or windstorms on the Forest during FY 2007. A widespread ice storm occurred in October 2006, but damage was generally limited to tree tops and limbs. Most tree mortality was caused by scattered incidences of insect and disease infestations that typically affected particular tree species. For example:

- Hemlock woolly adelgid has caused substantial hemlock mortality, mostly in the eastern section of the Forest.
- The killing front of beech bark disease is within the Forest boundary causing substantial mortality to American beech trees. It is estimated that 1 to 2% of beech trees are resistant to the disease. While approximately 30 to 40 percent of the beech trees will survive, the wood will no longer be merchantable and nut production will decline.
- Gypsy moth defoliation occurred, mostly in oak trees, in the southern section of the Forest in 2007 but was not severe enough to completely defoliate trees. If gypsy moth populations continue to increase there will most likely be more severe defoliation and some mortality within the near future reducing the oak component within the Forest.

Deer predation on tree seedlings occurred throughout the Forest, but that topic is addressed in the Timber Resources section of this report.

Natural Succession and Growth

Natural succession includes both the aging/growing of vegetation and the replacement of shade intolerant species by more tolerant species that can establish and grow in the forest understory. Aging affects tree age class and structure. As trees age and grow, they move into older age classes and larger size classes until they die and are replaced by smaller and younger trees or grass/herbaceous/shrub vegetation. As dominant tree species outgrow or out-compete other species, the vegetation composition of a stand or area shifts more toward the dominant species. The amount of mature forest canopy may also influence the understory composition from the shade that is produced. The relatively closed canopy of a mature forest favors the regeneration and growth of shade-tolerant species such as maple and beech while discouraging seed germination and growth of shade-intolerant and moderately tolerant species such as oak, black cherry, hickory, and yellow poplar.

During FY 2007, natural succession and growth continued across the entire Forest, in both managed and unmanaged stands.

Monitoring Question 37. Evaluation, Conclusions, and Recommendations

Forest Vegetation Management

The most significant effect to vegetation diversity from Forest management activities in FY 2007 was from the 183 acres of regeneration harvest that moved mature timber stands to an early successional or young structural stage. Regenerated species on these acres will also likely be somewhat different (more oak and cherry, for example, and less striped maple and beech) than the understory composition prior to harvest. Four additional acres were harvested and converted to semi-permanent wildlife openings that will be maintained to an early structural stage of grass and herbaceous species over the long term.

The 491 acres of intermediate harvest and 103 acres of timber stand improvement likely had little to minor effects on vegetation diversity. An estimated 23 acres of harvest related to wildlife habitat research was considered light thinning, which likely did not significantly alter structural or compositional diversity. Minor tree cutting occurred for road/landing construction and special use permit roads, but the resulting clearings are considered total soil resource commitments in which forest and soil productivity are lost for the long term.

The 450 acres of prescribed fire were either light-intensity underburns with little to no mature tree mortality, or maintenance burns of savannahs and a heritage resources site that maintained these sites in a non-forested condition. Thus, no age class changes occurred, although some structure and composition changes can be expected from seedling and sapling mortality.

Natural Disturbances

As reported above, there were no large disturbance events on the Forest during FY 2007 that would have had a significant effect on vegetation diversity. Ongoing insect and disease infestations had localized effects, but no large outbreaks were reported. Primary effects included scattered losses of hemlock due to the hemlock woolly adelgid, and similar losses of beech to the beech bark disease complex. Close to 5,000 acres of moderate defoliation occurred due to gypsy moth activity. Normally moderate defoliation does not cause mortality in deciduous hardwood trees unless combined with other stress factors, such as drought. Mortality begins to occur when trees are completely defoliated in late spring or early summer and need to re-grow leaves during the summer. Emerald ash borer was found in West Virginia for the first time in 2007. Although it has not yet been observed on the Forest, it has the potential for widespread mortality because it is known to infest a variety of ash species. More information on these pests and their current status can be found in the Insects and Diseases section of this report.

Natural Succession and Growth

Although we know that natural succession and growth occurred on every acre of forested land in FY 2007, it would be difficult and impractical to determine what precise effects these processes

had on age class diversity and composition change at the stand level. Overall, it is presumed that forested stands generally grew older and larger wherever management activities or natural disturbances did not intercede. However, it is not possible to estimate how many Forest stands increased in age class or shifted in species composition over a one-year period.

Recommendations: An estimation of general age class and composition should be done during the next comprehensive monitoring report (4-5 years) or Forest Plan revision (10-15 years). At that time, effects from Forest management activities and natural disturbance events can also be factored in to assess cumulative changes to vegetation diversity. In the mean time, we should continue to monitor and report Forest vegetation management activities or disturbance events that have a measurable effect on stand structure, age class, or species composition.

Monitoring Question 38. To what extent is the Forest meeting vegetation composition and age class desired conditions and goals for Management Prescriptions 3.0, 4.1, and 6.1?

Management Prescription (MP) 3.0

The main management emphasis in MP 3.0 is age class diversity and sustainable timber production. Desired conditions for vegetation in MP 3.0 are described on pages III-6 and III-7 of the Forest Plan. To move toward these conditions, the following goal and objective were developed for MP 3.0 (Forest Plan, page III-7).

Goal 3001 - Enhance diversity of forest vegetative cover through the dispersion of a variety of species, types, and ages.

Objective 3002 - Over the next 10 years regenerate the following amounts of forest vegetation to begin moving toward desired age class conditions for these forest types:

- Northern hardwoods: 1,000-2,000 acres*
- Mixed cove hardwoods: 8,000-12,000 acres*
- Mixed oak: 3,000-4,000 acres*

Table VD-2 displays the acres of regeneration harvest that occurred by forest community type in MP 3.0 during FY 2007.

Table VD-1. Regeneration Harvest Acres by Forest Community Type in MP 3.0, FY 2007

Time Period	Regeneration Harvest Acres by Forest Community Type in MP 3.0						Total
	Spruce	Northern Hardwood	Mixed Meso/Cove	Mixed Oak	Pine-Oak	Other	
FY 2007	0	0	132	37	0	20	187
Planning Period*	0	0	132	37	0	20	187

*FY 2007 was the first year of the 10-year planning period.

Management Prescription 4.1

This prescription area is a mosaic of spruce, spruce-hardwood, and hardwood communities. Management emphasis in MP 4.1 focuses on restoration and management of disjunct red spruce and spruce-hardwood communities. However, stands with little or no potential for spruce restoration are managed to promote healthy hardwood communities with a mix of age classes. Desired conditions for vegetation in MP 4.1 are described on pages III-12 and III-13 of the Forest Plan. To move toward these conditions, the following goals and objectives were developed for MP 4.1 (Forest Plan, page III-14).

Goal 4101 - Maintain or enhance the spruce component within mixed spruce-hardwood communities. Maintain a hardwood component in mixed stands as well to provide mast, nesting habitat, and species diversity.

Goal 4102 - Restore a spruce component to stands that contain understory spruce or scattered overstory spruce.

Objective 4107 - Within stands where spruce can be restored or enhanced, conduct approximately 1,000 to 5,000 acres of species composition and habitat structure enhancement work over the next 10 years. Prioritize efforts in areas that would restore habitat connectivity, increase the size of existing habitats, and provide travel corridors between existing habitats.

During FY 2007, no spruce/hardwood composition or structure enhancement work was accomplished through tree harvest or thinning, but 10 acres were planted with spruce seedlings.

Goal 4106 - In hardwood communities where spruce restoration is not practical, create and maintain a mix of age classes, favoring mast-producing species where possible.

Objective 4108 - Over the next 10 years regenerate approximately 2,000 to 5,000 acres of hardwoods on suited timberlands where spruce cannot be restored to begin moving toward desired age class and habitat diversity conditions.

During FY 2007, no hardwood regeneration harvest occurred in MP 4.1.

Management Prescription 6.1

Management emphasis in MP 6.1 focuses on sustainable production of mast and other plant species that benefit wildlife, and active restoration of pine-oak and oak-hickory communities. Desired conditions for vegetation in MP 6.1 are described on pages III-34 and III-35 of the Forest Plan. To move toward these conditions, the following goal and objective were developed for MP 6.1 (Forest Plan, pages III-35 and III-36).

Goal 6101 - Enhance diversity of wildlife habitat by managing for a variety of vegetation species, types, and age classes.

Objective 6105 - Over the next 10 years regenerate an estimated 2,000 to 5,000 acres of mixed and northern hardwoods to begin moving toward desired age class and habitat diversity conditions.

During FY 2007, no hardwood regeneration harvest occurred in MP 6.1.

Goal 6102 - Maintain, restore, or enhance the oak component within oak-pine and oak-hickory communities to provide long-term mast supplies, sustainable timber, and habitat diversity. Maintain or enhance the pine component in pine and mixed pine-oak stands.

Objective 6104 - Within oak ecosystems that can be restored, enhanced, or maintained, conduct 10,000 to 15,000 acres of prescribed fire over the next 10 years to enhance species composition and stand structure.

During FY 2007, an estimated 55 acres of prescribed fire occurred within oak ecosystems. Another 387 acres of prescribed burning were conducted in mixed mesophytic/cove hardwood ecosystems that had a red oak component.

Objective 6106 - Over the next 10 years regenerate the following amounts of forest vegetation to begin moving toward desired age class and habitat diversity conditions for these forest types:

- White oak: 700 to 1,200 acres*
- Red oak: 2,000 to 4,000 acres*
- Mixed oak: 1,000 to 3,000 acres*

Table VD-2 displays the acres of prescribed burning completed to promote oak regeneration in MP 6.1 during FY 2007.

Table VD-2. Prescribed Burning Acres for Oak Regeneration in MP 6.1 during FY 2007

Time Period	White Oak Acres	Red Oak Acres	Mixed Oak Acres	Total Acres
FY 2007	0	15*	39	55
Planning Period**	0	15	39	55

*Burning occurred in Mixed Mesophytic/Cove community type with a red oak component.

**FY 2007 was the first year of the 10-year planning period.

Monitoring Question 38. Evaluation, Conclusions, and Recommendations

The Forest did not make much progress toward achieving the 2006 Forest Plan vegetation diversity goals and objectives in FY 2007. This lack of progress is not surprising considering that most 2007 harvest or burn activities were designed to implement the 1986 Forest Plan, which did not have the same type of specific and comprehensive vegetation diversity goals, objectives, and desired conditions as does the 2006 Forest Plan.

Fiscal Year 2007 was a transition year between the 1986 and 2006 Forest Plans. Almost all projects that were implemented in FY 2007 were conceived and planned prior to the 2006 Forest Plan. However, in FY 2007 the Forest also revised and expanded its Strategic Integrated Five

Year Plan, which now has a number of projects planned specifically to help meet vegetation diversity objectives. Table VD-3 shows a list of current projects planned for the next five years that should contribute to vegetation diversity on the Forest. Although specific acres have not been identified yet for most projects, they will generally range from 100-200 acres for spruce restoration and habitat enhancement projects, 200-500 acres for timber sales, and 50-1,000 acres for prescribed burns. Project implementation may also vary by year, depending on available funding and other Forest priorities.

Table VD-3. Forest Five Year Plan Projects that Would Contribute to Vegetation Diversity

Project	Implementation Fiscal Year	Related Forest Plan Objectives
Cherry River II Timber Sale	2008	VE02, 3002
Louk Run Timber Sale	2008	VE02, 3002
Upper Williams Restoration/Habitat Enhancement	2008, 2009	VE03, 6105
Shock Run Prescribed Burns	2008, 2009	FM09, 6104
Coles Run Prescribed Burns	2009, 2011	FM09, 6104
White Sulphur Springs Prescribed Burns	2009-2012	FM09, 6104
Lower Williams #1 Timber Sale	2009	VE02, 3002
Hogback #1 Timber Sale	2009	VE02, 3002
East Fork and Nag Timber Sales	2009	VE02, 3002
Canaan Mtn./Dolly Sods Spruce Restoration	2009	VE03, 4107
Gauley Spruce Restoration/Habitat Enhancement	2009, 2010	VE03, 4107
Lower Williams #2 Timber Sale	2010	VE02, 3002
Hogback #2 Timber Sale	2010	VE02, 3002
Upper Greenbrier NW #1 Timber Sale	2010	VE02, 3002, 4108
NF South Branch Bat Habitat Enhancement	2010	VE03, 6105
Upper Greenbrier Spruce Restoration	2010-2012	VE03, 4107
Hogback #3 Timber Sale	2011	VE02, 3002
Upper Greenbrier NW #2 Timber Sale	2011	VE02, 3002, 4108
Big Rock #1 Timber Sale	2011	VE02, 3002
Big Rock #2 Timber Sale	2012	VE02, 3002
Big Mtn/Grassy Mtn. #1 Timber Sale	2012	VE02, 6105, 6106
Upper Greenbrier SE Ecological Restoration	2012	VE02, 6105, 6106
L. Shavers/L. Glady Bat Habitat Enhancement	2012	VE03, 6105

Recommendations: Continue to monitor progress toward Objectives 3002, 4107, 4108, 6104, 6105, and 6106 on an annual basis. Implement activities currently on the Forest’s Five Year Plan that would move vegetation toward Forest Plan vegetation diversity goals and objectives. Continue to look for additional opportunities to achieve vegetation diversity goals and objectives during watershed and project-level planning efforts.

To clarify the intent and requirement of this monitoring item, it is recommended that we change the wording to say: *To what extent is the Forest meeting vegetation composition and age class objectives and desired conditions for Management Prescriptions 3.0, 4.1, and 6.1?*