Terrestrial Ecosystem Diversity (Coarse Filter)

INTRODUCTION

The Monongahela National Forest (MNF) is located in the central Appalachian Mountains, which is one of the major regional concentrations of native biological diversity in the eastern United States (The Nature Conservancy 2003). Variations in elevation, topography, geology, soils, and climate produce a wide range of ecological communities that support a great diversity of plant and animal species. Low-elevation river valleys support species typical of the southeastern and mid-Atlantic United States, while high-elevation ridges and wetlands support species that are commonly found in New England and southeastern Canada. On the western two-thirds of the Forest, up-slope precipitation supports moist, highly productive communities. The eastern third of the Forest lies in the rain shadow of the Allegheny Mountains and is dominated by drier, less productive ecosystems. Within these general areas, variations in slope and aspect produce a mosaic of forested communities. Throughout the Forest, unusual combinations of topography and geology create unique communities such as bogs, shale barrens, and rock outcrops.

Various laws and regulations address the maintenance and recovery of biological diversity on national forests. The National Forest Management Act (NFMA) and its implementing regulations require national forests to preserve and enhance the diversity of plant and animal communities to meet multiple use objectives based on the suitability and capability of the land. NFMA regulations also require maintenance of viable populations of existing native and desirable non-native species (16 U.S.C. 1600(6)(g)(3)(B); 36 CFR 219.19, 219.26, and 219.27(g)). Conserving native ecosystem diversity is a large part of the Forest Service's strategy for maintaining species viability.

Ecosystem diversity was not identified as a major Need for Change issue. However, Vegetation Management and Remote Backcountry were identified as major issues. Efforts to address these issues could influence the Forest's strategy for conserving ecosystem diversity. Public and internal comments identified the following topics that have been incorporated into the Ecosystem Diversity, Vegetation, or Remote Backcountry analyses: old growth, forest habitat fragmentation, prescribed fire, wildlife, roadless areas, biodiversity, ecosystem approach to management, and age class distribution. Efforts to address these topics form the framework within which the Forest works to conserve ecosystem diversity.

Issues and Indicators

Issue Statement

Forest Plan management strategies may affect the amount, distribution, structure, and composition of ecological communities.

Background

Ecological communities are the foundation of biological diversity. Communities on the Forest include those in need of ecological restoration, such as spruce forests and oak forests, as well as unique communities in need of protection, such as bogs and shale barrens. A key function of forest planning is to provide for such restoration and protection needs while also providing a mix of diverse habitats to meet the demands of multiple uses.

To address the requirements for maintaining diversity and viable populations, the Forest Service has developed an analysis process called species viability evaluation. Species viability evaluation takes a two-part approach that is referred to as a "coarse-filter/fine-filter" approach (Haufler et al. 1999), or an "ecosystem diversity/species diversity" approach. Coarse-filter analysis refers to evaluating biodiversity conservation through a classification and assessment of the component ecosystems that make up a landscape (Haufler et al. 1996). It is based upon the theory that conserving an adequate representation of natural plant and animal communities will maintain most species that occur in a given planning area (Haufler et al. 1999). In conserving representative communities, natural disturbance regimes and the historic range of variability of natural communities are considered (Haufler et al. 1999). The historic range of variability, generally defined as the range of communities and forest age classes that existed prior to settlement, represents conditions to which native species and communities are best adapted. It measures how close the coarse-filter strategy comes to providing representation of natural communities.

This analysis focuses on ecological communities that predominate on the landscape; communities that are rare, unique, or declining; and communities that provide habitat for species with potential viability concerns. Communities were evaluated for direct effects of management on National Forest System (NFS) land. Communities and the species that inhabit them also are affected by activities on intermingled non-NFS land; therefore, the cumulative effects of Forest Service and other activities were evaluated to the extent possible for all land within the Forest boundary (proclamation boundary and purchase units).

Indicators

The following indicators are used to reflect the potential changes by alternative based on anticipated levels of management activities that could affect ecosystem diversity components:

Amount and development stages of major forested communities by alternative - Major forested communities cover most of the land area within the Forest boundary. These major communities provide the bulk of the wildlife habitat on the Forest.

Amount of each rare and unique community potentially affected by alternative - In addition to the major forested communities, many rare or otherwise unique communities exist on the Forest. Most rare and unique communities do not cover large areas of the Forest; however, they are important habitats for many specialized, disjunct, and endemic species. For each alternative, the projected amount of each rare and unique community is evaluated relative to presettlement, post-extractive logging, and current conditions.

Representation of ecological communities in Minimum Dynamic Area (MDA) Reserves by alternative (potential old growth) - Conservation planners use the term "minimum dynamic area" (MDA) to refer to the minimum size necessary for an ecological reserve to absorb natural disturbances and still maintain all forest development stages over the long term (Frelich 1995, cited in Haney et al. 2000). Each plan alternative contains Management Prescriptions (MPs) and other direction that will prohibit or greatly limit even-aged timber management on certain areas of land. These areas, if large enough, are considered MDA reserves or potential old growth.

Scope of the Analysis

Direct, indirect, and cumulative effects are analyzed for the three indicators described below over the short and long term.

Amount and Development Stages of Major Forested Communities - Effect to the following major forested communities are analyzed:

- Spruce Forests
- Mixed Mesophytic and Cove Forests
- Northern Hardwood Forests
- Hemlock Forests
- Oak Forests
- Pine-Oak Forests
- Riparian Forests

The Current Conditions section describes these communities.

Amount of Each Rare and Unique Community - Effects to the following rare and unique communities are analyzed:

- Bogs, Fens, Seeps, and Seasonal Ponds
- Open Wetlands
- Stream Channels
- Glades and Barrens
- Rock Outcrops and Cliffs
- High Elevation Grassland
- Shrub Balds
- Caves and Mines
- Woodlands, Savannas, and Grasslands
- Remote Habitat
- Lakes and Ponds

Estimation methods varied by community according to the amount and type of information available. The Current Conditions discussion below contains descriptions of the rare and unique communities and the methods used to estimate them.

Representation of Ecological Communities in Minimum Dynamic Area (MDA) Reserves – Potential Old Growth - Areas analyzed or considered as MDAs include the following:

- Congressionally designated wilderness areas (MP 5.0).
- Proposed wilderness (MP 5.1).

- Remote backcountry (MP 6.2).
- Certain special areas (MP 8.x) that were designated for preserving biological or scenic qualities.
- Potential spruce restoration areas within MP 4.1.
- Under the action alternatives, much of the NRA, in which scenic and recreational management is emphasized.
- Suitable habitat for the West Virginia northern flying squirrel.
- Key areas near Indiana bat hibernacula.
- Corridors for eligible Wild and Scenic River status.
- Certain areas with a Scenery Management System (SMS) classification of very high scenic integrity.
- Lands classified as tentatively unsuitable for regulated timber production.

While each of these areas was allocated for specific purposes other than general conservation of biodiversity, when viewed together, they perform an additional function in the Forest's strategy for coarse-filter conservation of ecological communities. Within these areas, vegetative composition and structure will be shaped largely by natural succession and disturbance processes, or management activity will tend to mimic these processes. Over time, these areas are expected to develop a large component of old growth, so they constitute the Forest's primary strategy for providing this habitat component.

In many places, lands covered by these MPs and management direction cover large areas, and the various categories often adjoin and overlap each other. Therefore, the areas will perform the coarse-filter function of preserving large core areas containing representative examples of natural communities that can trend toward presettlement conditions. Over the long term, reserves smaller than the MDA are not expected to be effective at maintaining all forest development stages and their associated biodiversity. The MDA reserves indicator assesses the number and size of reserves provided by each alternative, as well as the degree to which the major forested communities are represented in reserves.

CURRENT CONDITIONS

Amount and Development Stages of Major Forested Communities

Community Descriptions

Spruce Forest - This community consists of high-elevation forests dominated by spruce (*Picea* spp.), or a mixture of northern hardwoods with at least 30 percent spruce in the overstory. Native red spruce (*Picea rubens*) is the tree species that dominates most areas of the spruce forest community, but where they occur, plantations of non-native Norway spruce (*Picea abies*) are also included. Mixed hardwood/spruce forests were included in this community because they tend to harbor many of the same species with potential viability concerns as pure spruce forests. The 30 percent spruce threshold was chosen because research suggests that the probability of occurrence of the endangered West Virginia northern flying squirrel (*Glaucomys sabrinus*

fuscus) increases rapidly as conifer overstory exceeds 30 percent (Menzel et al. undated). Thus, 30 percent approximates the point at which mixed forests resemble spruce forests structurally and the associated fauna appear regularly. Selection of the 30 percent threshold for this analysis does not change the way the Forest currently identifies suitable West Virginia northern flying squirrel habitat for project-level analyses. Generally, 10 percent spruce in the overstory is used for these analyses to be conservative and capture all possible habitat.

Mixed Mesophytic and Cove Forest - Mixed mesophytic and cove forests are deciduous forests on mesic sites at low and middle elevations. Plant species composition is diverse and varies widely, though sites in this community usually lack strong components of yellow birch (*Betula alleghaniensis*) or oaks, other than northern red oak (*Quercus rubra*). This is a broad definition that probably includes many beech-maple (*Fagus grandifolia-Acer* spp.) stands that could be considered northern hardwoods. These stands were included in the mixed mesophytic and cove forests community because their habitat characteristics are more similar to other forest types in this community than they are to the very moist, high-elevation northern hardwood sites that have a strong yellow birch component.

Northern Hardwood Forest - This community consists of cool, mesic deciduous forests at middle to high elevations. As defined here, northern hardwood forests differ from mixed mesophytic and cove forests by occurring on moister sites at higher elevations, by containing a stronger component of yellow birch, and by being more likely to contain minor amounts of red spruce. Mixed stands containing 30 percent or more spruce in the overstory are included in the spruce forests community.

Hemlock Forest - Hemlock forests are dominated by eastern hemlock (*Tsuga canadensis*) or a mixture of hemlock and eastern white pine (*Pinus strobus*). Hemlock forests tend to occur in moist coves. Although hemlock forests currently cover a minor percentage of the Forest, they were included as a major forest community because historic information suggests that they were more widespread prior to initial logging of the area (Abrams and McCay 1996).

Oak Forest - This community consists of dry to mesic sites dominated by oaks (*Quercus* spp.). Prior to widespread fire suppression, such sites typically were subjected to moderate levels of recurrent disturbance, often consisting of periodic low-intensity surface fires. Such fires are thought to favor oak regeneration by creating or maintaining canopy openings and by killing seedlings of shade-tolerant, fire-sensitive tree species (Abrams and McCay 1996, Abrams et al. 1997, Schuler and McClain 2003).

Pine-Oak Forest - Pine-oak forests are dominated by pines or a mixture of pines and oaks. They typically occur on xeric or dry-mesic sites, often on ridge tops or in association with rock outcrops. In the absence of fire suppression, some yellow pine sites may be maintained in a semi-open condition by frequent low to moderate intensity fires. Forests dominated by white pine or white pine-oak mixtures are also included in this community. White pine sites may be less xeric and are less prone to frequent fires than yellow pine sites.

Riparian Forest - Riparian forests occur along streams. Typically they are dominated by a wide array of mesophytic deciduous trees, but conifer species such as eastern hemlock, eastern white pine, and red spruce also are important components of many riparian forests.

Amount and Development Stage Breakdown

We assessed communities for four important time periods. The first period was presettlement, generally defined as the time prior to widespread European settlement. This time period represents communities that existed prior to large-scale alteration by non-indigenous people, and it serves as a baseline against which other time periods are evaluated. The second period evaluated was the end of the extensive logging era that occurred during the late 19th Century and early 20th Century. This period represents the greatest historical departure from presettlement conditions for most communities. Current conditions are the third time period for which communities were evaluated. Current conditions represent the starting point for evaluating the effects of Forest Plan alternatives on ecological communities. Finally, projected conditions for each alternative were assessed through a 100-year planning horizon. Analysis of communities for the entire planning horizon allowed us to evaluate the effects of management through a period when existing forest communities will age substantially relative to current conditions. The entire planning horizon also allowed time for management strategies to make progress toward desired conditions. Limiting the analysis to the early decades of the planning horizon would have ignored important changes in the age structure of forested communities in later decades that will result from the current condition and the effects of management activity in the early decades. However, projections beyond the first decade or two must be viewed with caution because of the potential for changes in management emphasis, as well as substantial uncertainty over factors beyond the control of the Forest, such as continued acid deposition, global climate change, and human population growth.

The species viability chapter of the Analysis of the Management Situation contains additional details on the methods used to identify and classify ecological communities.

Analysis of the major forested communities proceeded as a two-step process. The first step was to estimate the total amount of each community for each time period that was assessed. Data sources for these estimates differed according to the time period considered. Estimates for presettlement amounts were based largely on the Forest's Ecological Land Type Phase (ELTP) mapping (USDA Forest Service 2002a), which projects potential natural vegetation for all land within the Forest boundary. Because the current forest is largely a product of the stands that regenerated following widespread extractive logging in the late 19th and early 20th Centuries, the Forest's Combined Data System (CDS) stands database was used to estimate major forested communities for the post-extractive logging and current time periods. Forest Inventory and Analysis (FIA) data for private lands were used to supplement current estimates for all land within the Forest boundary (data obtained from FIA website). Spectrum model outputs were used to estimate future amounts of major forested communities under each alternative. The species viability chapter of the Analysis of the Management Situation contains additional details on the methods used to estimate amounts of major forested communities.

The second step in the analysis of major forested communities was to break down the total estimates into development stages. Forested communities were divided into three stages based on the type of structural habitat provided.

Young stands occur on recently disturbed sites that are regenerating. For the purposes of this analysis, young stands include herb, seedling, sapling, and small pole stands (0-39 years old). These structural categories were combined as a way of keeping the number of habitat type/development stage combinations down to a manageable level. While we recognized that there are differences in habitat structure and associated species among these structural categories, we felt these categories are more similar to each other than they are to later development stages. Many thicket-associated species occur in these young forests. This definition of the young forest stage includes the early successional (0-19 years) and early-mid (20-39 years) successional stages that are used in other sections of this EIS.

The second development stage evaluated was the mature forest stage. Mature forests consist of large pole and sawtimber stands (40-120 years old). While forests in this stage generally are even-aged and lack an extraordinary degree of vertical habitat complexity, habitat structure can vary considerably depending on site conditions and disturbance history. These forests are characterized by species that prefer closed-canopy conditions. The mature stage includes the mid successional (40-79 years) and mid-late successional (80-120 years) stages that are used in other sections of this EIS. However, for this analysis, these stages were combined for economy at the coarse filter scale. While the mature stage covers a large range of ages, habitat structure within a given community type tends to be similar across much of this age range, while differing noticeably from younger and older forests.

The third development stage is old forest. Old forests are late-successional stands (120+ years old) that typically are uneven-aged with a high degree of vertical and horizontal habitat complexity, including canopy gaps and well-developed midstory and understory vegetation. Old forests correspond to Runkle's (1996, modified from Oliver 1980) canopy replacement stage, which is characterized by gap-phase regeneration of individual trees or small groups of trees.

For each of these development stages, ages refer to time elapsed since the stand was last disturbed heavily enough to establish a new overstory, and not necessarily to the age of all of the dominant trees. Thus, recent two-age harvests and clearcuts with reserve trees are considered young forests, even though they still contain some older trees. Likewise, a stand that has entered the gap-phase regeneration stage may have a substantial component of young trees, but it is still considered an old stand if the last stand-scale disturbance occurred more than 120 years ago.

For presettlement conditions, development stage breakdowns were estimated based on a review of estimates of return intervals for stand-replacing windstorms and fires in the northeastern United States (Lorimer and White 2003). Because most current stands originated during the extractive logging period in the late 19th and early 20th Centuries, development stages for the post-extractive logging period and the current period were estimated using stand origin dates in the CDS database. Future development stage distributions under each alternative were projected based on Spectrum model outputs. The species viability chapter of the Analysis of the

Management Situation contains additional details on the methods used to estimate development stages of major forested communities.

Presettlement Period - During presettlement times within the Forest boundary (regardless of current ownership), mixed mesophytic and cove forest was the most extensive community type, covering an estimated 670,000 to 760,000 acres, or 40 to 45 percent of the landscape (Figure ED-1). Oak forest and spruce forest were also extensive, with oak forest covering an estimated 350,000 to 360,000 acres (21 percent of the landscape) and spruce forest covering an estimated 170,000 to 430,000 acres (10 to 25 percent of the landscape). It is likely that areas identified as oak forest had a substantial component of American chestnut (*Castanea dentata*) (Abrams and McCay 1996). Hemlock forest covered a total estimated area of 120,000 to 150,000 acres (7 to 9 percent of the landscape). Pine-oak forest was estimated at 68,000 acres (4 percent of the landscape). This likely is an underestimate considering historic accounts that tell of large areas of white pine in the river valleys in the southeastern part of the Forest (Brooks 1911). White pine was reduced to a minor component in many of these areas by historic logging and fires. Because of a current lack of white pine potential, the ELTP mapping may have missed some of these areas. Northern hardwood forest was estimated at 0 to 130,000 acres (0 to 8 percent of the landscape). Riparian forest, which overlaps the other communities, was estimated at 130,000 acres (8 percent of the landscape). When only current NFS land was considered, the landscape percentages were similar, though spruce forest was slightly more prominent and mixed mesophytic and cove forest was slightly less prominent, due to the concentration of NFS land in higher elevations (Figure ED-2).

The forest development stage analysis suggested that, as a whole, presettlement forested communities were overwhelmingly dominated by old stands (120+ years old). Old forest stands are estimated to have covered somewhere between 69 and 87 percent of the landscape (Figures ED-3 and ED-4). Young forest stands (0 to 39 years old) probably covered 4 to 12 percent of the landscape, while mature stands (40 to 120 years old) were estimated to have covered about 7 to 18 percent of the landscape. Not surprisingly, the old stages of the three most widespread forest communities were estimated to have been dominant, with old mixed mesophytic/cove forest covering between 27 and 40 percent of the landscape, old oak forest covering 15 to 20 percent of the landscape, and old spruce forest covering 6 to 29 percent of the landscape (Figures ED-5 and ED-6).

These estimates of presettlement forested communities and development stages should be interpreted cautiously. Although they were constructed using the best available information, it is important to remember that they are based on limited empirical data. The ELTP mapping that formed the basis of the community classification was constructed from soil mapping, geological mapping, and botanical data collected in representative sites (USDA Forest Service 2002a). However, the determination of potential natural vegetation for ELTPs required a substantial component of professional judgment. The disturbance regimes used to estimate amounts of the forest development stages were constructed from disturbance return interval data (Lorimer and White 2003, and references therein), but the data came from similar forest types in other areas. Therefore, these estimates should be considered approximations based on limited available information.

Post-Extractive Logging Period - On current NFS land, three forested communities were most dominant following the extractive logging period that occurred during the late 19th and early 20th Centuries. Mixed mesophytic and cove forest was estimated to cover approximately 360,000 acres (39 percent of the landscape), while oak forest covered about 250,000 acres (27 percent of the landscape) and northern hardwood forest occupied approximately 180,000 acres (20 percent of the landscape). The other major forested communities each covered less than 10 percent of the landscape.

Compared to estimated presettlement conditions, coverage by northern hardwood forest, oak forest, and pine-oak forest appears to have increased after extractive logging, while the extent of spruce forest and hemlock forest appears to have decreased greatly (Figure ED-2). Such changes are consistent with historical accounts of the conversion of mesic, conifer-dominated communities to northern hardwood and oak-dominated communities following logging, soil erosion, and fires (Stephenson 1993). However, caution must be exercised in interpreting these apparent changes because of the different methods used to estimate presettlement versus 1935 community coverage. It is possible that an unknown portion of the apparent changes could be due to methodological biases. The apparent decline of hemlock forest may be at least partially an artifact of the way stands are typed in the CDS database. Hemlock tends to occur in small groves, which may have been included in larger hardwood stands.

The forest development stage analysis indicated that in 1935, current NFS land was overwhelmingly dominated by young forest stands. Considering all of the major forest communities together, young stands were estimated to have covered an estimated 82 percent of the landscape, with mature forests occupying about 13 percent of the landscape and old forests virtually nonexistent (Figures ED-4 and ED-5). The remaining 5 percent of the landscape is presumed to have been non-forested, but this likely underestimates non-forested areas due to overlap of the forest types in the stands layer with areas identified as non-forest using other sources. Other sources used to identify some of the rare and unique communities indicated that about 73,000 acres (8 percent) of current NFS land was non-forested in the mid 1930s (see Table ED-3 in the Rare and Unique Communities section). Although not directly estimated due to lack of information for private lands, it is reasonable to assume that because of the widespread logging that occurred, forested stands on current non-NFS land within the Forest boundary also would have been heavily dominated by young stands. However, because current non-NFS land is concentrated in the lower, flatter areas, it is likely that a higher proportion of that land was non-forested agricultural land.

Current Period - Because the current forested communities are largely the result of stands that regenerated after extractive logging in the late 19th and early 20th Centuries, and the same CDS forest type data were used for estimating 1935 and current conditions on NFS land, the estimated total amounts of current forested communities are very similar to the 1935 estimates, and the same three communities still are overwhelmingly dominant on the landscape (Figures ED-1 and ED-2). The most extensive current forested community is mixed mesophytic and cove forest, covering approximately 360,000 acres (39 percent of the landscape) on NFS land and approximately 620,000 acres (36 percent of the landscape) on all land within the Forest boundary. Oak forest is the next most extensive forested community, occupying about 250,000 acres (27 percent of the landscape) on NFS land and about 370,000 acres (22 percent of the

landscape) on all land in the Forest boundary. Northern hardwood forest is still the third most dominant community, covering about 170,000 acres (18 percent of the landscape) on NFS land and 350,000 acres (21 percent of the landscape) on all land within the Forest boundary. However, because we included mixed hardwood-spruce stands in the spruce community for the estimate of current conditions, the acreage classified as northern hardwoods decreased slightly compared to the 1935 estimate, while the acreage classified as spruce increased slightly. Relative to estimated presettlement conditions, spruce forest and hemlock forest still appear to be greatly reduced in extent, whereas northern hardwood forest, oak forest, and pine-oak forest still appear to be more extensive.

Currently, mature forest stands dominate most of the landscape within the Forest boundary (Figures ED-3 through ED-6). On NFS land, mature forests (all communities combined) are estimated to cover approximately 770,000 acres (84 percent of the landscape). On all land ownership within the Forest boundary, mature stands cover about 1.28 million acres (75 percent of the landscape). Such dominance by mature stands contrasts greatly with the estimated 7 to 18 percent coverage by mature stands during presettlement. This overwhelming dominance by mature forest is a direct result of aging of the stands that regenerated following extractive logging in the late 19th and early 20th Centuries.

The total area of young forest stands has declined greatly since 1935 (Figures ED-3 through ED-6). Young stands now cover approximately 64,000 acres (7 percent of the landscape) on NFS land and approximately 160,000 acres (9 percent of the landscape) on all lands within the Forest boundary. Thus the area covered by young stands has declined to within the range estimated for presettlement conditions (Figures ED-3 and ED-4).

Total area of old forest stands has increased since 1935, but old forests still cover only about 38,000 acres (4 percent of the landscape) on NFS land and about 50,000 acres (3 percent of the landscape) on all lands within the Forest boundary (Figures ED-3 through ED-6). The extent of old forest is still far below the estimated presettlement extent (Figures ED-3 and ED-4).

Figure ED-1

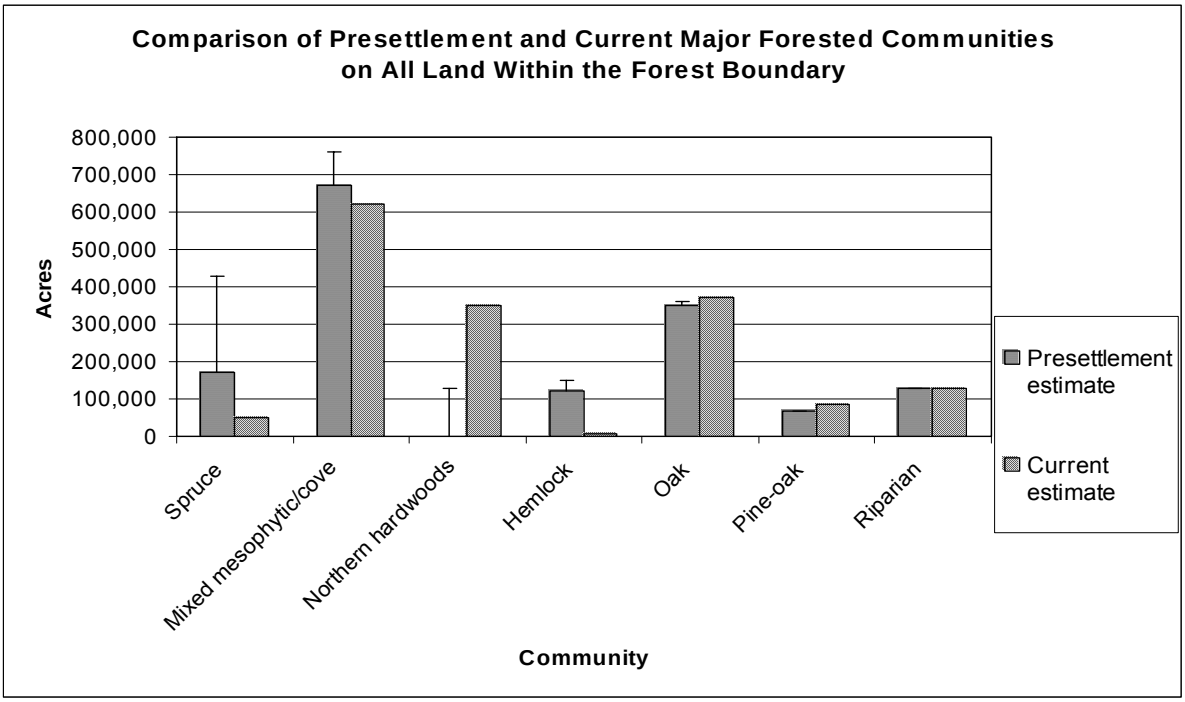


Figure ED-2.

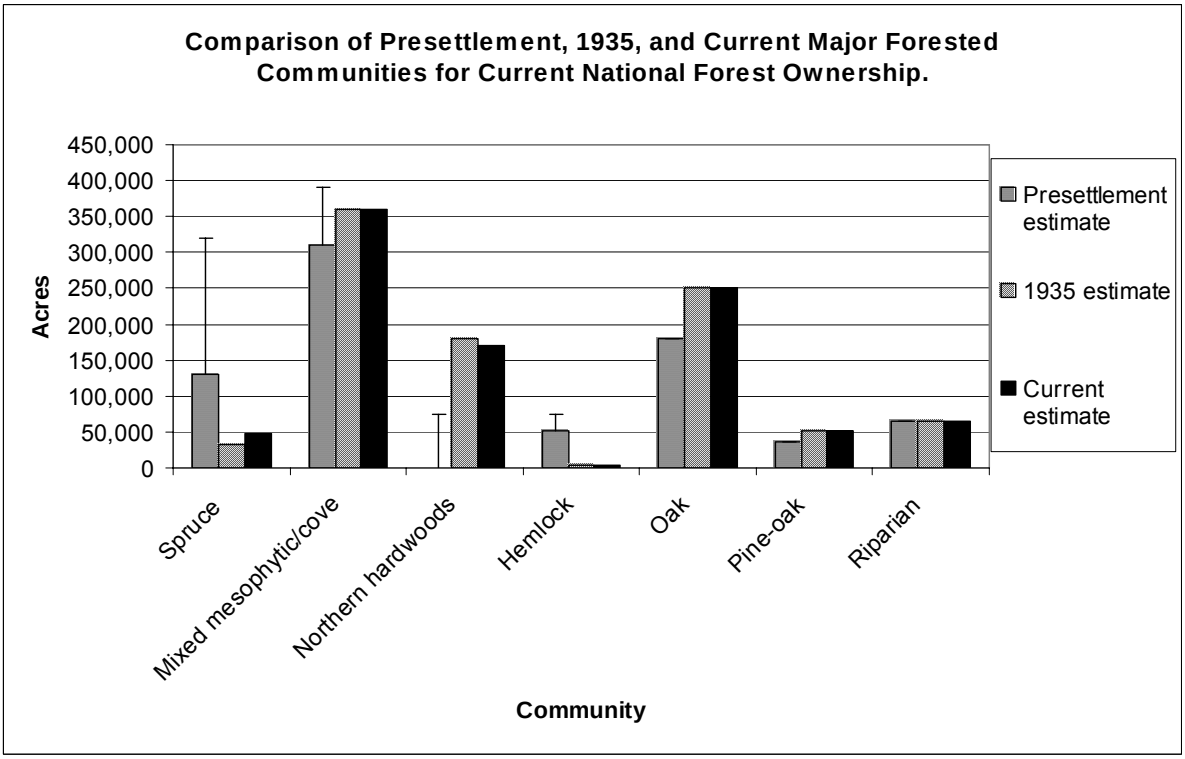


Figure ED-3.

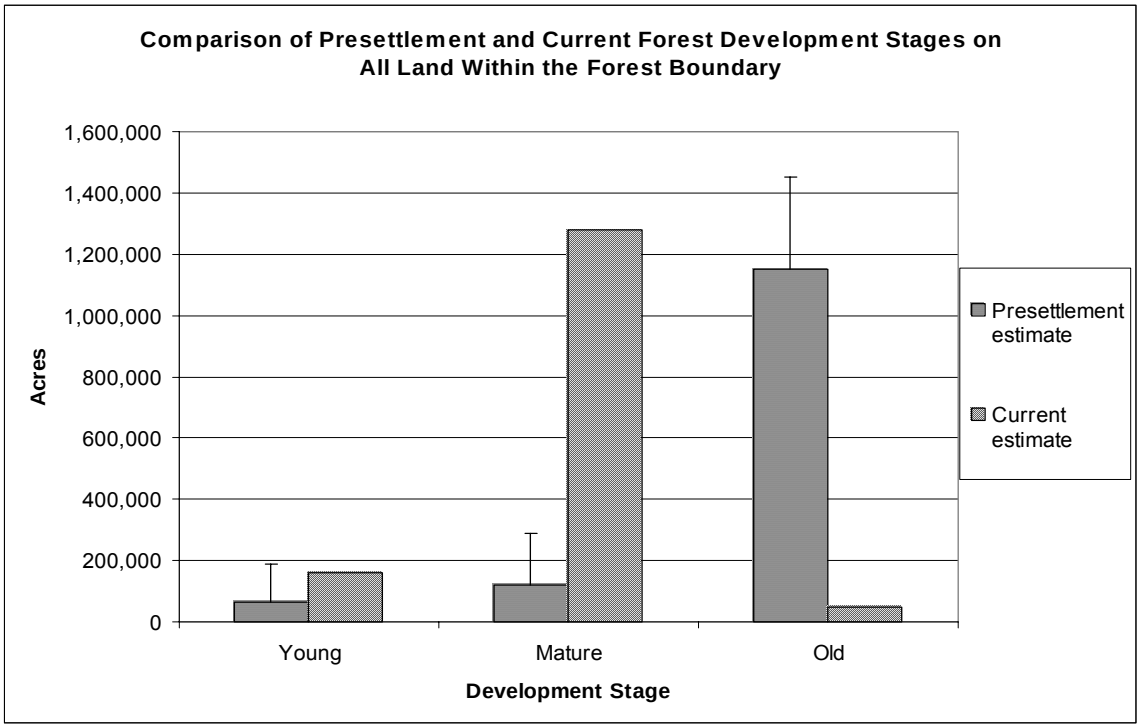
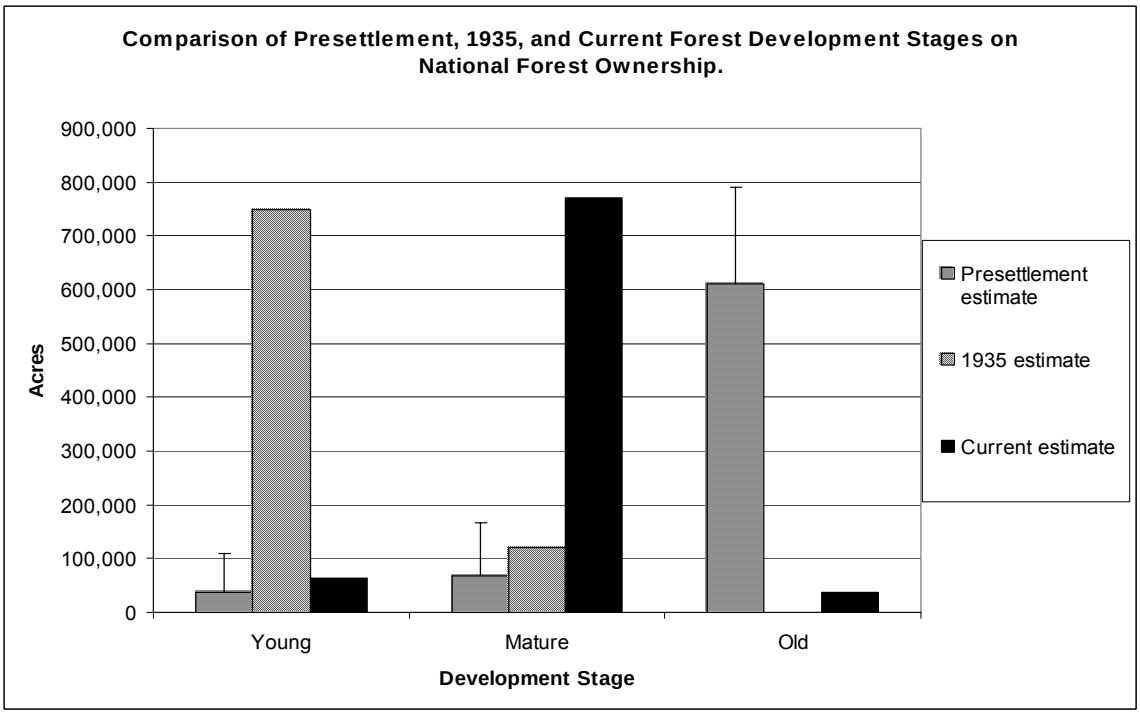


Figure ED-4.



Young = 0-39 years, Mature = 40-120 years, Old = 120+ years.

Figure ED-5.

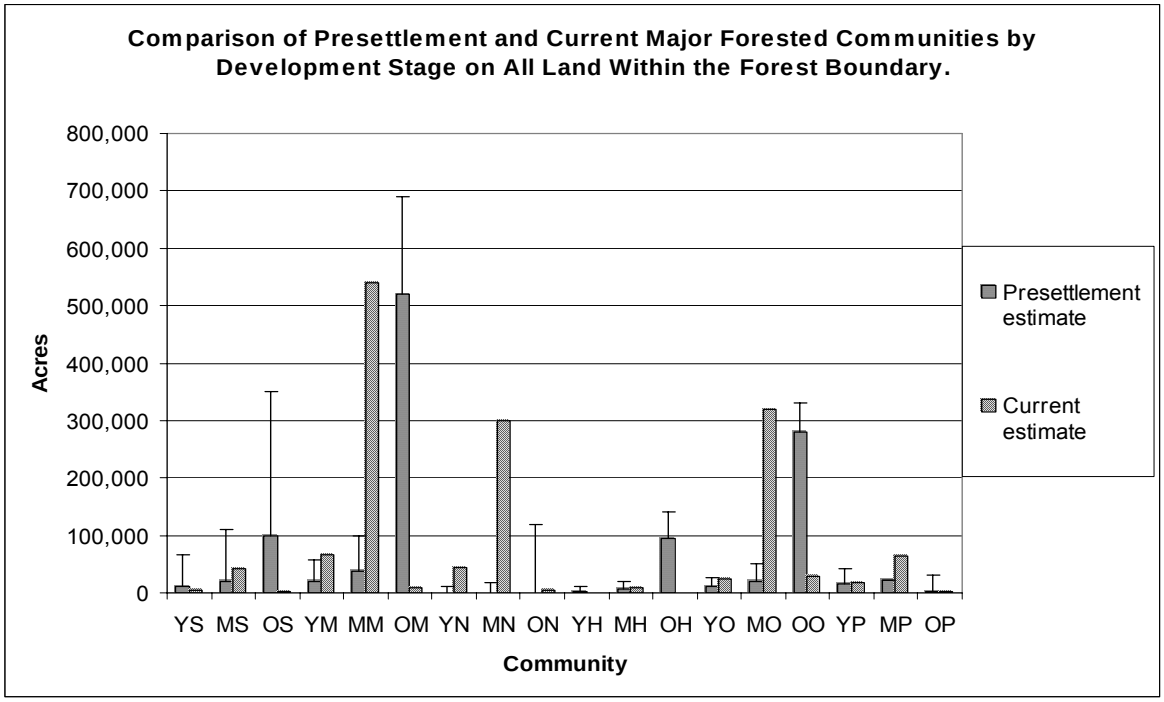
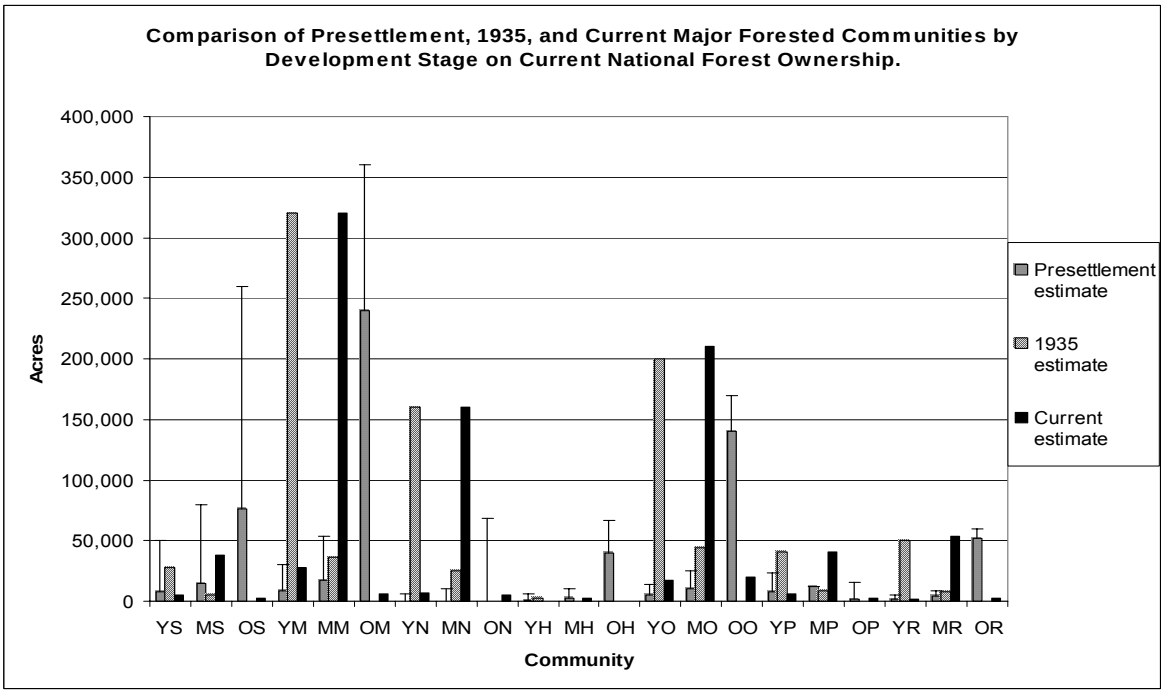


Figure ED-6.



First letter of community abbreviation refers to forest development stage: Y = young (0-39 years), M = mature (40-120 years), O = old (120+ years). Second letter refers to community: S = spruce, M = mixed mesophytic/cove, N = northern hardwoods, H = hemlock, O = oak, P = pine-oak, R = riparian.

Amount of Rare and Unique Communities

Bogs, Fens, Seeps, and Seasonal Ponds

Bogs, fens, seeps, and seasonal ponds consist of non-riverine wetlands characterized by saturated or seasonally ponded soil. Non-alluvial wetlands, as well as alluvial wetlands located outside of active stream channels, are included in this community. Coverage by emergent woody or herbaceous vegetation is more or less continuous. Areas of this habitat may or may not have a closed tree canopy depending on the length of the annual period of saturation or ponding. Area of this community was estimated using National Wetland Inventory (NWI) mapping of palustrine scrub-shrub and palustrine forested wetland types (Cowardin et al. 1979).

This community currently covers an estimated 6,000 acres on all ownerships in the Forest boundary (Table ED-1). Bogs, fens, seeps, and seasonal ponds on NFS land were estimated at 2,000 acres (Table ED-2). It is likely that the NWI mapping missed small wetlands; therefore these estimates may underestimate the true extent of this community on the Forest.

No reliable information was available to allow estimation of presettlement or post-extractive logging amounts of this community. For the analysis of alternatives, future amounts of this community were assumed to remain similar to current amounts for all alternatives. This assumption is based on the fact that wetlands are protected by Clean Water Act permitting and mitigation requirements, and by Forest-wide standards and guidelines on NFS land.

Open Wetlands

Open wetlands include marshes and shallow areas of open water. They are characterized by long annual periods of inundation or saturation, which prevent formation of closed tree canopies. Open wetlands can occur in association with bogs, fens, seeps, and seasonal ponds; in beaver impoundments; or along the shorelines of man-made lakes and ponds. Area of this community was estimated using NWI mapping of palustrine unconsolidated bottom, palustrine aquatic bed, palustrine unconsolidated shore, palustrine emergent, and palustrine open water wetland types (Cowardin et al. 1979).

Open wetlands currently are estimated to cover 3,000 acres on all land in the Forest boundary (Table ED-1). For NFS land only, the area of open wetlands is estimated at 1,000 acres (Table ED-2). It is likely that the NWI mapping missed small wetlands; therefore these estimates may underestimate the true extent of open wetlands on the Forest.

No reliable information was available to allow estimation of presettlement or post-extractive logging amounts of this community. For the analysis of alternatives, future amounts of this community were assumed to remain similar to current amounts for all alternatives. This assumption is based on the fact that wetlands are protected by Clean Water Act permitting and mitigation requirements, and by Forest-wide standards and guidelines on NFS land.

Stream Channels

For the purposes of the terrestrial species viability evaluation, stream channels are defined as the channels, gravel and sand bars, and banks of perennial streams. Although these are aquatic habitats, they are used by some of the terrestrial and semi-aquatic species that are covered by the terrestrial portion of the species viability evaluation. Intermittent streams were not included because of their limited ability to provide habitat for the terrestrial fine-filter species associated with this community.

Estimates of stream channel habitat were based on the National Hydrography Dataset (NHD) GIS layer for the Forest (USGS 2000). On all land within the Forest boundary, about 6,000 miles of streams were identified in this manner (Table ED-1). On NFS land only, total stream length was estimated at about 3,000 miles (Table ED-2). These estimates were used to represent presettlement, post-extractive logging, and current stream channel habitat amounts. Using the NHD layer to represent past and current conditions assumes that losses of stream reach due to culverts, channelization, and fill have been minimal. The estimate derived from the NHD layer also was used to represent future stream channel habitat under each alternative, based on the assumption that Clean Water Act protections and the Forest's standards and guidelines will minimize potential losses of stream reaches.

Glades and Barrens

Glades and barrens are areas characterized by sparse or stunted vegetation due to shallow soil, low soil fertility, harsh climatic conditions, exposed parent material, or some combination of these factors. The extent of these areas was estimated using the ELTP GIS layer. Areas identified in the ELTP layer as limestone glades or shale barrens were considered to represent the glades and barrens community. Because glades and barrens are poorly suited for most traditional land uses, their extent likely has changed little over time, and future land uses are unlikely to impact them. Therefore, the ELTP estimate was used to represent the presettlement and post-extractive logging extent of glades and barrens, as well as the current extent and future extent under all alternatives. By this method, glades and barrens were estimated to cover about 5,000 acres within the Forest boundary, and about 2,000 acres on NFS land (Tables ED-1 and ED-2). All glades and barrens shown on the ELTP layer are in the eastern part of the Forest. Because glades and barrens represent small inclusions in other community types, it is likely that the ELTP layer missed some occurrences of this community. Therefore, these estimates likely underestimate the true extent of the community.

Rock Outcrops and Cliffs

The rock outcrops and cliffs community consists of rock outcrops, cliffs, talus, and boulder fields characterized by exposed rock, shallow soils, and sparse vegetation. Because these rocky habitats are poorly suited to most land uses, the amount of this community was assumed to change little over time. Therefore, soils map units that indicate presence of rock outcrops were used to estimate presettlement, post-extractive logging, and current occurrences of this community. This method may have overestimated total rock outcrop/cliff habitat because the soil map units depict those soils that typically contain frequent outcrops, not the outcrops

themselves. However, no other comprehensive inventory of rock outcrops and cliffs exists. Using this method, rock outcrops and cliffs were estimated to cover about 26,000 acres within the Forest boundary (Table ED-1), and about 6,000 acres on NFS land (Table ED-2). Future amounts of this community under all alternatives were presumed to remain the same, based on the general lack of management activity in this community.

High Elevation Grassland

This community consists of grassy balds, pastures, and hay fields located above 3,000 feet in elevation, often on ridge tops, summits, or exposed slopes. Current occurrences of this habitat all appear to have been created by logging, anthropogenic fires, agriculture, or some combination of these factors (Stephenson 1993), and they are maintained by livestock grazing, mowing, or soil conditions caused by past logging and fires.

Quantification of the presettlement extent of this community is difficult due to lack of information. Historic accounts indicate that scattered balds existed at the time of settlement (Maxwell 1910, Wayland 1925 cited in Stephenson 1993, Core 1966, Clarkson 1966 cited in Stephenson 1993). Core (1949, cited in Stephenson 1993) estimated that several thousand hectares of treeless areas existed in eastern West Virginia at the time of settlement. ELTPs indicating grass/forb dominance are not useful for estimating presettlement high-elevation grassland. They all occur in the Dolly Sods/Roaring Plains area, and based on historic accounts of the origin of those open areas, it appears they were once spruce forests that were converted to grassland through fires, soil erosion, and grazing (Brooks 1911).

Although grass/forb dominated ELTPs do not represent presettlement grasslands, they were useful for estimating the current extent of high-elevation grassland. These ELTPs were combined with grazing allotments, CDS stands shown as open areas, and hay/pasture/grasslands from the West Virginia Gap Analysis GIS layer (Strager and Yuill 2002). The resulting GIS layer was overlaid on the 3,000-foot elevation contour to represent high-elevation grasslands. By this method, current high-elevation grasslands were estimated at about 27,000 acres on all land within the Forest boundary (Table ED-1). Current high-elevation grasslands on NFS land were estimated at 14,000 acres (Table ED-2). Based on Core's (1949, cited in Stephenson 1993) presettlement estimate of several thousand hectares, it would appear that current amounts of this community exceed presettlement amounts. However, casual observation suggests that much of this community currently consists of heavily grazed pasture on private land, which likely does not provide the same type of habitat that was provided by presettlement occurrences of this community.

High-elevation grasslands at the end of the period of extractive logging were estimated by overlaying the 1937 land use classification provided by the West Virginia Gap Analysis program (Pohlmann 1937) on the 3,000-foot elevation contour. Land cover classes indicating hay and pasture land suggest that high-elevation grass-dominated communities covered around 81,000 acres on all ownerships within the Forest boundary (Table ED-1), and about 27,000 acres on current NFS land (Table ED-2). These estimates should be interpreted with caution because the original 1937 land cover map was drawn at a scale of 1:500,000 and its level of accuracy is unknown.

For each alternative, estimates of future high-elevation grasslands on NFS land were based on projected trends in grazing allotments, wildlife openings, and savannas. For non-NFS land, general trends in pasture and hay land were evaluated using data from the Census of Agriculture conducted by the U.S. Department of Agriculture (USDA 2004, USDA 1999).

Shrub Balds

Shrub balds are exposed, high-elevation sites that have sparse tree cover and are dominated by ericaceous shrubs. This community is limited to those areas that are permanently dominated by shrubs and does not include young seedling/sapling forest stands. Shrub balds often are interspersed with high-elevation grasslands.

The presettlement extent of this habitat is unclear. An account of the Fairfax Line survey in the 1740s indicates that a large open area existed in the Bear Rocks area near Dolly Sods (Wayland 1925). The account indicates that the ground was "marshy," so it is likely that the open area contained bogs, as well as possibly containing shrub balds and grassy balds. Many of the historical references cited above for high-elevation grasslands do not distinguish between grass-dominated and shrub-dominated openings, so it is possible that some of these accounts refer to a combination of grass balds and shrub balds.

Current shrub bald occurrences are limited to the Dolly Sods/Roaring Plains area. Some authors believe these balds were the result of soil erosion, wildfires, and grazing during the 19th and early 20th Centuries (Brooks 1911, Core 1966), but the Fairfax Line account cited above suggests that these activities may have expanded existing shrub balds. We used ELTPs with the primary plant association code of heathland to estimate the current extent of shrub balds. These ELTPs total about 3,000 acres on all land within the Forest boundary (Table ED-1), essentially all of which is on NFS land (Table ED-2). Because this community is the result of soil conditions that are not likely to change greatly over time, these ELTPs were also used as an estimate for the post-extractive logging period and the predicted future extent of shrub balds under all alternatives.

Caves and Mines

This community consists of natural caves, as well as mines with microclimates capable of supporting cave-associated biota. Amount and distribution of cave habitat was estimated using the Forest's GIS layer depicting cave locations. This layer indicated that there are 340 known cave openings within the Forest boundary (Table ED-1). Of these known openings, 225 of them are on NFS land (Table ED-2). Some of these are multiple openings to the same cave, and undoubtedly there are many unknown entrances. Because cave formation is a slow geologic process, current caves were assumed to be essentially permanent, and therefore were used to estimate past and future cave habitats.

Woodlands, Savannas, and Grasslands

This habitat includes open woodlands and savannas at low elevations that are characterized by low canopy cover and grass-dominated understories. Hay fields and pastures are included in this

community and constitute the bulk of the acreage. These habitats are maintained in an open condition by periodic fire, mowing, grazing, or other disturbance.

The presettlement status of the open habitats was difficult to evaluate due to lack of information. For areas east of the Appalachians, there are numerous accounts of openings and savannas created by Native American agriculture and burning (e.g., Maxwell 1910). In contrast, there are very few accounts of the effects of native cultures on presettlement vegetation in eastern West Virginia. Maxwell (1910) cited an early account asserting that the Iroquois people of western New York drove out the native inhabitants of West Virginia in 1672. The land was said to have been still empty of native people when settlers arrived in the mid-1700s. A few lands were said to have still been open when the settlers arrived, and other areas in the Tygart and Cheat valleys were forested with young, even-aged stands that seemed to indicate that they had once been open. Some sources indicate that much of eastern North America was de-populated around 1500 due to disease epidemics introduced by early European explorers. This de-population may have allowed formerly cultivated land to revert to forest by the time of widespread settlement (Owen 2002). Brooks (1911) asserted that all of West Virginia was forested when settlers arrived, except for a few old Native American fields and open glades. Thus there appears to be some evidence of scattered anthropogenic savannas and grasslands prior to European settlement, but the information is not specific enough to allow estimation of the amount. It is not known to what extent non-anthropogenic grassy openings may have occurred as inclusions in fire-maintained oak and pine-oak forests, though it is possible that such habitats existed.

Estimates of current woodlands, savannas, and grasslands were based on combining data from the following sources: hayfields, pastures, and grasslands in the West Virginia Gap Analysis GIS layer; the Forest's GIS layer of grazing allotments; and CDS data on stands classified as open. The resulting layer was further stratified to include only those areas below 3,000 feet elevation (areas above 3,000 feet were included in high-elevation grasslands). Based on this estimate, current woodlands, savannas, and grasslands cover about 66,000 acres on all ownerships within the Forest boundary (Table ED-1). Casual observation suggests that most of this acreage consists of heavily grazed pastures on private land. Therefore, it is likely that current occurrences of this community provide habitat different from that provided by presettlement occurrences. Only about 7,000 acres of this community occurs on NFS land (Table ED-2).

Woodlands, savannas, and grasslands at the end of the extractive logging period were estimated by overlaying the 1937 land use classification provided by the West Virginia Gap Analysis program (Pohlmann 1937) on the 3,000-foot elevation contour. Land cover classes indicating hay and pasture land below 3,000 feet suggest that low-elevation grass-dominated communities covered around 170,000 acres on all ownerships within the Forest boundary in 1937 (Table ED-1). About 40,000 acres of this total occurred on current NFS land (Table ED-2). These estimates should be interpreted with caution because the original 1937 land cover map was drawn at a scale of 1:500,000 and its level of accuracy is unknown.

For each alternative, estimates of future woodlands, savannas, and grasslands on NFS land were based on projected trends in grazing allotments, wildlife openings, and savannas. For non-NFS land, general trends in pasture and hay land were evaluated using data from the Census of Agriculture conducted by the U.S. Department of Agriculture.

Remote Habitat

This community consists of remote habitats away from frequent disturbance by humans. Although remote habitat covered essentially the entire landscape in presettlement times, and still covers a substantial area today, it was treated with the unique communities because it represents a land-use overlay on the other communities, rather than a distinct community type.

For the purposes of this evaluation, remote habitats were defined as all areas that fall within the Recreation Opportunity Spectrum (ROS) primitive or semi-primitive non-motorized categories. See the Recreation section of this chapter for a description of the methods used to estimate ROS classifications on NFS land. On non-NFS land, an ROS map provided by West Virginia University was used to estimate the current amount of remote habitat. In the absence of quantifiable information on likely future amounts of remote habitat on non-NFS land, this estimate also was used as a maximum estimate of future remote habitat on non-NFS land under all alternatives.

Current remote habitats on all land within the Forest boundary were estimated at 280,000 acres (Table ED-1). Of this total, about 190,000 acres are on NFS land (Table ED-2).

Estimating presettlement amounts of this habitat was not an issue as the entire Forest was remote habitat at that time. Remote habitats at the end of the extractive logging period could not be estimated due to lack of information. However, given the level of activity necessary to log essentially all of the land within the Forest boundary, it is likely that much less remote habitat existed in the 1930's than exists currently. Future remote habitat was evaluated using projections of ROS classifications under the various Plan alternatives.

Lakes and Ponds

This community is comprised of lakes and ponds. Lakes and the larger ponds are largely human-created, whereas smaller ponds may be natural or human created. Natural ephemeral ponds are included in the bogs, fens, seeps, and seasonal ponds community; beaver impoundments are included in the open wetlands community. No natural lakes or large ponds exist on the Forest; therefore we presume that in terms of total area, the extent of this community was trivial during presettlement times. No data exist to allow estimation of the extent of this community at the end of the extractive logging period.

Using NHD lakes and ponds polygon data (USGS 2000), the current amount of lake and pond habitat on all land within the Forest boundary was estimated at about 700 acres (Table ED-1). Current lakes and ponds on NFS land were estimated at 200 acres (Table ED-2). It was apparent from visual inspection of the GIS layers that there is substantial overlap between the smaller lakes and ponds estimated from NHD and the open wetlands community estimated from NWI. Due to protection afforded by the Clean Water Act and Forest-wide direction, lakes and ponds habitat was projected to remain approximately constant in the future under each alternative. This may have caused a slight underestimate of future amounts because it ignores the possibility of construction of new farm ponds on private land.

Table ED-1. Comparison of Estimated Presettlement, 1935-1937, and Current Amounts of Rare and Unique Communities within the Monongahela National Forest Boundary
(NFS land and other ownership combined. All amounts are acres unless otherwise noted. "Unknown" denotes that there was no reliable way to determine this information.)

Community	Presettlement		1935-1937		Current	
	Amount	Percent of Landscape	Amount	Percent of Landscape	Amount	Percent of Landscape
Bogs, Fens, Seeps, and Seasonal Ponds	Unknown	Unknown	Unknown	Unknown	6,000	<1
Open Wetlands	Unknown	Unknown	Unknown	Unknown	3,000	<1
Stream Channels (miles)	6,000	NA	6,000	NA	6,000	NA
Glades and Barrens	5,000	<1	5,000	<1	5,000	<1
Rock Outcrops and Cliffs	26,000	2	26,000	2	26,000	2
High Elevation Grasslands	Unknown	Unknown	81,000	5	27,000	2
Shrub Balds	Unknown	Unknown	3,000	<1	3,000	<1
Caves and Mines (number of entrances)	340	NA	340	NA	340	NA
Woodlands, Savannas, and Grasslands	Unknown	Unknown	170,000	10	66,000	4
Lakes and Ponds[1]	Unknown	Unknown	Unknown	Unknown	700	<1
Total Remote Habitat	1,700,000	100	Unknown	Unknown	280,000	16

[1] This category contains substantial overlap with the open wetlands category.

Table ED-2. Comparison of Estimated Presettlement, 1935-1937, and Current Amounts of Rare and Unique Communities on Monongahela National Forest System Lands Only
(All amounts are acres unless otherwise noted. "Unknown" denotes that there was no reliable way to determine this information.)

Community	Presettlement		1935-1937		Current	
	Amount	Percent of Landscape	Amount	Percent of Landscape	Amount	Percent of Landscape
Bogs, Fens, Seeps, and Seasonal Ponds	Unknown	Unknown	Unknown	Unknown	2,000	<1
Open Wetlands	Unknown	Unknown	Unknown	Unknown	1,000	<1
Stream Channels (miles)	3,000	NA	3,000	NA	3,000	NA
Glades and Barrens	2,000	<1	2,000	<1	2,000	<1
Rock Outcrops and Cliffs	6,000	1	6,000	1	6,000	1
High Elevation Grasslands	Unknown	Unknown	22,000	2	14,000	2
Shrub Balds	Unknown	Unknown	3,000	<1	3,000	<1
Caves and Mines (number of entrances)	225	NA	225	NA	225	NA
Woodlands, Savannas, and Grasslands	Unknown	Unknown	40,000	4	7,000	1
Lakes and Ponds[1]	Unknown	Unknown	Unknown	Unknown	200	<1
Total Remote Habitat	915,000	100	Unknown	Unknown	190,000	20

[1] This category contains substantial overlap with the open wetlands category.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth

Potential reserves occur on the landscape in a wide variety of sizes, spatial configurations, and ecological settings. Therefore, it is important to consider not only the total area of land that could contribute to achieving coarse-filter goals, but also the adequacy of individual units or aggregations of units to serve as functioning biodiversity reserves.

The size of an MDA depends on the size of the disturbances that characterize a particular landscape. As a general rule of thumb, ecological reserves should be twice the size of the largest expected stand-replacing disturbance, or 50 times the size of the mean expected stand-replacing disturbance (Johnson and Van Wagner 1985, Shugart 1984 cited in Haney et al. 2000). Applying these rules to wind and fire disturbance size data from the northeastern U.S. (Seymour et al. 2002) and the southern and central Appalachians (Haney et al. 2000) produced estimated MDAs ranging from 1,200 acres to 25,000 acres (Table ED-3). We chose 10,000 acres as a representative mid-range MDA. Ten thousand acres falls near the MDA estimates produced by a maximum fire size in the central Appalachians and a mean wind disturbance size in the northeastern U.S. Therefore, this MDA size should represent communities where fire is the primary stand-replacing disturbance (e.g., pine-oak), as well as those communities where wind is the primary stand-replacement mechanism (e.g., northern hardwoods). Larger MDA estimates were not chosen given that all of the reserves exist in a matrix of moderately managed forest that offers habitat for many of the old forest species that are conserved by the reserves. This is particularly true given that the lightly managed Indiana bat primary ranges were not included in the reserves.

To identify reserves meeting the MDA, we aggregated contiguous and immediately adjacent parcels that are not likely to be subject to large-scale even-aged management (see list of MPs and other areas in indicator description above). We screened the aggregated areas using the 10,000-acre MDA threshold to identify functional ecological reserves under each alternative. We then evaluated the degree to which the various ecological communities are represented in functional reserves.

Two areas of restricted management were not included in the ecological reserves concept: channel management corridors along streams, and Indiana bat primary range. While channel management corridors contribute to structural habitat diversity by providing strips of potential old growth within managed landscapes, they are too narrow and subject to edge effects to serve as ecological reserves by themselves. Within Indiana bat primary range, old forest and partial harvesting will be emphasized, which will make primary range less intensively managed than lands in the suitable timber base. However, active management could occur, focusing on habitat enhancement for Indiana bats. Such management will involve thinning and other treatments to achieve a semi-open canopy and an abundance of snags. The degree to which these management practices mimic natural disturbance and successional processes in the variety of forested communities where they might be applied is debatable. Therefore, channel management corridors and Indiana bat primary range were not considered to be part of the ecological reserves evaluated in this analysis. Because these two lightly managed categories of land were not included in the reserves concept, this analysis is considered to represent the minimum ecological

reserve capacity of the Forest. Because channel management corridors and Indiana bat primary range do not vary by alternative, conducting the analysis in this conservative manner did not affect comparisons among alternatives.

The purpose of the MDA analysis was to provide a conceptual tool for evaluating the degree to which each alternative addresses landscape-scale ecological issues like forest fragmentation/patch size, old growth, and maintenance of natural disturbance and forest development processes. While Forest Plan direction does not explicitly provide for MDA reserves, they are an effect of MP allocation and Forest-wide direction to address other issues, and the Forest recognizes that the combined effect of such allocations and direction constitutes the primary mechanism for addressing the old growth, fragmentation, and patch size issues (see also 2006 Forest Plan, Appendix B).

The MDA indicator provides a rough index by alternative of the potential for development of large blocks of old forest that are shaped largely by natural processes. It is important to remember that the MDA reserves are generally surrounded by forested land that enhances their function beyond what would be achieved by similar-sized reserves in an agricultural or suburban landscape. In the early decades of the planning horizon, forest structure and function within the reserves will be similar to forest structure and function outside the reserves. Thus the full effect of the reserves will take at least several decades to emerge, as timber harvests maintain young and middle-aged forest characteristics outside the reserves, while old-growth dynamics develop inside the reserves.

Table ED-3. Estimates of MDAs for the Appalachians and Northeastern U.S.

MDA Acres	Rationale	Disturbance Size Citation
1,200	Twice a maximum wind disturbance size for southern Appalachians (Chattahoochee NF, Georgia)	Haney et al. 2000
1,750	50 times a low-end mean wind disturbance size for northeastern U.S.	Seymour et al. 2002
8,700	Twice a maximum fire disturbance size for central Appalachians (George Washington NF, Virginia)	Haney et al. 2000
11,500	50 times a high-end mean wind disturbance size for northeastern U.S.	Seymour et al. 2002
18,700	Twice a maximum wind disturbance for northeastern U.S.	Seymour et al. 2002
25,000	50 times a mean fire size for northeastern U.S.	Seymour et al. 2002

Ten areas on the Forest currently meet the 10,000-acre MDA threshold (Table ED-4). These areas range from about 11,000 acres to nearly 100,000 acres and are located in the northern, central, and southwestern parts of the Forest (See Map Package – Minimum Dynamic Area Reserves Alternative 1, which also represents the current condition). The total area contained in these reserves is approximately 310,000 acres. This total area comprises about 34 percent of all NFS land and about 18 percent of all land within the Forest boundary. The reserves are

disproportionately located in the higher elevation areas of the Forest, and are largely dominated by northern hardwood forest, mixed mesophytic/cove forest, and spruce forest.

The proportion of each major forested community that is contained within the reserves varies greatly among the communities (Table ED-4). Ninety-five percent of spruce forest on NFS land is contained in the reserves. Seventy-one percent of northern hardwood forest on NFS land falls within the reserves, as does an estimated 56 percent of the hemlock forest. Reserves contain about 29 percent of the mixed mesophytic/cove forest on NFS land, but only 12 percent of the pine-oak forest and 9 percent of the oak forest. Based on these proportions, it would appear that spruce forest, northern hardwood forest, and hemlock forest are well represented in reserves. Mixed mesophytic and cove forest has somewhat less proportional representation in reserves, while pine-oak and oak have very little proportional representation in reserves.

However, the true measure of how well communities are conserved may not be the percentage of the current community total that is included in reserves. Rather, the amount of a community included in reserves expressed as a percentage of the presettlement amount of that community may be a better gauge of adequate representation. Based on applying this measure to all land ownership in the Forest boundary, only about 1 percent of the presettlement amount of hemlock forest is included in reserves, and the representation of spruce forest is 11 to 27 percent. In contrast, representation of northern hardwoods in reserves appears to be at least 93 percent of the estimated presettlement amount. Representation of mixed mesophytic/cove forest is about 15 percent, while representation of pine-oak forest and oak forest is 9 and 6 percent, respectively (Table ED-4). These percentages suggest that representation of hemlock forest and spruce forests in reserves is relatively low, even though reserves include a large proportion of the existing acreage of these communities on NFS land. Percentage representation of mixed mesophytic and cove forest is similar to spruce forest, but because mixed mesophytic and cove forest is such a widespread community, relatively low percentage representation probably is not a major conservation concern for this community.

Regardless of whether representation is measured against current or presettlement amounts, representation of oak and pine-oak forests in reserves appears to be low. However, because oak and the yellow pine-oak component of pine-oak communities are fire-adapted, including these communities in *de facto* reserves may not be the best way to conserve them. MPs 5.0 and 6.2, along with West Virginia northern flying squirrel habitat, comprise a large majority of the acreage in MDA reserves. Currently MPs 5.0 and 6.2 mandate suppression of wildfires, and MP 6.2 also prohibits use of prescribed fire. West Virginia northern flying squirrel habitat is not likely to include fire-adapted communities. Long-term conservation of oak and pine-oak communities requires more active management than is currently allowed in these MPs.

Table ED-4. Current Representation of Major Ecological Communities in MDA Reserves, Monongahela National Forest

Community	Acres	Percent of Current Amount on NFS Land	Percent of Estimated Presettlement Amount on All Ownerships Within Forest Boundary
Spruce forest	46,000	95	11 – 27
Mixed mesophytic/cove forest	110,000	29	14 – 16
Northern hardwood forest	120,000	71	≥93
Hemlock forest	2,000	56	1
Oak forest	22,000	9	6
Pine-oak forest	6,000	12	9
Other communities	9,000	27	?
Total[1]	310,000	34	18

[1]Due to rounding, the total does not equal the sum of the components.

ENVIRONMENTAL CONSEQUENCES

Resource Protection Methods

Laws, Regulations, and Policies

Numerous laws, regulations, and policies govern the management of ecological communities on NFS lands. National laws and regulations have also been interpreted for implementation in the Forest Service Manual and Handbook. Some of the more influential laws, regulations, and policies governing management of ecological communities are listed in Table ED-5 below:

Table ED-5. Major Laws, Policies, and Regulations Influencing Management and Protection of Ecological Communities on National Forest System Land

Act/Law/Regulation/Policy	Law/CFR/FSM/FSH Number
Wilderness Act	16 U.S.C. 1131-1136
Eastern Wilderness Act	16 U.S.C. 1132
National Forest Management Act	16 U.S.C. 1600-1614
Clean Water Act	33 U.S.C. 1251 - 1376
Multiple Use-Sustained Yield Act	16 U.S.C. 528-531
National Forest Planning Regulations – diversity requirements	36 CFR 219.26, 36 CFR 219.27(g)
Healthy Forests Restoration Act	P.L. 108-148
Forest Service Manual, Ecosystem Classification, Interpretation, and Application	FSM 2060
Forest Service Manual, Wilderness Management	FSM 2320

Forest Plan Direction and Implementation

Forest Plan direction for the management and protection of ecosystem diversity occurs at two levels, Forest-wide and MP. Forest-wide goals, objectives, standards, and guidelines encourage or require the maintenance of a diversity of community types and forest ages, from young regeneration areas to old growth. Specific direction calls for the protection of rare communities. Revised Forest-wide direction that applies to the action alternatives has a stronger emphasis than 1986 Forest Plan direction on ecosystem diversity, restoration, and maintenance of representative examples of natural ecological communities. The revised Forest-wide direction includes a strategy to use MPs 5.0, 5.1, 6.2, 7.0, and portions of 8.0 as sources for core areas of potential old growth. The revised Forest-wide direction also includes goals and objectives to maintain and restore rare communities, fire-adapted communities, and representative examples of unmanaged natural habitats. Guidelines in the revised Forest-wide direction include stronger prohibitions on disturbance in wetlands and other rare communities.

Management Prescription (MP) direction also includes goals, objectives, standards, and guidelines encouraging maintenance of a diversity of community types and forest ages. Such direction is contained primarily in those MPs that are in the suitable timber base, where active management is a primary means of achieving age class diversity (MPs 2.0, 3.0, 4.0, 4.1, and 6.1). As with Forest-wide direction, the revised MP direction contains a stronger emphasis than the existing MP direction on ecological restoration. MP 4.1, which exists only in the three action alternatives, focuses on restoration of natural species composition and habitat structure in spruce and hardwood-spruce communities. The revised direction for the action alternatives also has a new emphasis on maintenance and restoration of oak forest and other fire-adapted communities in MP 6.1. The revised MP 6.2 for the action alternatives has a new secondary emphasis on restoration of natural communities, in addition to the primary emphasis on remote backcountry recreation. Also, in the action alternatives, the NRA has been allocated to a new MP (8.1) that contains a secondary emphasis on ecological restoration.

During Forest Plan implementation, planning for major management activities generally is conducted on a fifth- or sixth-order watershed basis. Project planning and analysis attempts to achieve the plant community age class composition expressed in the desired condition for the MPs contained in the watershed. Site-specific analysis is used to attain desired dispersion of community components and age classes across the landscape. Rare communities and other communities of interest are identified through project-level analysis, and mitigation measures are applied to protect or enhance these communities as needed.

Effects Common to All Alternatives

Mineral Exploration, Development, and Leasing

Amount and Development Stages of Major Forested Communities - Gas well sites, mine sites, and associated roads, pipelines, and facilities convert some major forested community acreage to non-forest habitat. These features also contribute to fragmentation of remaining forest habitat. After completion of mineral development activities, disturbed areas may recover to provide young forest habitat, and ultimately mature forest by the later decades of the planning

horizon. The speed and degree of recovery would depend on the intensity of surface disturbance and the effectiveness of reclamation.

Natural gas leasing is the most common form of mineral development on the Forest. Effects of gas development on major forested communities usually are minor. Typically the maximum surface disturbance associated with each gas well is about 15.5 acres. This includes about 2 acres for the well site, 2 acres for access roads, and 11.5 acres of pipelines. Pipelines are approximately 15 to 40 feet wide, and monitoring on the Forest has shown that the tree canopy usually closes over the pipeline within 3 to 5 years. Thus, the long-term effects of each gas well amount to the conversion of an estimated 4 acres of forested habitat to non-forested habitat. The maximum density of gas wells in most areas is about one well per 640 acres. Therefore, the long-term effects to major forested communities are estimated to include the conversion of less than 1 percent of the forested habitat in a given area to non-forested habitat.

Development of other federal minerals currently is rare on the Forest, but it could occur in the future under any of the plan alternatives. Effects from development of minerals other than gas are difficult to predict because they vary depending on the mineral being developed, recovery methods (subsurface vs. surface mining), the intensity of surface disturbance, and the effectiveness of reclamation. However, any mineral development activity is likely to involve at least some long-term conversion of major forested communities to non-forest habitat.

Amount of Rare and Unique Communities - Federal mineral exploration, development, and leasing will avoid most rare and unique communities. Mineral activities could occur in pastures, grazing allotments, or wildlife openings that are classified with the high-elevation grasslands or woodlands, savannas, and grasslands communities. Such activities could result in small losses of these community types. Should mineral activities occur in areas that currently have a semi-primitive non-motorized ROS classification, remote habitat would be reduced by the amount of land that no longer meets the semi-primitive non-motorized criteria.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Surface occupancy associated with federal mineral activity is prohibited in many of the areas that make up MDA reserves. These areas include the following:

- Congressionally designated Wilderness (MP 5.0)
- Recommended wilderness (MP 5.1)
- MP 6.2
- Remote backcountry portions of the NRA
- MP 8.0 scenic areas and botanical areas
- Key areas for Indiana bats

Surface occupancy is not specifically prohibited in eligible Wild and Scenic River corridors, but the requirement to maintain the potential Wild or Scenic classification makes surface occupancy very unlikely. Surface occupancy is not prohibited in the following areas that are part of MDA reserves:

- Certain areas with a very high scenic integrity objective
- Portions of the NRA that are not remote backcountry
- Potential spruce restoration areas within MP 4.1.
- West Virginia northern flying squirrel suitable habitat

The proportion of total MDA reserve acreage that is open to surface occupancy varies by alternative. Within areas where surface occupancy is possible, alteration to ecological communities would be as described above for major forested communities. Such minor surface disturbance would not measurably affect the proportional representation of communities in reserves, and is not expected to substantially impair the integrity and function of MDA reserves.

Vegetation/Timber Management – Mechanical Treatments

Amount and Development Stages of Major Forested Communities - For the purpose of evaluating ecological effects to major forested communities, mechanical vegetation treatments can be classified into three categories: even-aged regeneration harvesting, uneven-aged harvesting, and intermediate treatments such as thinning.

Even-aged regeneration harvesting is the major tool used to manipulate the age class distribution of the major forested communities. These types of harvest treatments change mature and old stands into young stands. Resetting forest development not only changes the structure of the community, it can also arrest natural changes in plant and animal species composition that occur as the community ages. Depending on the community types and the existing age class distribution in a given area, changing mature and old stands to young stands can contribute to or detract from the coarse-filter conservation goal of maintaining the natural forest development stage distribution on representative portions of the landscape.

Uneven-aged harvests do not convert mature and old stands to young stands. Depending on the community types and the existing age class distribution in the area considered, this lack of conversion can contribute to or detract from the coarse-filter conservation goal of maintaining the natural forest development stage distribution on representative portions of the landscape. Although uneven-aged harvests do not reset forest development, they do change community structure by creating canopy gaps that allow development of complex vertical layering of understory and midstory vegetation. Uneven-aged harvesting also allows increased growth rates in the unharvested trees, which can hasten the development of large trees. Uneven-aged harvesting creates or perpetuates multiple age classes of trees within a stand, and it favors the regeneration of shade-tolerant trees. Taken together, these changes create a stand that is structured similar to an old forest. Depending on existing community types and forest development stage distributions, such accelerated development of stands with old forest characteristics can contribute to or detract from maintenance of representative examples of natural community composition and forest development stages.

The effects of intermediate treatments on community structure are similar to the effects of uneven-aged harvesting. However, intermediate treatments generally are used as part of an even-aged management system, so the associated effects are temporally limited to the latter portion of a typical even-aged rotation. Effects associated with intermediate treatments may contribute to the development of community structure typical of old stands for a few decades of the rotation. Depending on existing community types and development stages, such old forest characteristics can contribute to or detract from maintenance of representative examples of natural community composition and development stages.

Amount of Rare and Unique Communities - Mechanical vegetation management will avoid most rare and unique communities. Management activities in areas adjacent to rare and unique communities could alter light regimes or microclimates enough to affect community structure or composition, but site-specific mitigation measures are expected to minimize such effects. Maintained openings that are classified as high-elevation grasslands or woodlands, savannas, and grasslands could be used as log landings. Such use would result in the temporary loss of that portion of the community. Vegetation damage and soil compaction from such use could alter the structure and composition of the community for several years to several decades following use.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - In the various land classifications that make up MDA reserves, mechanical vegetation treatments either are not allowed, are directed at enhancing the specific unique values of the land classification, or are intended to restore natural ecological communities. The proportion of land in these categories varies by alternative. Any vegetation treatments that occur are not expected to substantially impair the integrity and function of MDA reserves. To the extent that the treatments restore natural ecological community structure, they may improve the integrity and function of MDA reserves. Restoration treatments, particularly spruce restoration in MP 4.1, may change the proportional representation of communities in MDA reserves to the extent that the treatments cause changes in forest types. Any such change would likely involve an increase in the representation of spruce forest and a corresponding decrease in the representation of northern hardwood forest.

Vegetation/Timber Management – Salvage Harvest

Amount and Development Stages of Major Forested Communities - Salvage harvests remove dead or dying trees from sites that have been affected by a natural disturbance such as fire or wind. Salvage harvests do not change the existing forest development stage distribution; salvage areas have already been changed from mature or old forest to young forest by a natural disturbance. However, salvage harvests simplify community structure and remove organic material from the site. This removal of structure and organic material can change natural community recovery processes and, in general, it detracts from maintenance of representative examples of natural communities.

Amount of Rare and Unique Communities - Salvage harvesting would avoid most rare and unique communities. Salvage activities in areas adjacent to rare and unique communities could alter light regimes or microclimates enough to affect community structure or composition, but site-specific mitigation measures are expected to minimize such effects. Maintained openings that are classified as high-elevation grasslands or woodlands, savannas, and grasslands could be used as log landings. Such use would result in the temporary loss of that portion of the community. Vegetation damage and soil compaction from such use could alter the structure and composition of the community for several years to several decades following use.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The intensity of salvage operations allowed in MDA reserves varies among the land categories that make up the reserves. A breakdown of the various levels of salvage allowed follows.

Removal of any commercial timber products, including through salvage, is prohibited:

- Designated Wilderness (MP 5.0)
- Some of the MP 8.0 scenic and botanical areas

Salvage is not explicitly addressed, but all management of overstory vegetation is limited to research or actions undertaken to maintain or improve TEP species habitat, effectively prohibiting large-scale salvage:

- West Virginia northern flying squirrel suitable habitat
- Indiana bat key areas

Salvage is not prohibited, but is limited to extensively damaged areas or cannot substantially alter the natural environment:

- Recommended Wilderness (MP 5.1)
- MP 6.2
- Eligible Wild and Scenic River corridors

Salvage is not restricted:

- Some MP 8.0 scenic areas
- The NRA
- MP 4.1 spruce restoration areas
- Certain areas with a very high scenic integrity objective

The proportion of MDA reserve area in these intensity categories varies among the alternatives.

Salvage logging occurs in areas where the overstory is already dead or dying. It will not cause a change in forest type; therefore it will not change the proportional representation of ecological communities in MDA reserves. However, salvage operations have the potential to remove large amounts of dead wood, thereby changing natural community structure, altering the effects of the natural disturbance regime, and altering natural recovery processes. In locations where salvage occurs, such effects have the potential to impair the function of MDA reserves, which is to allow communities to be shaped primarily by natural processes or management that restores natural structure and composition. The degree to which this function is impaired would depend on the intensity of the salvage operation (i.e., basal area removed) and the area of the salvage operation in relation to the total area of the affected MDA reserve. Typically, salvage occurs in small, localized areas and has little potential to affect landscape-scale functions of MDA reserves.

Range Management – Livestock Grazing

Amount and Development Stages of Major Forested Communities - Acreage devoted to range allotments has been declining slowly over several decades, and the revised Forest-wide management direction calls for maintenance of existing grazing capacity. Based on current trends and revised management direction emphasis, new allotments likely will be limited to newly acquired lands that contain pastures. Therefore, range management is not likely to convert any existing major forested communities to non-forest habitat. If the decline in range acreage continues, some range land will be replaced by forested habitat, initially in the young forest stage, but ultimately progressing to the mature stage in the later decades of the planning horizon.

Depending on the existing community composition and development stage distribution of the area under consideration, such reversion of land to young and mature forest could have positive or negative effects on the maintenance of representative natural community composition and development stage distributions.

Amount of Rare and Unique Communities - Range management is not expected to expand in the foreseeable future, so there is little opportunity for range management to cause new effects to rare and unique communities. Should grazing allotments be created or expanded, every effort would be made to avoid impacts to rare and unique communities. However, any such creation or expansion of range allotments would increase the amount of high-elevation grasslands or woodlands, savannas, and grasslands. Should the current downward trend in range acreage continue, the amount of these grassland communities would decrease. A reduction in range acreage could result in passive restoration or enhancement of other rare and unique communities (e.g., bogs or seeps that may be included in current allotments).

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Range allotments are prohibited in designated Wilderness (MP 5.0), and new allotments are prohibited in recommended Wilderness (MP 5.1). In all other land classifications that make up MDA reserves, range management is allowed to varying degrees. Because range management is not expected to expand appreciably in the foreseeable future, the potential for new effects on MDA reserves is low. Maintenance of existing allotments within MDA reserves may prevent communities from being shaped primarily by natural processes or management that restores natural structure and composition. However, range management affects such a small total acreage Forest-wide (currently around 7,000 acres) that any effects on MDA reserves are expected to be minor.

Fire Management – Fire Suppression

Amount and Development Stages of Major Forested Communities - Fire suppression prevents intense wildfires from converting mature and old forests to young forests. Fire suppression also prevents low-intensity wildfires from consuming dead wood and killing understory vegetation, thereby encouraging the development of complex habitat structure and promoting shade-tolerant, fire-sensitive vegetation. The degree to which fire suppression contributes to or detracts from maintenance of representative natural communities and forest development stages depends on existing community composition, structure, and forest development stage distribution relative to the presettlement condition. Fire suppression in fire-adapted communities can have negative effects on the restoration and maintenance of natural community composition and structure. Long-term suppression in such communities can cause an unnatural buildup of fuels, which increases the potential for stand-replacing wildfires. In such situations, suppression in the short term can prevent community destruction by unnaturally intense fires that result from the long-term fuel buildup, but the benefit of such suppression is short-lived unless it is coupled with fuel reduction efforts to prevent future intense fires.

Amount of Rare and Unique Communities - Fire suppression typically is an emergency activity with the highest priority given to safety and prevention of property damage. Although efforts will be made to avoid damage to rare and unique communities, under some circumstances

it may be necessary for fire lines and other disturbance associated with suppression activities to impact these communities. Any such damage would be rehabilitated to the extent possible.

Other effects of fire suppression on rare and unique communities depend on whether suppression occurs in a fire-adapted landscape. In fire-adapted areas, suppression may allow encroachment of woody vegetation in fire-maintained examples of high-elevation grasslands or woodlands, savannas, and grasslands. Such encroachment could degrade or eliminate these communities. In non-fire-adapted landscapes, fire suppression could protect fire-sensitive rare and unique communities (e.g., certain wetlands and wet rock outcrop communities) from wildfire effects.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The effects of fire suppression on MDA reserves depend on whether suppression is occurring in a fire-adapted landscape. Suppression in fire-adapted communities impedes the operation of natural disturbance and recovery processes, thereby interfering with the function of MDA reserves. To the extent that fire suppression causes forest type changes, it can alter the proportional representation of communities in MDA reserves. Suppression in non-fire-adapted communities can prevent the destruction of fire-sensitive communities. Because most fires in such communities are human-caused, suppression in non-fire-adapted areas acts to protect the natural disturbance and recovery processes, thereby supporting the function of MDA reserves. To the extent that it prevents forest type changes due to catastrophic fire, suppression in these communities can maintain proportional representation of ecological communities in MDA reserves.

Fire Management – Prescribed Fire Use

Amount and Development Stages of Major Forested Communities - Prescribed fire generally involves low-intensity surface fires that consume dead wood and kill understory vegetation. Such fires simplify vertical habitat structure above the ground, but often encourage growth of herbaceous plants and low shrubs near the ground. In fire-adapted communities such as oak forests, such effects would contribute to the coarse-filter goal of maintaining representative examples of natural communities. In non-fire adapted communities such as spruce forests, prescribed fire would tend to create or perpetuate unnatural community composition and structure. It is possible for prescribed fires to escape and become more intense fires that kill overstory trees. Such fires would convert mature or old stands to young stands. Depending on the existing community types and forest development stage distribution, development stage conversion could contribute to or detract from maintenance of representative natural community composition and development stage distributions.

Amount of Rare and Unique Communities - Prescribed fire will avoid rare and unique communities, unless fire is necessary for community maintenance or enhancement. If a prescribed fire escapes control, it could damage fire-sensitive rare and unique communities if any are present in the area. Prescribed fire in fire-adapted landscapes could enhance or expand rare and unique communities.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The effects of prescribed fire on MDA reserves depend on whether prescribed fire is used in a fire-

adapted landscape. Prescribed fire in fire-adapted communities mimics natural disturbance and recovery processes, thereby enhancing the function of MDA reserves. To the extent that prescribed fire maintains forest types that would otherwise be lost to the effects of fire suppression, it can maintain the proportional representation of communities in MDA reserves. Prescribed fire in non-fire-adapted communities can alter or destroy fire-sensitive communities. In this context, prescribed fire changes the natural disturbance and recovery regime. If prescribed fire escapes control and damages the overstory, it can change forest types and alter the proportional representation of communities in MDA reserves.

Roads – Construction, Reconstruction, Maintenance, and Decommissioning

Amount and Development Stages of Major Forested Communities - Construction of new roads converts small amounts of major forested communities to non-forested habitat. New roads also create an edge effect, thereby fragmenting remaining forested habitat. Such fragmentation can change plant and animal species composition, typically in a manner that moves species composition further away from representative natural conditions. Reconstruction of existing roads has similar effects to the extent that the existing roads have been reclaimed by forested communities. These effects tend to have negative effects on the maintenance of representative natural community composition and structure, and result in a minor decrease in overall area covered by major forested communities. However, some disturbance-dependent forested communities (e.g., oak forest) require human-caused disturbance because of the loss of presettlement disturbance regimes. For these communities, access is essential for management that mimics the natural disturbance regimes. The level of road construction and reconstruction necessary to facilitate management access contributes to the maintenance of representative natural communities and forest development stages.

Road maintenance perpetuates the habitat changes that are created by road construction and reconstruction. Road maintenance prevents natural processes from reversing fragmentation and recovering lost forested area. In disturbance-dependent communities that are perpetuated by management-related disturbance, road maintenance ensures continued access to facilitate the necessary management.

Road decommissioning hastens natural recovery from the fragmentation and loss of forest associated with road construction and reconstruction. Decommissioning can also remove the access necessary for management in disturbance-dependent forested communities.

Amount of Rare and Unique Communities - Road construction and maintenance activities generally will avoid impacting rare and unique communities unless avoidance is not possible (e.g., an essential crossing of a stream channel or linear wetland). When avoidance is not possible, project-specific mitigation measures will minimize damage. Proper road maintenance could reduce or eliminate negative effects such as sedimentation of nearby wetlands. Road decommissioning could result in restoration of rare and unique communities in locations where existing roads were built across such communities. Road construction or reconstruction in areas that currently have a semi-primitive non-motorized ROS classification would cause a decrease in remote habitat area.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The potential intensity of road construction, reconstruction, and maintenance varies among the categories of land that are included in MDA reserves. A breakdown of the various levels of intensity follows.

Generally no road construction, reconstruction, or maintenance allowed:

- Designated Wilderness (MP 5.0)

Maintenance of existing roads allowed, but generally no new construction:

- Recommended Wilderness (MP 5.1)
- MP 6.2
- Some MP 8.0 scenic areas
- Indiana bat key areas

Maintenance of existing roads allowed; new construction not prohibited, but likely to be minor to nonexistent because of potential conflict with primary management emphasis:

- Most MP 8.0 scenic and botanical areas
- Remote backcountry portions of the NRA
- Eligible Wild and Scenic River corridors
- Certain areas with a very high scenic integrity objective
- West Virginia northern flying squirrel suitable habitat

System road density limited to 2½ miles per square mile:

- MP 4.1 spruce restoration areas

No major limitations:

- Portions of the NRA outside of remote backcountry

The allocation of MDA reserve acreage among these land categories varies by alternative.

The loss of forested area caused by road construction and reconstruction reduces the proportional representation of the affected ecological communities in MDA reserves. However, roads typically occupy a small fraction of the landscape, so substantial changes in proportional representation are not expected. For example, in MP 4.1 the maximum system road density of 2½ miles per square mile would result in roads occupying less than 2 percent of the landscape, assuming an average roadbed width of 33 feet.

The fragmentation effect of roads can alter natural ecological processes, which affects the function of MDA reserves. The fragmentation effect would be greatest immediately after road construction, and would decline as adjacent tree canopies grow and partially cover the road opening. Road maintenance prevents natural recovery processes from reversing the effects of past road construction.

Recreation – Developed Recreation

Amount and Development Stages of Major Forested Communities - Depending on the intensity of developed recreation activities, the associated facilities can have effects ranging from minor alteration of forested community structure (e.g., a small picnic area) to replacement of the forested community with structures and non-forested habitat (e.g., a visitor's center). Such facilities generally have a negative effect on the maintenance of representative examples of natural community composition and forest development stages, although the effects at the low end of the intensity scale are so minor that they can be considered negligible. Viewed in aggregate at the Forest-wide scale, the effect of new and existing developed recreation facilities on the total amounts of the major forested communities is likely to be very small.

Amount of Rare and Unique Communities - New developed recreation sites will avoid substantial impacts to rare and unique communities. Minor impacts could result if recreational access is provided to allow visitors to enjoy unique community attributes (e.g., a boardwalk through a bog). Where existing developed sites occupy or are adjacent to rare and unique communities, any increase in recreational use could intensify existing effects or cause new effects (e.g., trampling). Any construction of developed recreation facilities in areas that currently have a semi-primitive non-motorized ROS classification would cause a decrease in remote habitat area.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The type of developed recreation facilities allowed or expected in MDA reserves varies among the land classifications included in the reserves. Following is a breakdown of the expected level of developed facilities.

No facilities allowed or only those necessary for resource protection:

- Designated Wilderness (MP 5.0)
- Recommended Wilderness (MP 5.1)
- Eligible Wild and Scenic River corridors
- Indiana bat key areas

Generally only small, low impact facilities expected:

- MP 6.2
- Remote backcountry portions of the NRA
- Some 8.0 scenic and botanical areas
- West Virginia northern flying squirrel habitat

Expected facilities are consistent with maintenance of high scenic quality:

- Certain areas with a very high scenic integrity objective
- Some 8.0 scenic areas

Facilities allowed that are consistent with the desired ROS zone, could include high-impact developed facilities in some areas:

- Portions of the NRA outside of remote backcountry

No major limitations on facilities:

- MP 4.1 spruce restoration areas

The proportional breakdown of MDA reserve acreage among these land categories varies by alternative.

Low impact facilities (e.g., boardwalks, signs, small picnic sites) occupy such small amounts of land that their effects on representation of ecological communities in MDA reserves will be negligible. Other effects from such facilities, such as fragmentation and interference with natural disturbance and successional processes, are also expected to be negligible.

Higher impact facilities (e.g., large picnic areas, campgrounds, visitor centers) that have more intense site-specific effects can alter or remove ecological communities, fragment communities, and interfere with natural disturbance and successional processes. However, on a Forest-wide basis, developed recreation sites are expected to occupy a very small total area. Therefore, to the extent such developed sites occur in MDA reserves, their effects on overall community representation and function in MDA reserves are expected to be very minor.

Recreation – Dispersed Recreation

Amount and Development Stages of Major Forested Communities - Trails associated with dispersed recreation generally have a very minor effect on major forested communities. These effects typically are limited to the absence of understory and midstory vegetation along the treadway. Dispersed-use trails generally do not involve removal of the tree canopy and therefore do not contribute to forest fragmentation at the stand scale or higher.

Other impacts of dispersed use could include construction of small facilities such as footbridges and pit toilets, trampling outside of trail treadways, and trampling or removal of vegetation and dead wood in and around dispersed campsites. All of these impacts tend to remove or simplify habitat structure and alter natural vegetation development processes. These impacts tend to have a negative effect on the maintenance of natural community composition and forest development stages. In most cases the effects are so minor that they could be considered negligible, although more substantial effects could occur in localized high-use areas.

Amount of Rare and Unique Communities - New trails and other facilities associated with dispersed recreation will avoid rare and unique communities unless avoidance is not possible. Where avoidance is not possible, such as a footbridge across a stream channel, site-specific mitigation measures will minimize negative impacts. Where trails or other dispersed recreation sites lie adjacent to rare and unique communities, increases in recreational use could result in new impacts to those communities (e.g., trampling, unauthorized plant collection).

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Dispersed recreation involves such low-intensity alteration to ecological communities that it would not have a measurable impact on the representation or function of ecological communities in MDA reserves.

Recreation – Motorized Recreation Use

Amount and Development Stages of Major Forested Communities - Effects associated with motorized recreation are largely due to the roads that are necessary to facilitate motorized access. These effects are discussed above in the roads subsection. Because roads are rarely constructed solely for motorized recreational use, motorized recreation is likely to occur on roads that would have been constructed anyway for management access reasons. Therefore, effects of roads used for motorized recreation would not be additive to the road effects already discussed.

However, off-road motorized use could have additional effects on major forested communities. The Forest does not allow off-road motorized vehicle use except on designated routes. Currently there are no designated routes; so authorized off-road motorized recreation would require construction of a dedicated trail system to accommodate off-road vehicles. The effects of constructing and maintaining such a system would be similar to the effects of road construction and maintenance, but the effects would be in addition to the effects of roads that are constructed for management access. However, per mile of trail, fragmentation and forest loss effects would be less than road construction effects because off-road vehicles generally do not require trails as wide as most roads. Although no plan alternative contains specific goals, objectives, or limitations regarding the amount of off-road vehicle trails to be constructed, it is considered unlikely that the Forest would construct enough off-road vehicle trails to measurably affect the amount and development stages of major forested communities.

Amount of Rare and Unique Communities - Most effects to rare and unique communities due to on-road motorized recreation are covered above in the roads subsection. However, heavy on-road motorized recreation use could impair the ability of road maintenance to prevent sedimentation of nearby wetlands and stream channels.

Off-road motorized recreational sites generally would avoid rare and unique communities. Any unavoidable impacts, such as essential crossings of stream channels or linear wetlands, would be mitigated to minimize negative effects. Off-road motorized recreation sites could impact nearby wetlands and stream channels through sedimentation. However, every effort would be made to design off-road motorized trails such that off-site impacts to rare and unique communities are avoided or mitigated.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Potential effects of on-road motorized recreation on MDA reserves are covered above in the roads subsection. Off-road motorized recreation would require construction of a new trail system. These effects would also be similar to the effects discussed above under roads, but would be in addition to those effects. However, per mile of trail, the magnitude of such effects would be less than effects associated with road construction due to the narrower width of off-road vehicle trails. Although no plan alternative contains specific goals, objectives, or limitations regarding the amount of off-road vehicle trails to be constructed, it is considered unlikely that the Forest would construct enough off-road vehicle trails to measurably affect community representation in MDA reserves.

Soil, Water, Riparian, Aquatic – Active Restoration

Amount and Development Stages of Major Forested Communities - Active soil, water, riparian, and aquatic restoration tends to focus on localized areas. Such localized activity has little or no potential for appreciable effects on the amount and development stage distribution of major forested communities. Revegetation for sediment and erosion control could eventually lead to reforestation of currently non-forested areas, resulting in minor increases in the amount of certain major forested communities.

Amount of Rare and Unique Communities - Active soil, water, riparian, and aquatic restoration is likely to result in improved condition or increased amounts of rare and unique communities with an aquatic component, such as stream channels and wetlands. If such restoration involves revegetation of non-forested areas, it could cause a decrease in the area of high-elevation grasslands or woodlands, savannas, and grasslands. Positive and negative impacts to rare and unique communities are not expected to affect large areas, but given that these communities generally occupy a small fraction of the landscape, such small effects may or may not be considered minor.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Active soil, water, riparian, and aquatic restoration is generally allowed in most land classifications that are part of MDA reserves, although in many areas such restoration must blend with the natural environment and/or be consistent with ROS and SMS objectives. Localized active soil, water, riparian, and aquatic restoration affects such small areas that it has little or no potential for noticeable Forest-wide effects on the representation of ecological communities in MDA reserves. Such restoration may promote noticeable improvements in natural processes and functions in localized areas within MDA reserves, but at the Forest-wide level such effects are likely to be negligible.

Soil, Water, Riparian, Aquatic – Passive Restoration

Amount and Development Stages of Major Forested Communities - Passive soil, water, riparian, and aquatic restoration tends to be applied across broader areas than active restoration. Passive restoration that involves reforestation of currently non-forested areas has the potential to increase the amount of certain major forested communities. However, given that very little area currently is non-forested, any such effects are expected to be minor.

Amount of Rare and Unique Communities - Effects of passive soil, water, riparian, and aquatic restoration on rare and unique communities will be similar to those discussed above for active restoration.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - Effects of passive soil, water, riparian, and aquatic restoration on representation of ecological communities in MDA reserves will be similar to those discussed above for active restoration. Such effects could occur on a broader scale than that expected for active restoration. However, the area covered by restoration activities still is not likely to be large enough to create substantial effects.

Wildlife/Fish Habitat Restoration

Amount and Development Stages of Major Forested Communities - The potential effects of wildlife and fish habitat restoration on major forested communities vary widely depending on the wildlife species of management interest. Traditional maintained wildlife openings convert major forested communities to non-forest habitat and contribute to fragmentation of remaining forested habitat. These activities constitute a small negative effect on the maintenance of representative examples of natural community structure and forest development stage distributions. The desired condition for maintained openings does not exceed 8 percent in any MP, and those MPs outside the suitable timber base have no goals for maintained openings. Therefore, the Forest-wide effects of maintained openings on major forested communities, while not negligible, are not likely to affect a large proportion of the major forested communities under any alternative.

Habitat restoration activities for species characteristic of forested environments could increase the amount of certain major forested communities, and could contribute to the maintenance of natural forest development stage distributions. However, such habitat restoration typically is conducted on a small scale and any effects are likely to be minor.

Amount of Rare and Unique Communities - Wildlife and fish habitat restoration generally will avoid any negative impacts to rare and unique communities. If the species of management interest occurs in a rare or unique community, restoration likely will cause improved condition or increased amount of that community. Generally such effects will be limited to small areas, but because most rare and unique communities cover a small fraction of the landscape, the effects may or may not be considered minor.

Creation of new maintained wildlife openings will increase the area of high-elevation grasslands and woodlands, savannas, and grasslands. Total acreage is likely to be small in the context of the entire Forest, but relative to existing acreage of these communities, increases may or may not be considered minor.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth - The land classifications that make up MDA reserves generally allow fish habitat restoration, as long as it blends with the natural environment and/or is consistent with ROS and SMS objectives. Wildlife openings are allowed in MP 4.1 spruce restoration areas and the NRA. New wildlife openings are expected to be rare to nonexistent in the other land classifications due to prohibitions or conflict with the primary management emphasis. Restoration of forested habitat is generally allowed throughout the MDA reserves, except in the Cranberry Glades Botanical Area. Management techniques for habitat restoration are severely restricted in designated and recommended Wilderness (MPs 5.0 and 5.1, respectively).

Where traditional wildlife openings are allowed, they can subtract a small amount of area from ecological communities represented in MDA reserves. Fragmentation associated with openings may interfere with natural disturbance and successional processes. However, desired conditions for maintained openings where they are allowed do not exceed 5 percent, so the effects are expected to be minor. Habitat restoration activities in forested habitats will not change

community representation in MDA reserves unless the activities cause a forest type change. Even in such a case, habitat restoration activities are not expected to affect large areas of the landscape, so effects to community representation in MDA reserves are expected to be minor. Wildlife habitat restoration in forested areas could enhance natural structure and function of communities in MDA reserves. Fish habitat restoration would affect such small areas of communities in MDA reserves that the effects are expected to be negligible.

Direct and Indirect Effects by Alternative

The discussion of direct and indirect effects by alternative focuses on NFS land. The Cumulative Effects section discusses the combined effects of activities on NFS land and activities on other land ownerships within the Forest boundary.

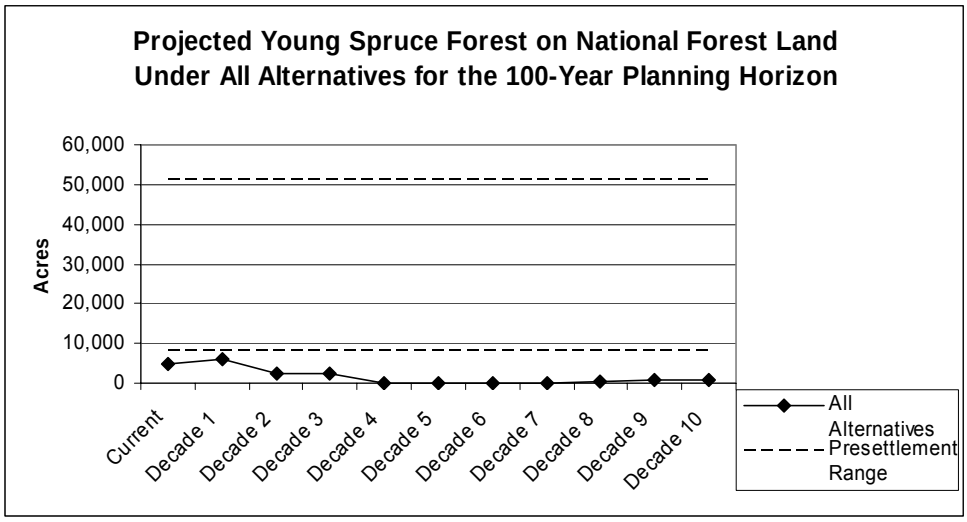
Amount and Development Stages of Major Forested Communities

Spruce Forest - Because forest type changes were not modeled in Spectrum, the projected total amount of each of the major forested communities under all alternatives remains the same as the current amount. In reality, for the action alternatives, spruce restoration efforts and continued natural succession are likely to cause the total amount of spruce forest to increase somewhat at the expense of northern hardwoods. The likelihood of spruce forest approaching presettlement amounts due to restoration and succession is difficult to assess, but land allocations suggest there are likely to be differences in active restoration among the alternatives. Restoration activities are likely to increase spruce forest the most under Alternative 4, which allocates the most northern hardwood areas to MP 4.1. Thus, in the early and middle decades of the planning horizon, Alternative 4 would move the total amount of spruce closer to the presettlement range than the other alternatives. Alternative 1 allocates no land to MP 4.1 and is likely to result in the least amount of active spruce restoration and, therefore, the greatest deviation from the presettlement range. Among the action alternatives, Alternative 3 allocates the least amount of northern hardwoods to MP 4.1 and is likely to result in low levels of active spruce restoration, while Alternatives 2 and 2M would restore less spruce than Alternative 4, but more than Alternative 3. Based on the amount of northern hardwoods in MP 4.1 and the various passive management areas, the combined amount of active and passive restoration would be similar under all of the alternatives. Therefore, toward the end of the planning horizon as natural succession proceeds, the total amount of spruce restoration likely would be similar under all alternatives.

Because essentially all spruce forest is considered suitable habitat for the West Virginia northern flying squirrel, extensive even-aged timber harvest is not expected to occur in spruce forest under any alternative. Therefore, the aging of existing stands will be the primary factor determining future amounts of spruce forest development stages under all alternatives.

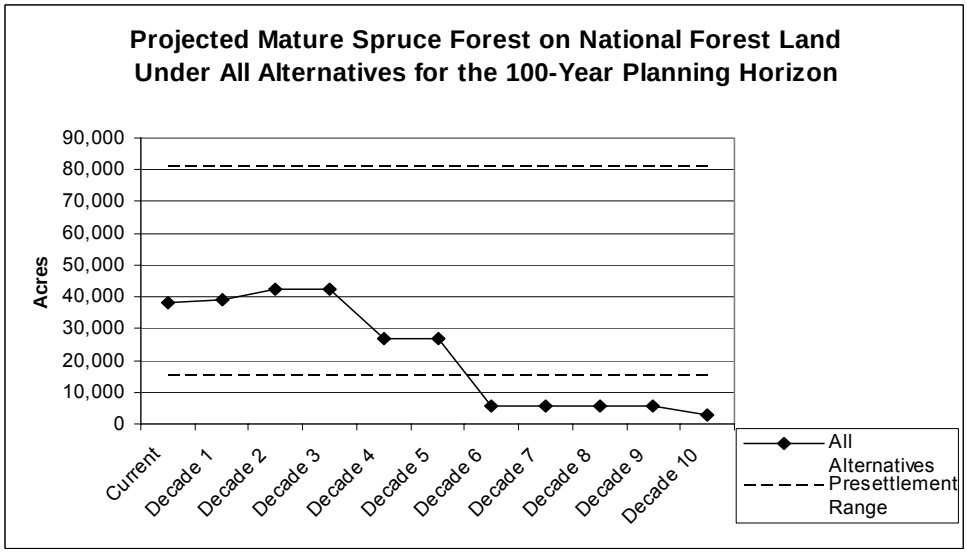
As current stands age, young spruce forest is projected to decline from its current low levels to approximately zero by the fourth decade of the planning horizon (Figure ED-7). This decline would keep the amount of young spruce forest below the estimated presettlement range. However, this projection does not account for the possibility that natural disturbances could create small amounts of early successional spruce forest.

Figure ED-7.



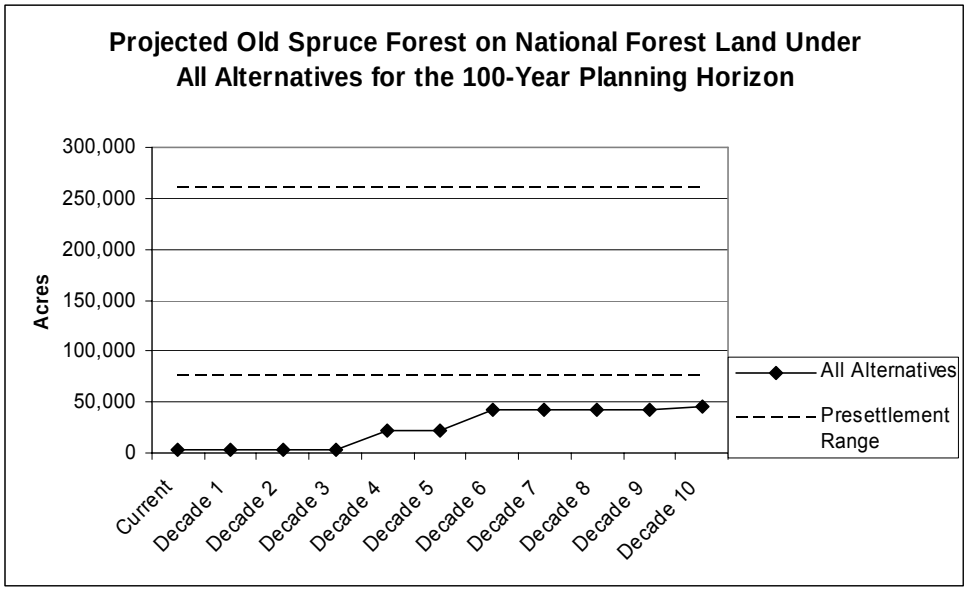
As current mature stands reach the old stage, mature spruce forest also is expected to decline, reaching approximately 6,000 acres by the sixth decade and less than 3,000 acres by the end of the planning horizon (Figure ED-8). This decline would reduce the amount of mature spruce forest below the estimated presettlement range. Again, this projection does not account for the effects of natural disturbances, which could reset forest development in some areas and maintain higher than the projected amounts of mature spruce forest. Also, it does not account for the potential restoration of mature northern hardwoods to mature spruce forest, which could keep the amount of mature spruce forest within the presettlement range. Because of different allocations to MP 4.1, such a scenario would be most likely to occur under Alternative 4 and least likely under Alternative 1.

Figure ED-8.



Old spruce forest is projected to increase from the current very small amount to about 42,000 to 45,000 acres in the sixth through the tenth decades of the planning horizon (Figure ED-9). This projected amount is still below the estimated presettlement range, but it is based only on aging of existing stands and does not account for potential increases due to spruce restoration. Because of differences in the amount of land allocated to MP 4.1, active spruce restoration would be most likely to move spruce toward its presettlement range under Alternative 4, and least likely under Alternative 1.

Figure ED-9.

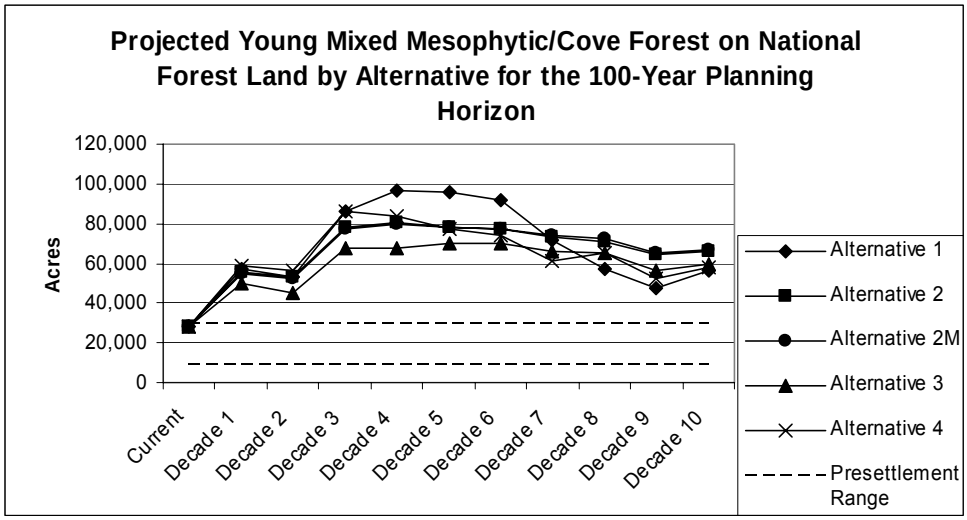


Mixed Mesophytic and Cove Forest – Future amounts of the forest development stages for this community are determined by two factors. Continued aging of existing stands drives an overall trend toward increasing amounts of the old stage and decreasing amounts of the mature stage, while timber harvesting drives a smaller trend toward increasing amounts of the young stage. For all three development stages, the general pattern through time is the same for all alternatives. However, the amounts do differ noticeably across alternatives for some decades in the planning horizon.

Young mixed mesophytic and cove forest, which currently is within the estimated presettlement range, is projected to increase to levels well above the presettlement range as timber harvesting to achieve age class diversity takes place during the first half of the planning horizon (Figure ED-10). Differences among alternatives are directly related to differences in the amount of even-aged timber harvesting. Alternative 1 produces the most, with the total amount reaching nearly 100,000 acres in the fourth and fifth decades of the planning horizon. Alternative 3 produces the least young mixed mesophytic and cove forest during this time, reaching about 70,000 acres during the fifth and sixth decades of the planning horizon. Alternative 4 produces the second highest amount of young mixed mesophytic and cove forest during the middle of the planning horizon, peaking at approximately 86,000 acres in the third decade. Alternatives 2 and

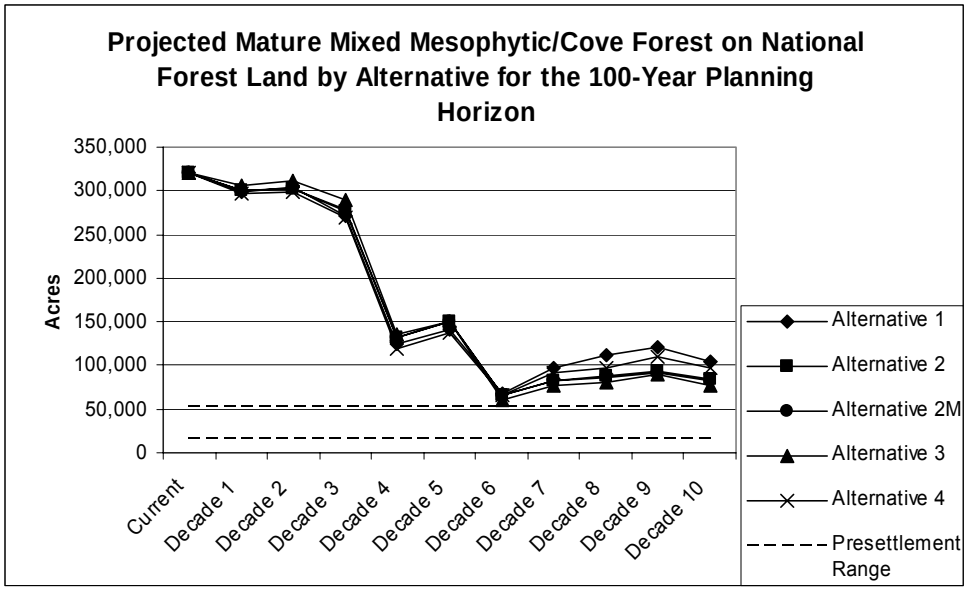
2M peak just above 80,000 acres in the fourth decade. Under all alternatives, the amount of young mixed mesophytic and cove forest is projected to decline during the later decades of the planning horizon, although in all alternatives the amounts remain well above the estimated presettlement range. The amount declines the most under Alternative 1, which reaches a low point of about 48,000 acres in the ninth decade. Alternatives 2 and 2M show the smallest decline, reaching a low point of about 65,000 acres in the ninth and tenth decades. Alternatives 3 and 4 have intermediate amounts, each providing a little less than 60,000 acres in the ninth and tenth decades.

Figure ED-10.



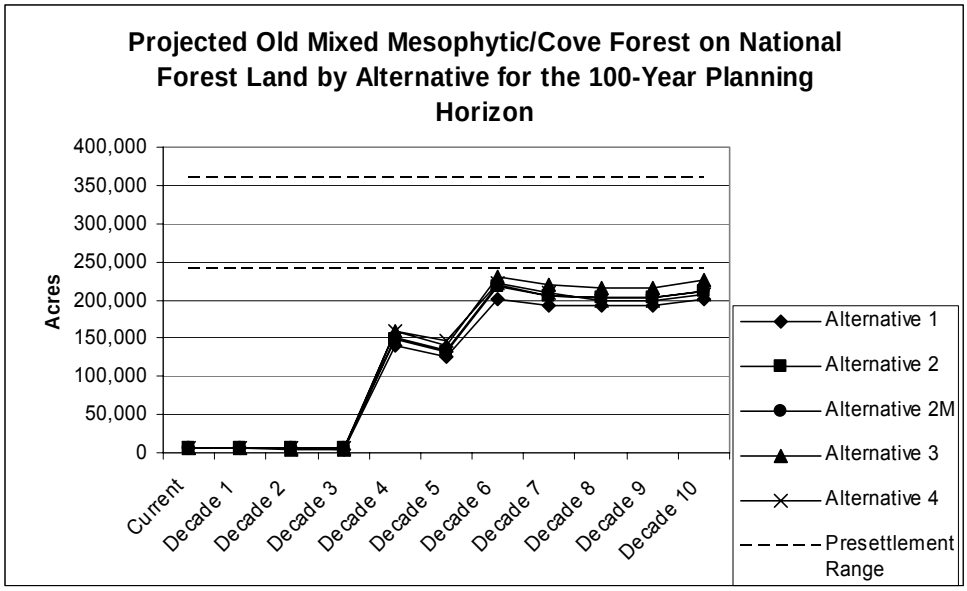
Under all alternatives, the amount of mature mixed mesophytic and cove forest is projected to follow a similar pattern throughout the planning horizon. This development stage is projected to decline only slightly from the current high level during the early decades of the planning horizon (Figure ED-11). The amount is projected to remain near 300,000 acres through the second decade of the planning horizon, and decline to about 270,000 to 290,000 acres in the third decade. These small declines reflect timber harvesting to achieve age class diversity. In contrast, the amount of mature mixed mesophytic and cove forest is projected to decline sharply under all alternatives during the middle decades of the planning horizon, reaching 60,000 to 70,000 acres in the sixth decade. However, the amount stays above the estimated presettlement range. This steep decline is caused by aging of mature stands into the old stage. After the sixth decade, the amount of mature mixed mesophytic and cove forest is projected to increase under all alternatives as stands harvested during the early decades of the planning horizon reach the mature stage. This increase is largest under Alternatives 1 and 4, which would harvest the most timber in the early decades. Under these alternatives, the amount reaches approximately 110,000 to 120,000 acres in the ninth decade. The increase is somewhat smaller under Alternatives 2, 2M, and 3, reaching about 90,000 acres in the ninth decade. Although the amount remains above the presettlement range for all alternatives, the amount under Alternative 3 is a little closer to the presettlement range than under the other alternatives during the sixth through tenth decades.

Figure ED-11.



Old mixed mesophytic and cove forest also is projected to follow a very similar pattern under all alternatives. For the first three decades of the planning horizon, the amount of old mixed mesophytic and cove forest is projected to remain at or below the current 6,000 acres under all alternatives (Figure ED-12). As currently mature stands reach 120 years of age during the fourth through sixth decades, the amount of old mixed mesophytic and cove forest increases dramatically under all alternatives, and remains near this higher level through the rest of the planning horizon. Some variation among alternatives is projected for the sixth through tenth decades. Alternative 3 is projected to maintain the highest amount at about 215,000 to 230,000 acres in the sixth through tenth decades, whereas Alternative 1 is projected to maintain the lowest amount at about 190,000 to 200,000 acres. Alternatives 2, 2M, and 4 are each projected to maintain approximately 200,000 to 220,000 acres during the sixth through tenth decades. These differences among alternatives are due to differences in the amount of timber harvest. Timber harvest reduces the amount of old mixed mesophytic and cove forest, both directly by harvesting old stands, and indirectly by harvesting mature stands before they can reach the old stage. During the sixth through tenth decades under all alternatives, the amount of old mixed mesophytic and cove forest approaches, but does not reach, the estimated presettlement range. Due to lower levels of timber harvest, Alternative 3 comes closest to reaching the presettlement range.

Figure ED-12.



Northern Hardwood Forest – For northern hardwoods, the projected patterns through time in the amounts of the forest development stages are similar to the patterns for mixed mesophytic and cove forest. However, because a smaller proportion of the northern hardwoods community is in the suitable timber base, the patterns in this community are more strongly driven by aging of existing stands and show less effect from timber harvesting, especially under the action alternatives. As with spruce forest, the quantitative projections for this community do not account for the effects of potential spruce restoration. Therefore, the projected amounts may be overestimates, particularly for the mature and old development stages, which are likely to be reduced somewhat by passive and active spruce restoration.

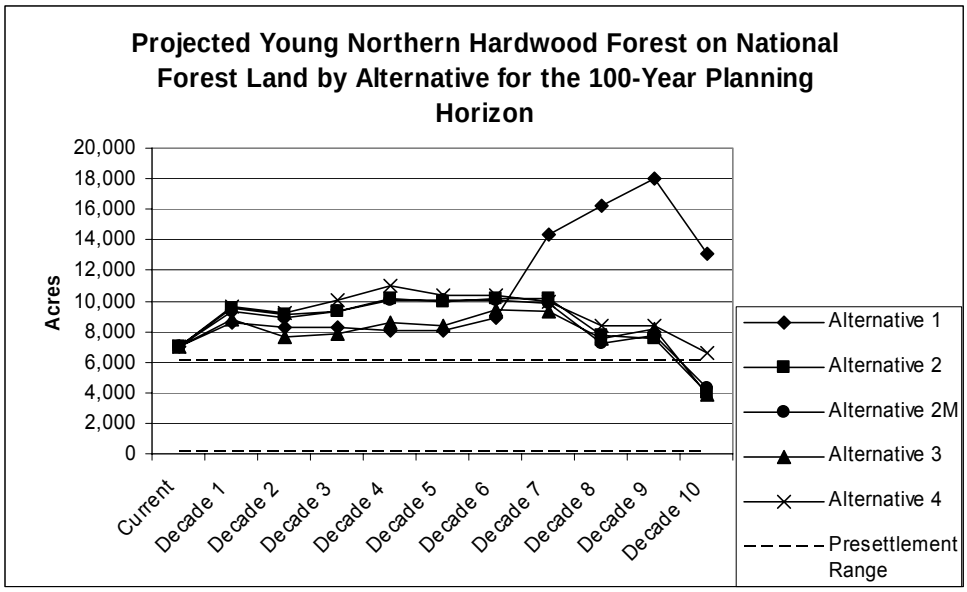
For all alternatives, the amount of young northern hardwood forest is projected to increase somewhat in the early decades of the planning horizon due to even-aged timber harvesting in the portion of northern hardwoods that is in the suitable timber base (Figure ED-13). The increase would be greatest under Alternatives 2, 2M, and 4, which have the largest amount of northern hardwoods in the suitable timber base. Under these alternatives, young northern hardwood forest is projected to reach a little more than 10,000 acres in the fourth through sixth decades. Alternatives 1 and 3 produce slightly less of this development stage, with projected amounts of about 8,000 to 9,000 acres during the fourth through sixth decades.

During the seventh through tenth decades, the projected amount of young northern hardwoods for Alternative 1 is projected to diverge from the amount projected for the other alternatives. Under this alternative, young northern hardwood forest is projected to increase to about 18,000 acres by the ninth decade, and decline to about 13,000 acres in the tenth decade. In contrast, the other alternatives all show an accelerating decline in young northern hardwoods during the seventh through tenth decades. Under Alternatives 2, 2M, and 3, the amount is projected to decline to about 4,000 acres in the tenth decade, while for Alternative 4 the amount declines to about 7,000 acres in the tenth decade. The difference in projected young northern hardwoods

under Alternative 1 versus the other alternatives is due to the absence of MP 4.1 in Alternative 1. Under the action alternatives, northern hardwoods in MP 4.1 were presumed to represent potential spruce restoration areas, so the model did not project any even-aged harvesting that would create young northern hardwoods in that MP. Modeling for Alternative 1 had no such assumption, so the model projected even-aged harvesting that caused an increase in the projected amount of young northern hardwoods.

For all alternatives, the amount of young northern hardwoods is projected to remain above the estimated presettlement range for most of the planning horizon. For Alternatives 2, 2M, and 3 the amount is projected to fall within the estimated presettlement range during the last decade. Under Alternative 4 the amount remains slightly above the presettlement range at the end of the planning horizon, while the amount under Alternative 1 rises much farther above the presettlement range during the later decades of the planning horizon.

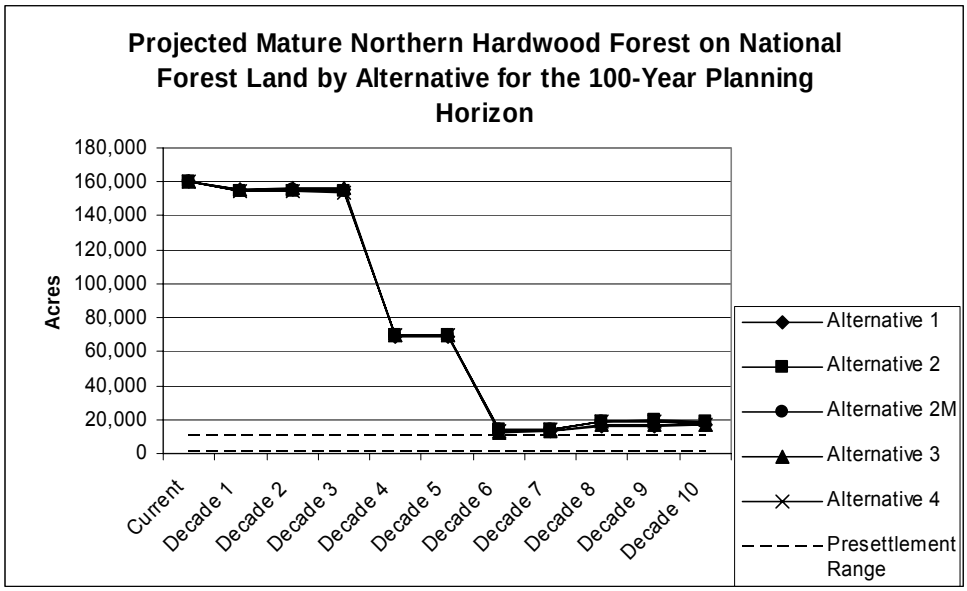
Figure ED-13.



The projected pattern for mature northern hardwoods is strongly driven by aging of current mature stands and is nearly identical across all alternatives (Figure ED-14). For the first three decades of the planning horizon, the amount of mature northern hardwoods is projected to remain near the current 160,000 acres. In the fourth through sixth decades, the amount drops sharply as current mature stands shift to the old stage. For all alternatives, mature northern hardwoods are projected to reach a low point of about 13,000 to 14,000 acres in the sixth and seventh decades. The amount is projected to increase only slightly too about 17,000 to 19,000 acres in the eighth through tenth decades as the small fraction of northern hardwoods projected to be harvested in the early decades of the planning horizon reaches the mature stage. For decades six through ten, the amount projected for each of the alternatives is just above the upper end of the estimated presettlement range. Amounts projected for Alternative 1 are not noticeably different from amounts projected for the other alternatives because the higher harvesting levels

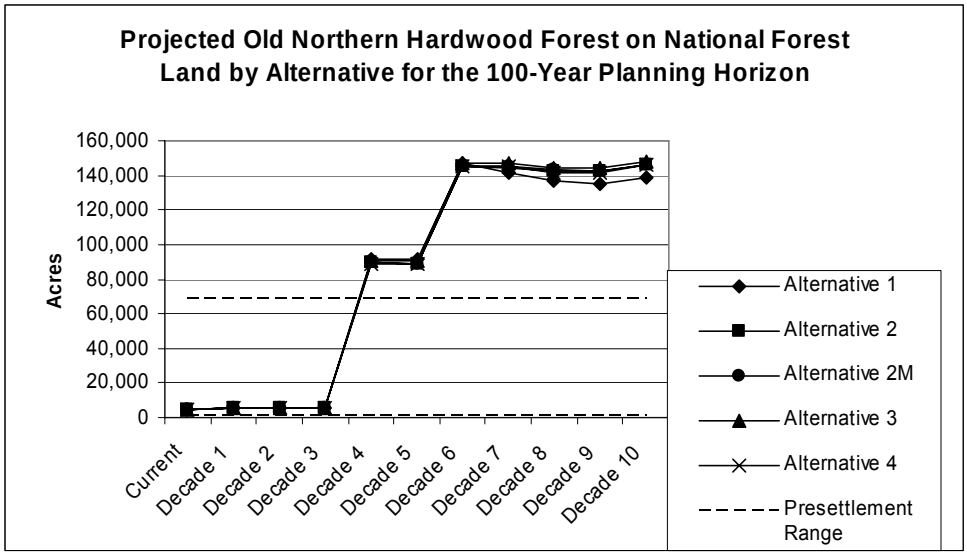
under Alternative 1 are not projected to occur until the later decades of the planning horizon. Areas harvested in the last four decades do not reach the mature stage by the end of the planning horizon.

Figure ED-14.



The projected pattern for old northern hardwoods also is strongly driven by aging of current mature stands and is similar for all alternatives. However, for the later decades of the planning horizon, small differences emerge between amounts for Alternative 1 and amounts for the other alternatives (Figure ED-15). Through the third decade, the amount of old northern hardwoods is projected to remain near the current 5,000 acres. During the fourth through sixth decades, old northern hardwood forest is projected to increase to around 150,000 acres, taking this community well beyond the upper boundary of the estimated presettlement range. For Alternatives 2, 2M, 3, and 4, the amount of old northern hardwoods is projected to remain around 145,000 acres through the end of the planning horizon. For Alternative 1, the projected amount remains much higher than amounts for the early decades, but declines slightly too about 135,000 acres during the ninth decade. This slight decline is due to higher projected timber harvest amounts in northern hardwoods under Alternative 1.

Figure ED-15.



Hemlock Forest – This forested community was not modeled separately, so there are no quantitative projections for future amounts of hemlock forest development stages. Currently this community is estimated to cover only approximately 3,000 acres, almost all of which is in the mature stage. Because of the rarity of hemlock forest and the likelihood that much of it is included in suitable habitat for the West Virginia northern flying squirrel or channel management corridors, it is unlikely that appreciable amounts of even-aged harvesting will occur in this community. Therefore, the pattern of development stages through time is expected to trend heavily toward old forest under all alternatives, especially during the second half of the planning horizon. Although ecological restoration efforts could benefit hemlock in the very short term, by the later decades of the planning horizon it is likely that hemlock forest will have been greatly reduced or eliminated by the hemlock wooly adelgid (*Adelges tsugae*). Due to this exotic insect, prospects for long-term restoration of hemlock forest are not promising under any alternative.

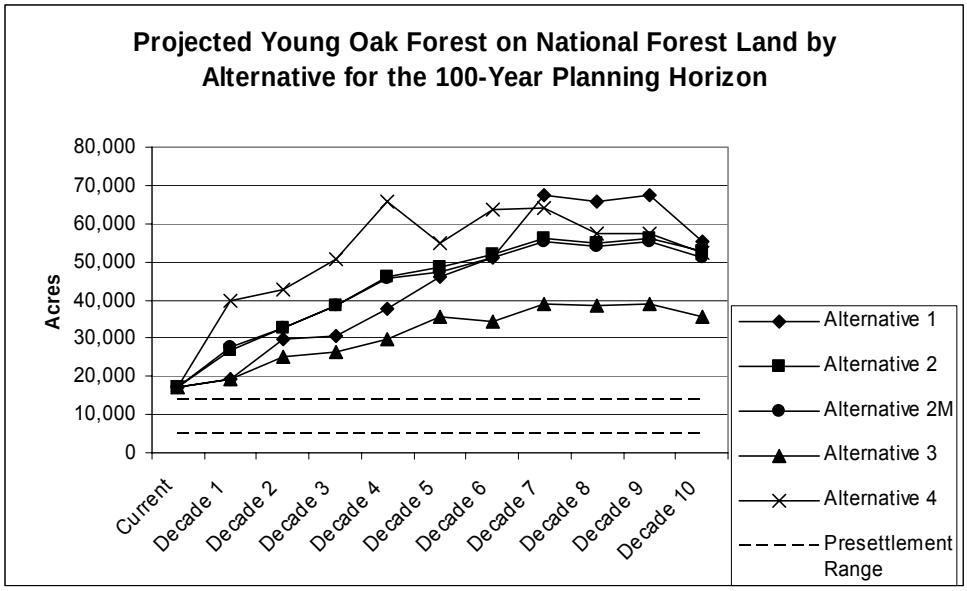
Oak Forest – The general pattern in development stage amounts of oak forest is similar to the patterns for mixed mesophytic/cove and northern hardwood forests, with large decreases in the mature stage and large increases in the old stage during the later decades of the planning horizon. However, the projections for oak forest development stage amounts show proportionally larger differences among alternatives because of larger differences in the way oak-dominated landscapes are allocated to MPs.

In addition to the projected changes in development stages based on harvest amounts and aging of existing stands, oak forest may experience changes in total amount due to species composition changes that are not reflected in the projections. Old oak stands, particularly those dominated by the shorter-lived and shade-intolerant oak species like scarlet oak (*Quercus coccinea*) and northern red oak (*Quercus rubra*), may experience a gradual shift toward mixed mesophytic and cove forest as the oaks are replaced by shade-tolerant species (see species composition discussion in the *Vegetation Management* section of this chapter). Such conversions could reduce total amounts of oak forest toward the estimated presettlement amount. Among the

action alternatives, Alternative 3, which allocates the least land to the suitable timber base, has the lowest projected levels of harvest in oak forest, and maintains the current 300-acre annual cap on prescribed burning, is likely to cause the largest conversion of oak to mixed mesophytic. Alternative 4 has the most land in the suitable timber base and the highest projected harvest activity; therefore it is the action alternative that is likely to convert the least amount of oak forest to mixed mesophytic. Alternatives 2 and 2M have intermediate projected levels of harvest activity and are likely to convert less oak to mixed mesophytic than Alternative 3, but more than Alternative 4. Alternative 1 is similar to Alternatives 2 and 2M in projected levels of harvest, but, as the no action alternative, it keeps in place the current 300-acre annual limit on prescribed fire. Therefore, it is less likely than Alternatives 2 and 2M to maintain oak regeneration. However, because of higher harvest levels, Alternative 1 is more likely than Alternative 3 to maintain oak regeneration. It is difficult to predict whether any alternative would reduce the total amount of oak forest below the estimated presettlement amount, but Alternatives 1 and 3 appear to have a greater chance of doing so than Alternatives 2, 2M, and 4.

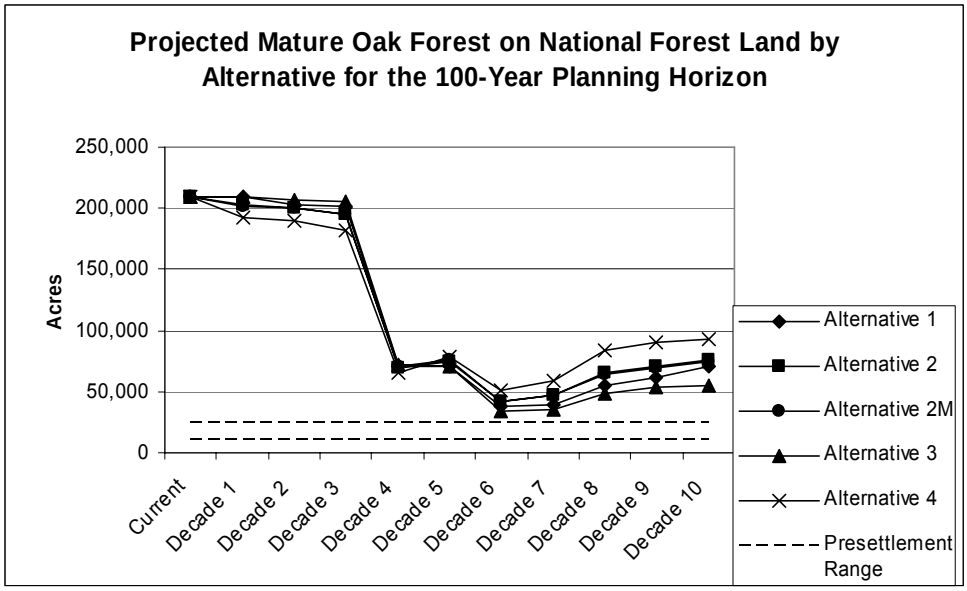
The projected amount of young oak forest shows a generally increasing trend under all alternatives for much of the planning horizon, with varying degrees of decline in the later decades (Figure ED-16). For the first six decades, Alternative 4 is projected to have the most harvesting in oak forest and hence the largest amount of young oak forest. Under this alternative, young oak forest is projected to peak at about 66,000 acres in the fourth decade. Alternative 3 has the least timber harvesting and the smallest projected amount of young oak forest during these decades, with about 35,000 acres in the fifth and sixth decades. Projected young oak forest for Alternatives 1, 2, and 2M is intermediate to Alternatives 3 and 4, reaching a little more than 50,000 acres in the sixth decade. In the seventh through tenth decades, young oak forest under Alternative 4 is projected to decline as the amount of timber harvest drops. Under the other alternatives, the amount of young oak forest is projected to level off in the seventh through ninth decades, declining only in the tenth decade. Alternatives 1, 2, 2M, and 4 are all projected to provide about 55,000 acres of young oak forest at the end of the planning horizon, whereas Alternative 3 is projected to provide approximately 35,000 acres at the end of the planning horizon. All alternatives are projected to increase young oak forest to levels well above the estimated presettlement range, although the projected amount under Alternative 3 should be somewhat closer to the presettlement range than the amounts projected for the other alternatives.

Figure ED-16.



The projected amount of mature oak forest shows the same general pattern across alternatives, with small differences in certain decades (Figure ED-17). The amount of mature oak forest is projected to remain high during the first three decades. Alternatives 1, 2, 2M, and 3 are projected to maintain around 200,000 to 210,000 acres during this time, while the amount under Alternative 4 is projected to decline somewhat to about 180,000 acres by the third decade. The small decline under Alternative 4 is due to higher levels of timber harvesting. Mature oak forest is projected to decline precipitously in decades 4 through 6 as many stands move into the old stage. The low point in the sixth decade is projected to range from about 34,000 acres to about 42,000 acres for Alternatives 1, 2, 2M, and 3. Alternative 4 is projected to produce about 51,000 acres of mature oak forest at the low point in the sixth decade. The projected amount is slightly higher for Alternative 4 than for the other alternatives because Alternative 4 is projected to harvest more in the early decades, and some of those harvested stands will have reached the mature stage by the sixth decade. The low point in the sixth decade would take the amount of mature oak forest near the estimated presettlement range for all alternatives, but under no alternative would mature oak forest decline enough to reach the presettlement range. For all alternatives, mature oak forest is projected to increase gradually in the seventh through tenth decades as previously harvested stands reach the mature stage. Alternative 4 has the highest levels of harvesting in the early decades, and is therefore projected to have the largest increase in mature oak forest in the later decades, reaching over 90,000 acres in the ninth and tenth decades. Alternative 3, which would have the least amount of harvesting in the early decades, is projected to have the smallest increase, reaching over 50,000 acres in the ninth and tenth decades. Alternatives 1, 2, and 2M are projected to produce about 70,000, to 75,000 acres of mature oak forest by the tenth decade.

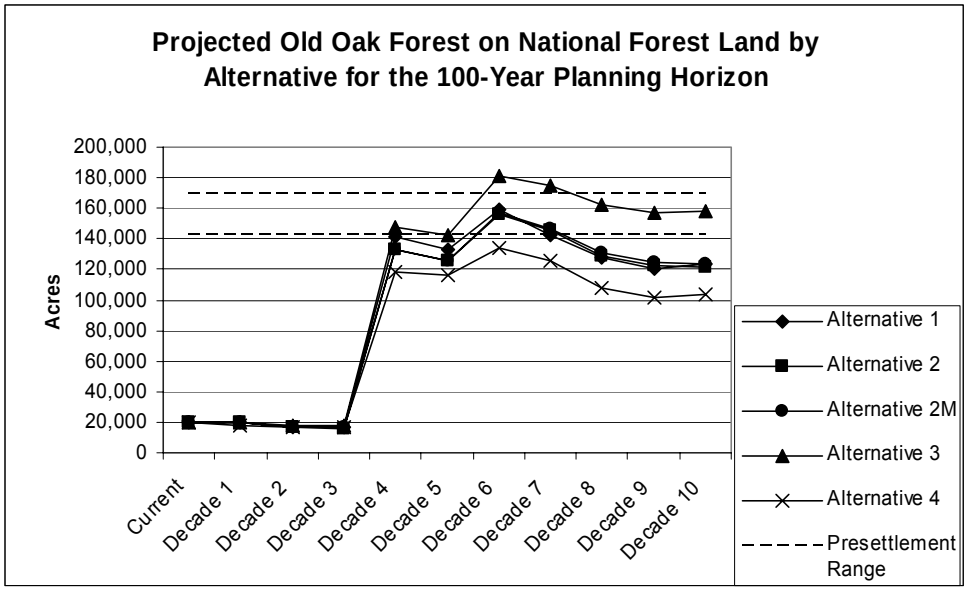
Figure ED-17.



Old oak forest also is projected to follow a similar pattern across alternatives, with widening differences among alternatives in the later decades of the planning horizon (Figure ED-18). For the first three decades of the planning horizon, all alternatives are projected to maintain old oak forest at or near the current amount of approximately 20,000 acres. Old oak forest is projected to increase rapidly during the fourth through sixth decades as currently mature stands age, with the largest increase occurring under Alternative 3 and the smallest increase occurring under Alternative 4. Alternative 3 is projected to produce about 180,000 acres at the peak in the sixth decade, whereas Alternative 4 is projected to produce about 130,000 acres at the sixth decade peak. Alternatives 1, 2, and 2M are each projected to peak at about 160,000 acres in the sixth decade. These differences among alternatives are due to differences in the amount of timber harvest, with higher amounts of harvesting reducing the amount of old oak forest. Under all alternatives, old oak forest is projected to decline gradually in the seventh and eighth decades as the rate of harvest begins to outpace the rate at which mature stands reach the old stage. The magnitudes of the differences among alternatives are projected to remain about the same throughout the sixth through tenth decades. By the end of the planning horizon, Alternative 3 is projected to produce about 160,000 acres of old oak forest, Alternatives 1, 2, and 2M are projected to produce about 120,000 acres, and Alternative 4 is projected to produce about 100,000 acres.

Alternatives 1, 2, 2M, and 3 produce enough old oak forest to reach the estimated presettlement range in certain decades. Under Alternative 3, old oak forest is projected to be within the presettlement range in the fourth, fifth, eighth, ninth, and tenth decades, and is actually projected to exceed the presettlement range in the sixth and seventh decades. Alternatives 1, 2, and 2M are projected to produce old oak forest amounts within the presettlement range in the sixth and seventh decades. Alternative 4 is not projected to produce enough old oak forest to reach the presettlement range in any decade.

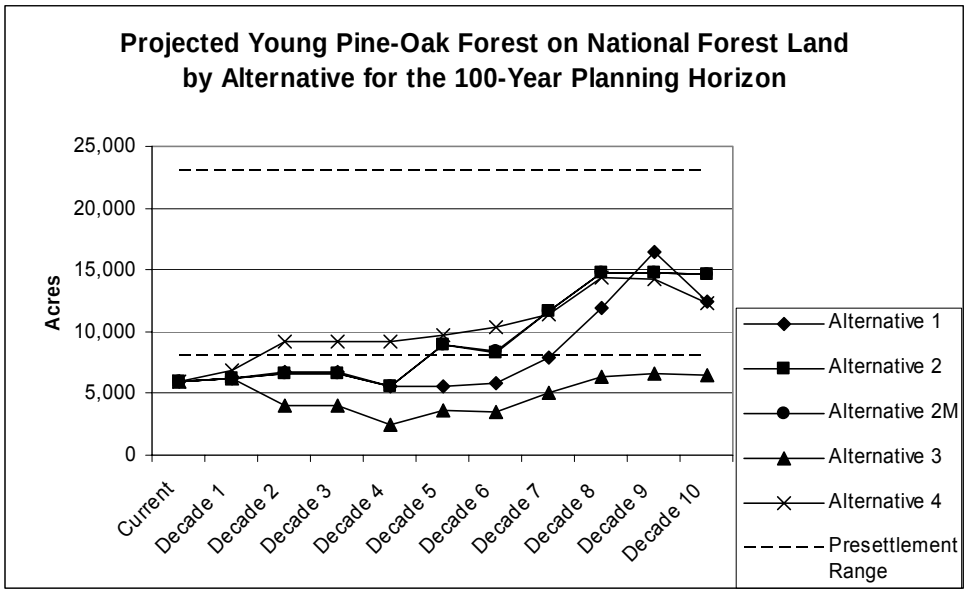
Figure ED-18.



Pine-Oak Forest – Projected development stages of pine-oak forest follow patterns similar to the other forested communities, with large decreases in the mature stage, large increases in the old stage, and fluctuations in the young stage that depend on the level of harvesting in a given alternative. Like oak forest, pine-oak forest is fire-adapted and is subject to similar potential changes in species composition in the absence of fire, timber harvest, or other disturbances.

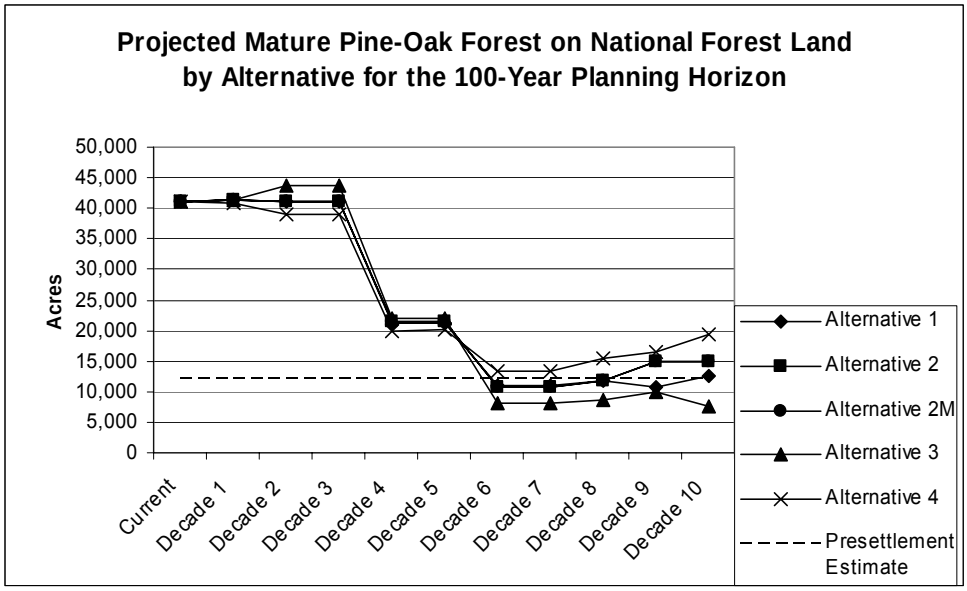
Each alternative exhibits a unique pattern in the projected amount of young pine-oak forest (Figure ED-19). For Alternative 1, minor fluctuations near the current amount of 6,000 acres are projected for the first six decades, followed by an accelerating increase to approximately 16,000 acres in the ninth decade. A decline to about 12,000 acres occurs in the tenth decade. Under Alternatives 2 and 2M, minor fluctuations around 6,000 acres are projected through the fourth decade. An increase to between 8,000 and 9,000 acres is forecast for the fifth and sixth decades. A continued increase to approximately 15,000 acres is projected for the eighth decade, with the amount leveling off near 15,000 acres for the ninth and tenth decades. Under Alternative 3, a gradual decline is projected for the early decades, with the amount reaching a low point of approximately 2,500 acres in the fourth decade. Thereafter a gradual increase occurs, with the amount leveling off at approximately 6,000 acres in the eighth through tenth decades. For Alternative 4, the amount of young pine-oak forest is projected to increase for the first two decades, leveling off at about 9,000 acres in the third and fourth decades. Beginning in the fifth decade, an accelerating increase is projected, with the amount peaking at about 14,000 acres in the eighth decade. A slight decline to about 12,000 acres is projected for the tenth decade. The differences among alternatives are directly related to the amount of timber harvest, with higher harvest amounts producing higher amounts of young pine-oak forest. Alternative 4 maintains amounts of young pine-oak forest within the estimated presettlement range for most of the planning horizon. Amounts projected for Alternatives 1, 2, and 2M are within the estimated presettlement range during several of the later decades, while the amount projected for Alternative 3 does not reach the estimated presettlement range.

Figure ED-19.



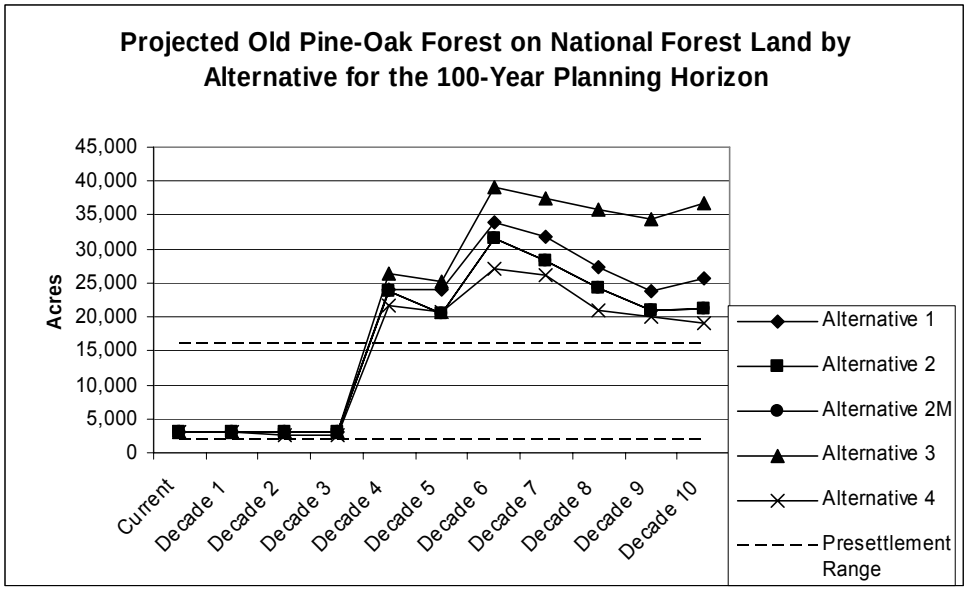
The projected amount of mature pine-oak forest follows a similar pattern under all alternatives, with small differences in certain decades due to differing amounts of timber harvesting (Figure ED-20). Alternatives 1, 2, and 2M maintain the current level of about 41,000 acres through the third decade. Alternative 3 shows a slight increase to about 44,000 acres in the second and third decades, whereas Alternative 4 shows a slight decrease to about 39,000 acres in the second and third decades. These minor differences are due to somewhat higher harvest levels in Alternative 4 versus somewhat lower harvest levels in Alternative 3, relative to Alternatives 1, 2, and 2M. For all alternatives, a large decline is projected in the fourth through sixth decades as current mature stands reach the old stage. Under Alternative 3, mature pine-oak forest reaches a low point of approximately 8,000 acres in the sixth and seventh decades. Under Alternative 4, the low point is approximately 14,000 acres. The difference is due to somewhat higher harvest levels under Alternative 4 in the early decades of the planning horizon; these harvests mean more stands are reaching the mature stage in the later decades of the planning horizon. Alternatives 1, 2, and 2M, with intermediate levels of harvesting in the early decades, reach a low point of about 11,000 acres in the sixth and seventh decades. For the remaining decades of the planning horizon, Alternative 4 shows a gradual increase to approximately 19,000 by the tenth decade. Alternatives 2 and 2M show a slight increase to about 15,000 acres in the ninth and tenth decades, while Alternatives 1 and 3 show little change for the last four decades of the planning horizon. The low levels of mature pine-oak forest in decades six through ten are near the estimated presettlement amount, although Alternative 4 maintains somewhat more than the presettlement amount, and Alternative 3 maintains somewhat less.

Figure ED-20.



The projected amount of old pine-oak forest shows a similar general pattern through time across alternatives, though differences in timber harvest amounts create large differences among alternatives in the later decades of the planning horizon (Figure ED-21). All alternatives maintain old pine-oak forest near the current 3,000 acres through the first three decades. As current mature stands reach the old stage, the amount of old pine-oak forest increases substantially in the fourth through sixth decades. The increase is greatest under Alternative 3, with the amount peaking at approximately 39,000 acres in the sixth decade. The increase is the smallest under Alternative 4, with a peak amount of about 22,000 acres in the sixth decade. The peak projected amount is intermediate under Alternatives 1, 2, and 2M, reaching about 32,000 to 34,000 acres in the sixth decade. A gradual decline through the later decades of the planning horizon is projected for all alternatives, although differences among alternatives due to varying timber harvest levels remain apparent. Alternative 3 provides a little over 35,000 acres of old pine-oak forest at the end of the planning horizon, whereas Alternatives 1, 2, 2M, and 4, with higher timber harvest levels, provide around 20,000 to 25,000 acres at the end of the planning horizon. For all alternatives, the amount of old pine-oak forest is projected to increase beyond the estimated presettlement range in the fourth decade and remain above the presettlement range for the remainder of the planning horizon. Alternative 3 exceeds the presettlement range by the largest margin, while Alternative 4 exceeds the presettlement range by the smallest margin.

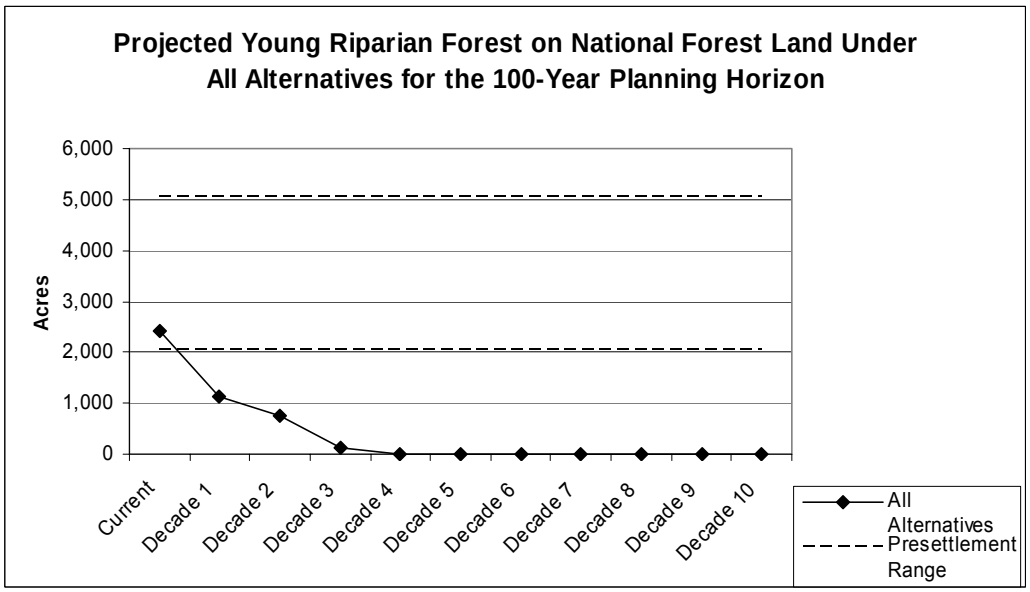
Figure ED-21.



Riparian Forest – All riparian forest is contained within channel management corridors, which is not subject to regulated even-aged timber management. Therefore, the amounts of riparian forest development stages are driven by natural forest development and disturbance processes, and do not differ by alternative.

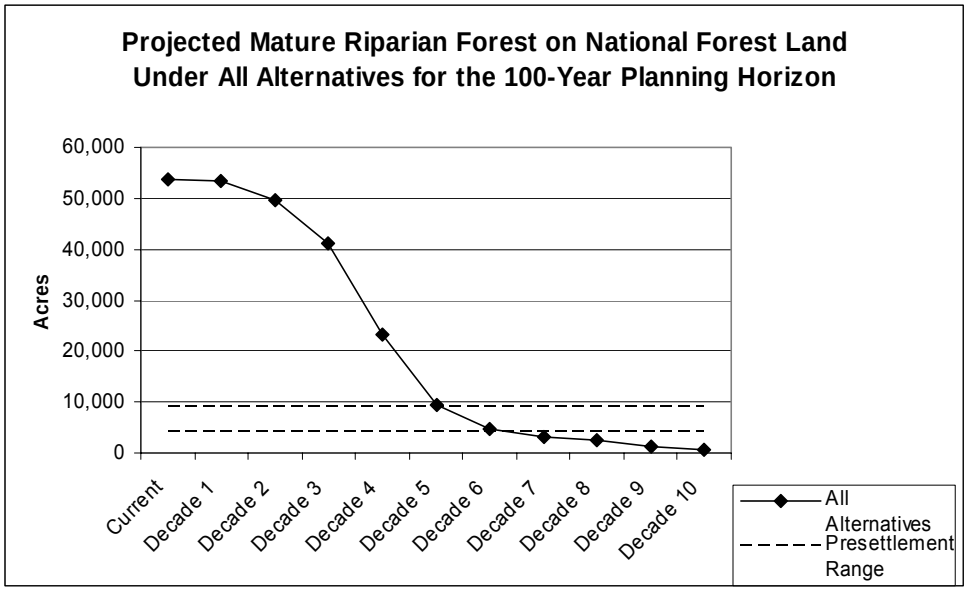
Young riparian forest is projected to decline to zero by the fourth decade and remain at that level for the rest of the planning horizon (Figure ED-22). The amount of young riparian forest stays below the estimated presettlement range for the entire planning horizon. However, the projections do not account for natural disturbances, which would likely create some young riparian forest.

Figure ED-22.



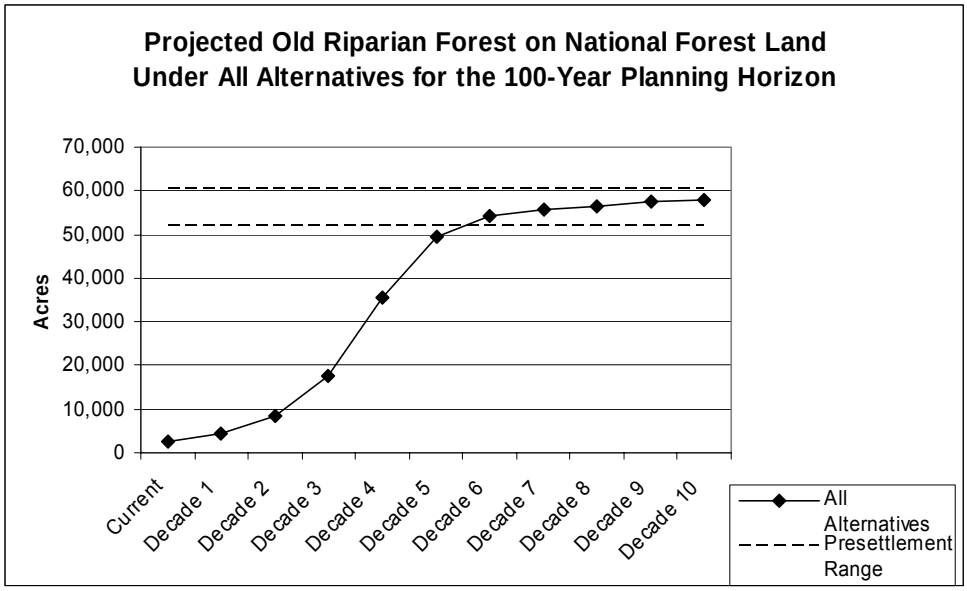
Mature riparian forest declines steadily through the early and middle decades of the planning horizon as current mature stands reach the old stage (Figure ED-23). The amount of mature riparian forest is projected to be less than 5,000 acres, which is below the estimated presettlement range, during the sixth through tenth decades. However, this projection does not account for the effects of natural disturbances, which could reset forest development in some areas and maintain higher than the projected amounts of mature riparian forest.

Figure ED-23.



Old riparian forest is projected to increase steadily throughout the early and middle decades of the planning horizon as stands continue to age in the absence of timber harvest (Figure ED-24). The amount levels off between 55,000 and 58,000 acres in the seventh through tenth decades. The amount of old riparian forest is projected to be within the estimated presettlement range in the sixth through tenth decades.

Figure ED-24.



Summary of Deviations Below Estimated Presettlement Ranges – For each alternative, the amount and development stage breakdown of each major forested community was evaluated relative to estimated presettlement amounts. Presettlement amounts provide a convenient yardstick with which to measure the effectiveness of a coarse-filter conservation strategy. However, effective community conservation does not necessarily require that community amounts be within their estimated presettlement ranges. Usually the exact amount of a given forested community development stage that is necessary for conserving the biological diversity associated with that community is unknown. For some communities, reaching the presettlement range within the planning horizon may not be possible because of past losses of that community. Also, maintaining all forested community development stages within their presettlement ranges could preclude meeting other multiple use goals and objectives, such as timber production and habitat for some game species. Plan alternatives must be evaluated in the context of such uncertainties and competing uses. Viewed in this context, the presettlement range becomes a tool for comparing the relative effectiveness of coarse-filter conservation among alternatives. Plan alternatives that provide amounts of a particular forested community development stage that are close to the presettlement range have a higher probability of conserving that community's biological diversity than plan alternatives that provide far less than the presettlement range. However, because we generally do not know the precise amount of a community that is necessary for effective conservation, a forested community development stage below the presettlement range should not automatically be interpreted as failure to conserve the biological diversity associated with that community.

A useful way to summarize the coarse-filter conservation implications of the amounts of forest development stages is to examine deviations below the estimated presettlement ranges. A large deviation below the presettlement range indicates potential difficulty in achieving coarse-filter ecosystem diversity conservation goals, whereas an amount within or above the presettlement range indicates ample representation of a community. For the projected amount of each major forested community development stage in each decade of the planning horizon, we calculated the

percent deviation below the lower boundary of the estimated presettlement range. For cases where the projected amount was within or more than the presettlement range, the percent deviation was set to zero. Then, for each major forested community development stage under each alternative, we calculated the average, maximum, and minimum percent deviation below the presettlement range across the 10-decade planning horizon (Table ED-6). Hemlock forest was omitted because it was not modeled separately, and riparian forest was omitted because it is included in the other forested communities. A large deviation indicates a substantial shortfall relative to estimated presettlement conditions, while a zero deviation indicates sufficient representation relative to presettlement.

For all three development stages of spruce forest, deviations are relatively high, indicating potential difficulty in the coarse-filter conservation of natural community diversity (Table ED-6). These deviations are due to historic losses of spruce forest, the current concentrated age class distribution, and lack of projected timber harvest due to restrictions associated with West Virginia northern flying squirrel habitat. However, the deviations for spruce forest do not account for potential restoration of spruce forest, which could move mature and old spruce forest closer to their presettlement ranges during the middle and later decades of the planning horizon. Because of differing land allocations to MP 4.1, Alternative 4 is likely to restore the most spruce forest, while Alternative 1 is likely to restore the least. Among the action alternatives, Alternative 3 is likely to restore the least spruce forest. The deviations also do not account for natural disturbances, which could maintain young spruce forest closer to its estimated presettlement range under all alternatives.

For young and mature mixed mesophytic and cove forest, all three development stages of northern hardwood forest, young and mature oak forest, and old pine oak forest, percent deviations are zero under all alternatives (Table ED-6). These zero deviations indicate that all alternatives are projected to provide at least the minimum estimated presettlement amount of each of these forested community development stages throughout the 10-decade planning horizon. This indicates that all alternatives provide sufficient coarse-filter representation of these forested community development stages.

Four major forested community development stages show projected deviations below the estimated presettlement range that differ among alternatives. For old mixed mesophytic and cove forest, the action alternatives are projected to have somewhat smaller average and minimum deviations below the presettlement range than Alternative 1. Among the action alternatives, Alternative 3 is projected to have marginally lower average and minimum deviations than Alternatives 2 and 4. Thus, Alternative 3 has the highest probability of conserving biological diversity associated with old mixed mesophytic and cove forests. The differences among alternatives are due to different levels of timber harvest, with larger harvest amounts producing larger deviations below the presettlement range. However, the differences among alternatives are not pronounced, and all alternatives show large improvements relative to current conditions.

For old oak forest, the average and minimum deviations under all alternatives decline greatly relative to the current deviation, although there are differences among alternatives. The average deviation over the planning horizon is projected to be higher under Alternative 4 than under the other alternatives. Alternative 3 has a somewhat lower average deviation than Alternatives 1 and

2. The differences among alternatives are due to different amounts of timber harvest, with larger harvest amounts producing larger deviations below the presettlement range. These differences among alternatives would seem to suggest a higher potential to conserve old oak forest under Alternative 3, a lower potential under Alternative 4, and an intermediate potential under Alternatives 1, 2, and 2M. However, this indicator should be viewed with caution because of likely differences in prescribed fire that are not reflected in the development stage amounts. Because of the 300-acre annual cap on prescribed burning, Alternatives 1 and 3 are likely to have much less prescribed fire than Alternatives 2, 2M, and 4, which could lead to species composition shifts, conversion of old oak forest to other communities, and actual deviations below the presettlement range that are larger than the projected deviations shown in Table ED-6.

Table ED-6. Percent Deviation Below the Estimated Presettlement Range for Forest Development Stages of the Major Forested Communities by Alternative

Community Development Stage[1]	Current Percent	Average % Deviation Over 10 Decades				
		Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Young spruce forest	38	84	84	84	84	84
Mature spruce forest	0	33	33	33	33	33
Old spruce forest	96	65	65	65	65	65
Young mixed mesophytic/cove forest	0	0	0	0	0	0
Mature mixed mesophytic/cove forest	0	0	0	0	0	0
Old mixed mesophytic/cove forest	98	47	44	44	41	43
Young northern hardwood forest	0	0	0	0	0	0
Mature northern hardwood forest	0	0	0	0	0	0
Old northern hardwood forest	0	0	0	0	0	0
Young oak forest	0	0	0	0	0	0
Mature oak forest	0	0	0	0	0	0
Old oak forest	86	31	32	31	26	40
Young pine-oak forest	25	14	9	9	40	1
Mature pine-oak forest	0	3	2	2	15	0
Old pine-oak forest	0	0	0	0	0	0

Community Development Stage[1]	Current Percent	Maximum % Deviation Over 10 Decades				
		Alt. 1	Alt. 2	Alt 2M	Alt. 3	Alt. 4
Young spruce forest	38	100	100	100	100	100
Mature spruce forest	0	82	82	82	82	82
Old spruce forest	96	96	96	96	96	96
Young mixed mesophytic/cove forest	0	0	0	0	0	0
Mature mixed mesophytic/cove forest	0	0	0	0	0	0
Old mixed mesophytic/cove forest	98	98	98	97	98	97
Young northern hardwood forest	0	0	0	0	0	0
Mature northern hardwood forest	0	0	0	0	0	0
Old northern hardwood forest	0	0	0	0	0	0
Young oak forest	0	0	0	0	0	0
Mature oak forest	0	0	0	0	0	0
Old oak forest	86	88	89	89	87	89
Young pine-oak forest	25	31	30	30	69	15
Mature pine-oak forest	0	11	10	10	38	0
Old pine-oak forest	0	0	0	0	0	0

Community Development Stage[1]	Current Percent	Minimum % Deviation Over 10 Decades				
		Alt. 1	Alt. 2	Alt. 2M	Alt. 3	Alt. 4
Young spruce forest	38	26	26	26	26	26
Mature spruce forest	0	0	0	0	0	0
Old spruce forest	96	41	41	41	41	41
Young mixed mesophytic/cove forest	0	0	0	0	0	0
Mature mixed mesophytic/cove forest	0	0	0	0	0	0
Old mixed mesophytic/cove forest	98	16	9	9	4	7
Young northern hardwood forest	0	0	0	0	0	0
Mature northern hardwood forest	0	0	0	0	0	0
Old northern hardwood forest	0	0	0	0	0	0
Young oak forest	0	0	0	0	0	0
Mature oak forest	0	0	0	0	0	0
Old oak forest	86	0	0	0	0	5
Young pine-oak forest	25	0	0	0	18	0
Mature pine-oak forest	0	0	0	0	0	0
Old pine-oak forest	0	0	0	0	0	0

[1]Riparian forest is not shown because it overlaps the other communities and is included in them. Hemlock forest is not shown because it currently occupies a minor portion of the landscape and was not modeled separately in Spectrum. Large-scale vegetation management is not expected in either of these communities, so any deviations from presettlement ranges will not differ among alternatives

For young and mature pine-oak forest, Alternative 3 has substantially higher deviations than the other alternatives, while Alternative 4 has the lowest deviations. The differences among alternatives are related to timber harvest amounts, with smaller harvest amounts producing larger deviations below the presettlement range. Under Alternative 3, the average and maximum deviations increase greatly relative to current conditions. This indicates that Alternative 3 has a greater risk than the other alternatives of not conserving biodiversity associated with young and mature pine-oak forests. Alternative 4 has the highest potential for conserving biodiversity associated with young and mature pine-oak forests.

Amount of Each Rare and Unique Community

Most rare and unique communities are not projected to change from current amounts, regardless of alternative. Management activities generally would avoid these communities because of unsuitability for most land uses. In cases where management must occur within or near these communities, adverse impacts would be avoided or minimized to the extent possible, according to plan direction to conserve rare communities. Also, most of these communities are maintained by soil, topographic, or geologic conditions that are not likely to change naturally in the foreseeable future. Amounts of the following rare and unique communities are not expected to change substantially from current amounts regardless of alternative (Table ED-7):

- Bogs, fens, seeps, and seasonal ponds
- Open wetlands
- Stream channels
- Glades and barrens
- Rock outcrops and cliffs
- Shrub balds
- Caves and mines
- Lakes and ponds

However, three other communities that are classed with the rare and unique communities occur on a larger scale and are subject to changes in area because of Forest Service management. These communities are high-elevation grasslands; woodlands, savannas, and grasslands; and remote habitat.

Relative to the current amount, the amount of high-elevation grassland is projected to increase somewhat under all alternatives except Alternative 3, where it is projected to decrease slightly (Table ED-7). The projected increases are associated with meeting the desired condition for maintained openings in the MPs that are in the suitable timber base. The amount would decline in Alternative 3 because of a large decrease in land allocations to these MPs. The largest increase would occur under Alternative 4. Projected increases in high-elevation grasslands are held down by the prevalence of West Virginia northern flying squirrel suitable habitat in high elevations. In making these projections, we assumed that desired conditions for maintained openings would not be met in suitable West Virginia northern flying squirrel habitat. If desired conditions for maintained openings are not met in other areas, the total amount of high-elevation grasslands could stay the same or decline under Alternatives 1, 2, 2M, and 4.

Table ED-7. Projected Amounts of Rare and Unique Communities in Future Decades Compared to Estimated Presettlement, 1935, and Current Amounts

(NFS land only. All amounts are acres unless otherwise noted. Amounts in bold are within the estimated presettlement range or within +/- 5 percent of the estimated presettlement amount.)

Community	Presettle-ment Amount	1935 Amount	Current Amount	Alt. 1 Amount	Alt. 2 Amount	Alt 2M Amount	Alt. 3 Amount	Alt. 4 Amount
Bogs, fens, seeps, seasonal ponds	Unknown	Unknown	2,000	2,000	2,000	2,000	2,000	2,000
Open wetlands	Unknown	Unknown	1,000	1,000	1,000	1,000	1,000	1,000
Stream channels (miles)	3,000	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**
Glades and barrens	2,000	**2,000**	**2,000**	**2,000**	**2,000**	**2,000**	**2,000**	**2,000**
Rock outcrops and cliffs	6,000	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**
High-elevation grasslands	Unknown	22,000	14,000	17,000	16,000	16,000	13,000	18,000
Shrub balds	Unknown	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Caves/mines (entrances)	225	**225**	**225**	**225**	**225**	**225**	**225**	**225**
Woodlands, savannas, and grasslands	Unknown	40,000	7,000	15,000	14,000	14,000	10,000	15,000
Lakes and ponds	Unknown	Unknown	200	200	200	200	200	200
Total remote habitat	915,000	Unknown	190,000	200,000	220,000	240,000	410,000	150,000

Woodlands, savannas, and grasslands are projected to increase under all alternatives (Table ED-7). This community is projected to approximately double under Alternatives 1, 2, 2M, and 4; it is projected to increase a little more than 40 percent under Alternative 3. These are considered maximum potential increases assuming desired conditions for maintained openings will be met.

The amount of remote habitat is projected to vary greatly by alternative (Table ED-7). Because remote habitat was estimated using land allocated to MPs with a semi-primitive non-motorized emphasis, the differences among alternatives are a direct reflection of different allocations to these MPs. Remote habitat would be most extensive under Alternative 3, increasing from the current estimated 190,000 acres to 410,000 acres. In contrast, remote habitat under Alternative 4 would decrease to an estimated 150,000 acres. Under Alternatives 1, 2, and 2M, remote habitat would increase by moderate amounts, to about 200,000, 220,000, and 240,000 acres respectively.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth

The total amount of land contained in MDA reserves is highest in Alternative 3, which has 520,000 acres, or 57 percent of NFS land, in reserves (Table ED-8). Total land in MDA reserves is lowest in Alternative 1 at 310,000 acres, or 34 percent of NFS land. Alternatives 2, 2M, and 4 contain intermediate amounts of land in MDA reserves. Alternative 2 has 380,000 acres (42 percent of NFS land) in MDA reserves, Alternative 2M has 390,000 acres (43 percent of NFS land) in reserves, and Alternative 4 has 360,000 acres (39 percent of NFS land) in reserves. The differences among alternatives reflect different land allocations to MPs where large-scale even-aged management is not likely to occur. The MDA maps by alternative in the map packet show the locations of the reserves in each alternative.

Table ED-8. Minimum Dynamic Area Reserves by Alternative

Indicator	Alternative 1 Existing Condition	Alternative 2	Alternative 2M	Alternative 3	Alternative 4
Number of MDA reserves	10	10	10	14	9
Total acres in MDA reserves	310,000	380,000	390,000	520,000	360,000
Percent of all NFS Land in MDA reserves	34%	42%	43%	57%	39%
Percent of all Land in Forest Boundary in MDA reserves	18%	23%	23%	30%	21%

Spruce Forest - Representation of spruce forest in reserves does not vary substantially by alternative (Table ED-9, Figure ED-25). Under each alternative, MDA reserves contain over 45,000 acres of spruce forest. In Alternative 1, 95 percent of spruce forest on NFS land is contained in MDA reserves. In the remaining alternatives, 97 percent of spruce forest is contained in MDA reserves. This high degree of representation under all alternatives is due to the inclusion of most spruce forest in West Virginia northern flying squirrel suitable habitat. Thus, representative examples of natural processes and habitat structure in spruce forest have a high likelihood of being conserved under all alternatives. Over time, substantial core areas of old spruce forest are expected to develop under all alternatives.

Mixed Mesophytic and Cove Forest - Representation of mixed mesophytic and cove forest in MDA reserves is highest under Alternative 3 (47 percent of the community on NFS land) and lowest under Alternative 1 (29 percent of the community on NFS land). Alternatives 2 and 2M

have 36 percent of the community on NFS land in reserves, while Alternative 4 has 33 percent in reserves (Table ED-9, Figure ED-25). While Alternative 3 conserves the largest amount of this community in MDA reserves, all alternatives conserve large amounts because this community is the most extensive community on the Forest. Even Alternative 1 conserves over 100,000 acres distributed among 10 different reserves. Therefore, representative examples of natural processes and habitat structure in mixed mesophytic and cove forest have a high likelihood of being conserved under all alternatives. Extensive core areas of old mixed mesophytic and cove forest are likely to develop under all alternatives.

Northern Hardwood Forest - Percentage representation of northern hardwood forest in MDA reserves is high under all alternatives, but does vary some among the alternatives (Table ED-9, Figure ED-25). Under Alternative 3, 84 percent of northern hardwood forest on NFS land is contained in MDA reserves, while Alternative 1 has 71 percent in reserves. Alternatives 2, 2M, and 4 have 81 percent of northern hardwood forest on NFS land in MDA reserves. While Alternative 3 has the largest representation of this community in reserves, northern hardwood forest is common on the landscape and, therefore, a large acreage of this community is contained in reserves under all alternatives. Alternative 1, which contains the lowest amount of this community in reserves, still has about 120,000 acres distributed among 9 reserves (Figures ED-8 and ED-25). Therefore, representative examples of natural processes and community structure are likely to be conserved under all alternatives. Large core areas of old northern hardwoods are likely to develop under all alternatives.

Hemlock Forest - Representation of hemlock forest in MDA reserves is highest under Alternative 3 (83 percent of the community on NFS land) and lowest under Alternative 1 (56 percent of the community on NFS land). Representation is similar for Alternatives 2, 2M, and 4, at 62 to 63 percent (Table ED-9). Although the percentage representation of this community is fairly high under all alternatives, the total area in reserves is less than 3,000 acres for each alternative (Figure ED-25). This low acreage is a result of the relative rarity of hemlock forest compared to the other forested communities. However, as mentioned previously, hemlock forest may be under-reported in the CDS database because it tends to occur in small groves that may have been included in other forest types. Regardless, the hemlock wooly adelgid poses a serious threat to this community, and it is unlikely that large core areas of old hemlock would develop under any alternative.

Oak Forest - Percentage representation of oak forest in MDA reserves varies widely by alternative. Alternative 3 has 42 percent of oak forest on NFS land in MDA reserves, while Alternative 1 has only 9 percent in reserves. Alternatives 2, 2M, and 4 have intermediate proportions of this community in reserves, at 16 percent, 16 percent, and 12 percent, respectively (Table ED-9, Figure ED-25). The potential consequences of these differences in representation are difficult to interpret. Higher representation in reserves would seem to favor conservation of natural processes and community structure, but on many sites long-term maintenance of oak forest depends on periodic disturbance. Therefore, the degree to which reserves conserve oak forest depends on the degree to which management of the reserves provides the necessary disturbance regime. From this perspective, Alternatives 2, 2M, and 4 would seem to have a greater chance than Alternative 1 of maintaining oak forest in MDA reserves. This is because the revised management direction for MP 6.2, the new direction for the NRA (MP 8.1), and the

new direction for recommended Wilderness (MP 5.1) allow greater opportunities to use prescribed fire to mimic natural disturbance regimes. Also, Alternatives 2, 2M, and 4 would greatly increase the annual acreage limit on prescribed fire. However, access to conduct prescribed burning is likely to be limited in MPs 6.2 and 5.1 because of the current low road density and prohibitions on building new roads. Among the action alternatives, the acreage included in the NRA is equal, so the differences in representation of oaks in MDA reserves are due to differences in allocations to MPs 6.2 and 5.1. Therefore, representation in MDA reserves may actually serve as an inverse indicator for long-term maintenance of oak forest, especially under Alternatives 1 and 3, which maintain the current 300-acre annual limit on prescribed fire.

Pine-oak Forest - Percentage representation of pine-oak forest in MDA reserves also varies greatly among the alternatives. Alternative 3 contains 64 percent of all pine-oak forest on NFS land in MDA reserves, while Alternative 1 has 12 percent in reserves. Alternatives 2, 2M, and 4 put 22 percent, 22 percent, and 16 percent, respectively, in MDA reserves (Table ED-9, Figure ED-25). As with oak forest, on many sites pine-oak forest is maintained by periodic disturbance. Also similar to oak forest, the differences among the action alternatives are due to varying allocations to MPs 6.2 and 5.1. Thus representation in MDA reserves may actually be an inverse indicator of the potential for maintaining natural processes in pine-oak forest, especially for Alternatives 1 and 3.

Figure ED-25.

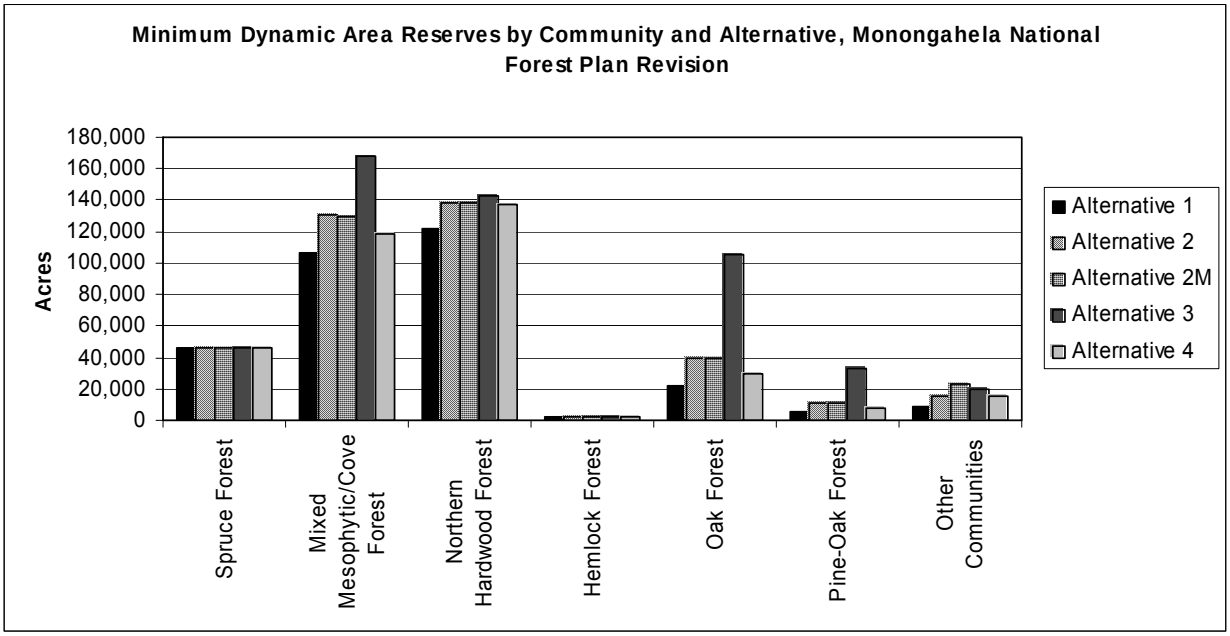


Table ED-9. Percent of Major Forested Communities within MDA Reserves[1]

Community	Percent of Current Community Amount on NFS Lands That is Contained in MDA Reserves				
	Alternative 1 Current Condition	Alternative 2	Alternative 2M	Alternative 3	Alternative 4
Spruce forest	95	97	97	97	97
Mixed mesophytic/cove forest	29	36	36	47	33
Northern hardwood forest	71	81	81	84	81
Hemlock forest	56	63	63	83	62
Oak forest	9	16	16	42	12
Pine-oak forest	12	22	22	64	16

[1]MDAs are blocks 10,000 acres or larger where even-aged management is prohibited or greatly limited.

Cumulative Effects

Amount and Development Stages of Major Forested Communities

The analysis of cumulative effects on the amount and development stages of major forested communities considers the potential effects of activities on all land in the Forest boundary, regardless of ownership. Because almost half of the land within the Forest boundary is not NFS land, private activities will account for a large share of the cumulative impacts of all activities within the Forest boundary. A variety of private activities have the potential to affect the amount and development stages of major forested communities, including timber harvest, oil and gas development, mining, residential and commercial development, and passive management that allows stands to grow older. Timber harvest and passive management have the greatest potential to affect forested communities over large areas. The other activities are likely to result in localized temporary or permanent losses of forested community acreage.

The likely extent of timber harvest on private land is difficult to project. However, FIA data for non-NFS land in the counties that contain the MNF offer some insight into current trends (data from FIA website). Based on FIA data from the 2000 inventory, annual timber volume growth exceeds volume removal by a ratio of approximately 1.6:1. Based on a comparison of data from the 1989 and 2000 inventories, the percentage of forestland that is sawtimber increased from about 66 percent to about 69 percent, while poletimber decreased from 23 percent to 21 percent and seedling/sapling stands decreased from 10 percent to 9 percent. These data suggest that harvesting on private land is not keeping up with growth. Over time, if this trend continues, the area of young forest will decrease, while the area of old forest will increase.

Cumulative effects on the total amount of each major forested community are likely to mirror the direct effects of management activity on NFS land. Gradual conversion of some areas of old oak and pine-oak to mixed mesophytic and cove forest is likely to occur on all ownerships within the Forest boundary. Because about two-thirds of current oak and pine-oak forest in the Forest

boundary is on NFS land, aging of these communities on NFS land is expected to contribute to this cumulative trend. Among the action alternatives, Alternative 3 has the lowest projected amount of management activity to counter this trend, and is expected to make the largest contribution to the cumulative conversion of oak and pine-oak forest to mixed mesophytic/cove forest. Alternative 4 is the action alternative with the most projected management activity and is expected to have the lowest cumulative contribution, while Alternatives 2 and 2M would make intermediate contributions to the cumulative conversion of oak and pine-oak forest to mixed mesophytic/cove forest. Alternative 1 is similar to Alternatives 2 and 2M in projected levels of harvest, but, as the no action alternative, it keeps in place the current 300-acre annual limit on prescribed fire. Therefore, it is more likely than Alternatives 2 and 2M to make a measurable contribution to cumulative oak and pine-oak species composition shifts. Alternative 1 should cause less conversion of oak than Alternative 3 because it would have more harvesting. These cumulative effects cannot be quantified accurately enough to predict whether total amounts of oak and pine-oak forest within the Forest boundary would be reduced below the estimated presettlement range, or whether mixed mesophytic and cove forest would be increased above the estimated presettlement range.

Total amounts of spruce forest and northern hardwood forest may also exhibit cumulative trends within the Forest boundary due to active and passive restoration of spruce. Such restoration may cause an increase in the total amount of spruce forest and a decrease in the total amount of northern hardwood forest. Because almost all current spruce forest and about half of current northern hardwood forest are on NFS land, and because other land owners are not likely to engage in large-scale spruce restoration, active and passive restoration of spruce on NFS land is likely to account for most of the cumulative change in these two communities. This cumulative effect cannot be quantified well enough to predict whether total amounts of these communities will approach their estimated presettlement ranges within the Forest boundary.

Cumulative changes in forest development stages also are likely to occur within the Forest boundary. Increases in the old stage of all forest communities are projected on NFS land, and current trends suggest that the old stage will increase on other land ownerships as well. This increase in the old stage will occur as current mature stands age, so it will be accompanied by a corresponding decrease in the cumulative amount of the mature forest stage. Because NFS land makes up a little over half of the land in the Forest boundary, passive Forest Service management (allowing stands to grow older) is expected to make a substantial contribution to this cumulative increase in old forest and decrease in mature forest. As a result of this trend, the mature stage of most communities is expected to decline from its current very high level toward the presettlement range. The old stage of most communities is expected to rise from its current very low level toward the lower boundary of the estimated presettlement range. However, because of the difficulty in forecasting the magnitude and direction of future trends on private land, we cannot reliably forecast whether the cumulative amounts of any of the major forested communities will be within their respective presettlement ranges at any given point in the planning horizon. However, based on differences in the direct effects on NFS land, Alternative 3 would come closer than the other alternatives to the presettlement ranges for mature and old stages of most forest communities.

Cumulative changes in the young stage of each forested community are difficult to predict due to the offsetting effects of projected increases on NFS land versus the declining trend on non-NFS land. For mixed mesophytic/cove forest, northern hardwood forest, and oak forest, this offsetting cumulative effect is unlikely to keep young forest amounts below the estimated presettlement ranges under any alternative because the projected amounts on NFS land are well above the presettlement range. For pine-oak forest, which is projected to be near or below the lower boundary of the presettlement range on NFS land for much of the planning horizon, the chance is greater that cumulative amounts of young forest on all land ownership could drop below the presettlement range. Alternative 3, which has the least projected young pine-oak forest on NFS land, would have the greatest risk of falling below the presettlement range. Alternative 4, which has the most projected young pine-oak forest on NFS land, would have the best chance of maintaining the cumulative amount within the presettlement range for most of the planning horizon. For spruce forest, hemlock forest, and riparian forest, which have no scheduled harvest on NFS land under any alternative, cumulative young forest amounts could decline below the estimated presettlement ranges as the young stage of these communities declines across all ownerships. However, natural disturbances may offset this effect.

Amount of Each Rare and Unique Community

The analysis of cumulative effects to rare and unique communities considers the potential effects of activities on all land in the Forest boundary, regardless of ownership. For the following rare and unique communities, projected future amounts under all alternatives are projected to remain similar to current amounts (Table ED-10):

- Bogs, fens, seeps, and seasonal ponds
- Open wetlands
- Stream channels
- Glades and barrens
- Rock outcrops and cliffs
- Shrub balds
- Caves and mines
- Lakes and ponds

These projections assume that activities on non-NFS land will not greatly change the amounts of these communities due to legal and regulatory protections (bogs, fens, seeps, seasonal ponds; open wetlands; stream channels; lakes and ponds) or lack of suitability for most land uses (all of these communities). However, these should be considered maximum projections for three reasons. First, adjacent land uses could adversely impact these communities without violating legal and regulatory protections and without encountering use limitations related to soil and geology. Second, for those communities with legal and regulatory protection, permits that allow some level of impact can be obtained for many activities. Although the permits usually require mitigation measures, such measures do not always completely offset the impact. Third, some more intensive land uses may be able to modify the environment enough to overcome the soil and geology-related limitations (e.g., second home development, highway construction, strip mining).

Three other rare and unique communities are projected to change from existing conditions due to their broader-scale occurrence and a greater likelihood of change due to active management (or lack thereof). For all three communities, the amounts on non-NFS land are projected to remain similar in the future under all alternatives, so the differences among alternatives are all due to projected changes on NFS land. While a projection of no change on non-NFS land may not be entirely realistic, available information does not support any quantitative estimates of substantial change. However, for high elevation grasslands and woodlands, savannas, and grasslands, data from the Census of Agriculture (USDA 2004, 1999) suggest that recent trends in hay and pasture land have been flat. The vast majority of the acreage of these two communities consists of hay and pasture land. Therefore, these data lend some support to the assumption of no substantial change in acreage on non-NFS land. Also, because all of the differences relative to current amounts are due to anticipated management on NFS land, the projected amounts for these three communities highlight the contribution of Forest Service management to cumulative effects.

Table ED-10. Projected Amounts of Rare and Unique Communities in Future Decades Compared to Estimated Presettlement, 1935, and Current Amounts[1]

(All ownership within the Forest Boundary. All amounts are acres unless otherwise noted. "Unknown" denotes that there was no reliable way to determine this information.)

Community	Presettle-ment Amount	1935 Amount	Current Amount	Alt. 1 Amount	Alt. 2 Amount	Alt. 2M Amount	Alt. 3 Amount	Alt. 4 Amount
Bogs, fens, seeps, seasonal ponds	Unknown	Unknown	6,000	6,000	6,000	6,000	6,000	6,000
Open wetlands	Unknown	Unknown	3,000	3,000	3,000	3,000	3,000	3,000
Stream channels (miles)	6,000	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**
Glades and barrens	5,000	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**
Rock outcrops and cliffs	26,000	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**
High-elevation grasslands	Unknown	81,000	27,000	30,000	29,000	28,000	25,000	30,000
Shrub balds	Unknown	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Caves/mines (entrances)	340	**340**	**340**	**340**	**340**	**340**	**340**	**340**
Woodlands, savannas, and grasslands	Unknown	170,000	66,000	73,000	72,000	72,000	68,000	73,000
Lakes and ponds	Unknown	Unknown	700	700	700	700	700	700
Total remote habitat	1,700,000	Unknown	280,000	≤300,000	≤320,000	≤330,000	≤510,000	≤250,000

[1]For non-NFS land, we assumed amounts would remain similar to current amounts. This assumption was based on the unsuitability of a many of these communities for most land uses, Census of Agriculture data showing flat trends in hay and pasture land (USDA 1999, 2004), and lack of reliable data suggesting imminent changes.

High elevation grasslands on all land in the Forest boundary are projected to be similar under Alternatives 1, 2, 2M, and 4 (Table ED-10). These alternatives are projected to increase this

community slightly from the current approximately 27,000 acres to approximately 28,000 to 30,000 acres. Under Alternative 3, high elevation grasslands are projected to decrease slightly, to approximately 25,000 acres.

Woodlands, savannas, and grasslands also are projected to change only slightly by alternative (Table ED-10). Although this community is expected to experience a large proportional change on NFS land (see direct effects above), when all land in the Forest boundary is considered, the changes due to Forest Service management are largely masked by the fact that a large percentage of this community is on non-NFS land. Under Alternatives 1 and 4, the total amount of this community on all land ownerships would increase from an estimated 66,000 acres to 73,000 acres. The projected amount under Alternatives 2 and 2M is similar (approximately 72,000 acres), while Alternative 3 would have the lowest projected amount (approximately 68,000 acres).

Even considering all land in the Forest boundary, changes to remote habitat could still be substantial, depending on the alternative considered. Alternative 3 is projected to increase total remote habitat in the Forest boundary from approximately 280,000 acres to as much as 510,000 acres. Alternatives 1, 2, and 2M would see smaller increases, to approximately 300,000, 320,000, and 330,000 acres, respectively. Alternative 4 is projected to produce a decline in total remote habitat, to approximately 250,000 acres. These projections should be considered the maximum potential remote habitat since they extrapolate forward existing amounts on non-NFS land. Any management on non-NFS land that changes semi-primitive non-motorized areas to a less remote ROS classification would result in less remote habitat than these projections.

Representation of Ecological Communities in MDA Reserves – Potential Old Growth

The assessment of cumulative effects of community representation in MDA reserves examines how much of each community is contained in reserves, relative to the total estimated presettlement amount of that community on all land ownerships in the Forest boundary. Viewing community representation in this context integrates the effects of past, present, and reasonably foreseeable actions on all land within the planning unit boundary.

Spruce Forest - Representation of spruce forest in MDA reserves relative to the estimated presettlement amount within the Forest boundary does not vary by alternative. All alternatives put an amount equal to 11 to 27 percent of the estimated presettlement amount on all land ownerships into MDA reserves (Table ED-11). Even though all alternatives put almost all current spruce forest on NFS land into reserves, the cumulative percentage representation in reserves relative to presettlement conditions is relatively low because of the early 20th Century decline in the overall amount of spruce forest. Current NFS land contains about 94 percent of current spruce forest in the Forest boundary, as well as about three-quarters of the acreage that was estimated to have been spruce forest in presettlement times. Therefore, there is very limited potential for other landowners to contribute to representation of spruce forests in reserves. However, MDA reserves that contain spruce forest form fairly cohesive units within the major high elevation parts of the Forest, so the potential for effective conservation of natural processes and community structure representative of spruce forests in the Forest boundary appears to be high (See MDA figures in the map packet).

Mixed Mesophytic and Cove Forest - Alternative 3 allocates 22 to 25 percent of the estimated presettlement amount of this community within the Forest boundary to MDA reserves, while Alternative 1 allocates 14 to 16 percent. Alternative 4 allocates 16 to 18 percent of the estimated presettlement amount to MDA reserves, and Alternatives 2 and 2M allocate about 17 to 20 percent (Table ED-11). The percentages may seem like low representation, but they represent large total acreages because this is the most extensive community within the Forest boundary. MDA reserves contain several large core areas of mixed mesophytic and cove forest that appear to offer a high likelihood of conserving natural processes, community structure, and potential old growth representative of this community within the Forest boundary. Notable examples include the Seneca Creek backcountry and surrounding lands, Otter Creek Wilderness and surrounding lands, Dolly Sods Wilderness, and the lower elevation backcountry areas surrounding Cranberry Wilderness (See MDA figures in the map packet). These core areas exist in all alternatives, but are largest in Alternative 3 and smallest in Alternative 1.

Current NFS ownership contains approximately 58 percent of the current amount of mixed mesophytic and cove forest within the Forest boundary, and about 46 to 51 percent of the acreage that was estimated to have been occupied by this community during presettlement. Therefore, activities that occur on other ownerships have a large potential to affect the overall conservation of this community within the Forest boundary. While some acreage of this community is included in state parks and a federal wildlife refuge that have some potential for conservation, the great majority of the non-NFS acreage of this community is privately owned. Private landowners typically are interested in generating an economic return from their property, and large numbers of private landowners are unlikely to coordinate their management to preserve large blocks of land. Therefore, it is unlikely that this private acreage will make a substantial cumulative contribution to conservation of mixed mesophytic and cove forest in large, cohesive MDA reserves.

Northern Hardwood Forest - Representation of northern hardwood forest in MDA reserves relative to the estimated presettlement amount is high under all alternatives, ranging from ≥93 percent under Alternative 1 to ≥110 percent under Alternative 3 (Table ED-11). This very high representation is due to the increase in northern hardwood forest that occurred as spruce forest and hemlock forest were decimated by extractive logging early in the 20th Century. Also, much of this community still contains a minor conifer component and is included in West Virginia northern flying squirrel suitable habitat. In addition to representing essentially all of the estimated presettlement extent of this community, the acreage comprises several cohesive core areas in the major high elevation areas of the Forest. MDAs with a strong representation of northern hardwood forest include the Cranberry-Gauley Mountain, Cheat Mountain, East Fork Greenbrier, Laurel Fork, and Canaan Loop areas (See MDA figures in the map packet). These core areas occur in all alternatives, with little variation in size between the alternatives with the most (Alternative 3) and least (Alternative 1) amounts of this community. Thus MDA reserves appear to offer a very high likelihood that representative natural processes, community structure, and potential old growth characteristic of this community within the Forest boundary will be conserved. Also, northern hardwood forest within MDA reserves is intermingled with spruce forest, and in many places occupies sites that are believed to have been spruce forest prior to extractive logging. Therefore, the high representation of northern hardwood forest in MDA

reserves provides the potential to increase representation of spruce forest through active and passive restoration.

Current NFS ownership contains about half of the current amount of northern hardwood forest within the Forest boundary. Because of the post-extractive logging increase in northern hardwoods at the expense of spruce and hemlock, the current amount of northern hardwoods on NFS land amounts to more than the total estimated presettlement amount within the Forest boundary. However, given that about half of the current amount of this community within the Forest boundary is on non-NFS land, other landowners have a large potential to affect the conservation of this community, and, ultimately, the restoration of parts of this community to spruce forest. The vast majority of non-NFS land is privately owned. Therefore, for the same reasons stated above for mixed mesophytic and cove forest, it is unlikely that private acreage will make a substantial cumulative contribution to conservation of northern hardwood forest in large, cohesive MDA reserves.

Hemlock Forest - Cumulative representation of hemlock forest in MDA reserves, relative to the estimated presettlement amount of this community, does not vary by alternative. Because of the large losses of this community following extractive logging, and possibly because the community is not tracked well by the CDS database, representation of this community in MDA reserves relative to the total estimated presettlement amount within the Forest boundary is a trivial 1 to 2 percent under all alternatives (Table ED-11). Because of the possibility that the community is underrepresented in the CDS database, cumulative representation in reserves may be somewhat better than it appears. However, without substantial restoration efforts, it appears unlikely that enough of this community is present in reserves under any alternative to ensure long-term cumulative conservation of community processes and structure within the Forest boundary. The threat from the hemlock wooly adelgid makes such large-scale restoration seem unlikely in the foreseeable future.

Currently, about 38 percent of existing hemlock forest in the Forest boundary is on NFS land. NFS land contains about 43 to 49 percent of the area that was estimated to have supported hemlock forest during the presettlement period. Thus actions of other landowners may play a large role in the conservation of existing hemlock forest and the possible restoration of the community. Nearly all of the acreage on non-NFS land is privately owned, so the potential for a substantial contribution of other landowners to cumulative conservation of hemlock forest in MDA reserves within the Forest boundary is very low.

Oak Forest - Representation of oak forest in MDA reserves relative to the estimated presettlement amount within the Forest boundary varies greatly by alternative. Alternative 3 allocates an amount equal to approximately 30 percent of the estimated presettlement amount to MDA reserves, whereas Alternative 1 allocates 6 percent. Allocations to MDA reserves in Alternatives 2, 2M, and 4 are also low relative to Alternative 3, at 11, 11, and 8 percent, respectively (Table ED-11). However, as was discussed above under direct and indirect effects, allocation of oak forest to MDA reserves under the action alternatives may serve as an inverse indicator of the degree to which natural processes and community structure are maintained, particularly for Alternatives 1 and 3, which maintain the current 300-acre annual limit on prescribed burning.

About two-thirds of current oak forest within the Forest boundary is on NFS land, and NFS land contains about half of the acreage that was estimated to have been oak forest during the presettlement period. Thus, non-NFS land owners have the potential to affect cumulative conservation of oak forest. Although Watoga State Park and Calvin Price State Forest contain a large, cohesive unit of oak forest within the Forest boundary in the Marlinton-White Sulphur district, the vast majority of the oak forest sites that are not on NFS land are in private ownership. Because private landowners generally seek a financial return from their land, they have the potential to conduct management activities that could mimic to some degree the disturbance processes that maintain oak forests. However, it is difficult to predict the degree to which private management will use silvicultural techniques that maintain oak forests versus techniques that hasten the conversion of oak forests to dominance by other species (e.g., diameter limit cutting). Because of this uncertainty, and because it is unlikely that owners of intermingled private parcels will coordinate their management to perpetuate oaks, there is no reason to expect a substantial contribution by private land owners to the cumulative conservation of natural processes and structure in oak forests.

Pine-Oak Forest - Representation of pine-oak forest in MDA reserves relative to the estimated presettlement amount within the Forest boundary varies greatly by alternative. Alternative 3 assigns to MDA reserves an amount equal to about 48 percent of the estimated presettlement amount of pine-oak forest on all land ownerships within the Forest boundary. Alternative 1 has the least cumulative representation of pine-oak forest, with MDA reserves containing 9 percent of the estimated presettlement amount of pine-oak forest within the Forest boundary. Alternatives 2, 2M, and 4 allocate 16, 16, and 12 percent, respectively, to MDA reserves (Table ED-11). As with oak forest, allocation to MDA reserves under the action alternatives may serve as an inverse indicator of the degree to which natural processes and community structure are maintained, particularly for Alternatives 1 and 3, which maintain the current 300-acre annual limit on prescribed burning.

Table ED-11. Percent Representation of Ecological Communities in MDA Reserves, Cumulative Effects

Community	Percent of Estimated Presettlement Amount on All Ownerships Within Forest Boundary That is Contained in MDA Reserves				
	Alternative 1 Existing Condition	Alternative 2	Alternative 2M	Alternative 3	Alternative 4
Spruce forest	11 – 27	11 – 27	11 – 27	11 – 27	11 – 27
Mixed mesophytic/cove forest	14 – 16	17 – 20	17 – 19	22 – 25	16 – 18
Northern hardwood forest	93+	106+	106+	110+	106+
Hemlock forest	1	1 – 2	1 – 2	2	1 – 2
Oak forest	6	11	11	29 – 30	8
Pine-oak forest	9	16	16	48	12

An estimated 61 percent of current pine-oak forest within the Forest boundary is on NFS land. A little more than half of the acreage within the Forest boundary that was identified as having been pine-oak forest during the presettlement period is on NFS land. Thus non-NFS land owners have the potential to affect cumulative conservation of pine-oak forest within the Forest boundary. Almost all of the non-NFS pine-oak forest is privately owned. As with oak forest, it is difficult to predict whether management of these forests will provide disturbance regimes that maintain pine-oak forests versus disturbance regimes that hasten their demise. Because of this uncertainty, and because it is unlikely that owners of intermingled private parcels will coordinate their management to perpetuate this community, there is no reason to expect a substantial contribution by private land owners to the cumulative conservation of natural processes and structure in pine-oak forests.