Appendix C

Analysis Of The Management Situation

Summary

Table of Contents

INTRODUCTION

The regulations to implement the National Forest Management Act (NFMA) require, as a part of the planning process, an analysis of the management situation (AMS). The primary purpose of the AMS is to identify any need for change from the direction in the original or 1986 Forest Plan. The AMS also determines the ability of the planning area to supply goods and services in the response to society's demands. Detailed AMS reports were prepared for the following topics:

- Recreation, Trails, Landscape Management and Wilderness Resources
- Heritage Resources
- Terrestrial Ecology and Special Forest Products
- Terrestrial Species Viability Evaluations
- Vegetation Management
- Timber Suitability Assessment
- Terrestrial Wildlife Species and Habitat
- Mineral Resources
- Soil, Water, and Air Resources
- Research Needs

The complete AMS is included in the official planning record. This appendix provides a summary that highlights the portions of the AMS that relate to the need for change. The need for change topics are:

- Backcountry recreation opportunities, including recommended wilderness
- Vegetation diversity and restoration opportunities
- Suitable timberlands and available timber supply
- Soil and water concerns.

This summary of the AMS highlights the following similar topics:

- Recreation and Wilderness
- Vegetation Diversity and Management
- Timber Management and Supply
- Soil, Water, and Air Resources

The intent of the summary is to give an overview of each resource summarized, anticipated demand for the resource, and a discussion of the change needed.

RECREATION AND WILDERNESS

The West Virginia Department of Tourism Annual 2001 Report indicates that 22 million visitors traveled to the state and spent over $3.1 billion dollars, with a total economic impact of $4.86 billion. Included are 8.6 million visitors who stayed overnight with an average stay of 3.72 days/person. Leisure expenditures were $69.50/person/day. The 2001 Report indicates:

- The most popular outdoor recreation activities that visitors participated in include: Site-seeing (20%), Visiting Parks (17.8%), Hiking/Mountain Biking (15.5%), Visiting Historic Sites (10.1%), Hunting/Fishing (8.6%), and Camping (6.8%).

- Visitors to West Virginia are primarily from the following states: Ohio (16.4%), Virginia (9.3%), Pennsylvania (8.1%) Maryland (7.5%), Kentucky (5.4%), North Carolina (4.9%) and Florida (4.65).

The top five overnight metropolitan markets are: Washington D.C., Cleveland, Pittsburgh, Charlotte, and Columbus.

- The Monongahela National Forest is within a day's drive of 1/3 of the United States population.
- The 2001 visitor survey indicates that one of the primary attractions of West Virginia is Outdoor Recreation activities, while areas of concern identified by visitors are the quality of restaurants and accommodations.
- The Monongahela National Forest provides over 50% of the available public land available for outdoor recreation in the State of West Virginia.
- In 2001, over 1 million hunting and fishing licenses provided over $15.5 million in revenues to the State, including 71,201 conservation stamps to non-residents.
- There are 9 state forests and 41 state parks totaling over 200,000 acres in West Virginia. In general, state managed parks have significant development and provide more developed recreation and leisure activities than most Monongahela National Forest facilities.

The following recreation activity participation statistics are results of the National Visitor Use Monitoring Program. The numbers are averages based on surveys completed on the Monongahela National Forest (Forest). Only the top 10 activities have been listed.

Table C-1. Visitor Use Monitoring Program Summary

Activity (participation on FS lands)	% Participation
1. Viewing Natural Features (scenery, flowers, etc)	59.42%
2. Viewing Wildlife, Birds	54.68%
3. Hiking/ Walking	46.64%
4. General/Other (relaxing, hanging out, escaping noise and heat)	45.79%
5. Driving for Pleasure	34.83%
6. Fishing	26.36%
7. Nature Center Activities	19.74%
8. Camping, Developed Sites	14.97%
9. Picnicking	14.95%
10. Downhill Skiing	11.18%

Note: Bicycling (mountain biking) is 5.71% and horseback riding is 0.25%.

As the remainder of the country becomes increasingly populated, it is reasonable to assume that the relatively uncrowded State of West Virginia will become more attractive for both recreationists and others seeking areas to get away from the crowds.

In West Virginia, the Forest, and to a lesser extent the State lands, are almost the exclusive providers of public primitive or semi-primitive non-motorized recreation opportunities. The Forest contains five Wildernesses totaling over 78,000 acres, or about 9% of the Forest. There are also over 324,400 acres of the Forest in Management Prescription 6.1 and approximately 125,000 acres in Management Prescription 6.2. Both of these prescriptions emphasize semi-primitive non-motorized (SPNM) recreation opportunities and represent almost 50% of the Forest land base. The National Visitor Use Monitoring was completed on the Monongahela National Forest from October 1, 2002 to September 30, 2003. The

results indicate that there were an estimated 38,590 visits to the 5 wildernesses on the Forest, which is about 3% of the total recreation use.

Need for Change

Revising the plan creates an opportunity to ensure our goals, objectives, standards, guidelines, and policies are appropriate to enhance our visitor's recreation opportunities and experiences. Opportunities exist to discuss, explore and define the role of the Monongahela National Forest as a recreation provider in terms of Forest settings. Using the Recreation Opportunity Spectrum (ROS) we have the opportunity to display a range of areas in a variety of existing and desired conditions across this spectrum. Because the Forest provides over 50% of the public lands outdoor recreation opportunities in the state of West Virginia, the amount of areas providing rural, roaded-natural, and semi-primitive non-motorized opportunities are extremely important to over 1 million visitors annually.

Revising the plan will also allow us to conduct a roadless area inventory and wilderness evaluation. This analysis will help identify what the appropriate amounts of semi-primitive non-motorized and wilderness study areas are for the Forest. The evaluation of wilderness potential and wilderness recommendation is one of the 6 planning decisions to be made in Forest Plan revision.

Changes Under the Revised Forest Plan

Forest Plan direction was reviewed and updated. The desired conditions and goals for recreation management were greatly expanded, and standards and guidelines were revised to provide protection of recreation resources and settings, while allowing more flexibility for management at the site level.

The Forest conducted a roadless area inventory and wilderness evaluation. Four areas (27,700 acres) were recommended for wilderness study. Two of these areas would expand existing wilderness.

The overall backcountry recreation settings and opportunities offered by Management Prescriptions 5.0, 5.1, 6.2 and 8.1 SPNM (Semi-Primitive Non-Motorized areas in the Spruce Knob-Seneca Rocks NRA) show a substantial increase (34,900 acres) over those in the 1986 Plan.

The Spruce Knob-Seneca Rocks NRA was given its own Management Prescription, 8.1, to emphasize the importance of this national recreation attraction. This prescription has its own set of expanded management direction. A revised management plan for the NRA is in the works that will tier to the NRA prescription and management direction.

VEGETATION DIVERSITY AND MANAGEMENT

Within the proclamation and purchase unit boundaries of the Monongahela National Forest are approximately 1.7 million acres. Of these, about 919,000 acres are in federal ownership, and about 881,000 acres are forested. The Forest is situated at the intersection of the southern reaches of some tree and plant species, and the northern extent of others. The Forest is mountainous, with a range in elevation from about 900 feet to a maximum of 4,863 feet, further contributing to the wide diversity in vegetation on the Forest. The general axis of the Forest is northeast to southwest.

This summary of Terrestrial Ecology and Special Forest Products AMS will cover: old growth, prescribed fire, and forest health (which includes insect and disease pathogens), altered disturbance regimes, ecological sustainability, and non-native invasive species.

Old Growth

Few areas of the Forest National Forest escaped the turn of the 20th century logging and are considered true old growth. These areas are protected by designation as candidate Research Natural Areas, Botanical Areas, or Scenic Areas and through specific Forest Plan standards and guidelines. These areas total around 300 acres and include the Gaudineer Scenic area (140 acres), Shavers Mountain Spruce-Hemlock Stand (68 acres), Virgin White Pine area (13 acres), and the Fanny Bennett Hemlock Grove (70 acres).

The 1986 Forest Plan calls for designating old growth in Management Prescriptions (MP) 3.0, 4.0, and 6.1. Old growth stands in these MPs were identified and designated during project development and analysis until the mid 1990s. Currently about 10,763 acres are given a land suitability code in the CDS database that identifies them as designated old growth. These designations are misleading because the areas are not likely true old growth and are more accurately described as future or potential old growth or mature habitat.

Currently, during project design and analysis, a pool of potential old growth stands is identified. Instead of designating stands as old growth and risk choosing less than optimal future habitat, the pool of potential old growth is treated as a resource, and impacts to this resource from proposed actions are assessed and documented. The pool of acres is often greater than the 5% called for in Forest Plan guidelines for MPs 3.0, 4.0, and 6.1, which are the only management prescriptions calling for designation of old growth.

The purpose of designating old-growth stands in MPs 3.0, 4.0, and 6.1 is different than the designation of large areas of forest where vegetation management is limited (5.0 and 6.2 MPs). MPs 5.0 and 6.2 areas serve as large areas of future old growth conditions. The small patches called for in the Forest Plan in other MPs were not meant to provide fully developed old growth habitat conditions, but rather to increase vegetative and structural diversity in areas where timber management is allowed.

About 98% of the Forest has been inventoried for age and forest type, including non-forested areas, as stored in the 2003 CDS database (although no age is associated with non-forested areas). The majority of the Forest is over 60 years old (84%), with 75% of the Forest between the ages of 60 and 104 years. About 9% of the forest is over 105 years old. The age of a stand can be considered an average as it is usually estimated from one or two trees representative of the majority of the stand. Many stands include multiple age classes depending on previous harvest or natural disturbances. Individual trees in a stand either older or younger than the given stand age are likely. These figures are for all management prescriptions and forest types.

Two internal reports were prepared to address and guide the management of old growth on the Forest since the adoption of the 1986 Forest Plan. The first in 1990, titled “Selection, Designation and Management of Old Growth”, provided direction, perspective, and a process for interdisciplinary teams to follow in selecting, designating, and managing areas to meet Forest Plan direction relating to old growth.

In the 1990 report a new term was used to describe the stands designated to meet Forest Plan old growth standards and guidelines under MP 3.0, 4.0, and 6.1. These areas are better described as “future old growth” and defined as areas of forest too young to be true old growth presently but set aside (designated) so that through time, proper management, and protection they will provide true old growth on the Forest. These stands do not necessarily exhibit old growth characteristics when designated as future old growth.

Before 1990, interdisciplinary teams identified a pool of the oldest stands within an analysis area but did not take the next step of designating 5% of the area as old growth. The 1990 report outlined steps for

interdisciplinary teams to take to identify a pool of possible old growth for designation. The report suggests that waterhole development, foot trail construction, stream improvement, and wildfire suppression should not be allowed in designated old-growth stands. All other activities should not normally be appropriate or permitted, including firewood collection, commercial thinning, regeneration harvest, salvage sales, timber stand improvement, wildlife openings, savannahs, prescribed fire, grazing, mineral activity, temporary road construction, log landings, permanent road construction, and right-of-way construction.

In 1995, the Forest reviewed the Forest Plan intent for designation and management of old growth areas in another internal report. In this report, titled "Clarification of Forest Plan Intent for Designated Old Growth Areas on the Forest", the Forest Plan intent for old growth designation was described as providing small, dispersed elements of old growth vegetation and structural diversity throughout the Forest in order to help maintain a wide variety of species. The intent was not to provide large tracts of contiguous forest habitat for forest interior-dependant species.

This report provided a set of guidelines to use in determining areas to designate as old growth, in accord with the generic guidelines developed at the national scale. The guidelines or criteria are: age, species composition, structural diversity, woody debris, gap formation, patch size, and adjacency.

Need for Change

Forest wildlife biologists have recognized that with the long rotation ages and small percentage of forest regenerated or thinned during each entry, conservation of old growth habitat when the stands have not yet developed mature forest characteristics may lead to less than optimal habitat. This change in application of the 1986 Forest Plan needs to be considered during revision.

The 1986 Forest-wide direction allowing for old growth patches to be harvested and replaced by other stands needs to be reconsidered during Plan revision.

Identification and conservation of potential old growth is desired by the Forest as part of the overall vegetation management strategy for age class and ecological diversity. One way to conserve potential old growth in MP 3.0, 4.0, and 6.1 areas is to assign individual areas, one at a time, to a separate management prescription. However, since these areas are likely to be small and subject to change, they may or may not provide a desired amount or distribution of areas over time. The conservation strategy should be expanded to identify and conserve a range of patch size and distribution of old growth across the Forest. It is the intent of the Forest to have a distribution of late successional stage forests that is representative of major forest types and ecological subsections, and comprised of large, medium, and small patches. The designation of old-growth stands called for in MPs 3.0, 4.0, 6.1, and 6.3 in the 1986 Forest Plan as amended needs to be revised to reflect desired conditions for potential old-growth conservation.

Changes under the Revised Forest Plan

Existing small patches of old growth are still protected in special area (8.0) designations. A strategy for identifying and conserving potential old growth has been developed for the Revised Plan. This strategy is more fully described in Appendix B to the Revised Plan, and is briefly summarized here.

Rather than try to protect or create old growth conditions through piecemeal, one-area-at-a-time designation, the Forest identified a broad-scale strategy during revision based on management prescription (MP) allocation and management direction constraints. The key assumption in this strategy is that where intensive vegetation management is prohibited or substantially constrained, ecological

processes will dominate vegetation change on the landscape, and forest stands will continue to age and develop old-growth characteristics over time.

Large patch sizes (>10,000 acres) should develop in large MP areas—such as 5.0, 5.1, 6.2, and portions of 8.1—where commercial timber harvest is not featured. These prescription areas are fairly well distributed in various forest types and ecological subsections across the Forest.

Medium and small patches should develop in other MPs—including MPs that emphasize timber management—through management direction that constrains timber harvest in specific areas. These areas include channel and wetland buffers, suitable habitat for WV northern flying squirrel, Indiana bat key areas and hibernacula, Wild segments of eligible Wild and Scenic Rivers, and areas with a Very High Scenic Integrity Objective. Again, these areas are well distributed throughout the Forest. Where medium and small patches occur next to or connect large MP patches, they should increase the size and habitat effectiveness of each.

The Revised Plan has also incorporated desired conditions for late successional stages into MPs that emphasize vegetation management for age class diversity. The late successional stages should provide for structural and habitat diversity, and are the areas where old-growth characteristics would most likely develop over time.

Prescribed Fire

The Forest is required to maintain an approved Fire Management Plan. In this document, fire management goals are given by MP. In all MPs, the suppression strategy is to control all fires. Because the Forest is relatively isolated from firefighting resources other than local crews and volunteer fire departments, the cost of suppression would increase exponentially once the capability of local resources is exceeded. The most cost-effective strategy is to safely control wildfires at the smallest possible size with local resources. The Forest used this same justification in 1997 to choose to not permit the management of unplanned ignitions.

The use of prescribed fire by MP is given in Forest Plan standards and guidelines. Dolly Sods and Dolly Sods North are unique in management due to the presence of unexploded ordnance. The management of fire in these areas is addressed in the MNF Fire Management Plan as a separate Fire Management Unit.

The 1986 Forest Plan does not recognize the role fire played in development of vegetation. An estimated 32% of the Forest is naturally suited to use of prescribed fire as a management tool based on landtype associations and existing forest types. The role of fire in the development of eastern forests before European settlement is still being discovered and is not well known for West Virginia and the Monongahela National Forest. The ecological role of fire in regeneration of oaks is better documented now, and silvicultural systems including prescribed fire have been developed.

In 1997, fires on the Monongahela from 1981 to 1995 were analyzed to predict size and intensity of future fires. The Forest has less than 10 fires a year. About seven occur at fire intensity level 1 (the lowest intensity level). For fires in this time period, 95% included a reported cause. Arson was the most reported cause at about 45%; hunters caused about 26% of the fires reported between 1980 and 1995, campfires caused 13%, smoking caused 9%, and lightning caused 7%. Distribution numbers have been similar since then.

Because of the low occurrence of natural fires, significant amounts of rain, and rapid decomposition, the issue of hazardous fuels on the Forest is secondary to the desire to reintroduce fire to ecosystems adapted to this natural disturbance. As gypsy moth damage and beech bark disease continue to cause morality,

hazardous fuels on the Forest may become a greater concern. The most common fire on the Forest is a surface fire that only partially consumes the duff layer; however, ladder fuels like pines, mountain laurel, and rhododendron can create localized areas of shrub crown fires, especially on steep slopes. Occasionally, conditions such as high winds or slash piles create conditions where a surface fire with mixed severity (some mortality of overstory trees) can occur.

The Forest continues to suppress and control all fires, regardless of ignition. To allow management of naturally ignited fires to accomplish specific vegetative goals and objectives, the Forest plan would need to be updated. An analysis would need to be made of the current fire fighting resources' ability to safely handle this use of fire. The Forest did not use prescribed fire as a management tool until 1998, but have averaged 139 acres/year since. The following table shows acres of prescribed fire by year since 1998.

Table C- 2. Acres of Prescribed Fire on MNF – 1998 to 2005

Year	Acres	Year	Acres
1998	85	2002	84
1999	220	2003	221
2000	95	2004	77
2001	152	2005	177

Need for Change

While desirable in some parts of the Forest, using wildland fires to accomplish natural resource management goals is not likely to be effective because the Forest has a low occurrence of lightning strikes in dry season. Also, the Forest currently lacks qualified people to manage a wildfire to meet resource goals. Finally, the intermingled land ownership within the Forest proclamation boundary necessitates an aggressive fire suppression strategy. For these reasons, revised Forest Plan direction should reflect the low potential for wildland fire use.

To retain management options, the Forest Plan should be changed to allow prescribed fire in MP 6.2 areas. Not all MP 6.2 areas are suited to prescribed fire, however in some areas wildlife habitat goals and desired ecological conditions may be met through prescribed fire.

The fire regimes and condition classes (FRCC) of the Forest needs to be determined. As part of this determination the Forest should identify ecosystems where fire does not need to be re-introduced, where prescribed fire would not meet management goals, and where use of prescribed fire is essential or potentially effective. Current management direction requires the Forest to determine FRCC before proposing prescribed fire, regardless of resource objective. FRCC is more easily determined in western forests; however the Eastern Region is working to establish methodologies for determining FRCC in eastern forests. Currently the Forest uses a coarse-scale model developed for the contiguous United States and is creating a local model.

Changes under the Revised Forest Plan

Revised Forest Plan direction expands the role of prescribed fire to be used for ecosystem restoration and fuels reduction. Prescribed fire is allowed in MP 6.2, and all other MPs except for Wilderness. In addition, MP 6.1 has been revised to emphasize the increased use of fire as an ecological tool for restoring oak ecosystems. Through consultation with USFWS, the Forest's annual limit on prescribed fire has been raised from 300 to 3,000 acres.

Aggressive fire suppression is emphasized throughout the Forest, and wildland fire use is not presented as a desirable option for the reasons discussed above.

Fire regimes and Fire Condition Classes have been determined for the Forest and integrated into fire planning at the Forest-wide scale.

Forest Health

Because forest health issues differ by temporal and spatial scales, any definition of forest health is likely to be conceptual in nature. The use of the term "health" is controversial because although health is easy to comprehend in terms of the human body, it may not be appropriate for ecosystems such as a forest. However, some researchers and managers have determined characteristics of what are considered healthy forests. Kolb et al. (1995) propose the following characteristics as a definition of forest health: 1) physical and biotic resources to support forest cover; 2) resistance to dramatic change; 3) functional equilibrium between supply and demand of essential resources; and 4) diversity of seral stages and stand structures.

The AMS focuses on those elements of dramatic change acting on the Forest. The insects and diseases known to be affecting the forest at greater than historic levels are not native to the eastern United States. Endemic insects and diseases will not be discussed in this analysis.

Insect and Disease Pathogens - Beech bark disease, a disease complex formed by the combined action of a non-native scale insect and native fungi, was first described from the Forest in 1981 (Mielke et al. 1982). Beech bark disease is found across the Forest. Mortality and decline of beech trees is occurring. As beech trees die, they often sprout from stumps and roots, creating a beech thicket of sprouts in the understory. Large woody debris is being added to the forest floor and to stream channels from beech mortality. It is not yet known how composition changes in forest canopy, midstory, and understory would affect the long-term health of forested stands with beech bark disease.

Eastern hemlocks across the Forest are affected by the hemlock wooly adelgid, particularly in riparian areas. Decline of trees, mainly evident through thinning of the canopy, is noted across the Forest. This non-native insect has the potential to affect riparian ecosystems across the Forest through loss of shade and disruption of nutrient cycles. Small-scale bio-control of the adelgid is planned for 2004.

The gypsy moth caterpillar prefers to feed and lay eggs on species of oak. The populations of gypsy moth across the Forest are monitored, and spraying to control population levels has occurred. Gypsy moth has the potential to affect forest structure and composition through decline and mortality of overstory oaks trees. The risk of more frequent and more intense fires may also increase if tree mortality increases on drier parts of the Forest, and surrounding private forests are also affected.

All insects and diseases predispose trees to other stressors such as drought, freeze injury, acid precipitation, decay fungi, and other insects. Monitoring and controlling where possible these exotic stressors is needed to continue to have a healthy forest. The Forest also continues to cooperate with others in monitoring for new exotic pathogens and increases of native insects and diseases.

Altered Disturbance Regimes - As discussed under the "Old Growth" and "Prescribed Fire" sections, there are areas of the Forest with vegetation adapted to low-intensity surface fires. Also, after the near total clearing of the forest at the turn of the 20th century, some areas burned that normally would not experience this disturbance, or the intensity of fires was greater than would naturally have occurred. Another result of the extensive clearcutting that occurred is that the forests changed from a largely uneven-aged structure to one that is essentially even-aged.

Ecological Suitability to Management - The ecological suitability of certain areas and the management prescriptions assigned to them is a concern documented in the 2001 Timber Monitoring Report. For example, one goal of lands under MP 6.1 is to focus on manipulation of the naturally occurring tree species composition to optimize hard mast production, age class distribution, and ensure a continuous mast supply. Also in the description of the purposes, note is made of the lands in transition from a predominately hardwood overstory to a mixed oak-pine or northern hardwood-red spruce type. These areas are singled out for a management strategy to maintain the mast production in these areas. This issue has been dealt with through site-specific implementation so that mast production on a site is ensured through regeneration of existing oaks and hickories, sometimes through intensive measures.

Some areas of the Forest with a diversity of hard mast species (red oak, white oak, hickory, black cherry) are the result of near catastrophic disturbances at the turn of the century. Most of West Virginia was cleared of trees by the 1920s, and then areas were burned and often grazed before returning to forest cover. Also, the death of American chestnut trees helped oaks to gain dominance in some areas. Some areas of the Forest are more suited to northern hardwoods (for example, sugar maple, beech, birch, and yellow birch). To regenerate oaks on some areas has increased costs of management due to the need for planting and protection of oak seedlings. Also, during project-level analyses, some publics have opposed management practices such as herbicide, prescribed fire, and clearcutting necessary to maintain mast species in areas not ecologically suited to continued regeneration of oak species. The Forest has developed land delineations based on ecological land types to aid in the determination of where managers should and should not concentrate efforts to regenerate certain tree species.

Non-native Invasive Species - Non-native invasive species (NNIS) are known to occur on the Forest. Control efforts have focused on pastures on the Forest.

A list of known and expected non-native plant species and their risk ranking has been drafted for the Forest to use during botanical surveys. This list includes 91 species. Eighteen species are considered a severe threat and are known to invade natural habitats and replace native species. Thirty one non-native plants are less invasive than those just mentioned and have less impact on native plant communities, but are generally found in disturbed areas, are capable of spreading into adjacent undisturbed areas, and pose a significant threat. Twenty seven species pose a lesser threat, and are non-native plants normally established and spread in areas of ground disturbance with full sunlight or partial shade. An additional fifteen non-native plants are problematic elsewhere in parts of West Virginia, but their status is unknown within the Forest proclamation boundary.

Invasive species generally have high reproductive rates, are pioneering species, are long lived, reproduce vegetatively and rapidly, have high genetic variability, tolerate a wide range of conditions, and are abundant in their natural range.

Need for Change

Bringing fire back into some ecosystems would help re-establish the ecological role of this disturbance. Allowing for prescribed fire in MP 6.2 areas is a change needed in the Forest Plan. This topic is covered in the Prescribed Fire section above.

The purpose statements for management emphasis under MP 6.1 need to be reworded if MP 6.1 is retained in the revised Forest Plan. The statements under the secondary purposes for these areas dealing with a management strategy for sites reverting from hardwood to conifer and the intermingled high site hardwood types needs clarification. In some areas, conversion to red spruce is desirable. The statement

that hard mast be optimized on all areas under MP 6.1 may not be feasible in those areas where oak species are being replaced by northern hardwoods or the costs to slow succession are high.

Monitoring of even-aged regeneration harvest units has shown that oaks sometimes do not compete well on sites with higher site indices without tubes to protect seedlings, or herbicides to reduce competition. The Forest Plan needs to be flexible enough to include consideration of the ecological setting when determining tree species to emphasize. During Plan revision, the interdisciplinary team needs to consider whether it makes sense from an ecological and economic perspective to implement intensive management techniques in order to perpetuate certain mast species in some areas. Also, the team should consider the impacts of succession on those areas of the Forest where vegetation management is not occurring. If not addressed specifically in Forest Plan revision, then the costs and benefits of retaining hard mast in some areas need to be addressed at the project level.

The Forest should develop ways to address non-native invasive species (NNIS) and other undesirable species. The Forest needs to detect invasive plants, control known species, avoid establishing non-native invasive species, and use native material for our revegetation projects. The list of non-native invasive plants likely found on the Forest should not be incorporated into the revised Forest Plan, as it is a work in progress. The revised Forest Plan should include a strategy for prioritizing treatment and monitoring. The Forest Plan should remain flexible for NNIS management. Some species on the list such as common chickweed and coltsfoot are older imports from colonial days. Having this fairly long list of species does not mean that all species will be controlled on all sites. A risk analysis is needed to determine which species to control and where, so that maximum benefits are gained from control efforts.

The 1986 Forest Plan lists recommended grasses and legumes for revegetating disturbed areas. Since 1986, some of the species listed in this table are considered noxious, invasive plants and a potential threat to natural plant communities that should be avoided. This list needs to be updated to remove these species and include species that are acceptable.

Changes under the Revised Forest Plan

The MP 6.1 purpose statements have been revised to reflect desired changes in conifer (primarily red spruce) and oak ecosystem management. In particular, management intent has shifted somewhat to restoring oak ecosystems where ecologically appropriate, which should provide for sustainable wildlife habitat and mast production over time. MP 6.1 also now features more emphasis on using prescribed fire as an ecological tool to help restore oak ecosystems where appropriate. All tools are available to help achieve oak regeneration and ecosystem restoration.

The Revised Forest Plan includes new Forest-wide NNIS management direction in the Vegetation section, as well as revised direction for the use of native plants for revegetation and other purposes. The non-native invasive species list is dynamic and will therefore be updated outside of the Revised Plan to allow for maximum flexibility in addressing periodic changes.

TIMBER MANAGEMENT AND SUPPLY

This summary will cover: silvicutural methods, rotation ages, forest types, and timber production with a discussion of allowable sale quantity (ASQ).

Silvicultural Methods, Rotation Ages, and Forest Types

The 1986 Forest Plan predicted that during the first decade of implementation, the Forest would use both even-aged and uneven-aged regeneration harvest on an estimated 2,000 acres a year and thin an estimated 4,000 acres a year. As reported in the *Revised Biological Assessment* (USDA 2001), from 1987 to 1998 the annual average was an estimated 4,000 acres, both regeneration and thinning, managed by commercial timber harvest. This has been declining annually; from 1995 to 1998 the annual average was 2,031 acres managed by commercial timber harvest per year; from 1999 to 2003 the average annual harvest fell to about 1,469 acres (less than 0.2% of the total MNF acres). Table C-3 displays the amount of harvest per year for each silvicultural method, from 1986 through 2003.

Table C-3. Acres of Timber Harvest by Harvest Method, 1986-2003

Fiscal Year	Regeneration Harvest				Thinning	Uneven-Aged Harvest		Salvage
	Clearcut	2-Aged	Shelterwood Seed Tree	Totals		Single Tree	Group Selection	
1986	846	0	48	894	3,405	124	0	50
1987	1,347	0	122	1,469	3,958	234	39	5
1988	1,827	0	98	1,925	4,333	433	0	107
1989	1,574	0	19	1,593	2,459	239	0	0
1990	924	0	0	924	3,324	356	0	68
1991	1,404	21	53	1,478	2,241	848	31	892
1992	1,110	64	47	1,121	2,460	944	0	55
1993	1,253	60	90	1,403	1,655	27	0	31
1994	789	44	46	879	1,417	0	0	85
1995	646	272	53	971	1,093	0	164	538
1996	533	333	94	960	1,899	238	403	0
1997	356	341	58	755	1,529	313	97	0
1998	460	213	200	873	1,495	141	33	88
1999	433	488	104	1,025	1,410	214	137	11
2000	435	249	82	766	659	0	0	0
2001	56	385	21	462	534	79	0	0
2002	45	176	113	335	502	0	0	0
2003	90	156	184	430	776	0	14	0
Totals	**14,129**	**2,802**	**1,432**	**18,363**	**35,149**	**4,191**	**913**	**1,930**

The amount of area regenerated through clearcut with reserve tree harvesting has trended downward since 1991, with a peak of 1,827 acres in 1988. In the 18 years since the Plan was signed, about 68% of the acres regenerated through clearcut with reserve tree harvesting were under MP 6.1 and only about 29% of the acres under MP 3.0.

Before 1992, two-aged harvest method was not used on the Forest, even though the Forest Plan does allow for this harvest, then called deferred rotation. Since 1992, the Forest has treated an estimated 2,802 acres in two-aged harvest. The majority of acres (about 70%) regenerated through two-aged harvesting comes form lands managed under MP 6.1.

Table C-4 displays the acres that were harvested by Management Prescription (MP).

Table C-4. Acres and Percent of Timber Harvest by Management Prescription and Harvest Method

Even-Aged Management	MP 2.0		MP 3.0		MP 6.1		MP 8.0	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Clearcut Reserve Tree	128	1%	4,170	29%	9,558	68%	273	2%
Two-Aged	21	1%	801	29%	1,980	70%	0	0
Shelterwood/Seed Tree	0	0	534	37%	898	63%	0	0
Totals	149	1%	5,505	30%	12,436	68%	273	1%
Uneven-Aged Management	MP 2.0		MP 3.0		MP 6.1		MP 8.0	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Single Tree Selection	780	19%	2,238	53%	263	6%	910	22%
Group Selection	724	79%	60	7%	98	11%	31	3%
Totals	1,504	29%	2298	45%	361	7%	941	18%
Thinning	MP 2.0		MP 3.0		MP 6.1		MP 8.0	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
	936	3%	11,919	34%	22,278	63%	0	0
Salvage	MP 2.0		MP 3.0		MP 6.1		MP 8.0	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
	0	0	287	16%	1,555	84%	0	0

An estimated 18,363 acres have been regenerated through shelterwood or seed tree harvesting since 1986. The use of these regeneration harvests, mainly shelterwood, has generally increased over time as clearcutting has deceased. Under these even-aged regeneration harvest methods, the greatest residual basal areas are found, making these a good choice in areas where retention of vertical structure in the forest is important, while allowing for regeneration of shade intolerant or moderately tolerant tree species. Again, the majority of acres (63%) come from lands under MP 6.1.

The 18,363 acres that were regenerated on the Forest since 1986 are the acres harvested using clearcut, two-aged, shelterwood, and seed tree harvests. When all even-aged regeneration harvests are broken out by management prescription, MP 6.1 areas contributed about 68% of the acres regenerated.

Thinning is used on the Forest to improve the health and increase growth of the residual stand by reducing the density of trees in the stand. Thinning is part of an even-aged silvicultural system, and is often called an intermediate harvest as it occurs between regeneration harvests. Since 1986 it is estimated that 35,149 acres have been treated using the thinning silvicultural method. Lands under MP 6.1 have contributed about 63% of the area thinned in the last 18 years compared to about 34% from MP 3.0 lands. Total acres thinned have declined steadily over the life of the current Forest Plan.

Uneven-aged harvesting occurs on the Forest; both single tree selection and group selection are used. There have been areas managed by group selection, with thinning between clearings created through group selection. In either uneven-aged silvicultural system, both regeneration harvesting and thinning occur during the same entry into the stand. The regeneration openings range in size from the space of one tree to up to two acres (Forest Plan standard). An estimated 4,191 acres have been managed through single tree selection over the past 18 years. It is surprising that the majority of acres managed under this system, about 53%, have come from lands under MP 3.0. Uneven-aged silvicultural systems are to be used on MP 2.0 lands, and while the total acres managed under single tree selection from this MP seems low, these lands only make up about 3% of the Forest.

An estimated 913 acres have been harvested through group selection since 1986. These totals include group selection combined with thinning between group openings. The majority of acres (79%) managed through group selection have come from MP 2.0 lands.

Intermediate harvesting has been used to salvage mortality on the Forest. An estimated 1,930 acres have been treated since 1986. Again, the majority of management (80%) has occurred on MP 6.1 lands.

In 2001 the Forest held an interdisciplinary meeting to review Forest Plan direction on use of clearcutting and planting of oak and conifer. The group compared Forest Plan standards, guidelines, and management direction on these subjects, and discussed changes in legislation, scientific information, Forest Service policy, etc. that have occurred since the 1986 Forest Plan was authorized. The changes were discussed to determine impacts to the Forest's ability to implement the Forest Plan or achieve assigned outputs. The group also identified management direction, standards, or guidelines to address in Forest Plan revision.

In addressing Forest Plan direction on clearcutting, the group sought to answer the question, why are we clearcutting less than the Forest Plan projected? The group noted that there are two aspects to this question. First, why is the Monongahela National Forest harvesting less commercial timber in general? Second, why is the Forest using other even-aged methods instead of clearcutting?

As the fiscal year (FY) 1999 Monitoring Report for the Forest National Forest indicated, the volume of timber offered for sale has declined over the years. Several factors have contributed to the overall reduction in timber harvests since the Forest Plan was approved:

- National policy changes initiated by the Chief of the Forest Service
- Unexpected discovery of threatened and endangered species in management prescriptions suited and available for commercial timber production
- New mitigations for protection of riparian areas and reducing sediment movement to stream channels
- Fewer new roads have been built; with emphasis shifting to the use of existing roads
- Escalating complexity of National Environmental Policy Act (NEPA) analysis, including costs, time to complete analyses, and appeals of decisions

As mentioned previously, the area regenerated through clearcut harvesting has declined since 1993 from an average of an estimated 1,285 acres per year to 384 acres per year in 1994 – 2003; in 2002 only 46 acres were regenerated through clearcut harvesting. The use of alternative even-aged regeneration harvest methods has increased as a result of:

- In the early 1990s, Chief Robertson directed forests to reduce the use of clearcutting, and only use clearcutting when shown to be the optimal method for achieving specific management objectives.
- Emphasis on retaining leave trees to minimize visual effects of even-aged regeneration harvesting
- Efforts to provide structural diversity in regenerating stands to benefit various wildlife species.

The alternative even-aged regeneration harvests used on the Forest include shelterwood and two-aged harvests. The overstory in a shelterwood harvest should be removed after regeneration is established underneath, however this may not always occur. In the two-aged regeneration method, the residual basal area is reduced to 15 to 40 square feet per acre (including culls and den trees) and this age class is retained through to the next removal harvest (end of the rotation). There are concerns that the residual basal area in a two-aged harvest, or in a shelterwood harvest that is not removed will eventually shade the regeneration and inhibit growth.

Generally, commercial timber harvest has been the means by which the Forest manages age class distribution, and to some extent, forest types on lands available and suitable for commercial timber management. The Forest Plan allows commercial timber management on approximately 36% (~331,000

acres) of the Forest. The remaining 64% of the Forest is expected to change primarily through natural events and succession. On approximately 23% of the Forest (Wilderness and MP 6.2), natural forces are the disturbance factors expected to impact forest type and age class diversity.

A variety of tree species currently exists in forested stands of the Forest. The Forest contains stands with largely one tree species and stands that have a mix of hardwoods and conifers with a variety of shade tolerant and intolerant tree species.

Shade tolerant, intolerant, and moderately tolerant tree species are found on the Forest. For example, sugar maple, beech, and hemlock are considered shade tolerant, while black cherry, some oaks and hickories, yellow poplar, and birch are considered shade intolerant. Shade tolerance is based on the requirements of seeds to germinate and the young trees to grow into the upper canopy. Shade intolerant trees need full sunlight to maximize seed germination and growth. Shade tolerant trees have seeds that are able to germinate under the shade of a forest canopy and continue growing with only the partial sunlight that filters in below the shade of other trees.

Major forest types on the Monongahela are broken out as shown in the table below. More information on these types can be found in Appendix A.

Table C-5. Current Major Forest Type Distribution for the MNF

Forest Community Type	Acres	Percent of Forest
Mixed mesophytic/cove hardwood	360,000	39
Mixed oak	250,000	27
Northern hardwood	170,000	18
Pine-oak	51,000	6
Spruce/fir/hemlock	51,000	6
Totals	**882,000**	**96**

Brush or shrub lands comprise about 1% of the Forest (about 9,000 acres) and are classified as either upland or lowland. Open areas with grass, forbs, or other herbaceous ground cover comprise a little more than 2% of the Forest (about 20,000 acres). The brush, shrub, and open forest types do not include lands that are regenerating after a regeneration harvest; however, trees may not be filling in all of these areas.

A combination of even-aged and uneven-aged management or no active management of the timber resource perpetuates the current forest. Non-commercial methods and natural events contribute to diversity of forest types and age classes.

An estimated 2% of the Forest is comprised of stands of trees less than 15 years of age. The majority of the Forest trees are over 60 years old (84%). About 9% of the Forest trees are over 105 years old. The age of a stand can be considered an average as it is usually estimated from trees representative of the majority of the stand. Many stands include multiple age classes depending on previous harvest or natural disturbances. There may be individual trees in a stand either older or younger than the given stand age. These figures are for all management prescriptions and forest types.

Need For Change

There is a need to update standards and guidelines to address silvicultural and resource protection methods. The following items need to be reviewed, and possibly modified, during Plan revision:

- Size of even-aged regeneration units – The maximum size of any even-aged regeneration unit is 25 acres in the 1986 Plan, although NFMA allows a maximum of 40 acres. There are provisions for exceeding this size; however it may be desirable to change the Forest Plan. Average unit size for the past 18 years has been about 15 acres. Wildlife habitat fragmentation concerns may be addressed by having fewer but larger regeneration harvest openings.

- Spacing of even-aged regeneration units – The 1986 Forest Plan standard is 1/8 of a mile between even-aged regeneration harvest units. The area between units should also be a manageable stand of trees. If the current trend of small-sized regeneration harvest units is likely to continue, then having the flexibility to group small harvest units closer to reduce edge effects may be desirable.

- Shape of even-aged regeneration harvest units – The 1986 Forest Plan (page 174) states that long, narrow clearcuts with an undulating perimeter are preferred. This guidance may not still be applicable given the current knowledge of wildlife habitat needs.

- Definition of openings – An opening is currently defined as a harvest area where the vegetation is less than 20% of the height of the surrounding vegetation by the 1986 Forest Plan. We may want to clarify terms used in the Forest Plan to differentiate between a temporary opening of a regeneration harvest unit and the grass and forbs dominated openings generally considered permanent or semi-permanent and created for wildlife habitat.

- Percent of size classes – If the size class guidelines for MP 3.0 areas are not being met, rotation ages may need to be adjusted.

- Frequency of entry – Vegetative management is not occurring as frequently as allowed, mostly because of the time to prepare NEPA documents and analysis, more appeals of decisions, and the longer time to complete timber sales. The implication of these delays needs to be examined and guidelines modified to consider these effects. The definitions of quiet time and major projects also need to be clarified or adjusted.

- Clearcutting as the normal regeneration harvest method – For reasons previously noted, clearcutting has not been the main even-aged regeneration harvest method for many years. The sections of the Plan where silvicultural systems are described need to be updated.

- Grapevine management – Grapevine management guidelines need to be evaluated for increased flexibility. Grapevine management was an issue in the development of the 1986 Forest Plan, is it still a concern of the public? Grapevines damage regenerating stands of young trees and some areas have not been regenerated because grapevines could not be treated before harvest. Are the effects to wildlife habitat greater if localized grapevines are lost or if mast-producing trees are not regenerated?

- Rotation ages – Current science should be reviewed to confirm appropriate rotation ages for tree species. For example, in MP 3.0 areas, should rotation ages be based on maximum age of tree species, or when loss from mortality is unacceptable, or when economic loss becomes unacceptable, or based on wildlife species needs?

- Age class distributions – Management direction may need to take into consideration that the distribution of age classes may vary depending on the ecological setting of an area.

Changes Under the Revised Forest Plan

The direction on size restriction (25 acres maximum) of even-aged openings has been removed in the Revised Forest Plan, allowing the Forest to default to regional and national standards (40 acres maximum, unless Regional Forester approval is obtained). Although it is expected that most even-aged openings would remain relatively small, the elimination of the 25-acre restriction provides more flexibility at the project level to address wildlife and ecological concerns.

The direction on spacing of even-aged openings has been carried forward into the Revised Plan and combined with the definition of openings. It was felt that these were important considerations, not only from a vegetation management perspective, but also to provide for wildlife security and travel.

The direction on the shape of even-aged harvest units was changed to a guideline in the Revised Plan that focuses on areas of visual concern.

Size and age classes were not addressed through rotation ages in the Revised Plan. In fact, 1986 Plan rotation age requirements were dropped to provide more flexibility for vegetation management. One reason is that most management that occurs in the next couple of planning periods is only going to affect one size/age class, due to the current even-aged nature of forest stands. Age classes are addressed by desired conditions in the revised Plan. If younger size or age classes are desired on suitable timber land, they can be achieved through regeneration harvest, now that management is not constrained by rotation ages. If older size or age classes are desired, they can be achieved through natural succession over time on unsuited lands where commercial vegetation management is constrained or prohibited (wilderness, recommended wilderness, backcountry recreation, special areas, channel/wetland buffers, listed species habitat, etc.). Rotation ages can be more appropriately applied to individual stands at the project level through site-specific silvicultural prescriptions.

Frequency of entry is described for management prescription areas where timber harvest may occur. The quiet time and major project restrictions in MP 6.1 were replaced in the Revised Plan with one standard that limits the overall disturbance in a prescription area unit of the planning period. This change is designed to increase management flexibility while providing for wildlife security over time.

Clearcutting is no longer referred to as the "normal" cutting method for any prescription in the Revised Plan. It has to be the optimal method for the situation in which it is being applied.

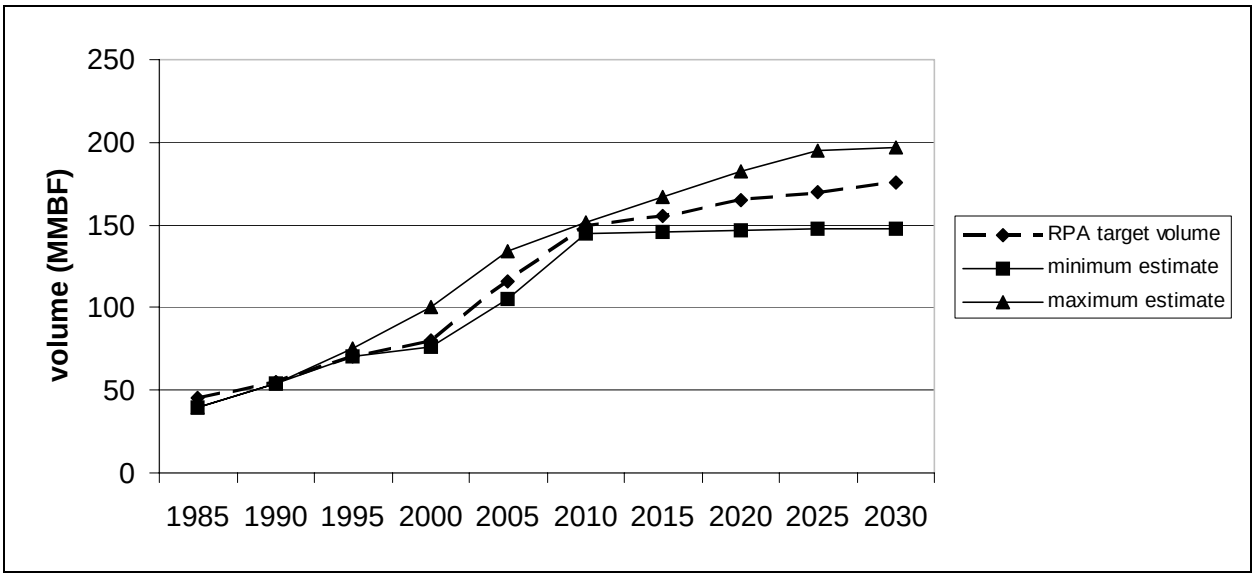
Timber Production

For 1986 Forest Plan, a group knowledgeable of the timber markets in the state met to estimate future demands. The group represented the Monongahela National Forest, the West Virginia Division of Forestry, and the Research and State and Private branches of the USDA Forest Service. Of interest for this Plan revision are the group's basic assumptions on timber markets and demands.

Essentially, the group agreed with the Regional Plan RPA (Resources Planning Act) target and felt that within 50 years from 1982, the timber industry would be using 60 to 80% of the annual growth. Figure 1 is an approximation of the timber demand projected by the group in 1982.

All the group's assumptions were reviewed to determine if they have come true, continue to be logical assumptions, or whether conditions have changed such that they no longer apply. The group admitted to taking an optimistic viewpoint based on the fact that the wood products industry in the state has adjusted dramatically to supplies over the past century. Below are the group's basic assumptions and discussion about whether the assumptions held true:

Figure C-1. Timber Demand Projections for the Monongahela National Forest



1. The current state of the National's economy will not persist and a 2.5% to 3.5% annual increase in the gross national product (GNP) can be expected.

In 1991, the U.S. Department of Commerce, Bureau of Economic Analysis began using gross domestic product (GPD) to describe the United States economy in place of GNP. GDP and GNP are generally similar numerically; GDP measures production in the US no matter who produces it and GNP measures production by US citizens regardless of where they are. According to the Bureau of Economic Analysis, the GDP increased and average of 3% per year from 1986 to 2002 based on chained 1996 dollars. This assumption held true.

2. Total integrated harvesting and milling operations will become more commonplace. The technology for an integrated mill is currently available and will improve over time.

From conversations with people knowledgeable of the wood industries in the state (Steve Milauskas, personal communication, Baumgras, et al. 2003), total integrated harvesting and milling operations have not become commonplace in West Virginia.

3. Current utilization standards will change from a fixed top diameter to use of the total tree.

Utilization standards for the Forest have not changed to include whole tree harvesting. Generally whole trees or the tops of trees (if removed from the harvest unit) are utilized as chips. The Forest is not offering sales for bid based on any demand or utilization of chipped wood. Based on conversations with people knowledgeable of the wood product industry in the State, there is not likely to be a demand for whole tree harvesting. The greatest value in West Virginia hardwoods is in the bole. Processors of engineered wood products are often species specific in their preferences and high-density species such as oaks are not desirable for these products. It is unlikely that whole tree harvesting will become common in Appalachia, unless the United States reverses the trend of declining domestic paper production, or implements policies favoring biomass fuels. Also, the topography of the Monongahela does not favor

high-tech or whole-tree logging systems, and with the emerging concern of soil nutrient loss through acid deposition, there is a growing recognition that tops and limbs high in calcium should be left on site where there is a demonstrated need.

4. There will be a gradual shift from emphasis on quality sawlog production/demand to wood fiber thereby making smaller diameter trees more competitive.

Smaller trees and smaller wood from the tops of larger trees are more often utilized than in the early 1980s. At the writing of the 1986 Forest Plan, there was little market for pulpwood. There is now an oriented strand board plant within trucking distance of the Forest. The hardwood industry in West Virginia is more diversified than other sates including markets for pulp, veneer, dimension lumber, oriented strand board, plywood, and laminated veneer lumber. As the trees on the Forest age, and since high-grading has not occurred, it is predicted we are heading into a period of high quality hardwood products (Luppold, personal communication). However, the highest value logs pay their way out of the woods. Consideration of lower grade material is secondary when determining sale economics but could add to the perceived value of a sale if economical end uses are present. Smaller diameter trees will not become more "competitive"; on steep terrain where high-tech processors cannot be used effectively, small trees cost more to harvest than do large trees.

5. Exports of wood fiber from the eastern one-half of the USA to Europe will increase. The USA may eventually become a net exporter of wood fiber products.

Exports of hardwoods from the eastern half of the United States to Europe have increased and the eastern United States is a net exporter of hardwood lumber. The United States continues to be a net importer of wood, but in 2000 was the third largest exporter of hardwood logs (www.bea.doc.gov). Asia has become the largest exporter of hardwoods in the world. This was probably not predicted when the Forest plan was written. Exports of high quality hardwoods from the eastern United States are expected to increase (Luppold, Milauskas, personal communication). For softwood wood fiber, there has been a decline in the amount of domestic wood consumed by the pulping industry in the northeastern United States. The United States as a whole will likely never be a net exporter of wood products (Baumgras 2003).

6. More wood will be substituted for other materials such as steel, aluminum, etc., due to its low energy costs to produce.

There is some market share pressure on wood in residential construction (from steel) and decking (from plastics). However, there are efforts underway to increase use of wood, particularly engineered wood products, in nonresidential building construction. The trend of lumber made from either recycled plastic or wood waste mixed with plastic was probably not considered when the Forest Plan was written. Demand for plastic and wood-plastic composite materials in U.S. construction is predicted to grow nearly 13 percent annually through 2006 (www.freedonia.ecnext.com/coms2/ summary_0285-228282_TM). The niche for Appalachian hardwoods in general, and West Virginia hardwoods in particular, seems to be the continued production of high quality hardwood lumber for applications not easily substituted by aluminum and steel.

7. The shift of the wood industries from the West to the Southeast and Atlantic seaboard states will continue.

The Southeast and Atlantic seaboard states are contributing more to the Nation's wood supply as the volume of harvests decline from western National Forests. The distribution of ownership of timberlands is not uniform across the country. In 1992, 55% of the industrial timberlands were in the South (Virginia to Texas and Oklahoma) and 23% in the North (Maine to Maryland to Missouri to Minnesota). Non-

industrial private timberlands are heavily concentrated in the East, with more than 87% in the eastern half of the country. About 75% of national forest timberlands are west of the 100th Meridian (Powell et al. 1994). With this distribution of ownership, the relationship to declines in federal timber harvests in the West and increases on industrial lands in the South and North is expected and likely to continue.

8. The taxing structure on private timber lands will become less favorable thereby placing greater demands for the public lands to produce timber, especially large quality sawlogs which require longer rotations.

The taxing structure of private lands has not become less favorable to timber harvest or forest management (Milauskas, personal communication), and greater demands have not been placed on public lands to produce large quality sawlogs. There are tax incentives in place for private landowners wishing to use the State's Forest Stewardship program. However, as practices such as diameter limit and logger's choice continue on private forest land, the number of high quality sawlogs will decline. Even though demand for large diameter, high quality timber may increase and much of this timber is on the Monongahela National Forest, most industry owners do not expect much of this wood to be available for harvest (Baumgras 2003).

9. Wood fiber processing technology will continue to improve thereby making such processes as press drying, flake board, oriented stand board, etc., very competitive.

This assumption came true for the region and the State. Two OSB plants are operating in the State, one within trucking distance to the Forest. It is likely that the State will see greater production of these types of products.

10. Wood for energy (fuelwood) will not play a big role regarding demand from NFS lands because of limited urbanization and apparent adequate supplies from private lands.

The Monongahela National Forest has not seen a significant removal of fuelwood. However, the relationship described in the assumption is confusing. Rural households are more likely to use fuelwood in large amounts for heating, as opposed to urban households.

11. Timber demand is at fair market price levels. At other price levels it may be different.

This assumption still holds true. At any given market price (assuming no price distortions) the quantity supplied will be in long-term equilibrium with the quantity demanded. Shifts in supply and/or demand can cause price fluctuations resulting in new equilibriums (Baumgras 2003). In effect, this assumption is more a general statement on the timber market than an assumption.

The Forest Plan estimated timber production by year for 10-year periods. For the first 10 years, the Forest Plan estimated a maximum of 57.1 million board feet (MMBF) could be harvested (see page 46). An estimated 57.9 MMBF was projected for the second 10-year period, and a maximum of 60.1 MMBF was projected for the third 10-year period, which has just begun.

Table C-6 shows the volume of commercial timber products offered for sale, sold, and harvested for fiscal years 1987 through 2005. The volumes differ because some portion of the sold volume in any fiscal year may have been offered in a previous fiscal year or harvested in a succeeding year. These volume figures exclude the volume of timber products sold through the permit system. These figures represent the volume of timber products sold through sealed bid and removed under timber sale contracts.

Table C-6. Timber Volume (MMBF) Offered, Sold, and Harvested by Fiscal Year from the MNF

Fiscal Year	Volume Offered	Volume Sold	Volume Harvested
1987	34.3	30.0	36.0
1988	40.1	36.0	50.7
1989	40.5	39.0	36.9
1990	39.1	34.0	28.3
1991	39.0	39.0	36.4
1992	38.7	35.4	36.6
1993	30.0	30.0	33.5
1994	32.8	26.7	20.9
1995	29.7	25.6	22.1
1996	15.2	12.2	28.3
1997	17.0	12.7	25.2
1998	14.6	9.9	24.5
1999	0.9	9.6	24.2
2000	15.2	3.9	13.9
2001	13.9	13.2	7.5
2002	2.0	12.8	7.8
2003	0.9	2.1	11.7
2004	1.1	2.1	9.0
2005	12.6	8.4	8.2

As the Forest Plan has been implemented, some land designations made in the Forest Plan have been determined to be not entirely appropriate. For example, some land designated as MP 3.0 on which the production of timber products is to be emphasized, support populations of threatened and endangered species, or are underlain by sensitive soils, or have limited access. All of these limitations on the commercial production of timber were not considered when the Forest Plan Allowable Sale Quantity (ASQ) was set. Land allocations will be reviewed in Forest Plan revision, and these concerns need to be considered. Objectives will be developed for management on both suited and unsuited lands.

The Forest Plan's final "timber base" of 331,160 acres was expected to remain constant regardless of any increase in the size of the Forest (e.g. via purchase), and would be the total acreage of the Forest that would be managed for timber over a 200-year period. Provided Forest Plan standards and implementation remain constant, the maximum volume of timber potentially available to industry, the ASQ, was expected to change each decade as the average volume per acre increases as stands mature. The ASQ provided in the first decade of the Forest Plan (1987-1996) was 43 MMBF per year, less than the projected 57 MMBF because there was no market at the time for the large volume of small timber. ASQ in the current decade (1997-2006), under constraints of the 1986 Forest Plan, is about 48 MMBF per year. Again this is less than the projected 57.9 MMBF because of a projected lack of market for small timber. Projected ASQ on the 331,160 acres was expected to increase gradually over the first five decades and then stabilize for a long period at an annual rate of 77 MMBF per year on the 331,160 acres of timber base. At the end of the first 200-year rotation, the long-term sustained yield of timber under the Forest Plan was projected to be approximately 85 MMBF per year.

Need For Change

There is a need to re-visit suitable lands determinations, revise supply estimations, and recalculate ASQ based on the changes noted above.

Changes under the Revised Forest Plan

Timberland suitability and ASQ have been assessed and updated for Forest Plan revision. See the Timber Supply section of Chapter 3 of the EIS. Spectrum modeling to achieve desired vegetation conditions given certain known constraints indicates that the ASQ is 10.5 MMCF or 63 MMBF per year. This amount represents the maximum amount of timber production that may occur in any given year, rather than the actual amount of production that will occur, which can be influenced by such factors as budget, personnel, appeals, litigation, natural events, or shifting Forest priorities. As seen in Table C-5, the actual amount of timber offered, sold, or harvested can vary greatly depending on many variables.

The Total Sale Program Quantity, or TSPQ, represents both the maximum amount of timber projected on suited timberlands (ASQ), plus the maximum amount of timber that could be produced on lands not suited for timber production. This latter amount is derived from Forest Plan objectives (Forest-wide objective VE03 and MP objectives 6136 and 4107) for vegetation management to enhance Indiana bat habitat and spruce/hardwood ecosystem restoration on 4,000 to 12,000 acres over the next decade. Using a combination of silvicultural treatments (thinning, uneven-aged, shelterwood, two-aged), the Spectrum model estimated that a maximum of 2.17 MCF of timber per acre may be produced. From a maximum of 12,000 acres treated, a projected maximum of 26,000 MCF per decade could be produced, or about 15.6 MMBF per year. Added to the ASQ, this amount would contribute to a modeled annual maximum of 13.1 MMCF or 78.6 MMBF of TSPQ that could be produced. As noted above, the actual amount produced will depend on many variables.

SOIL, WATER, AND AIR

The Monongahela National Forest was established in 1920 with about 7,200 acres of land purchased through the Weeks Act. This Act authorized the purchase of land for long-term watershed protection and natural resource management following massive cutting of the Eastern forests in the late 1800s and at the turn of the century. Today the Forest has over 919,000 acres of public lands in 10 counties in West Virginia, making it the fourth largest National Forest in the 20 northeastern states.

The Forest is unique in that it contains the headwaters of five major river systems; the Monongahela, Potomac, Greenbrier, Elk, and Gauley. Twelve rivers on the Forest are considered eligible for potential inclusion in the National Wild and Scenic Rivers System. In addition, the Monongahela has 129 miles of warm water fishing and 576 miles of trout streams. About 90% of the trout waters of West Virginia are within the Forest.

The soils of the Monongahela National Forest are developed under a mesic climatic temperature regime where annual air temperatures are 48 degrees Fahrenheit and a soil and moisture regime where annual precipitation is 58 inches. The parent material that underlies the soils is comprised of sedimentary geology that makes up the Appalachia Ridge and Valley and the Allegheny Plateau.

The Forest lies near the industrial heart of the United States. It is within a day's drive of a large percentage of the United States population, and is surrounded by a high concentration of coal-fired electrical power production facilities; the leading source of sulfur dioxide (SO2) and nitrogen oxide (NO4) emissions. This network of coal-fired electrical power plants includes the generally defined "Ohio River Valley" and Tennessee Valley Authority (TVA) sources. Emissions created by the power plants, in combination with the population's use of fossil fuels, have a substantial impact on Forest air quality.

We strive to continue the tradition of watershed protection, restoration and stewardship that began on this National Forest over 80 years ago.

The health of the aquatic ecosystem across the Forest has been heavily influenced by the extensive clearcutting that occurred during the turn of the 20th century. Construction of railroads doubled in the 1880s and then doubled again in the 1890s, allowing access to and transportation of the timber resource. As a result, much of what is now the Monongahela National Forest had been clearcut by the late 1920s. Watershed and stream channel conditions still exhibit a number of impacts associated with the extensive logging that occurred.

Stream ecosystems continue to suffer from limited large woody debris, elevated sediment levels, and effects from substandard roads located within close proximity to stream channels. Recovery from the impacts of activities at the last turn of the century is a long-term process.

In 1994, the Forest adopted interim guidelines for managing riparian areas. The interim guidance established a riparian area strip width for perennial, intermittent, and ephemeral streams, lakes, and impoundments and wetlands. It also defined the management of the riparian area strip with respect to timber removal. The interim guidelines were established to give more protection to the aquatic resource and make the standards easier to implement.

A Riparian Working Group was formed in 1999 to address issues relating to riparian area management, watershed protection, and restoration. The group determined that riparian dependent resources were not being adequately protected with either the Forest Plan direction or the interim guidelines. New riparian management guidelines were developed to address the deficiencies. These new guidelines focused primarily on headwater channel protection, channel stability, large woody debris recruitment, and basal area retention. The 1986 Forest Plan was not amended to include these guidelines. Instead, the Forest applied these site-specifically as ground conditions warranted.

The primary effect of the new recommendations is that more protection is given to smaller intermittent and all ephemeral streams. These recommendations help protect the critical headwater channels form loss of stability, down cutting, and sedimentation.

The soils on the landscape of the Forest have been subject to the effects of excessive cutting and burning. This resulted in damaging floods, severe erosion, topsoil loss, and pollution of streams used for water supply. Severe fires further increased erosion. The fires at the turn of the century burned so hot that soil carbon was lost to the atmosphere and soil productivity in some areas on the Forest was irretrievable. Although there has been some recovery for the soil resource in the past century, many soils on forested landscapes on the Forest still have thin surface horizons and in some areas remain non-existent.

The 1986 Forest standards and guidelines for soil protection mainly center on soil disturbance, which could lead to erosion and the resulting sedimentation of streams. Soil erosion and sedimentation, and protection of water quality were the two primary concerns of the soil resource in the 1986 Forest Plan. However, soil erosion is still a significant issue at present. Data from recent water quality monitoring for sediment levels in streams on the Forest reveals that many streams have high levels of sediment.

Soil productivity is emphasized in the Forest Plan through direction that calls for fertilization and liming of disturbed soils (p. 79 and Appendix S). However, there is no reference to undisturbed soils that may be affected by base cation depletion that could result in loss of soil productivity. Also, the fertilization and liming practices are directed at reestablishing vegetation to prevent erosion or soil movement from the disturbed site, and not at benefiting growth of existing vegetation.

Historically high sulfate (SO^4) deposition from sources in the Ohio River Valley has contributed to acidification of streams and could affect soil productivity on parts of the Forest. In fact, research

scientists have found evidence of nutrient depletion occurring in certain soils on the Forest. Sulfates are also primary contributors to visibility impairment or regional haze.

Although the 1986 Forest Plan acknowledges these issues and provides for air pollution effects monitoring, new information indicates that acid deposition may be affecting soil productivity and water quality. Since the Plan was written we have more data showing that acid deposition may be affecting the base cation status of sensitive soils on the Forest.

Need For Change

Key elements of the current 1999 riparian management standards and guidelines need to be incorporated into the revised Forest Plan. There is concern that the riparian management guidelines developed in 1999 are still difficult to implement on the ground. Distinguishing between different channel types in the field is often difficult even for hydrologists. Seasonal variations in flow and leaf cover are two factors that can influence channel identification. An error in the identification of channel type could result in a lower level of protection than is required by the guidelines. The basal area requirements in the guidelines may also need to be revisited. There is an opportunity to make riparian management guidelines easier to understand and implement.

Under the 1986 management direction, the level of woody debris in streams across the Forest is recovering at a very slow rate. The need for woody debris in the streams remains high. Riparian Management direction needs to address this issue in order to help streams recover. With increased knowledge over the past two decades about the importance of woody debris in streams and aquatic ecosystems, this revision provides an opportunity to re-evaluate our management direction for streamside zones. In addition, Geographic Information Systems (GIS) technology provides an opportunity to determine how changes in management will impact streams as well as timber production.

The 1986 Forest Plan does not address the issue of acid deposition. Plan Revision gives us the opportunity to look at areas that are highly susceptible to impacts caused by acid deposition and to develop management direction to address and minimize these impacts.

There is regional interest in soil productivity relating to atmospheric deposition and carbon cycling. Experiment stations and universities desire to continue cooperation for mutual benefit. The Forest is involved with numerous cooperators in a bio-complexity proposal on the issue of sustainability. Current science on soil nutrients, especially calcium, does not appear to support short rotation, whole-tree, biomass harvest on the Forest. The Forest does not allow whole-tree harvest; however, short rotation is a concern because it more rapidly takes calcium off-site than the traditional 90-120 year rotation where clearcutting is applied. The bole, bark, and roots of a tree represent about 50% of the calcium; leaves about 3%; and limbs and tops about 40%. These impacts need to be considered in the larger environmental setting, including other resource impacts.

Opportunity in Forest Plan Revision exists to address these concerns and to provide for monitoring soil productivity in relationship to base cation depletion and timber harvesting. Revision efforts should center on formulating a methodical approach to assessing risk, providing mitigation, and monitoring this issue.

Changes under the Revised Forest Plan

Revised Forest Plan direction expands desired conditions and goals for the soil, water, and air resources in order to better address restoration, maintenance, and improvement of resource conditions. The Revised

Plan also includes objectives to restore aquatic and riparian habitat, and to decommission roads, both of which should help improve watershed conditions during the planning period.

Key elements from the 1999 interim guidelines were incorporated into Revised Forest Plan direction. More flexibility was also provided to adjust to variable on-site conditions. Basal area requirements were replaced with explicit direction as to when and where it is appropriate to manage vegetation within channel and wetland buffers. These buffer areas are not considered part of the suitable timber base, and the general lack of programmed harvest within them should provide for large woody debris.

Key elements for the 1986 Plan, including Appendix S, were incorporated into Revised Forest Plan direction for the maintenance of soil quality and productivity.

The revised Forest Plan provides management direction and a monitoring strategy to address the potential effects of acid deposition on soil nutrient depletion.

BENCHMARKS

Benchmark analyses are included as part of the Analysis of the Management Situation (AMS). The purpose of the AMS is to "*provide a basis for formulating a broad range of reasonable alternatives*." The benchmarks define the range within which alternatives can be constructed. Hence, there is an emphasis on minimum and maximum conditions for national forests, e.g., minimum level of management, maximum timber potential, etc… Benchmarks themselves do not constitute alternatives since alternatives attempt to integrate management of all resources, and benchmarks do not.

Benchmarks approximated economic and biological resource production opportunities and were useful in evaluating the compatibilities and conflicts between individual resource objectives. The 1986 Forest Plan benchmarks were considered sufficient for some resources—including recreation and range—for the following reasons:

- Outputs and activities have not changed dramatically from 1986 projections.
- Outputs and activities are not projected to change dramatically in the next planning period.
- 1986 benchmark ranges were sufficiently broad in scope to address projected changes.

The following three benchmarks were re-analyzed during plan revision:

1. Minimum Level Management
2. Maximum Timber Production
3. Maximum Net Present Value

Minimum Level Management - The minimum level management benchmark defines actions needed to maintain and protect the unit as part of the National Forest System. The benchmark focuses on base levels of management sufficient to protect resource integrity; thus, outputs are possible but incidental in nature.

Minimum level management objectives were:

- Protect the life, health, and safety of incidental users,
- Protect against land and resource damage from and to adjoining lands of other ownership,
- Conserve soil and water resource,
- Prevent significant or permanent impairment to the productivity of the land,
- Administer unavoidable, non-Forest Service special uses and mineral leases, licenses, permits, contracts, and operating plans.

For the minimum level management benchmark, no scheduled harvesting activities occurred and vegetation followed natural succession. Developed campgrounds were closed, and maintenance was only for those facilities needed to support basic ownership activities. Dispersed recreation (hiking, hunting, fishing, etc…) was not promoted but was allowed. Cultural resources were identified and protected when being impacted by other resource activities.

The primary purpose of this benchmark was to develop a baseline for subsequent analyses and to be a building step for alternatives. Consideration of the objectives stated above aided in the development of resource management standards and guidelines.

Maximum Timber Benchmark - The maximum timber benchmark estimates the maximum physical and biological production of timber together with costs and benefits. There is no requirement to consider cost efficiency. The NFMA regulations, at 36 CFR 219, outline minimum specific management requirements to be met in accomplishing goals and objectives for a national forest. The requirements guide the development, analysis, and eventual implementation and monitoring of forest plans. The requirements set forth guidance on resource protection, vegetation manipulation, silvicultural practices, riparian areas, soil and water, and diversity of plant and animal communities.

A series of assumptions were used to define the analysis conducted with Spectrum:

- Objective function was maximum timber for ten periods
- All tentatively suitable lands were available for scheduling
- Harvest of existing stands occurred no earlier than Culmination of Mean Annual Increment
- Base sale schedule cannot exceed long-term sustained yield capacity
- No demand limitations placed on timber production.

Several key results of the maximum timber benchmark were:

- 753,000 tentatively suitable acres were allocated to timber production
- The long-term sustained yield capacity of 43 MMCF/year (258 MMBF/year) was never reached in the planning horizon
- Sale schedule for the first five decades.

Table C-6. Maximum Timber Benchmark Sale Schedule

Indicator	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Volume (MMCF/year)	41	41	41	41	41
Volume (MMBF/year)	246	246	246	246	246

Maximum Net Present Value (NPV) Benchmark - The maximum NPV benchmark estimates the maximum net present value of those resources having an established market or assigned value. Cost efficiency and revenue maximization are the focal points of this benchmark. Similar to the maximum timber benchmark, minimum management requirements are considered in formulating the model.

A maximum NPV benchmark was completed for the timber resource. A maximum NPV benchmark for minerals was not completed. The USDI Bureau of Land Management is responsible for issuing and administering federal mineral leases on NFS lands. Because the Forest cannot predict the nomination of areas for leasing, it is not possible to schedule the regulated production of mineral resources from the Monongahela.

The assumptions used for this analysis were similar to those for the Maximum Timber Benchmark. Results are shown in Table C-7

Table C-7. Maximum Net Present Value Benchmark Sale Schedule

Indicator	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Volume (MMCF/year)	40	40	40	40	40
Volume (MMBF/year)	240	240	240	240	240

REFERENCES

Baumgras, J., M. Bumgardner, B. Hansen, W. Luppold. 2003. Reply to MNF timber demand assumptions, August 25, 2003. Unpublished.

Emery, M.R., C. Ginger, S. Newman, and M.R.B. Giammusso. Special forest products in context: Gatherers and gathering in the eastern United States. USDA Forest Service, Northeastern Research Station. General Technical Report, NE-306.

Kolb, T.E., M.R. Wagner, and W.W. Covington. 1995. Forest health from different perspectives. In: Eskew, L.G., comp. Forest health through silviculture; proceedings of the 1995 national silvicultural workshop. General Technical Report RM-GTR-267. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Luppold, William. 2003. Personal communication with Melissa Thomas-Van Gundy regarding the hardwood industry in West Virginia, including estimates of demand and prices.

Mielke, M.E., C. Haynes, and W.L. MacDonald. 1982. Beech scale and *Nectria galligena* on beech in the Monongahela National forest, West Virginia. Plant Disease. 66:851-852.

Milauskas, Steve. 2003. Personal communication with Melissa Thomas-Van Gundy regarding the hardwood industry in West Virginia, including estimates of demand and prices.

National Forest Visitor Use Monitoring National and Regional Project Results, September 2002

Studlar, S.M. 2003. Moss harvest in West Virginia: Target species and incidental take. Unpublished Report submitted to Monongahela National Forest.

USDA Forest Service, Monongahela National Forest. 1990. Selection, designation and management of old growth. Unpublished report.

West Virginia Division of Tourism, 2002, Annual Report