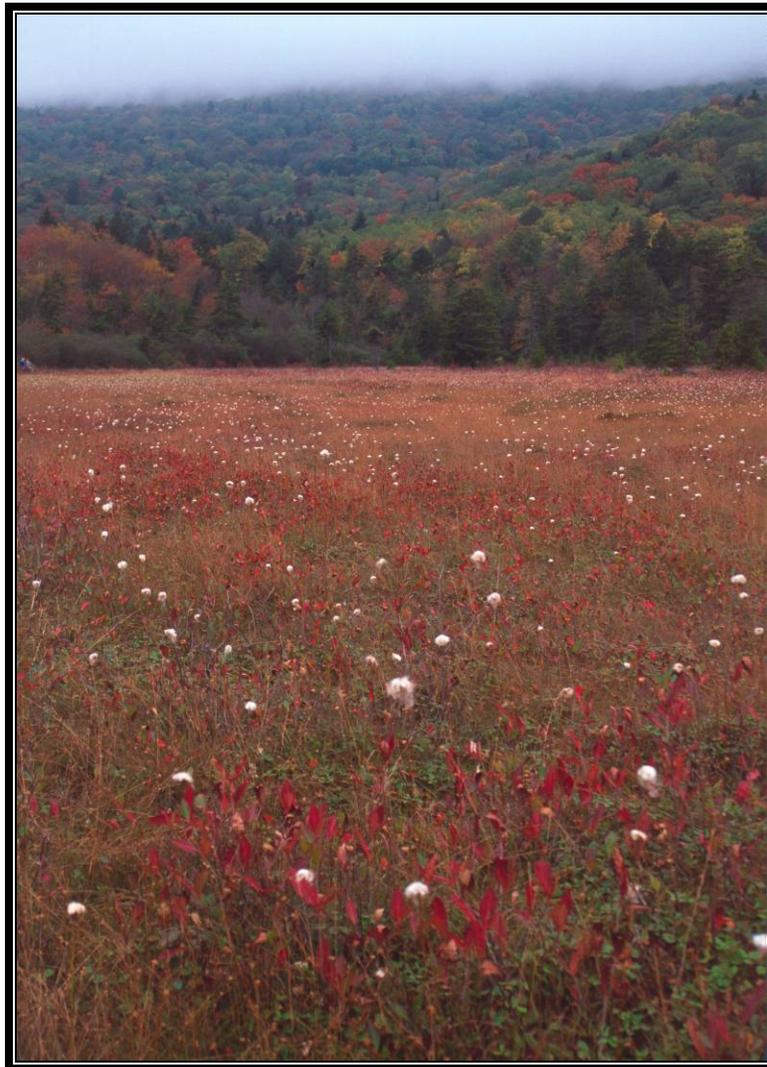


**Monongahela National Forest
Monitoring and Evaluation Report
For Fiscal Year 2010**



August 2011

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Cover photo: Cranberry Glades Ecological Area, by David Ede

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We would also like to thank our cooperators and partners who provided valuable monitoring information for this report, including West Virginia Division of Natural Resources, USDA Forest Health Protection, and USDA Northern Research Station.

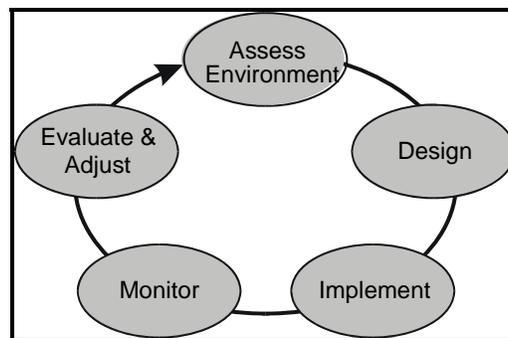
Purpose and Scope of This Report

Background

Land management is an adaptive process that includes social, economic, and ecological evaluations of conditions and trends that contribute to sustaining social, economic, and ecological systems. The Monongahela National Forest (Forest) is committed to collaborating internally and with other land management partners to provide highly credible resource information that meets a wide range of needs. Credible information requires inventory, monitoring, and evaluation activities that are appropriate, consistent, and effective.

Monitoring and evaluation are separate, sequential activities. Monitoring involves collecting data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. Information gained from monitoring and evaluation is used to determine how well the desired conditions, goals, objectives, and outcomes of the Forest's Land and Resource Management Plan (Forest Plan) have been met. Monitoring and evaluation keep the Forest Plan up-do-date and responsive to changing conditions and issues, and provide the feedback mechanism for adaptive management (Figure 1). The results are used to identify if and when changes are needed to the Forest Plan or the way it is implemented.

Figure 1. An Adaptive Management Learning Loop



The Forest has been monitoring and evaluating costs and resource conditions since the release of the 1986 Forest Plan, and it has produced an Annual Monitoring Report for many of those years. The last report was completed in 2010 for activities that occurred in Fiscal Year (FY) 2009. The 1986 Plan was replaced by a revised Plan in 2006. The 1986 and 2006 Plans are similar in many aspects, but there are also many differences. Chapter IV of the 2006 Forest Plan contains some monitoring items that are virtually the same as items found in the 1986 Plan, either because they are required by law or agreement, or because they are long-term or ongoing items that are monitored periodically to show trends in effects or conditions. However, the 2006 Forest Plan has other monitoring items that are either new or represent a significant changes compared to monitoring that was done in the past. These new or different items are reflective of new management direction, shifts in management emphasis, or are in response to lessons learned

from previous monitoring efforts. All of the 2006 Chapter IV monitoring items were developed by an interdisciplinary team during Forest Plan revision, and they have undergone public review and input through the plan revision process.

Monitoring Types and Legal Requirements

The Forest Plan has several types of monitoring that generally fall into four broad categories:

- Category 1: Required monitoring items related to the National Forest Management Act,
- Category 2: Attainment of goals and objectives,
- Category 3: Implementation of standards and guidelines, and
- Category 4: Effects of prescriptions and management practices.

Category 1 monitoring items are mandatory components of the Forest Plan, derived from the National Forest Management Act, and tiered to requirements found in planning regulations at 36 CFR (Code of Federal Regulations) 219. For the 1986 Forest Plan, these items include:

- Comparing outputs/services with those projected in the Forest Plan [219.12(k)(1)].
- Comparing actual management costs in relationship to estimated costs [219.12(k)(3)].
- Document measured prescriptions/effects, including significant changes in productivity of the land [219.12(k)(2)].
- Lands are adequately restocked as specified in the Forest Plan [219.12(k)(5)].
- Lands identified as not suited for timber production are examined at least every 10 years [219.12(k)(5)].
- Evaluate maximum size limits for harvest areas [219.12(k)(5)].
- Destructive insects/disease do not increase to potentially damaging levels [219.12(k)(5)].
- Monitor population trends in indicator species as a result of habitat changes (219.19).

Category 2 through 4 monitoring items are more flexible and are tailored to address issues raised through public comments and interdisciplinary team review, as translated into Forest-wide direction and management practices. These items are more likely to change through time as indicated through monitoring evaluation results and recommendations.

Not all of the results of these monitoring items are reported on an annual basis. For example, lands identified as not suited for timber production are typically reported for Forest Plan revision, which the Forest completed in 2006.

Monitoring Program

Many approaches to Forest Plan monitoring are currently being used throughout the agency. However, each monitoring program should: 1) meet the legal requirements of the planning regulations, 2) be consistent with corporate data standards and protocols, and 3) be developed through an interdisciplinary approach that addresses the ecological, social and economic dimensions of Forest management in an integrated manner.

To meet these objectives, the Forest's monitoring program has a number of components. First the Forest Plan must have direction that provides broad, strategic guidance for monitoring. This direction is found in Chapter IV in the 2006 Forest Plan.

Second, the broad, strategic direction in the Forest Plan should have an associated Monitoring Implementation Guide that provides specific, technical guidance on how the monitoring should be accomplished. The 1986 Forest Plan did not have such a guide. In its place, Forest program managers and specialists developed their own individual monitoring criteria and strategies. However, for the revised 2006 Plan a detailed Monitoring Implementation Guide has been developed. This Guide delineates information for implementing each monitoring item such as the specific monitoring to be done (what), the driver behind the monitoring (why), methodology (how), personnel (who), timing (when), location (where), data storage, costs, and priority. The Guide is not direction, but rather a tool that is intended to be as flexible as possible to allow for timely changes in order to increase the effectiveness of the overall monitoring program.

Third, an annual monitoring plan or schedule can be used to estimate activities for the current or upcoming fiscal year. This schedule can, in turn, be used in budget and work planning at the Forest and District levels, and to help keep the public apprised of our planned activities.

Fourth, the monitoring activities that occur on an annual or other regular basis need to be tracked and disclosed. The activities for FY 2010 are described in this Annual Monitoring Report.

Annual Monitoring Report

The FY 2010 Annual Monitoring Report provides an opportunity to track implementation of Forest Plan decisions and the effectiveness of specific management practices. This report summarizes monitoring and evaluation efforts that were conducted in FY 2010 for resources and conditions on the Monongahela National Forest. For each resource area, there is typically a list of accomplishments in FY 2010, followed by a more detailed description of the monitoring and evaluation that occurred. The monitoring and evaluation sections are generally divided into three parts: 1) a description of how the monitoring is linked to the 2006 Forest Plan, 2) a description of the monitoring that was done and the results from that monitoring, and 3) an evaluation of the monitoring, including any conclusions that were made and recommendations for changes to project implementation, Forest management direction, or future monitoring needs.

This report includes the Category 1 required monitoring items on pages IV-6 and IV-7 of the Forest Plan. Other monitoring items are addressed for the following resources: Timber Resources, Air Quality, Heritage Resources, Mineral Resources, Recreation Resources, Special Uses, Transportation System, Botanical Resources, Rangeland Resources, Wildlife Resources, and Aquatic Resources

Future reports may add, delete, change, or combine monitoring items found in this report. The overall goal of these changes is to have a program that we can refine and improve as we discover better ways to monitor and evaluate management practices and their effects on Forest resources.

Monitoring flexibility is an important part of adaptive management for the Forest. We believe that better monitoring leads to better practices, projects and decisions as public land managers.

Forest Plan Amendments and Administrative Corrections

There were no Forest Plan significant amendments in FY 2010; however, there were two one-time, project-specific amendments to the Plan in connection with issuing the Timberline Special Use Permit. In addition, the Forest completed two administrative corrections to the Plan. These corrections are summarized below:

- Changes to Management Prescriptions due to Congressional Wilderness designations (Correction #10).
- Changes to Forest Management Prescription map (Correction #11).

These corrections were posted on our internet and intranet websites to inform the public and our employees of these changes. They can be found in the “Forest Planning” section, under “Forest Plan Revision” at: <http://www.fs.usda.gov/mnf>. More corrections are planned for FY 2011, and they will be included in next year’s Annual Monitoring Report.

Public Involvement

Our monitoring reports are currently being posted on the Forest’s external and internal websites to provide recent information on our monitoring and evaluation activities. Changes to monitoring items or protocols will be posted on our websites as well. We hope to also include postings of the MIG and annual schedule in the near future, with hard copies or all three documents available on request. Additionally, we will be looking for ways to further involve the public and our partners in the Forest’s monitoring program.

Net Acres – Monongahela National Forest As of September 30, 2010 (By County and By District)

County	Acres	District	Acres
Barbour	11	Cheat	128,089
Grant	20,001	Gauley	158,525
Greenbrier	108,235	Greenbrier	245,777
Nicholas	23,858	Marlinton	135,981
Pendleton	82,038	Potomac	146,479
Pocahontas	310,896	White Sulphur	105,218
Preston	3,897		
Randolph	203,866		
Tucker	101,467		
Webster	65,800		
Totals	920,069	Totals	920,069

Outputs and Services

Introduction

Outputs and services are not only the results of Forest Plan implementation, but they also show our customers that we are accountable for doing what we say we will do. The Forest Plan is our contract with the public, and by fulfilling that contract we strive to build and maintain public trust, understanding, and collaboration with the Forest and our activities.

2010 Accomplishments

Forest accomplishments are directly addressed in the monitoring items covered below.

Monitoring and Evaluation

FOREST PLAN MONITORING ITEMS FOR OUTPUTS AND SERVICES

The 2006 Forest Plan includes one monitoring item for Outputs and Services on page IV-6. This item was reworded somewhat due to recommendations made in the FY 2007 Annual Monitoring Report and a subsequent Forest Plan administrative correction.

1. *How close are outputs and services projected for Forest Plan implementation to actual outputs and services?*

This monitoring item is derived from the NFMA requirement to compare how close we come to providing the outputs and services to the public that we project in our Forest Plan. There are a number of different ways to assess or report outputs and services generated by the Forest. This report will focus on the following indicators:

- 1) Target accomplishments that address program implementation in the Forest Plan,
- 2) Attainment or movement toward Forest Plan measurable objectives in resource areas such as vegetation, roads, trails, fire, wildlife, timber, and minerals.

Monitoring Question 1. How close are outputs and services projected for Forest Plan implementation to actual outputs and services?

Target Accomplishment Comparison

The first method used to compare projected and actual outputs and services is to look at the target accomplishments for FY 2010. Table OS-1 displays target accomplishments that were given to the Forest, the amount we planned to do, the amount we actually accomplished, and the difference between the original target and what we accomplished.

The accomplishments are related directly or indirectly to Forest Plan goals, objectives, or desired conditions. They do not account for everything we do as a Forest, but rather those items that were assigned a specific target by the Forest Service. Other accomplishments, such as aquatic passage restoration, are noted in the resource sections of this report.

Table OS-1. Comparison of Target, Planned, and Actual Accomplishments for FY 2010

Resource or Program Area	Accomplishment Description	Target Amount	Planned Amount	Actual Amount	Actual Difference from Target
Aquatic Habitat	Acres of inland lake habitat enhancement	38	38	38	0
Aquatic Habitat	Miles of stream habitat restored or enhanced	7	7	7	0
Botanical	Acres treated for noxious weeds and invasive plants	98	296	423	+325
Heritage	Number of priority heritage assets managed to standard	19	19	24	+5
Facilities	Number of Admin. facilities maintained to standard	39	39	42	+3
Fire	Acres treated to reduce risk of catastrophic wildland fire	3,847	3,040	3,841	-6
Lands	Number of title management cases resolved	5	5	6	+1
Lands	Miles of property line marked or maintained to standard	16	16	27.4	+11.4
Lands	Acres acquired through purchase or donation	1,500	1,500	449	-1,051
Lands/Sp. Uses	No. of land use authorizations administered to standard	58	58	75	+17
Lands/Sp. Uses	Number of land use proposals and applications processed	60	60	30	-30
Minerals	Number of geologic resources or hazards managed	2	2	2	0
Minerals	Number of mineral proposals processed	4	5	5	+1
Minerals	Number of mineral operations administered to standard	30	31	31	+1
Planning	Land Management Plan amendments underway	1	1	0	-1
Range	Acres of grazing allotments managed to standard	3,000	4,500	4,994	+1,994
Range	Number of grazing allotments with new NEPA decisions	4	8	0	-4
Range	Acres of rangeland vegetation improved	80	300	1900	+1,820
Roads	Miles of Forest system road decommissioned	2	27	24.8	+22.8
Roads	Miles of high clearance system roads improved	6	6	142	+136
Roads	Miles of high clearance system roads maintained	137	300	303	+163
Roads	Miles of roads improved	13	14.2	216	+203
Roads	Miles of roads maintained	647	953	1,487	+840
Roads	Miles of passenger car system roads improved	7	8.2	73	+66
Roads	Miles of passenger car system roads maintained	510	653	1,184	+674
Recreation	Acres of NFS lands covered by a motor vehicle use map	919,126	919,126	919,619	+493
Recreation	Number of recreation site capacities operated to standard	425,895	425,895	425,895	0
Recreation	Number of recreation sites maintained to standard	140	133	133	-7
Recreation	Miles of system trail maintained to standard	225	225	225	0
Recreation	Wilderness areas managed to minimum stewardship level	3	3	8	+5
Recreation	No. of recreation special uses administered to standard	38	38	37	-1
Soil and Water	Acres of soil and water resources improved	135	135	135	0
T&E Species	No. of T&E species with recovery actions accomplished	5	5	5	0
Timber	Volume (CCF) of regular timber sold	11,880	11,880	12,455	+575
Timber	Acres treated to achieve healthier stand conditions	124	124	54	-70
Vegetation	Acres of forest vegetation established	450	346	357	-93
Vegetation	Acres of forest vegetation improved	1,000	1,000	1,044	+44
Wildlife	Acres of terrestrial habitat enhancement or restoration	988	1,001	11,835	+10,847
Inventory	Acres of inventoried data collected or acquired	53,495	53,495	68,268	+14,773
Monitoring	Annual monitoring requirements completed	14	14	24	+10

Monitoring Question 1. Evaluation, Conclusions, and Recommendations for Accomplishment Comparison

As seen in Table OS-1, the Forest met or exceeded target accomplishments in 31 of 40 (78%) program areas in Fiscal Year 2010. Targets were exceeded in 24 of the 40 (60%) areas. Overall, targets were accomplished at an effective level. The areas where targets were not met were:

- Land Management Plan amendments underway,
- Acres treated to reduce risk of catastrophic wildfire,
- Acres acquired through purchase or donation,
- Number of land use proposals and applications processed,
- Number of grazing allotments with new NEPA decisions,
- Recreation sites maintained to standard,
- Recreation special uses administered to standard,
- Acres treated to achieve healthier stand conditions, and
- Acres of forest vegetation established.

Although there were a number of potential amendments to the Forest Plan in FY10, but none of them turned out to be necessary due to delays in litigation resolution (WVNFS delisting, RACR areas), and resolution of other Forest Plan concerns through administrative corrections (changes in Management Prescriptions due to wilderness designation).

For forest vegetation established, treatments to reduce wildland fire risk, and recreation sites maintained to standard, the target acre amounts exceeded the planned amounts, which were the amounts that we thought we could accomplish. In all of these cases, we accomplished as much or more work than we planned to do but still did not meet the target amount. These shortfalls may have been because the target amounts were unrealistic from the start, as opposed to our ability to accomplish work that we planned.

The large deficit in acres acquired through purchase or donation can be attributed to delays in purchasing one property called Thunderstruck. This large property (1,000+ acres) was complex to begin with, involving multiple tracts and owners, but the purchasing process was further complicated by a couple of changes in agency protocols last year that required new appraisals and additional work. This property is on schedule to be purchased in FY11.

The Forest accomplished 50 percent of the assigned 2010 target for Land Use Permits Processed. This shortfall stemmed from the following factors: 1) the 2010 target was 40 percent higher than the typical annual target even though funding and staffing actually decreased, 2) an increase in the number of complex and time-consuming permits to process, and 3) increased personnel time spent coordinating maintenance activities of existing Special Use Permits instead of authorizing new permits.

The Forest completed the NEPA analysis for 8 grazing allotments in the South Zone in FY10, but the decision for the NEPA EA was delayed at the request of the Regional Office until the first quarter of FY11. Thus, the FY10 Accomplishment Report shows a deficit of NEPA decisions in FY10, but the FY11 Accomplishment Report should show a corresponding surplus.

The small shortfall in administering recreation special uses was partly due to lower recreation funding that did not allow the Forest to hire as many seasonal recreation employees as we needed. This funding deficiency was felt in other aspects of recreation management as well. For example, even though we met the reduced target of 225 trail miles maintained, this amount was not as large as in years past and did not meet the Forest Plan objective of 425 trail miles maintained on an average annual basis.

The acres treated to achieve healthier stand conditions target was not met largely due to the way these acres are reported, as the portion of all treatment acres that are funded by CWK2 money. This portion is relatively small compared to the total funding we received and the total acres we accomplished for stand improvement, including tree thinning, crop tree release, and tree harvesting to improve age class distribution or to reduce insect and disease infestations.

Target accomplishment overruns can occur for a number of reasons. Sometimes the targets are set too low. Sometimes contract bids come in lower than expected and we can accomplish more for the same amount of appropriated dollars. Other times we receive additional funding or personnel help during the year so that we can accomplish more than we originally predicted. One example of this is the additional funding we received from the American Recovery and Reinvestment Act of 2009 (ARRA), which allowed us to greatly exceed targets for Acres of Rangeland Vegetation Improved, and road maintenance, improvement, and decommissioning.

Recommendations: Continue to apply for sufficient funding to meet Forest needs and objectives. Work with the Washington and Regional Offices to set realistic targets.

Forest Plan Objective Progress

Another way to look at Forest outputs and services is to examine how they may have contributed to measurable objectives in the Forest Plan. Table OS-2 describes these Forest Plan objectives and contributions that were made to achieving them in FY 2010.

Table OS-2. Progress toward Measurable Forest Plan Objectives in Fiscal Year 2010

Resource or Program Area	Forest Plan Objective	FY10 Progress Toward Objective
Fire Management	FM09 - Over the next 10 years use prescribed fire on 10,000 to 30,000 acres. Emphasize use in areas to reduce hazardous fuels and fire risk to property or investments, and/or in areas to maintain, restore, or enhance wildlife habitat or other ecosystem components.	An estimated 1,016 acres were treated with prescribed fire in FY10.
Vegetation	VE02 - Maintain or create age class diversity on suitable timberlands to provide for sustainable timber production and a variety of structure and wildlife habitat. Treat an estimated 20,000 to 40,000 acres over the next decade to move toward desired age class conditions.	An estimated 63 acres were treated with even-aged harvest in FY10 to move toward desired age class conditions.
Vegetation	VE03 - Treat an estimated 4,000 to 12,000 acres over the next decade on lands not suited for timber production to help restore ecosystems and enhance wildlife habitat.	An estimated 730 acres were treated in FY10 to help restore ecosystems or enhance habitat.

Resource or Program Area	Forest Plan Objective	FY10 Progress Toward Objective
T&E Species	TE30 - Provide a continuous supply of suitable roost trees by maintaining a minimum of 50 percent of each primary range on NFS lands in any combination of mid successional (40-79 years), mid to late successional (80-120 years), and late-successional (>120 years) age classes.	Because of Forest Plan Standards (TE23-TE25, TE33, TE35, TE36), no reduction in bat roost trees occurred in FY10.
Wildlife and Fish	WF07 - Reduce aquatic habitat fragmentation associated with the Forest transportation system by correcting 30-50 passage barriers, according to aquatic priorities, over the next 10 years. Correct existing passage problems with bridges, open bottom arches, or other structures that restore or simulate channel conditions that facilitate upstream and downstream passage of aquatic organisms, or remove barriers when roads are decommissioned or closed.	Three passage barriers were corrected in FY10, one in Poca Run, and two along FR 44. Many other culverts on small perennial or intermittent streams were also removed.
Wildlife and Fish	WF08 - Actively restore aquatic and riparian habitat conditions in 30-50 miles of stream over the next 10 years. Activities that restore or improve the natural structure and function of channel and riparian conditions may include the installation of instream structures, large woody debris loading, riparian fencing, riparian planting, and bank and channel stabilization.	An estimated 3.5 miles of aquatic and riparian habitat were restored or improved in Lambert Run and Coats Run.
Wildlife and Fish	WF09 - Maintain at least 50,000 acres of mid-late and late successional (>80 years old) mixed mesophytic and cove forest to meet habitat needs for cerulean warbler, a Management Indicator Species. (Current >80 year old mixed mesophytic and cove forest is estimated at around 320,000 acres.)	The 318 acres of harvest that occurred in FY10 had no measurable effect on our ability to continue to meet this objective.
Wildlife and Fish	WF10 - Maintain at least 150,000 acres of 50-150 year old oak and pine-oak forest in MPs 3.0 and 6.1 to meet habitat needs for wild turkey, a Management Indicator Species. (Current 50-150 year old oak forest is estimated at around 220,000 acres.)	No measurable loss of 50-150 year old oak forest occurred in FY10. There was likely a slight increase in these age classes due to natural aging/succession.
Wildlife and Fish	WF11 - Maintain at least 20,000 acres of mid-late and late successional (>80 years old) spruce forest to provide optimum habitat for West Virginia northern flying squirrel, a Management Indicator Species. The long-term objective is to increase mid-late and late successional spruce forest to at least 40,000 acres. (Current >80 year old spruce forest is estimated at around 38,000 acres.)	No measurable loss of >80 year old spruce forest occurred in FY10. There was likely a slight increase in these age classes due to natural aging/succession.
Wildlife and Fish	WF12 - Maintain at least 560 miles of coldwater stream habitat capable of supporting wild, naturally producing brook trout, a Management Indicator Species.	There were no known reductions in coldwater stream habitat in FY10.
Recreation	RC04 - Provide an annual average of 75 miles of Trail Maintenance/Reconstruction in Wilderness, and 350 miles in non-wilderness areas.	An estimated 225 miles of trail were maintained/reconstructed in FY10.
Recreation	RC27 - Develop a Forest-wide trail management plan to establish trail classes, permitted uses, construction, reconstruction, and maintenance priorities.	Trail management planning continued in FY10 and will likely conclude with a completed plan in FY11.
Timber	TR03 - Make available 25 to 105 million cubic feet of timber for the decade, which will contribute to Allowable Sale Quantity (ASQ).	A little over 1.2 million cubic feet of timber were made available in FY10.
Timber	TR04 - Provide timber harvest, and related reforestation and timber stand improvement activities, to contribute toward the attainment of desired vegetation conditions. On suitable timber lands, harvest timber, other than by salvage, on an estimated 20,000 to 36,000 acres over the next 10 years.	In FY10 we had 318 acres of harvest, 843 acres of TSI, 10 acres of planting, and 197 acres of site prep.

Resource or Program Area	Forest Plan Objective	FY10 Progress Toward Objective
Minerals	MG05 - Inventory abandoned mines and prepare restoration plans to address biological and physical resource concerns, chemical stability, and human health and safety.	No abandoned mines were inventoried in FY10. Work began with the State to plan restoration of the Tub Run abandoned coal mine.
Minerals	MG06 - Keep 70 to 80 percent of federally owned oil and gas available for exploration, development and production.	Availability remains at roughly 74 percent of MNF lands.
Roads	RF03 - Over the next decade, decommission or reclaim at least 30 miles of roads that are no longer needed for achieving access management objectives. These can include system roads or old woods roads. Actions may range from full obliteration to administratively removing a road from the transportation system as long as it poses no resource impacts without additional rehabilitation efforts.	An estimated 24.8 miles of Forest system and non-system roads were decommissioned in FY10.

Monitoring Question 1. Evaluation, Conclusions, and Recommendations for Plan Objective Progress

Table OS-2 indicates that the progress made toward achieving Forest Plan objectives was highly variable in FY 2010. For objectives where we are trying to maintain certain habitat conditions (WF09-WF12), we were reasonably successful, although habitat conditions are innately variable and subject to influences beyond our management activities. For objectives that require active treatments, such as prescribed burning or road decommissioning, the results were mixed.

For instance, our accomplishment of 1,016 acres of prescribed burning is moving us toward our ten-year objective of 10,000 to 30,000 acres, but when combined with previous year outputs, it still puts us well behind our desired production. However, the Five Year Plan for the Forest indicates a dramatic increase for burn acres could occur in the near future. This increase, if realized, would put us back on track to achieve Objective FM09.

Similarly, timber production remains low compared to our objective levels. Given current funding/staffing and NEPA capability levels, however, it appears that the original objective levels may have been ambitious. Time will tell whether expectations need to be adjusted.

Conversely, the 24.8 miles of road decommissioning we did, combined with decommissioning done in FY07-FY09, has us exceeding the ten-year objective of at least 30 miles.

This variability in our capacity to achieve objectives is one of the main reasons why we monitor our progress. By tracking results, we can shift management priorities or emphasis over time to provide more resources to objectives where we have more to do. In certain instances, monitoring may also show us where we need to lower or raise our objective expectations.

For example, we may have had unrealistic expectations for Objective VE03: *Treat an estimated 4,000 to 12,000 acres over the next decade on lands not suited for timber production to help restore ecosystems and enhance wildlife habitat.* We have been treating a substantial amount of

acres to restore ecosystems and enhance wildlife habitat, but those acres have not typically been in lands not suited for timber production. Thus, we find ourselves in a situation where we are making a concerted effort to help restore ecosystems and enhance wildlife habitat, but we are not able to effectively display the results of that effort through this objective. On the other hand, we did enhance or restore an estimated 730 acres of unsuited timberlands in FY 2010, which is a sizable contribution to Objective VE03.

Other monitoring results may sound an alarm for public expectations. For example, the shortfall in miles of maintained trails may indicate that we need one or more of the following: 1) procure more maintenance funding, 2) find innovative ways to do maintenance, 3) reduce the amount of trail miles open to the public for safe and enjoyable use, and/or 4) revise the Forest Plan trail maintenance objective.

Recommendations: Continue to monitor progress toward achieving Forest Plan objectives. Use monitoring results to make needed adjustments in Forest management strategies, direction, and projections.

Costs

Introduction

This is a required monitoring item under the National Forest Management Act (NFMA). The “costs” refer to the costs required to manage the Forest, which in large part are the costs needed to implement the Forest Plan and its various resource programs. Certain costs, like those needed to produce an allowable sale quantity of timber, are projected during Forest Plan development or revision, but these costs are sometimes associated with maximum potential outputs rather than what a Forest can accomplish based on annual funding, personnel, or work plans. Such variables tend to fluctuate on an annual basis. Therefore, this report will focus on the budget funding projected to accomplish the 2010 annual program of work, and how close the Forest actually came to using that projected funding to achieve work related to Forest Plan implementation.

2010 Accomplishments

There are no accomplishments to report for costs, although budget funding and spending were used to achieve the accomplishments described in the Outputs and Services section of this report. Budget funding and spending for FY 2010 are displayed in Table C-1, below.

Monitoring and Evaluation

FOREST PLAN MONITORING ITEMS FOR COSTS

The 2006 Forest Plan includes one monitoring item for costs on page IV-6:

2. Costs: How close are projected costs to actual costs?

Despite what this monitoring item implies, there are no specific management costs listed in the Forest Plan, nor is there any specific Forest Plan direction for costs. Forest Plan implementation costs must be calculated on an annual basis, as they are influenced by annual variables such as budget, personnel, materials and supplies, vehicle use, and inflation rates. The Final EIS for Forest Plan Revision (2006) conducted an economic analysis that looked at several key resource-related costs for Plan implementation, but this analysis did not come close to including all the costs that are involved in operating a Forest and its many program areas on an annual basis. The best way to show these operating costs, both projected and actual, is to look at the annual budget allocations and expenditures for the Forest.

Monitoring Question 2. How close are projected costs to actual costs?

Table C-1 shows both the budget allocations and expenditures for 44 program area funding codes that were used on the MNF in FY10. These program areas cover most of the annual operations

Table C-1. Budget Funding Versus Management Costs for Fiscal Year 2010

Program Code	Program Name	\$\$ Allocated in Budget	Budget \$\$ Spent	Balance in \$\$	Percent of Budget \$\$ Spent
CMFC	Capital Improvement/Mtnce - Facilities	1,123,423	764,100	359,323	68%
CMRD	Capital Improvement/Mtnce - Roads	3,416,165	2,990,378	425,787	88%
CMTL	Capital Improvement/Mtnce - Trails	603,387	591,463	11,924	98%
CMXN	Constrained Nonfed External Reimburse	4,417	4,417	0	100%
CP09	Facilities Maintenance Cost Pool	244,500	243,549	951	100%
CRFR	Facilities Improvement/Renovation	533,255	534,181	-926	100%
CRRD	Road Maintenance and Decommission	2,458,528	2,440,770	13,758	99%
CRWE	Watershed Restor/Ecosystem Enhance	185,214	180,112	5,102	97%
CWF2	Cooperative Work, Nonagent Based	40,000	582	39,418	1%
CWFS	Cooperative Work, Other	24,344	5,391	18,953	22%
CWK2	K-V Regional Projects	130,000	122,036	7,964	94%
CWKV	K-V Sale Area Projects	588,440	296,376	292,064	50%
ERBA	Federal Highway Emergency Budget Aut.	15,253	0	15,253	0%
FDSD	Unit Recreation Enhancement	392,774	288,898	103,876	74%
GBGB	Gifts and Bequests	5,440	5,436	4	100%
HTAE	Federal Highway Admin. Expense	10,000	9,633	367	96%
HTAP	Federal Highway Aquatic Passage	60,000	57,283	2,717	95%
HTRP	Federal Highway Public Roads	12,000	6,742	5,258	56%
LALW	Land Acquisition L&WCF	2,677,000	2,676,305	695	100%
MSEQ	Administrative Maps	10,000	1,605	8,395	16%
MVIS	Maps for Visitors and Recreation	20,000	6,168	13,832	31%
NFXF	NFS Federal External Reimbursement	5,880	3,235	2,645	55%
NFXN	NFS Nonfederal External Reimbursement	128,750	750	128,000	1%
NFIM	Inventory and Monitoring	588,000	566,764	21,236	96%
NFLM	Landownership Management	348,000	348,634	-634	100%
NFMG	Minerals Management	338,000	330,135	7,865	98%
NFN3	Rehabilitation and Restoration	47,000	46,484	516	99%
NFPN	Land Management Planning	106,000	103,591	2,409	98%
NFRG	Range Management	99,000	94,053	4,947	95%
NFRW	Recreation/Heritage/Wilderness	1,803,669	1,778,373	25,296	99%
NFTM	Forest Products	685,548	686,346	-798	100%
NFVW	Vegetation & Watershed Management	775,000	756,286	18,714	98%
NFWF	Wildlife/Fish Habitat Management	990,387	975,044	15,343	98%
QMOM	Quarters Maintenance	25,000	7,702	17,298	31%
RIRI	Restoration of Improvements	9,000	4,822	4,178	54%
RTRT	Reforestation Trust Fund	320,000	318,025	1,975	99%
TPPS	Timber Pipeline-Sale Preparation	295,000	56,099	238,901	19%
URMJ	Cost Recovery Lands Major Project	204,228	116,860	87,368	57%
URMN	Cost Recovery Lands Minor Project	5,000	0	5,000	0%
URCP	Organizational Camps	10,000	2,599	7,401	26%
URFM	Commercial Film-Local Admin Unit	2,000	1,908	92	95%
WFHF	Hazardous Fuel Reduction	206,300	198,217	8,083	96%
WFPR	Pre-suppression and Fuels	481,000	463,001	17,999	96%
WRHR	Hazardous Fuels Federal Lands	303,803	299,267	4,536	99%
44 BLIs	Monongahela NF Totals	20,330,435	18,387,352	1,938,548	90%
Totals without CMFC, CMRD, CWKV and TPPS		14,907,407	14,280,399	627,008	96%

on the MNF, and most of these operations are related to specific management goals and objectives in the Forest Plan. For example, the program code CMTL (Capital Improvement/Maintenance – Trails) helps pay for the improvement or maintenance of recreation trails on the Forest, which ties directly back to Objective RC04 in the Forest Plan: “Provide an annual average of 75 miles of trail maintenance/reconstruction in wilderness, and 350 miles in non-wilderness areas” (page II-33). Other Forest Plan ties are not so obvious, but they do exist. For instance, the program codes NFTM, TPPS, NFVW, NFWF, and WFPR could all help fund tree-harvesting activities for a variety of vegetation, habitat, or fuel reduction objectives in the Plan.

Although Table C-1 does not account for the entire budget—it is missing project earmarks, line officer cost pools, and some other administrative costs—it does address most of the resource-related work that was done to help accomplish or support implementation of the Forest Plan.

Monitoring Question 2. Evaluation, Conclusions, and Recommendations

Overall, the Forest spent about 90 percent of the 44 program code budget allocations in FY 2010 (Table C-1). This amount of expenditure indicates that the Forest funding allocations were adequate to accomplish most of its program of work related to Forest Plan implementation, and that the Forest stayed within its budget allocated by Congress.

However, if the CMFC, CMRD, CWKV, and TPPS program codes are removed from the overall calculations, the Forest spent 96 percent of the remaining budget allocations. The CMFC and CMRD program codes (facilities and road maintenance) both had significant earmark contributions that the Forest was able to carry over for FY 2011, including almost all of the balance amounts that are shown in Table C-1. Thus, the Forest will have the opportunity to spend this money next year. Similarly, the CWKV and TPPS program codes have large amounts of unspent money, but that money can, in most cases, be returned and spent in future years. So, even though the CMFC, CMRD, CWKV, and TPPS program codes represent over \$1,300,000 in unspent allocations, this money is not necessarily lost to the Forest and much of it could be spent in the near future.

Another area where the Forest noticeably under-spent its allocation was in NFXN, which was a nonfederal external reimbursement from a partnership agreement. Unfortunately, this funding came too late in the year to spend, so it was returned. However, similar funding was generated through a similar agreement for FY 2011.

Of the 44 program funding codes above, 25 had spending results that were within 5 percent, plus or minus, of their budget allocation. Only three program codes had spending that exceeded their budget allocation, but all three were so minor that they were still statistically at 100 percent. Overall, the Forest did an excellent job of not exceeding its budget allocations.

Recommendations: Continue to monitor costs to meet the NFMA requirement, and to see how efficiently and effectively the Forest is spending its allocated budget to meet the needs of Forest Plan implementation.

Insects and Disease

Introduction

The purpose of this monitoring is to determine the current extent and severity of insect and disease occurrence on the Forest. The frequency and scope of monitoring may vary, but it typically occurs on an annual basis. Monitoring is usually conducted through a combination of aerial detection surveys and on-the-ground visual inspections during normal project work. The Monongahela National Forest (MNF) cooperates with the West Virginia Department of Agriculture (WVDA), USDA Animal and Plant Health Inspection Service (APHIS), and the State & Private Forestry branch of the USDA Forest Service (S&PF) to monitor and control insect and disease outbreaks within the Forest. Typically, S&PF and WVDA conduct the surveys or inspections, so there are no direct Forest accomplishments to report.

Monitoring and Evaluation

Monitoring Question 3. Are insect and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?

Monitoring Question 4. To what extent is the Forest managing undesirable occurrences of insect and disease outbreaks through integrated pest management?

These two monitoring questions are so interlinked that they will be addressed together in this report.

Forest Service employees in the S&PF Forest Health Program typically complete aerial detection surveys for insect and disease activity in July; however, FY10 surveys were suspended after an airplane crash involving employee fatalities. Thus there are no survey results to report for FY10.

Hemlock woolly adelgid continues to cause mortality to eastern hemlock trees on the Forest. However, severe and extended cold temperatures experienced during the 2009/2010 winter, may have slowed the advance temporarily. Surveys in the summer of 2009 and the spring of 2010 indicated a dramatic drop in adelgid populations.

Beech bark disease (BBD) continues to spread through the Forest. The scale and killing fronts of the beech bark disease complex are within the Forest boundaries, and beech management has become a complicating factor in many Forest vegetation projects.

A second infestation of emerald ash borer (EAB) was found in 2009 in Morgan County, West Virginia, near Berkeley Springs. No EABs were detected on the Forest in FY10.

The Asian long-horned beetle (ALB) and sirex woodwasp have not yet been observed in West Virginia. ALB has been found in Illinois, New York, New Jersey, and Massachusetts. Sirex woodwasp has been found in Pennsylvania, Michigan, New York, and Vermont.

Monitoring Questions 3 and 4. Evaluation, Conclusions, and Recommendations

The current insect and disease infestations are not related to management activities occurring on the Forest. The insects and diseases mentioned above are not native to the United States.

Due to the substantial increase of defoliated acres from gypsy moth in 2008 compared to the previous 2 years, the Forest decided to spray for gypsy moth in 2009. An estimated 471 acres were sprayed with an application of Gypchek, a viral biological control agent. An additional 20,585 acres were treated with *Bacillus thuriangiensis* variety *kurstaki* (BtK), a bacterial biological control agent. Egg mass surveys conducted by Forest Health Program employees and WVDA personnel in the fall of 2009 indicated the spray program was successful. There was a substantial collapse of the gypsy moth population in 2009. Studies were initiated in 2009 on the Forest to determine the location and effects of *Entomophaga maimaiga*, a fungus that kills gypsy moth caterpillars. The fungus is especially active in cool, wet weather during the spring or early summer and has proven to be an effective pathogen to help control gypsy moth.

Hemlock woolly adelgid came to the United States from Asia. It was first detected in West Virginia in 1992. Since 2003 over 300 trees in Forest recreation areas have been treated with insecticide to study the effectiveness of the various treatments. Amy Hill, USDA Forest Service entomologist with Forest Health Protection, held several meetings to prepare a hemlock action plan for the Monongahela National Forest. The Forest is also cooperating with other federal and state agencies, non-government organizations, and private landowners to develop a state-wide hemlock conservation plan. In FY10, the Forest decided to treat additional hemlock trees in developed recreations areas on the Forest.

The beech scale insect, native to Europe, is part of the beech bark disease complex. Presently it appears that only 1 to 2 percent of native American beech trees are resistant to this insect/disease complex. Forest employees are looking for American beech trees that appear to be resistant to the disease and recording the locations with GPS equipment. Several hundred beech nuts were collected by district personnel to send to Jennifer Koch, Research Scientist with the Northern Research Station Forestry Sciences Laboratory in Delaware, Ohio. The Forest is working with the Northern Research Station and USDA Forest Service State & Private Forestry Forest Health Protection to establish a resistant beech seed tree nursery on the Forest.

Emerald ash borer, native to Asia, was first detected in Michigan in 2002. Since then it has spread to Ohio, Indiana, Illinois, Maryland, and Pennsylvania, and it was found in 2007 in one site near a private campground in Fayette County, West Virginia. Forest Service personnel with S&PF placed traps in 2009 in or near Forest recreation areas to help determine if the insect is here. An inspection of the traps placed on the Forest did not reveal any EAB populations on the MNF. Traps were also placed in various locations throughout WV by WVDA and APHIS employees, and additional infestations were found. In October 2009, APHIS placed the entire State of WV under quarantine for all hardwood firewood, wood chips, bark chips, unprocessed ash wood products with attached bark, and ash trees. A Firewood Alert remains in effect, requesting Forest visitors to not bring potentially infested firewood into the Forest or move it once it is here.

Recommendations: Continue to cooperate with WVDA, APHIS, and S&PF to monitor the occurrence and outbreaks of insect and disease infestations through aerial detection surveys and visual on-the-ground inspections. Train MNF employees to recognize the various indications of non-native insect and disease infestations that may threaten the Forest.

Prepare an HWA action plan document to prioritize areas on the Forest in an effort to preserve critical habitat for Threatened, Endangered, Sensitive, and Management Indicator species and for aesthetic values in high visitor use areas. Complete NEPA documentation, as needed, to release predatory beetles as they become available and to treat high-priority hemlocks with insecticide.

Continue to locate disease-resistant American beech trees to collect scion and root grafts for potential future restoration efforts. Continue cooperating with the USDA Natural Resource Conservation Service Plant Materials Center at Alderson, WV to grow disease-resistant American beech seedlings, from root cuttings or scion grafts, for planting on national forest lands. Work with the Northern Research Station and the Forest Health Program in State & Private Forestry to establish a seed tree orchard from disease-resistant American beech stock on the Forest. Do not mark disease-resistant American beech trees in timber sale preparation activities. Invite Alan Iskra, Forest Plant Pathologist, and Rick Turcotte, Entomologist with State & Private Forestry Forest Health Program to hold a workshop on the Forest for timber markers in identifying disease-resistant American beech trees. Avoid cutting disease-resistant American beech trees during timber sale operations and site preparation for natural regeneration activities, if possible.



Figure ID-1. Hemlock Woolly Adelgid Infestation (white substance along needle twigs)

Land Productivity

Introduction

This section examines the effects that Forest management has had on the overall productivity of Monongahela National Forest lands. It does so by looking at the Management Prescriptions that have been assigned to the Forest, as well as the land-disturbing activities that occurred on the Forest during Fiscal Year (FY) 2010.

2010 Accomplishments

No accomplishments in FY 2010 were designed or implemented to change land productivity on the Forest. However, activities were implemented with the potential to affect land productivity. These activities are described and assessed in the Monitoring and Evaluation section, below.

Monitoring and Evaluation

The Monongahela National Forest Land and Resource Plan (2006) has one monitoring question that specifically addresses land productivity, on page IV-7:

Monitoring Question 6. Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?

To answer this question, we looked at three types of potential effects or changes on the Forest:

- 1) Changes to National Forest System (NFS) lands via acquisition, exchange or conveyance,
- 2) Changes to Management Prescriptions or prescription areas, and
- 3) Effects from Forest management activities with the potential to change land productivity.

Change to NFS Lands

The Forest acquired one parcel of land in FY 2010, TPL Cummings at 448.7 acres. This land has yet to be assigned a Management Prescription (MP). It is surrounded primarily by MP 6.1, with some MP 3.0 to the east. It has been logged in the recent past and has some open land with grazing potential. Therefore, this land acquisition is considered to represent a minor gain (.04 percent of Forest land base) in land productivity for the Forest at this time.

Changes to Management Prescriptions or Prescription Areas

No Management Prescription changes occurred in FY 2010. Furthermore, no Forest Plan amendments were generated to allow or disallow specific management activities that would have affected land productivity within any Management Prescription area.

Effects to Land Productivity from Forest Management Activities

Road Construction/Decommissioning - An estimated 3.1 miles of road were constructed in FY 2010, while 24.8 miles of road were decommissioned, creating a net difference of 21.7 miles or roughly 65 net acres of land (3 acres per mile) that were returned to production potential for tree growth, wildlife habitat, and watershed function.

Facility Construction/Decommissioning - There were no major facilities constructed or decommissioned in FY 2010, and thus little change occurred to land productivity from facility management on the Forest. The Forest did demolish 18 vault toilets and replaced them with 8 vault toilets, but the amount of productive area gained from these changes was negligible.

Timber Harvest - As seen in the Timber Resources section of this report, the Forest did not come close to exceeding its Long-Term Sustained Yield Capacity in FY 2010, and even-aged harvest units were successfully regenerated, though localized deer browsing problems persist. Although effects from harvest-related activities (tree-felling, skidding, road construction, etc.) did occur, they were generally minor and either mitigated through standard management practices or, as in the case of tree removal, compensated for by residual tree growth.

Mineral Extraction – In FY 2010 production was completed on the Nine and Nichols gas pipeline, which involved an estimated 7.25 acres of soil disturbance and conversion of land from a mostly forested to a non-forested condition. This area will likely remain in a non-forested condition for the duration of the pipeline. There were no other minerals-related activities that resulted in a change to land productivity on the Forest. Effects from mineral activity to other resources remain well under amounts projected in the Forest Plan EIS (see Minerals report).

Livestock Grazing – There were no significant effects or changes to land productivity reported from the range allotment inspections in FY 2010. A number of minor concerns were noted (NNIS, improvement needs, etc.), and these will be addressed through a combination of operational processes. There is still a need in some allotments to address restricting livestock from riparian areas. The South Zone Range EA documented several affected riparian areas in FY10 and it also proposed to move allotment perimeters based on pasture management and riparian concerns. The results should be reflected in the 2011 Monitoring Report.

Off Road Vehicle Use – Public off road vehicle use is not currently allowed on the Forest. Although some illegal use occurred on the Forest in FY 2010, most of it was on closed roads or trails that were already considered non-productive, total soil resource commitments.

Soils - No significant soil losses or soil detrimental disturbances were reported for FY 2010. In addition, more soil chemistry information was collected in FY 2010, and the Forest continued planning a soil liming project in the Lower Williams River area. Both of these efforts are designed to provide more information on how Forest activities and industrial pollutants may be affecting soil chemistry, which, in turn, may help us to understand how acid deposition is affecting soil and forest productivity over time.

Water Quality and Fisheries - No significant effects to water quality or fisheries due to ground disturbance were reported in FY 2010. However, sedimentation is an ongoing concern across the Forest, not only from Forest management activities, but also from sediment production occurring off-Forest and moving on-Forest through shared stream systems. A larger productivity concern, though, is the ongoing impact that acid deposition is having on aquatic ecosystems. Many streams on the Forest would not support aquatic life if it were not for introduced limestone sands that neutralize the acid deposition that comes from industrial pollution sources outside the Forest. Also, 3 aquatic passage barriers were removed in FY 2010. The removals should help increase fish and other aquatic organism productivity in the streams where the barriers previously existed.

Monitoring Question 6. Evaluation, Conclusions, and Recommendations

Change to NFS Lands

Although there was only one 449-acre land addition in FY 2010, there are several potential acquisitions currently in the works. We should continue to track these changes in order to monitor the potential for land use and productivity changes across the Forest.

Changes to Management Prescriptions or Prescription Areas

There were no changes to MPs in FY 2010 and therefore no changes to land uses or productivity as a result of MP changes.

Effects to Land Productivity from Forest Management Activities

Across the Forest, cumulative effects to land productivity from management activities were low in FY 2010. Activity levels for extractive or ground-disturbance uses were generally low. As noted above, the Forest saw a net gain of land productivity of 49 acres due to road construction and decommissioning, and a change in forested to non-forested land on 7.25 acres due to gas pipeline construction. Ground disturbance was typically mitigated through management practices or mitigation measures identified at the project level. New road construction was kept to a minimum and was more than compensated for by the decommissioning of existing roads.

Soil chemistry data and soil liming should help us better understand interactions between existing conditions, our management activities, and external influences such as acid deposition.

Recommendations: Continue to monitor changes to NFS lands and Management Prescriptions, and effects to land productivity from Forest management activities. Continue to apply Forest Plan management requirements and additional mitigation measures as needed to reduce the potential for impacts to land productivity at the project level. Continue to collect soil and foliar chemistry data, along with the results from restorative activities such as soil liming.

Timber Resources

Introduction

A total of 12,455 hundred cubic feet (ccf) of timber was offered for sale and awarded through timber sale contracts, forest products permits, and stewardship contracts in 2010. The Ridge West Stewardship Contract on the Gauley Ranger District, the second stewardship contract from the Lower Williams Vegetation EIS Record of Decision, was awarded to Collins Hardwood Company LLC of Richwood, WV, on July 1. The contract contained an estimated 3,194 ccf of hardwood timber bid at \$616,402.00; and included stewardship projects totaling 188 acres of timber stand and wildlife habitat improvements bid at a total cost of \$387,026. The Fernow 11-1 Timber Sale, 280 ccf of hardwood sawtimber harvested as a part of research done on the Fernow Experimental Forest on the Cheat-Potomac Ranger District, was awarded to Dingess Lumber Company of Belington, WV, on September 24. That company was the highest bidder (of three), with a sealed-bid value of \$35,580.67. Hogback 1 Timber Sale on the Cheat-Potomac Ranger District, the first sale to be advertised from the Hogback Environmental Assessment Decision Notice, was awarded to Allegheny Wood Products, Inc., of Petersburg, WV, on September 30. That company provided the higher of two sealed bids, with a bid value of \$318,255.00 for the estimated 6,414 ccf of timber involved.

The expected completion and publication of a decision for the Upper Greenbrier North Vegetation Management Analysis on the Greenbrier Ranger District was delayed due to the additional analysis required as a result of the re-listing of the West Virginia northern flying squirrel under the Endangered Species Act by the U.S. Fish and Wildlife Service. The Decision Notice is now expected in 2011. Data collection and surveys continued and development of a proposed action began on the Big Mountain Project on the Cheat-Potomac Ranger District.

Associated activities with timber sales include stocking surveys, site preparation for natural regeneration, planting tree seedlings, protection of tree seedlings, and timber stand improvement. These activities must be monitored and evaluated to ensure the forest remains healthy and diverse, in both species and ages of trees, so that it may be continuously managed on a sustainable basis for the enjoyment and use of future generations.

Stocking surveys are mandated by the Forest and Rangeland Renewable Resources and Planning Act of 1974. The purpose is to ensure national forest lands that have been treated with a regeneration harvest method, or lands that have otherwise been deforested, are re-growing or reforested with adequate stocking.

Site preparation activities that enhance the natural regeneration of hardwood trees include, but are not limited to: 1) using herbicide for control of competing vegetation; 2) cutting residual (usually non-commercial trees of low quality or small size) trees during or immediately after a timber harvest to encourage sprouting and improve the quality of the future stand; 3) vine control to improve potential growth of young tree seedlings and sprouts; and 4) prescribed burning to enhance regeneration of trees such as oak and hickory.

Timber stand improvement activities include, but are not limited to crop tree release, pre-commercial thinning, and vine control.

Fill-in planting with tree seedlings usually is done on this Forest to ensure a certain species that may be difficult to regenerate remains a component of the stand or to restore certain species that are currently not as prevalent as they were historically. Protection of tree seedlings is necessary in certain areas where deer browsing may inhibit the survival or growth of tree seedlings. Protection may include, but is not limited to fencing, individual tree shelters, and application of chemical deer repellent.

2010 Accomplishments

Timber Program accomplishments for 2010 included:

- Budget and work planning, including out-year planning for the next 5 years.
- Surveys and data collection to develop a proposed action for the Big Mountain project area on the Cheat/Potomac Ranger District.
- Developing alternatives to the proposed action, analyzing effects, and describing mitigating measures to reduce or eliminate potential adverse effects for the Upper Greenbrier River project area on the Greenbrier Ranger District.
- Preparing, advertising, and awarding the Ridge West Stewardship Contract on the Gauley Ranger District.
- Preparing, advertising, and awarding the Fernow 11-1 Timber Sale on the Fernow Experimental Forest.
- Preparing, advertising, and awarding the Hogback 1 Timber Sale on the Cheat-Potomac Ranger District.
- Preparing the Fernow 11-2 Timber Sale on the Fernow Experimental Forest and the South Williams and Red Oak North Stewardship Contracts on the Gauley Ranger District for advertisement and award in 2011.
- Offering and awarding a total of 12,455 CCF of timber through timber sale contracts, stewardship contracts, and forest products permits.
- Harvesting approximately 7,700 CCF of timber sale and stewardship contract volume, in addition to 1,675 CCF of permit volume.
- Administering the following active timber sales:
 - Fernow 10 and 11-1 Timber Sales on the Cheat/Potomac Ranger District,
 - Louk Run on the Greenbrier Ranger District,
 - Desert Branch, Middle Horse, and West Cherry on the Gauley Ranger District, and
 - Upper Sawyer and Ridge West Stewardship Contracts on the Gauley Ranger District.
- Completing the following timber-related work:
 - 318 acres of timber harvest, with 63 acres of regeneration harvest (without Fernow),
 - 14 acres of regeneration harvests were fenced to reduce deer browsing effects,
 - 843 acres of timber stand improvement,
 - 197 acres of site preparation, and
 - 376 acres of stocking surveys.
- Monitoring and evaluation efforts as described below.

Monitoring and Evaluation

The Monongahela National Forest Land and Resource Plan (2006) outlines required timber resource monitoring on page IV-7. Changes to some monitoring questions were made in 2008 to better capture what was actually being monitored on the Forest and what was driving the need to monitor. See Administrative Correction 7 for the changes that were made.

Item 7 - Are regeneration harvest units adequately restocked after five years?

Item 8 - To what extent is commercial harvest occurring on lands suited or not suited for timber production? Is there any need to adjust the suitable timberlands on the Forest?

Item 9 - Are even-aged harvest units, particularly clearcuts, exceeding the 40-acre size limit established under the NFMA? If they are, is there a need to adjust the size limit to better accommodate Forest Plan management objectives and practices?

Monitoring results for these questions are reported below.

Monitoring Question 7. Are regeneration harvest units adequately restocked after five years?

The purpose of this monitoring is to ensure that lands are adequately stocked within 5 years of a regeneration harvest, as required by the National Forest Management Act (NFMA) of 1976. Monitoring is accomplished through stocking surveys conducted after the first and third growing seasons following the completion of the site preparation for natural regeneration activity initiated during or immediately after the regeneration harvest. The expected precision and reliability of this monitoring is considered very high.

Forest personnel conducted stocking exams on 376 acres of regeneration harvest in 2010. The North Zone (Greenbrier, Cheat, and Potomac Ranger Districts) continue to be plagued with extensive deer browsing, which is affecting the diversity, height, growth, and quality of the regenerating stand. The Forest has made changes in an attempt to overcome these problems, including shelterwood cutting, leaving large quantities of slash on ground, fencing, herbicide applications, prescribed burning, and proposed road gate management (to improve hunter access).

Monitoring Question 7. Evaluation, Conclusions, and Recommendations

As mentioned in previous annual monitoring reports, the impacts of deer browsing on tree regeneration are still apparent. In some parts of the Forest a browse line is developing where little or no vegetation palatable to deer is growing on the forest understory. Districts are currently taking steps to increase regeneration success with fill-in planting and deer enclosure fencing projects in regeneration units where excessive deer browsing is threatening the growth of tree seedlings and sprouts. In 2010, 14 acres in were fenced to protect regeneration. Stocking surveys will continue to monitor the effects of deer browse on the vegetation within regeneration harvest units and the effects of protection methods.

Recommendations: It is highly recommended that pre-harvest surveys be completed prior to or during project analysis to determine where those areas are that are experiencing heavy deer browsing. If regeneration harvests are planned in these areas, deer exclosure fences should be installed immediately, where practical and feasible, after a unit is cut to ensure the unit regenerates with adequate stocking of acceptable tree species. In those areas where there is a potential for regeneration failure due to excessive deer browse and fencing is not practical or feasible, timber harvesting should be deferred until the deer population decreases. For example, in 2009 the Forest requested that WVDNR re-instate a doe harvest season in counties with national forest land, initiate special deer hunts, and/or allow the Forest to open roads for hunters during the fall deer hunting seasons in areas where deer browsing is a chronic problem to our regeneration efforts. However, these requests were not granted.

Additional site preparation for natural regeneration or other cultural treatments such as snag creation may be needed to reduce the amount of shading by residual trees in two-age harvest units. In many of the two-age harvest units too many trees were left in the residual stand. Creating snags or doing additional site preparation for natural regeneration would increase the amount of sunlight reaching the forest floor, which should increase the growth of shade-intolerant regeneration, thereby increasing tree species diversity.

Another tool that could be used during the planning process is to increase the size and number of regeneration units. A large regeneration unit of 30 to 40 acres has a better chance of success, if deer browse is a concern, than smaller regeneration units of 5 to 15 acres. If a larger percentage of a project area is regenerated, the deer will not be able to have as much of an impact because the browsing will not be concentrated in small areas. The revised Forest Plan signed in 2006 allows up to 40 acres to be regenerated in a single unit and up to 25 percent of the area to be in young stands between 0-19 years of age. In the 1986 Forest Plan, the maximum size of a regeneration unit was 25 acres and MP 6.1 (the management prescription that contains the most acres of suitable timber land) allowed up to maximum of 8 percent of a project area to be in regeneration. Although 25 acres was allowed as a maximum size of a regeneration unit, many regeneration harvests of less than 10 acres were planned. Also, even though the 1986 Forest Plan allowed up to 8 percent of an area to be regenerated, usually less than 5 percent was chosen for regeneration in the decision document and even fewer acres were actually marked for regeneration on the ground.

Monitoring Question 8. To what extent is commercial harvest occurring on lands suited or not suited for timber production? Is there any need to adjust the suitable timberlands on the Forest?

This monitoring item is derived from the NFMA requirement to identify lands not suited for timber production every 10 years, roughly the Forest planning horizon. MNF lands considered not suited for timber management were determined as part of the recent Forest Plan revision process that culminated with the revised 2006 Forest Plan. The suitability analysis can be found in the Timber Supply section of Chapter 3 in the Final EIS for Forest Plan Revision (2006). The Forest Plan revision analysis identified an estimated 329,400 acres of land considered suitable for timber production on the Forest, which means that there are roughly 589,700 acres on the Forest that are not suited for timber production.

We recognize that the Forest Plan revision suitability analysis was done at a very broad scale and that refinements may be needed as lands are scrutinized more closely, typically during project-level analysis or timber stand compartment examination. All sorts of factors may influence potential refinements, including stream buffer delineation, the discovery of federally listed plants or animals, new special area designations, pockets of land that are extremely steep or susceptible to erosion, or areas that are just not economically feasible to commercially harvest. These refinements, either individually or collectively, can be used to adjust suitable timberlands through Forest Plan amendments or revision.

It is important to note, however, that trees may be cut or harvested in areas that are considered not suited for timber production—if that activity is designed to achieve goals or objectives in the Forest Plan other than timber production, such as enhancing wildlife habitat, treating insect and disease infestations, or reducing hazards to Forest visitors. For example, there are several habitat enhancement projects scheduled on the Forest’s Five Year Plan; however, they have not yet reached the layout or implementation stage to determine how much of the timber-related activity would occur on suited vs. non-suited lands.

Monitoring Question 8. Evaluation, Conclusions, and Recommendations

Virtually all of the commercial timber harvest on the Forest in FY 2010 occurred on lands considered suitable for timber production in the 2006 Forest Plan. Furthermore, there were no reports of specific changes needed to timberland suitability. There were trees harvested in small or isolated instances—for example, to provide a needed stream crossing, road access under a special use authorization, or development of mineral/gas exploration and gas pipeline sites—but these activities were allowed under Forest Plan management direction, and they did not necessitate any change in suitability classification.

Recommendations: The Forest will continue to examine the issue of suited vs. not suited timberland during analysis for upcoming timber sale projects. Minor land classification changes may be made based on field reviews and stand examinations. Major changes due to stand conditions, environmental restrictions, or legislative actions affecting the suitability of lands for timber production should be addressed in Plan amendments or during Plan revision. Changes should also be recorded in the Natural Resource Information System (NRIS) vegetation inventory FSveg (Field Sampled Vegetation) and FSveg Spatial databases. Currently there is not a need to adjust the suitable timberland base.

Monitoring Question 9. Are even-aged harvest units, particularly clearcuts, exceeding the 40-acre size limit established under the NFMA? If they are, is there a need to adjust the size limit to better accommodate Forest Plan management objectives and practices?

The purpose of this monitoring is to evaluate whether we are meeting the NFMA-imposed 40-acre size limit for even-aged timber harvest, particularly clearcutting. If we are not meeting this limit, we need to evaluate why we are exceeding it, and whether there may be a need to change the size limit to better accommodate our Forest management objectives and practices.

Even-aged silvicultural system harvest methods are defined on page A-2 in Appendix A of the 2006 Forest Plan. The 25-acre even-aged harvest size limit from the 1986 Forest Plan was replaced in the 2006 Forest Plan with the 40-acre size limit in the National Forest Management Act. Exceptions to this size limit could be allowed on a case-by-case basis with Regional Forester approval.

There are no harvest size restrictions when using uneven-aged silvicultural harvest methods, although individual group selection cuts are generally considered to be less than 2 acres in size.

Monitoring Question 9. Evaluation, Conclusions, and Recommendations

The Hogback Environmental Assessment and Lower Williams River Environmental Impact Statement are two of the first NEPA analyses for timber sales that will be completed under the 2006 Revised Forest Plan. Proposed even-aged harvest units in the Hogback analysis average an estimated 31 acres per unit. Unit size ranges from 11 acres to the maximum of 40 acres. An estimated 1,256 acres are clearcuts with reserve trees and 88 acres are shelterwood harvest. In the Lower Williams project, even-aged harvest unit size averages an estimated 27 acres per unit, with a range from 10 acres to 37 acres. An estimated 887 acres of the planned harvest units are regeneration cuts with residuals and 38 acres of shelterwood harvest.

In conclusion, none of the proposed, completed, or sold timber sales in FY 2009 had even-aged harvest units that exceeded the maximum size limit of 40 acres in the NFMA, which applies to the 2006 MNF Forest Plan.

Recommendations: Continue to monitor the size of regeneration units of even-aged silvicultural harvest treatments to ensure the layout of the unit does not exceed the maximum 40-acre size limit. If units do exceed the 40-acre limit, ensure that the rationale is documented in project decisions and evaluated in future monitoring reports to determine if there is a need to adjust Forest management practices or Forest Plan direction. Currently, there is not a need to adjust the even-age harvest unit size limit.

Air Quality

Introduction

Air quality on the Forest is determined by regional and local sources of air pollution and the weather patterns that disperse these pollutants. Air quality, or the amount of pollution in the atmosphere, can negatively affect Forest resources but the Forest does not have *direct* regulatory authority over external sources of air pollution. One way that the Forest works to improve air quality is by reviewing and commenting on specific air permits issued by state air regulators. The Clean Air Act Amendments of 1977 established the Prevention of Significant Deterioration (PSD) program, under which federally designated Wildernesses such as Dolly Sods and Otter Creek were given special protection from degradation of air quality and associated resources. Companies seeking to upgrade existing or build new facilities must obtain a PSD permit. The Forest reviews and comments on the class I air quality analysis protocol, modeling results and the draft permit for each permit application. The main objective for these reviews is to determine the potential impacts of new sources of pollution on Air Quality Related Values (AQRVs) such as visibility, streams, and vegetation in the class I areas. Results of these assessments are communicated to state and federal air regulators; however, our role remains one of consultation rather than regulation.

Forest-wide direction in the 1986 Land and Resource Management Plan (LRMP, US Forest Service 2006) called for the Forest to “*evaluate air quality impacts and assist air pollution control authorities in identifying and preventing adverse impacts to forest and range resources*”. Further, it says the “*Forest will work with Federal and State air quality management agencies to protect Class I air quality in Otter Creek and Dolly Sods Wildernesses*”. Similar direction was incorporated in the revised 2006 Land and Resource Management Plan. As such, the Forest continues to review and comment on PSD permits within the vicinity of the Forest. The Forest also works with State agencies on Regional Haze State Implementation Plans. These plans assess the level of impact the emission source within a given state have on Class I areas and calculate any necessary emission reductions to help improve visibility within Class I areas.

Given the role the Forest plays in PSD permitting processes, it is important for us to understand what current levels of air pollution in and near the Forest are, and how those levels of air pollution are impacting Forest resources. For this reason, the 2006 LRMP also calls for the Forest to monitor air quality and associated effects to AQRVs. General direction for Management Prescription 5.0 in the 2006 LRMP requires the Forest “*to plan and provide for air resource monitoring that is needed to insure that class I area AQRVs are protected.*” In Fiscal Year 2010, the Forest continued to monitor air quality in cooperation with the Northeastern Forest Experiment Station. Ozone, acid deposition, and meteorology are measured at two sites: the Forest Service research office site in Parsons, WV and at Bearden Knob, a high-elevation site near Davis, WV. Visibility monitoring also continues at the Bearden Knob site.

Additionally, the Forest continued to measure the condition of pollution-sensitive resources, identified as AQRVs in the Class I areas, and across the Forest. The focus has been on the effects of deposition to aquatic and terrestrial ecosystems. Water chemistry is the primary

indicator used to monitor aquatic ecosystems, but the Forest has also developed an inventory of aquatic insect species found within the class I area streams. Water chemistry samples were collected for 97 sites in the spring of 2010.

Considering that many streams in the Class I areas and on the Forest are acidic, it is probable that the base status of soils in those watersheds are also affected by acid deposition, which in turn could affect vegetation. To better understand the current condition of sensitive soils on the Monongahela, the Forest has implemented a soils monitoring program. Additionally, the MNF has been collaborating with NRCS to inventory and map soils within the Forest, specifically to understand more about the soil chemistry and the distribution of various soil types.

2010 Program Accomplishments

The following was accomplished in FY 2010:

- The Forest reviewed and provided input on four Prevention of Significant Deterioration permits proposed or issued by the states of West Virginia and Virginia. Through these processes Forest air specialists also worked with counterparts in the National Park Service to draft preliminary guidance on developing a mitigation plan and developing an inventory for conducting Class I cumulative increment modeling in this region of the country.
- We continued operation of the IMPROVE aerosol samplers for visibility monitoring.
- We monitored ozone concentrations year-round at the Bearden Knob monitoring site.
- We monitored acid deposition using bulk deposition samplers at the Bearden Knob monitoring site and at the NADP site at the NE research station.
- The Forest continued coordination with researchers and other agencies on implementing the concept of critical loads for managing resources affected by depositions. This coordination occurred through the initiation of a multi-agency effort to look at implementing the concept of critical loads nationally.

Monitoring and Evaluation

The Monongahela National Forest Land and Resource Plan (US Forest Service 2006) outlines air quality monitoring on page IV-8.

11. To what extent is Forest management contributing or responding to air pollution effects on ecosystems and visibility?

12. Are Air Quality Related Values of the Dolly Sods and Otter Creek Wildernesses improving over current adversely affected levels?

13. What are the trends in ambient air pollutant concentrations near the Forest?

Monitoring results for these questions are reported below.

Monitoring Question 11. To what extent is Forest management contributing or responding to air pollution effects on ecosystems and visibility?

Visibility monitoring conducted on the Forest is part of a national effort called IMPROVE (Interagency Monitoring of PROtected Visual Environments). The original purpose of IMPROVE was to determine visibility conditions at class I areas across the country. In 1997, EPA recognized that visibility was impaired at all class I areas and the Regional Haze Rule was adopted. The Regional Haze Rule has a goal of significantly reducing emissions of visibility impairing pollutants and returning visibility to natural conditions by the year 2064. With the advent of these regulations, the role of IMPROVE has now expanded to track changes resulting from emission reductions that will be implemented.

The IMPROVE aerosol samples measure the amounts of various species of fine particulate in the atmosphere—including sulfates, nitrates, and organic carbons—by collecting weekly filter samples and sending these samples for laboratory analysis. Of all the species monitored through the IMPROVE network, sulfates contribute the most to visibility impairment in Dolly Sods and Otter Creek (Figure AQ-1; ammso4f = Ammonium Sulfate). Using the quantity and types of aerosol data collected in the samplers, values for light extinction and visibility distance can be calculated. The visibility data reflects that although the full range of visibility conditions can be experienced at any time of the year, on average visibility is better in the winter than the summer. This is due to the fact that sulfate levels are significantly higher in the summer than the winter (Figure AQ-1¹).

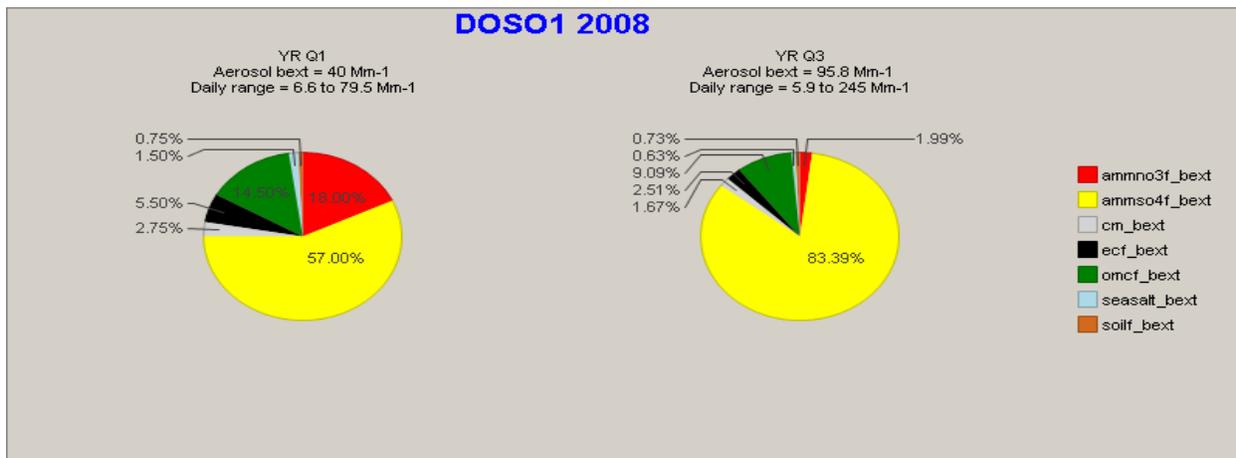


Figure AQ-1¹. 2008 Winter (Q1) and Summer (Q3) fine particulate matter composition

¹ Data reported here is for the calendar year 2008, due to the lag time in IMPROVE data analysis and reporting, results are not yet available for calendar year 2009 or beyond.

Since the Forest began monitoring aerosols in 1993, visibility has improved (Figure AQ-2). As sulfates are the largest component of visibility impairing pollution at Dolly Sods and Otter Creek (Figure AQ-1), most of the visibility improvement can be attributed to reductions in sulfur dioxide emissions made through the Acid Rain Program, part of the 1990 Clean Air Act Amendments. This program called for a total reduction of 10 million tons of sulfur dioxide emissions (half the 1980 level). The first phase of reductions began in 1995 and targeted the highest emitting power sources. The second phase of reductions began in 2000, and targeted power plants with lower emissions.

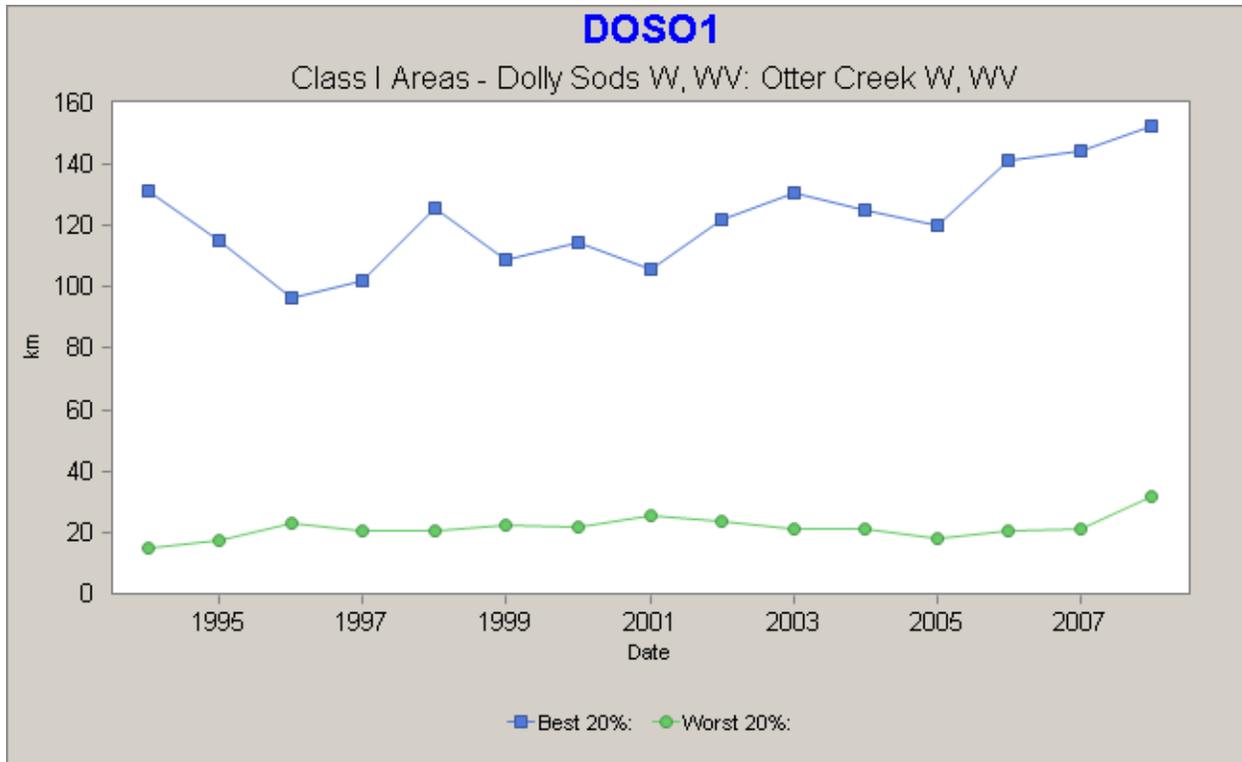


Figure AQ-2. Visibility distance on the best 20 percent and worst 20 percent days at the Dolly Sods IMPROVE station located at Bearden Knob, West Virginia

A recent study analyzed IMPROVES and CASTNET data to address spatial and temporal trends in monitored sulfate levels across the United States. The results show that the maximum statistically significant percent decrease in sulfate occurred at Dolly Sods, at a rate of 73 percent (Malm et al. 2002). These trends in part are reflected in Figure AQ-2 below, showing the 20 percent best and worst visibility days where the light extinction is decreasing with corresponding increases in the standard visual range. This trend is not as evident in the 20 percent best visibility days as it is in the 20 percent worst visibility days but both are improving. Additionally, these figures show that despite the significant decreases in sulfate, levels are still high and visibility is still impaired. This is evident in the pictures of Figure AQ-3, which provide a visual representation of the Standard Visual Ranges (SVR) shown in the trend plots.



Figure AQ-3. Pictorial representation of best and worst monitored Standard Visual Range values at Dolly Sods

Monitoring Question 12. Are AORVs in Class I and Class II wildernesses improving over currently adversely affected levels?

Reductions in Sulfur dioxide emission are not only reflected in the visibility monitoring, but are also reflected in the bulk deposition and National Atmospheric Deposition Program measurements from Bearden Knob and Parsons (Figures AQ-4 and AQ-5).

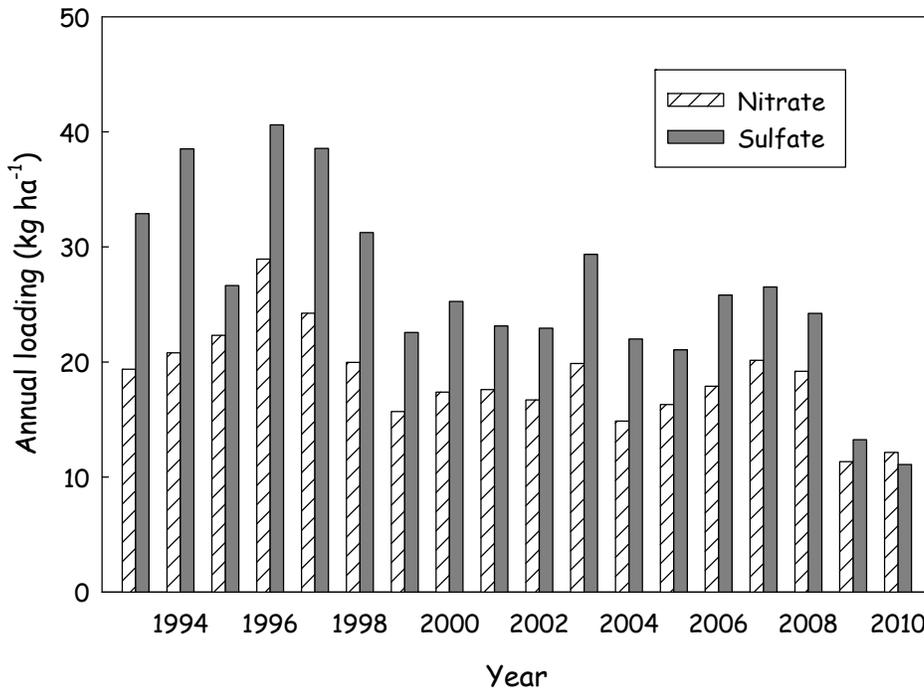


Figure AQ-4. Bulk Deposition for Sulfate and Nitrate at Bearden Knob. Data provided by the Fernow Experimental Forest

(Note that 2010 data is missing data from parts of November and December so it does not represent an entire year as is the case for 1993-2009)

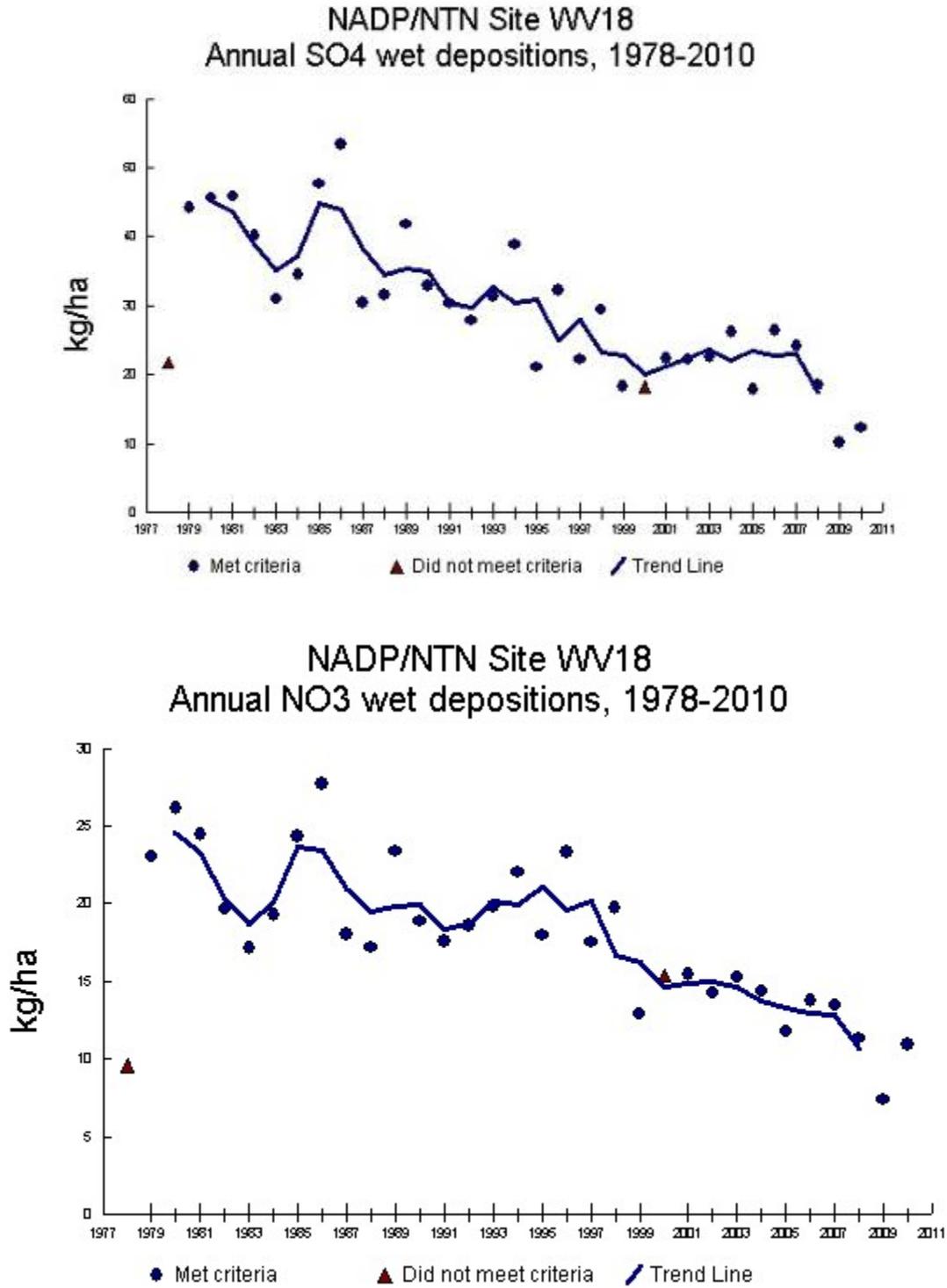


Figure AQ-5. NADP Trends Data for Sulfate and Nitrate at the Parsons Monitoring Site

Over the last 20 years, there has been a decreasing trend in both sulfate and nitrate deposition. Although downward trends in SO₂ emissions and SO₄ deposition are predicted to have a positive effect on aquatic and soil resources on the MNF, the reductions are not great enough to reverse all of the degradation that has already taken place. For example, results from modeling projections in the Southern Appalachian Mountain Initiative, and MAGIC modeling results for the MNF show that a number of streams on the Forest have been acidified to the point where they are no longer capable of sustaining aquatic life or have acidified to where only the most tolerant aquatic species remain, will not recover at current levels of deposition. Additionally, these reports found that some systems are so acidified that they will not recover even if we were willing to wait 100 years and deposition went to zero (Sullivan et al. 2004). According to these projections, reductions in SO₂ emissions resulting from the 1990 Clean Air Act amendments will not be enough to restore the chemistry in many of these acidified streams to levels where aquatic life can thrive, even after 100 years. Significant additional emission reductions will be needed to restore already degraded streams, and to protect streams that have not yet degraded significantly.

Monitoring Question 13. What are the trends in ambient air pollutant concentrations near the Forest?

Ozone monitoring has been conducted at two sites on the Forest. One site is located at the Forest Service office complex in Parsons, WV and is part of the national monitoring network, CASTNET (Clean Air Status and Trends Network). The other site is located at Bearden Knob outside of Davis, WV. High or chronic ozone exposure is a human health concern and can harm people with respiratory illnesses, or those involved in vigorous outdoor activities. Ozone can also have harmful effects on vegetation when it enters through the stomata in plant leaves. A National Ambient Air Quality Standard (NAAQS) is set for ozone in the United States to protect human health. The standard is based on a rolling eight-hour average of daily hourly values, with the fourth highest maximum eight-hour value averaged over 3 years. Currently, this value can not exceed 0.085 parts per million (ppm); however the EPA has recently lowering this standard to 0.075 ppm. It is anticipated that this change will affect attainment status for many areas. Although neither site on the Forest is used to determine attainment of the NAAQS, a recent review of the monitoring data from Bearden Knob shows that the NAAQS were exceeded (based on the attainment criteria described above) from 1995-1999. Data from 2004-2006 show that the NAAQS have not been exceeded, but levels remain just below the current standard at approximately 0.077 ppm. The most recent data, from 2006 show that two of the calculated eight-hour averages at Bearden Knob were above 0.080 ppm, with the fourth highest maximum value below this at 0.077 ppm. Nonetheless there are no counties containing National Forest land on the Monongahela National Forest that are listed as impaired for ozone by the US EPA in 2008.

Ozone

Ozone concentrations have been monitored at the Nursery Bottom site (1673 ft elevation), and at the nearby high elevation Bearden Knob site (3855 ft elevation). Ozone exposures at the two sites exhibit important differences: concentrations at the Bearden Knob site show relatively little diurnal variation and remain around 0.045 ppm (seasonal hourly average, April to October), while those on the Nursery Bottom show a large variability throughout the day from a low of around 0.02 ppm to a high of around 0.045 ppm (Lefohn et al. 1994). Thus the peak

concentrations of the two sites are the same but the exposure by the vegetation differs, with lower exposures at the lower elevations of the FEF. Ozone levels sufficient to cause foliar injury of sensitive plant species have been recorded (Edwards et al. 1991; Lefohn et al. 1994), and some ozone symptoms have been recorded in Otter Creek (Jackson and Arbucci 1989) but widespread injury has not been observed. Data for the two sites taken in 2007 and 2008 show high variability but maintain the trend of lower average ozone levels at the Nursery Bottom site than on Bearden Knob (Figure).

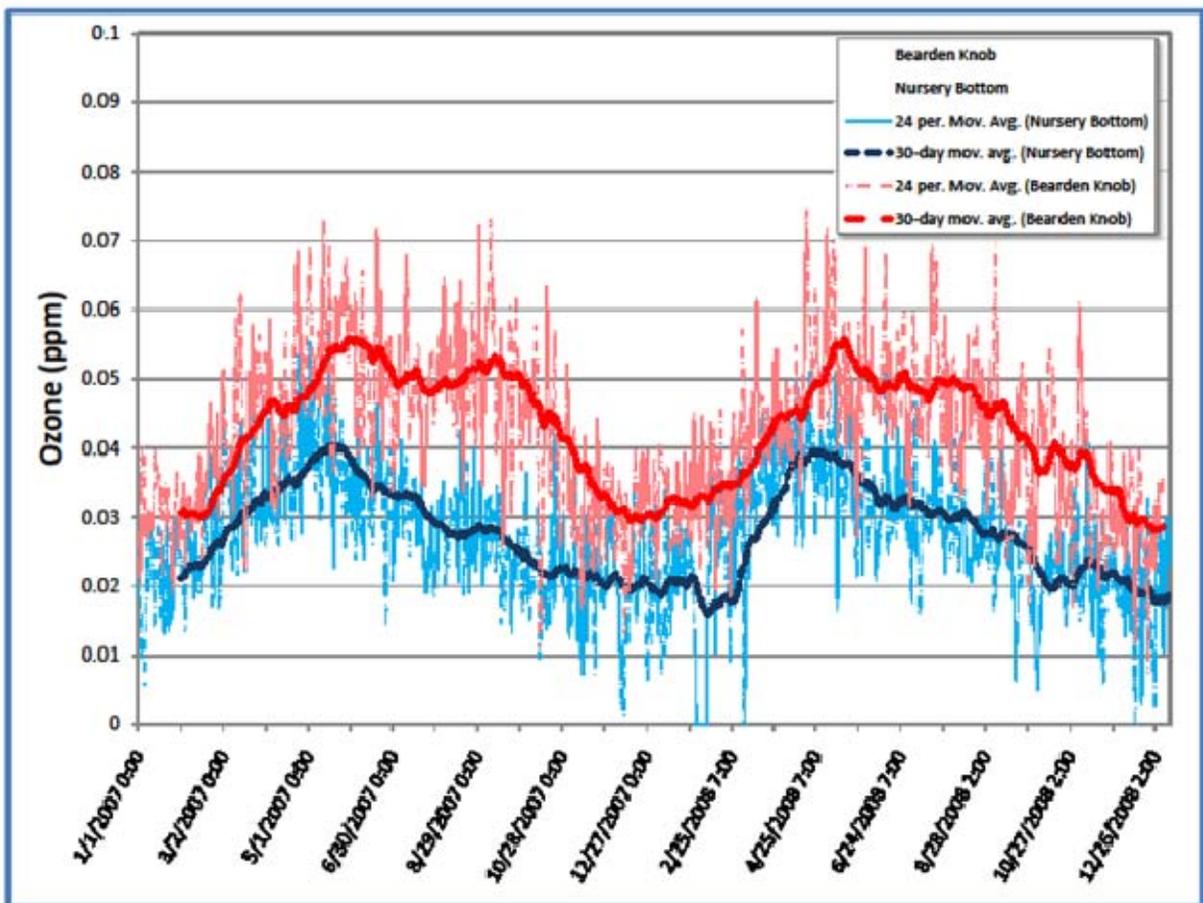


Figure AQ-6. 2007 and 2008 hourly ozone data from Bearden Knob and the Nursery Bottom summarized with 24-hour and 30-day moving averages

Response of vegetation to ozone in these areas from 1988 through 1999 was determined using the combination of W126 values (sigmoidally weighted exposure index), the number of hours that average concentrations were greater than or equal to 0.10 ppm (N100), and the presence of moderate or more extreme droughts. These values generally suggested minimal ozone effects, or effects to only highly sensitive tree species, with the exception values in 1988. Values at Parsons

in 1988 indicate that moderately sensitive and/or resistant tree species could have experience growth reductions due to ozone; however average Palmer index conditions for 1988 indicated severe drought for most of West Virginia. As a result, high stomatal resistance (leaves closed their pores) would have been common, so moderate and severe ozone damage would have been unlikely because the ozone would have been less able to get into the leaves to do damage. Otter Creek and Dolly Sods Wildernesses were evaluated for ozone injury during this drought period and ozone damage symptoms were less than those observed in 1989-1990 under near normal conditions (Edwards, Huber and Wood et al. 2004).

The US EPA currently has a proposal to update the 8-hour ozone standard, both primary and secondary values. They are proposing setting the primary 8-hour standard at somewhere between 60 and 70 parts per million (ppm). The secondary standard is a measure of ozone exposure to plants during daylight hours of the growing season (summer months) – the W126 mentioned above. Higher ozone levels are weighted more since they have a greater impact on plant health and growth. The US EPA is proposing to set the secondary standard between 7 and 15 ppm-hours. Exposure levels in 2008 ranged from 12 to 24 ppm-hours on the Fernow Experimental Forest (FEF) near Otter Creek Wilderness. Past exposure levels ranged from 12 to 46 ppm-hours, were lowest in 2004 (between 12 and 13 ppm-hours) and greatest in 2001 (approx. 46 ppm-hours). There is no obvious trend in ozone exposure.

Fine Particulates

The pollutant of most concern to public health and visibility on the Monongahela National Forest is particulate matter. Even though particulate matter itself has no serious effects on ecosystems it does affect human health and visibility. Because of its smaller size, PM_{2.5} poses greater respiratory health system risks than PM₁₀.

The PM_{2.5} standard requires concentrations of PM_{2.5} not to exceed a 24-hr average of 35 µg/m³ (micrograms per cubic meter). This standard was changed from the previous 65 µg/m³ by the EPA on 12/17/06 <http://www.epa.gov/particles/fs20061006.html>. Average annual arithmetic PM_{2.5} concentrations are not to exceed 15 µg/m³.

Monitoring Questions 11, 12, and 13. Conclusions and Recommendations

Air quality direction under the revised LRMP (US Forest Service 2006) is similar to that in the former 1986 plan except that it clarifies the Forest's role in the regulatory arena and emphasizes the Forest's responsibility for protecting air quality when conducting management activities. Similarly, the air quality Monitoring and Evaluation items in the coming revised plan break out and clarify monitoring items as they relate to air quality direction (Chapter IV, Monitoring and Evaluation Matrix, Items 11-13). Under the revised plan we monitor and assess trends to determine whether or not air pollution concentrations and AQRVs are improving over current adversely affected levels. Additionally, it addresses how the Forest should track to what extent management is contributing or responding to air pollution effects on ecosystems and visibility. This directly ties to the Forest's role in PSD permitting and other regulatory processes, as well as how we are using monitoring data in these efforts. There are also linkages there between air pollution effects on AQRVs such as visibility, soil and water, and how the Forest is responding to these effects in management decisions.

Given the existing and coming direction under the revised LRMP, visibility, acid deposition and ozone monitoring will continue at Bearden Knob and the Forest Service office in Parsons as part of an ongoing effort to track air pollution trends. This data will be used when assessing the condition of air quality and AQRVs in the class I areas. It will also be used when looking at how management activities may exacerbate or contribute to affected AQRVs. Additionally, the Forest will continue its involvement in PSD permitting processes and other regulatory initiatives, such as the regional planning organizations under the Regional Haze rule in effort to reduce the negative effects of air pollution on the AQRVs in Dolly Sods and Otter Creek Class I areas. In addition, efforts aimed at developing critical loads for class I areas will continue.

Heritage Resources

Introduction

The Heritage Resources Program strives to maintain professional standards regarding site management, artifact curation, and response to requests from other Forest programs in a timely and efficient manner. In addition, the Heritage Resources Program seeks to provide heritage education opportunities for the public.

The Heritage Resources Program also strives to maintain an active, open relationship with professional archaeological associations, scholarly institutions, local history groups, interested individuals, and regional interest groups that emphasize heritage resources. We provide information and support to these groups and individuals in as timely and efficient manner as possible. The Forest Archaeologist participates on the boards of various community public history groups, including the Council for West Virginia Archaeology, Rich Mountain Battlefield Foundation, and the Appalachian Forest Heritage Area (AFHA) Group. Heritage Resources personnel also participate in the semi-annual meetings of the Council for West Virginia Archaeology and the West Virginia Archaeological Society.

2010 Program Accomplishments

The Heritage Resources Program completed 89 projects in FY 2010 that resulted in a file letter or report. Nine projects requiring field work were completed, involving survey of a total of 18 acres. A single new site was identified.

Monitoring and Evaluation

FOREST PLAN MONITORING FOR HERITAGE RESOURCES

The 2006 Forest Plan has two monitoring questions for heritage resources, found on page IV-8. They have been reworded somewhat due to recommendations made in the FY 2007 Annual Monitoring Report and a subsequent Forest Plan administrative correction.

Monitoring Question 18. Are project-specific mitigation measures being followed as recommended in project designs? If so, are they providing effective protection for heritage resources?

Monitoring Question 19. Are heritage resources being affected in non-project areas (e.g. from looting, OHV use, erosion, etc.)?

These monitoring questions respond to the National Historic Preservation Act of 1966, as well as part b) of Goal HR01 from the 2006 Forest Plan (p. II-38): *Preserve, protect, stabilize, monitor, interpret and, when appropriate, mitigate for loss of, or adverse effects to, historic properties.*

In 2010, the Heritage Resources Program inventoried one new site to the heritage site files. I monitored the current condition of archaeological sites as part of our larger field schedule. In FY 2010 a total of 20 sites were monitored. Sites that were monitored include National Register listed sites, National Register eligible sites, and sites located in or near current projects. I monitored these sites in order to assess changes in the site conditions and to identify natural or human causes of these changes. As a matter of efficiency, sites monitored were largely those located in or near current project areas.

Monitoring Questions 18 and 19. Evaluation, Conclusions, and Recommendations

Of the 20 sites that were monitored, all were found to be in good or undamaged condition (site forms are on file at the Forest Supervisor's Office). However, monitoring in previous years has revealed that occasionally sites are adversely affected by Forest Service management activities. Forest Service activities are generally planned to avoid adverse effects to NRHP-listed, eligible, or unevaluated heritage sites. Previous incidents involving adverse effects were likely caused by, or exacerbated by, internal communication failures.

We have not been as effective as we could be regarding monitoring the effects of projects to cultural resources in the near term; specifically, the effectiveness of project-specific mitigation measures (Item 18 above) has not been addressed for any recently implemented projects.

Recommendations: Identify ways to better provide Heritage Resource input prior to and during project implementation with both Forest staff and contractors.

Continue to seek additional funding and personnel for increased monitoring efforts. There are 2,417 heritage sites recorded on the Monongahela National Forest. Only 465 sites have been monitored in the past two decades. Given that a previous monitoring effort in 2004 revealed that sites have been inadvertently destroyed during project implementation, attempts should continue to be made to work more closely other Forest staff and contractors to ensure site avoidance, and to monitor known sites for success or failure in these efforts.

Mineral Resources

Introduction

Forest Plan direction identifies goals and objectives for the management of mineral resources on the Monongahela National Forest (MNF):

- *Goal MG01 - Make minerals available for exploration, development and production consistent with other appropriate uses and protection of the environment. Emphasize energy-producing minerals. Facilitate orderly and environmentally sound exploration, development, and production of mineral resources through standardized inspection, monitoring, and reporting requirements.*
- *Goal MG02 - Emphasize appropriate mitigation and reclamation of environmental disturbance for all mineral exploration and development proposals. Reduce environmental effects from past mineral-related activity. Restore disturbed land to a productive condition.*
- *Goal MG03 - Provide for reasonable access to and use of NFS land surface for mineral activities. Allow for and support reasonable use of NFS land for the exercise of reserved and outstanding mineral rights consistent with deed terms and law.*
- *Goal MG04 - Integrate mineral and geology project planning and implementation in a manner that is consistent with other resource management direction. Include collection and analysis of the appropriate geologic information as a part of Forest project planning and decision-making.*
- *Objective MG05 - Inventory abandoned mines and prepare restoration plans to address biological and physical resource concerns, chemical stability, and human health and safety.*
- *Objective MG06 - Keep 70 to 80 percent of federally owned oil and gas available for exploration, development and production.*

We track progress toward the achievement of Forest Plan goals and objectives by monitoring. For example, the Forest Plan (Chapter IV) contains direction for monitoring minerals to determine whether mineral exploration, development, and production mitigation measures are being followed and are effective in reducing impacts. The Forest may not be the entity that issues all permits for mineral development on NFS land, but we do have the responsibility to help ensure that the development activities do not result in unacceptable adverse effects to the land and other Forest resources. We accomplish this through a combination of identifying appropriate lease conditions, operating plan review and approval, and on-site inspections. With on-going mineral activity on the Forest, annual monitoring and evaluation for these effects allows the Forest to make adjustments more quickly to reduce unacceptable effects if present. Through the three monitoring questions answered herein, this monitoring report tracks progress toward achieving goals MG01, MG02, MG03, MG04 and objective MG06.

2010 Program Accomplishments

The Minerals Program accomplishments for Fiscal Year (FY) 2010 included:

- Budget and work planning, including out-year planning.
- In response to industry requests to lease approximately 11,000 acres of federally owned oil and natural gas, we completed the process of recommending consent to leasing with identification of the stipulations and conditions needed to ensure oil and gas leasing is consistent with the Forest Plan.
- Providing input, analysis, and review for various Forest projects.
- Inspecting 31 active mineral operations.
- Monitoring and evaluation efforts as described below.

Monitoring and Evaluation

The 2006 Forest Plan currently has three monitoring questions for Mineral Resources: questions 20, 21, and 22. Monitoring and evaluation efforts in FY 2010 for these questions are described below.

Monitoring Question 20. Are mineral exploration, development and production mitigation measures being followed and are they effective in reducing impacts?

Forest-wide General Monitoring

Forest Plan minerals monitoring included conducting inspection and field-checks of 31 active mineral operations to determine whether Forest Plan standards and mitigating measures identified in mineral operations decisions have been applied, and to look for resource conditions of concern associated with the mineral operations. There were 71 active mineral operations on MNF National Forest System (NFS) lands in FY 2010. Based on funding and direction, the Forest mineral staff inspected 44 percent of the active mineral operations in FY 2010 to a standard that ensures compliance with the approved operating plans (see Inspection Reports within each mineral operation on file with the Forest Geologist in the Forest Supervisor's Office). In FY 2010, one natural gas well was plugged (October 2009) due to a drop in gas production from it. The mineral operations monitored were associated with natural gas exploration, development and production, as well as, natural gas storage operations and maintenance. The active mineral operations chosen for inspection included all sites in which there were mineral operations involving earth disturbance, as well as, a sample of sites on which routine operation and maintenance of the facility occurred.

Monitoring Question 20. Evaluation, Conclusions, and Recommendations

Forest staff inspections of active mineral operations found most operations in compliance with respective operating plans. Operations that were out of compliance were so in ways that did not create substantial adverse environmental effects. For example, natural gas equipment/facilities

on a couple sites were showing rust and needed to be painted. Some operations inspected in FY 2009 that had similar kinds of maintenance needs showed improvement by the 2010 inspection period, and other sites developed undesirable conditions, such as tall grass around the wellhead. Operators are allowed to cut grass around the well pad after the July 15th ground-nesting bird protection period.

One of three wells in one gas field showed a newly installed gate and new signs. This was an improvement from the previous year but some of the facilities could have benefited from painting as identified in 2009. Another well site in a natural gas storage field inspected in June 2010 showed high grass around the wellhead and valves and, when later checked in August, the pad had been mowed.

Invasive plant presence has been monitored to a limited extent on gas well sites. Of the 31 well sites examined, thistles were found on 1 site, compared to 2 sites from last year. These figures are more of a representative sample of the numbers of wells inspected rather than a reduction in thistle. Several sites re-inspected in 2010 that had identified weeds in 2009 did not show weeds but the seasonal timing of the inspection and recent mowing may have been factors in the absence of weeds.

Inspection reports note that invasive thistle continues to grow, although not abundant on any of the sites. The Forest has told the operators to remove the thistle by cutting it prior to flowering and seeding. Such seeds once dropped, can remain in the ground for five years before sprouting. Manual thistle removal appears to be keeping the thistle from becoming abundant on the affected well sites, but it is not eliminating the thistle. Because thistle needs well-lighted conditions to thrive, it is not likely that the thistle will spread very far into the adjacent woods from the affected well sites.

Recommendations: Continue monitoring active mineral operations for compliance with approved operating plans. In particular, continue to identify site maintenance needs and invasive species presence at gas well sites and associated roads and pipelines, so that appropriate actions may be taken to ensure compliance with operating plans and thwart the proliferation and spread of invasive species at natural gas facility sites.

Follow-up Detailed Monitoring at Berry Energy B-800 Site

The Berry Energy, Inc. Gas Well B-800, was drilled in FY 2008, and we reported the results of some detailed monitoring in the 2008 and 2009 annual monitoring reports. In this 2010 monitoring report, we provide additional information on a monitoring item from FY 2009 that was deferred until FY 2010.

Detailed Monitoring Question

Were there other effects of concern that occurred as a result of the B-800 gas well project?

Our monitoring examined the effects of land application of drill pit fluids. The approved plan allowed for land application of drilling fluids according to the terms of the General Water

Pollution Control Permit GP-WV-1-88 at a location where they could not seep into the area's karst. This General Water Pollution Control permit authorizes land application as long as the fluids that are land applied meet the permit conditions.

Evaluation and Conclusions

The drilling pit liquids were treated to prepare for land application, and land application of approximately 80,000 gallons of drill pit fluids occurred in the designated area about 750 feet northwest of the drill site over the period of June 12 to June 21, 2008.

The area identified for land application was located where fluids could not seep into karst, and in gently sloping terrain to avoid risk of eroding overland flows. The size of the land application area was to be as small as possible to limit the potential for interfering with active Fernow silvicultural and prescribed fire research studies.

Impacts to vegetation occurred within the land application area even though the land application complied with the permit terms. Monitoring focused on the estimated 0.5-acre land application site used June 12-21 (USDA FS 2009 pp 46-49). This report provides a summary of monitoring findings through the end of FY 2010 (September 30, 2010).

The Fernow Experimental Forest staff continued to monitor vegetation and soil at the land application site and in a control area that was unaffected by land application.

Land Application Area Vegetation Monitoring Results

The results of the Fernow Experimental Forest staff's vegetation monitoring in the 0.5-acre land application area indicated that in July 2008, shortly after the land application occurred, 115 trees ranging in size from 1 to 27 inches in diameter (at breast height) showed symptoms of damage, including leaf browning, leaf drop, or twig dieback. In May 2009, 147 trees, or an additional 32 trees over the 2008 number of trees showed symptoms of damage. About half of the 147 trees had no live foliage, and were considered dead. Some sprouting of tree seedlings and ground vegetation was observed, as well as areas of dead ground vegetation, within the land application area in May 2009 (USDA FS 2011). Vegetation monitoring in the summer of 2010 documented an additional six trees of the 147 ranging in size from about 1 to 10 inches in diameter as dead (Adams 2011). In 2010, understory herbaceous vegetation re-growth was evident. The photographs below taken in August 2008 and June 2010 provide a visual comparison of the forest floor vegetation in the land application area (Figures MR-1 and MR-2).



Figure MR-1. Land Application area in August 2008, within two months of applying drill pit fluids



Figure MR-2. Land Application area in June 2010, about two years after applying drill pit fluids

Land Application Area Soil Analyses Results

Soil samples (collected from the top 10 cm, or slightly shallower than 4 inches) collected in July 2008, October 2008, May 2009, October 2009, and July 2010 were analyzed for a variety of elements² (data is located in the Forest geologist's file). Several elements were found at higher or slightly higher concentrations in the control area than in the land application area:

² Soil analytes discussed herein collected by Fernow Experimental Forest scientist Mary Beth Adams (unpublished data) include chloride, iron, manganese, calcium, potassium, magnesium, phosphorous, aluminum, sodium, zinc, and lead. Target analyte metals analysis was completed on the May 2009 soil sample, and included silver, arsenic, barium, beryllium, cadmium, cobalt, chromium, copper, mercury, nickel, antimony, selenium, strontium, thallium and vanadium.

exchangeable manganese and aluminum; total lead, arsenic, barium, cadmium, copper, mercury, selenium and vanadium. Chromium was slightly higher, but not substantially so, in the land application area compared to the control area. Several elements showed concentrations below the minimum detectable limits for the analyses methods. These were silver, beryllium, cobalt, antimony, and thallium. The results for all of these elements indicate that no State soil limits set by regulation were exceeded in the land application area.

Exchangeable iron and zinc were higher in the control area than the land application area in four of the five samples, and slightly lower in the control area than the land application area in the October 2008 sample. Exchangeable phosphorus was higher in the control area than the land application area in three of the five samples, and slightly lower in the control area in the October 2008 and Summer 2010 samples. Exchangeable calcium, potassium and magnesium were somewhat elevated in the land application area compared to the control area; however the concentrations of these common soil nutrients were within the expected ranges of soils on forested land in the MNF (soils data on file with the Forest Soil Scientist, Stephanie J. Connolly). Variability in concentrations of these elements in the land application and control areas may be due to soil sampling method and the natural variability in the soil profile.

Chloride, sodium, and strontium were elevated in the land application area compared to the control area.

Soil samples were analyzed one time for the element strontium. Although substantially higher in the land application area (87.7 mg/kg) compared to the control area (9.19 mg/kg), strontium is plentiful in the geosphere in concentrations as high as 400 mg/kg. Whole body content of strontium in humans (most of which is found in bones) has been documented to be 5 mg/kg in an average American adult, and people take in about 2 mg of strontium each day (<http://www.frankmckinnon.com/strontium.htm>). There is no regulatory standard set for strontium in soil. Chloride and sodium concentrations in the land application and control areas are depicted in Figure MR-3.

Both chloride and sodium concentrations in soil at the land application site have declined, and currently appear to be approaching pre-land application concentrations. Of the various elements tested in the soil and the findings described above, chloride and sodium concentrations in the soil appear to provide a reasonable way to continue tracking soil chemistry trends within the land application site. The sodium and chloride concentrations documented in the treated area, in contrast to the concentrations found in the control area, suggest that either or both of these elements are likely the source of the observed impacts to vegetation.

The drop in the number of new trees dying, the return of growth in understory herbaceous vegetation, and the soil sodium and chloride concentrations at levels approaching those of the control area, suggest the land application site may be starting to recover.

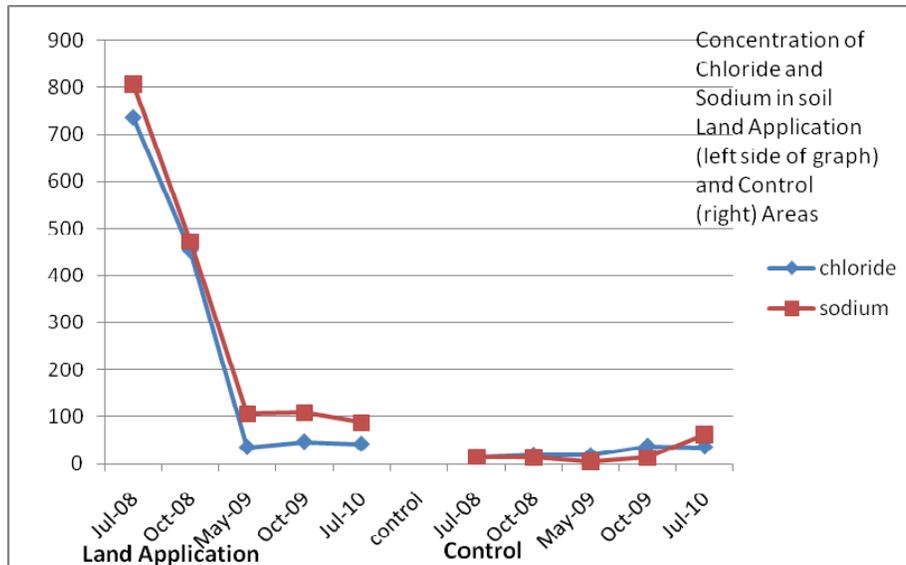


Figure MR-3. Chloride and sodium concentration in soil at the land application site for Berry Energy B-800 gas well drill pit fluids and control (unaffected by land application) site

Another piece of information collected during land application monitoring may have a bearing on the vegetation impacts observed. Although chloride concentration in the land applied drill pit fluids met the General Water Pollution Control Permit GP-WV-1-88 requirements, a Forest Service-collected sample of the drilling fluids being discharged documented a one-time high chloride concentration of 14,250 mg/l (USDA FS 2009 p. 46). This spike in chloride concentration could indicate that pit fluids were chemically non-homogeneous, and, as a result, fluids with higher concentrations of chlorides may have been applied to certain areas within the land application area. Although the opportunity to test such a theory on this land application instance had passed, Fernow and MNF staff completed a limited test of the hypothesis regarding chemical non-homogeneity of fluids that have flowed back to the surface from hydraulic fracturing. Although in an 18-foot tall upright tank rather than a drill pit, flowback fluids had chlorides concentrations that increased substantially with depth in the tank, supporting the hypothesis of chemical non-homogeneity (Edwards et al., In press). Because the study was done on one tank only, conclusions applicable to drilling fluids contained in pits cannot be made. However, recognizing the possibility of spatial variation in drill pit fluid chemistry provides the Forest Service with information useful to evaluating future proposals for land application of drill pit fluids on NFS land. This knowledge will also guide operators who plan to drill on NFS land to take actions to collect pre-discharge drill pit samples that are representative of thoroughly mixed drill pit fluid composition, and to ensure drill pit fluids are appropriately mixed at the time of discharge onto the land application site.

Through monitoring the land application, we gathered information about what happened and why it happened in order to help to avoid similar impacts to vegetation from land application of drill pit fluids on NFS land in the future. Based on the findings, it appears that the land application area received doses of sodium and chloride from the pit fluids that were too high for the vegetation to absorb them without being damaged. Because the land application site was confined to a small area to avoid impacting nearby on-going research, repeated hose applications

occurred within the confines of the 0.5-acre area. This resulted in some areas receiving drill pit fluid several times over the 10-day land application time period. Each application that delivered fluid containing sodium and chloride added to what had already been applied, resulting in higher concentrations of sodium and chloride accumulating in the soil and soil water, which was then taken up by plants in the height of the growing season. We also note that the concentration of chloride in the drill pit fluid at the discharge hose outlet varied, which may also have resulted in higher concentrations of drill pit fluid chemical constituents delivered to some spots within the land application area.

Recommendations: As long as soil chemistry data is collected, continue to track the land application and control areas' soil chemistry, and report findings in the FY 2011 monitoring report. Incorporate vegetation data collected by the Fernow Experimental Forest staff within the land application and control areas into monitoring reporting, as it becomes available.

Continue to incorporate new knowledge pertinent to land application of drill pit fluids into Forest Service processes for reviewing and evaluating gas well drilling proposals involving land application of drill pit fluids.

Apply the knowledge that repeated fluid application to an area over a short time period and/or during the growing season for plants, depending on the concentrations of chemical constituents in the fluid, may damage vegetation. In practice, operators would need to demonstrate that the pit is thoroughly mixed prior to predischage sampling and immediately prior to land application, and avoid discharging drill pit fluids onto the same ground more than once during land application.

Monitoring Question 21. How close are projected estimates of National Forest System land that could be impacted by natural gas development to actual amounts?

Periodically comparing our predictions on the amount of NFS land impacted by mineral activity to actual amounts provides a way to check whether mineral activity could be producing effects outside of anticipated ranges. Such monitoring also provides additional information on progress toward achieving Goals MG01, MG02 and MG04, which address mineral operations being conducted consistent with other uses and protection of the environment in ways that appropriately mitigate and reclaim mineral-related environmental disturbance, and in a manner that is consistent with other resource management direction.

Leasing the federally owned oil and gas estate is a Forest Plan implementation activity that could result in a proposal by the lessee to develop the natural gas within the leasehold area (USDA FS 2006b, pp. 42-43). Recently, a number of groups and individuals—who objected to the latest federal gas lease offerings on the Forest, or who attended a MNF-sponsored seminar on federal gas leasing and operations in March 2010—voiced concerns that exploration and development of the Marcellus shale, a relatively new Appalachian region natural gas exploration and development effort, will result in unacceptable effects to MNF resources, and these effects have not been analyzed or disclosed. These groups and individuals were concerned that the reasonably foreseeable natural gas development scenario prepared for Forest Plan revision no

longer represents potential gas development, and thus the scenario no longer provides a reasonable basis for effects.

We have heard concerns that Marcellus shale gas exploration and development will result in greater effects to National Forest resources than analyzed and disclosed in previous Forest Plan environmental documents because of what these people have seen and heard about Marcellus shale developments. In particular, some concerns people have expressed include:

- The overall area of National Forest land that could be impacted may be larger than predicted because Marcellus gas well sites are generally 4-5 acres in size compared to the estimated 2-acre well site projected in the Forest's reasonably foreseeable gas development scenario,
- Large volumes of freshwater typically required to complete hydraulic fracturing to release gas from the Marcellus shale could dry up or reduce aquatic habitat in Forest streams, and affect groundwater quantity,
- Disposal of used hydraulic fracturing water that flows back from the well could pollute land, streams, and groundwater if land application of these fluids is allowed to occur or if illegal disposal occurs, and
- Contamination or loss of groundwater quantity may occur due to high-pressure hydraulic fracturing.

As a result of these concerns, the aforementioned groups and individuals want the Forest Service to not consent to oil and gas leasing on the MNF, discard or amend the Forest's foreseeable gas development scenario as a basis for effects, and/or re-analyze effects of Marcellus shale gas exploration and development on MNF resources.

The Monongahela NF FY 2009 Monitoring and Evaluation report for mineral resources discussed the adequacy of the Forest Plan and associated NEPA documentation regarding future potential Marcellus shale development under a federal oil and gas lease. In this FY 2010 report for mineral resources, we provide an update on gas leasing and development activity and review its projected impacts based on the reasonably foreseeable development scenario, and examine how foreseeable Marcellus shale gas exploration and development may bear on projected impacts to MNF land and resources.

Monitoring Question 21. Evaluation, Conclusions, and Recommendations

Evaluation

The Forest Plan revision process provided the opportunity to determine if National Forest resource impacts from natural gas exploration and development have been occurring as predicted. Disturbance—including earth disturbance, vegetation clearing, and conversion from forested to herbaceous vegetation types—and associated effects were considered during Forest Plan revision for the projected reasonably foreseeable amount of natural gas leasing and development in the Monongahela National Forest Final Environmental Impact Statement (FEIS) for Forest Plan Revision (September 2006).

A comparison of predicted versus actual natural gas development on the Forest indicated substantially less development has occurred than predicted for the period 1991 through June

2006 (FEIS, p 3-368). Other than a natural gas pipeline installation involving an estimated 7.25 acres of earth disturbance (Nine and Nichols gas pipelines, approved in 2004 and 2008), no new surface-disturbing gas exploration, development, or production operations occurred in FY 2010. After adding in new surface disturbances for the period June 2006 through FY 2010, a comparison of predicted and actual surface-disturbing gas activities shows about 20 percent of the projected number of wells have been drilled, and 6 percent of the anticipated acres of surface disturbance, 8 percent of the anticipated road miles, and 30 percent of the anticipated gas pipeline miles have been actually proposed and authorized since 1991. Therefore, disturbance from gas development has been and continues to occur at levels considerably less than predicted in 1991 and reassessed in 2006.

At a site-specific scale, gas well site disturbed area and opening size were examined to determine how their size compared to acreage estimates used to generate earth disturbance projections. The Forest Plan revision effects analysis used an earth disturbance estimate of an average 2 acres per well site. Findings from an unpublished 2007 report by Mary Beth Adams indicate that gas well sites on the Forest range in size from an estimated 0.4 acres to 2.5 acres, with an average size of about 1.25 acres. These findings on well site size are another indication that earth disturbance from gas development is occurring at levels less than predicted.

Future Activity within Federally-Issued Leases

Prior to forwarding lands to the Bureau of Land Management (BLM) to be offered in a lease sale, the Forest staff verify that such leasing has been adequately addressed in the Forest Plan's NEPA document, identify conditions of surface occupancy from the Forest Plan, and determine that operations would be allowed somewhere on the proposed lease area, except where stipulations prohibit all surface occupancy (USDA FS 2006b, pp. 42-43). This process has been used on the MNF for more than two decades for the purpose of providing consent to the BLM to lease federally owned oil and gas. Approximately 107,600 acres or 19 percent of the federally owned oil and gas is currently leased on NFS land within the MNF.

Once a lease has been issued, proposals to conduct operations within the lease area undergo a site-specific analysis according to the National Environmental Policy Act (NEPA). Surface use plans for proposed activities within the lease must be reviewed and approved by the Forest Service before the proposed use of NFS land is authorized (FEIS, p. 3-372). This process for authorizing use of NFS land within a leased area has been used on the MNF for more than two decades.

Reasonably Foreseeable Development Scenario (RFDS): Oil and gas leasing regulation provides direction on the conduct of analyses (36 CFR 228.102 Subpart E). This direction requires a projection analysis of "...the type/amount of post leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program" (36 CFR 228.102 (c)(2) and (3)). The oil and gas RFDS is speculative, but is based primarily on geology, namely the potential for oil and gas resource occurrence based on credible geologic and mineral production information, along with past and present oil and gas activity. This RFDS is also developed with consideration of other important factors such as economics, technology, and physical limitations on access, and existing or anticipated infrastructure and transportation. Existing laws, regulation and certain

administrative limits, such as congressionally designated wilderness being unavailable for federal oil and gas lease, are assumptions included in the RFDS. Although the RFDS has its basis in oil and gas resource potential, it focuses on development potential within the MNF proclamation boundary and purchase units over the life of the Forest Plan (10-15 years). Surface uses necessary to implement the anticipated gas exploration and development on the MNF are included in the RFDS. The RFDS is not a “worst case scenario” based on well-spacing law.

The MNF Forest Plan utilized the RFDS as a basis for determining potential effects to Forest resources from gas leasing and development. The RFDS describes typical operator activities associated with natural gas exploration and developments that are expected to continue over the planning period. These activities include:

- Obtaining an oil and gas lease,
- Conducting preliminary investigations, most commonly by geophysical exploration using seismic shot hole or vibroseis methods,
- Exploratory drilling,
- Development and production (well sites, drilling, pipelines, access roads), and
- Plugging wells and decommissioning facilities that are not part of economical production (USDA FS 2006c, p 3-367).

In the RFDS, planned and potential gas developments were projected to result in the following activities per decade:

- Clearing about 130 acres for 66 gas well sites, each about 2 acres,
- Clearing about 138 acres for an estimated 19 miles of new road to access projected well drilling, and
- Clearing about 473 acres for 78 miles of gas pipeline from an estimated 41 producing wells (out of the 66 drilled wells); rights-of-way may be up to 50 feet wide.

It was assumed that some of the 66 wells would not yield gas. Consequently, it was also assumed that an estimated 50 acres would begin reverting back to forested land shortly after drilling. Cleared areas from producing wells would remain open, supporting herbaceous vegetation, throughout gas production of probably up to 30 years. Due to the intermingled private and federal land and mineral ownership, one half to two thirds of this predicted surface disturbance could be a result of privately owned gas (FEIS, pp. 3-367 to 3-368).

Potential for Marcellus Shale Gas and the Surface Resource Uses Projected in the RFDS

If Marcellus shale gas exploration and development occur within the planning period, they are expected to result in surface uses within the amount and type projected in the RFDS for the reasons explained below.

The Character of Marcellus Shale within the MNF. Economically recoverable Marcellus shale gas resources within the MNF are not proven. Reports range from no natural gas resources of note from tests for Marcellus shale gas in existing wells (Oriskany sandstone/ Huntersville chert) within the Forest, to discovery of Marcellus shale gas on privately owned land within and adjacent to the MNF boundary.

Economic Marcellus shale gas discovery depends on the ability to force the Marcellus shale layer to release a sufficient amount of the gas trapped within the tightly bound shale to recover the costs of drilling and releasing the gas profitably. Although discovery of economic Marcellus shale gas is reportedly occurring near the Forest, the complex folding and faulting of rock layers, combined with the thickness of Marcellus shale within the Forest, are expected to have a bearing on the likelihood and rate of Marcellus shale gas exploration within the Forest such that it is foreseeable to proceed slowly, if or when it does.

Obtaining a sufficient quantity of Marcellus shale natural gas from a well depends on the well bore's ability to extend into and have contact with a large amount of the Marcellus shale formation containing natural gas. If the Marcellus shale layer is discontinuous due to faulting, or difficult to follow with a well bore due to folds in the strata, as is the case within the MNF, establishing contact with extensive areas of gas-bearing portions of the Marcellus formation will be difficult and costly, if possible at all. Faulting present within the Forest also provides a conduit for any gas that may have been present in the Marcellus shale to escape, resulting in no gas or a "dry hole." The drilling history in the Forest for the deeper (than Marcellus) Oriskany sandstone/Huntersville chert provides evidence for the effects of folding and faulting on the potential and risk for discovering economic quantities of gas. Thus, the geologic setting of the MNF is expected to slow, delay, or possibly even preclude exploration and development of Marcellus shale gas within the Forest.

A review of the available information on completed Marcellus shale gas wells, their reported gas flows (final open flow data), and production records on Marcellus pay zone gas wells finds data supporting a lack of or delayed exploration and development.

Figure MR-4 uses data obtained from West Virginia Geological and Economic Survey (WVGES) to show the Marcellus shale gas situation in West Virginia. All but a few of the completed Marcellus pay zone gas wells are outside of or west of the MNF. Even though the shale formation that contains the Marcellus is thicker in the MNF area compared to other parts of West Virginia (hence could have the potential to contain and yield more natural gas), the majority of Marcellus exploration and development has occurred in areas where folding and faulting is less frequent and lower in magnitude (<http://www.wvgs.wvnet.edu/www/datastat/devshales.htm>).

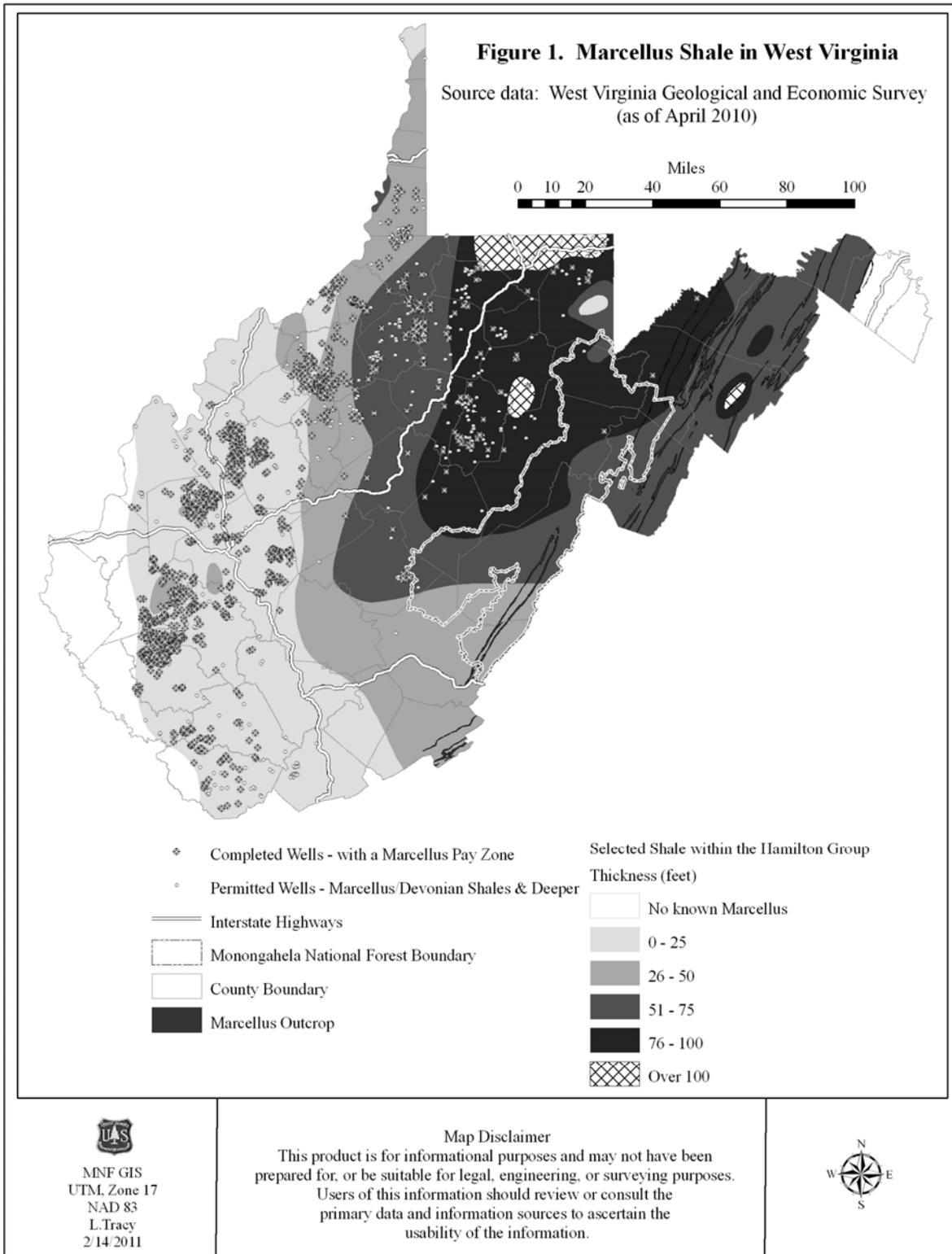


Figure MR-4. Marcellus Shale Development in West Virginia

Comparing gas flows from completed, vertically drilled (approximately vertical in contrast to wells with approximately horizontal bore holes) Marcellus pay zone wells in a similar geologic setting to the MNF with those in less folded and faulted portions of West Virginia, one finds gas flow rates away from the MNF to be on the order of four to eight times that of Marcellus shale wells close in proximity and in geologic setting to the MNF (West Virginia Geological and Economic Survey, 02/2011). No horizontal wells have been drilled in the MNF's geologic setting, therefore, gas flows or production capability from horizontal Marcellus shale wells is unknown (<http://www.dep.wv.gov/oil-and-gas/databaseinfo/Pages/OGD.aspx>).

The combination of low natural gas prices, high drilling and completion costs, paucity or otherwise limited availability of natural gas pipelines to transport gas to markets, and uncertainties associated with potential for successfully finding natural gas in the MNF's geologic setting should act together to slow, delay or possibly preclude development of Marcellus shale gas development in the foreseeable future on the MNF. Marcellus shale gas exploration and development that would occur is expected to produce impacts to surface resources similar to and within anticipated ranges analyzed in MNF 2006 Forest planning documents.

Surface Resource Use Projection. Given the character of Marcellus shale and the complex geology within the MNF, it is reasonable to expect only limited exploration for Marcellus shale gas during the planning period. However, if economically recoverable resources are discovered, additional Marcellus shale gas development could follow.

How would surface resource use associated with exploration and development of Marcellus shale gas compare to surface use projected in the RFDS?

Marcellus shale exploration and development has not occurred to date on Monongahela NFS land. However, we have had an indication on how such exploration and development may occur based on similar activities in other areas. A Marcellus shale well site, on the order of 4-5 acres, would be used to accommodate 6-8 well bores that would be drilled horizontally in different directions into the Marcellus shale formation. The best information available indicates that within the Forest, individual well sites would be spaced so that no more than one well site would occur in approximately 640 acres.

Typical operating activities such as obtaining a lease, conducting preliminary investigations, exploratory drilling, development and production, and plugging wells and decommissioning facilities that are not part of economical production, would still be expected to occur (FEIS, p 3-367). In addition, surface uses associated with projected levels of Marcellus shale exploratory drilling, development, and production are expected to be within predicted amounts in the current RFDS. For example, projected well spacing would be the same as that of the RFDS used in the Forest Plan revision, and this spacing leads to a similar projection of acres of use, or less, for access roads and pipelines (an estimated 13.5 acres, if pipeline rights-of-way were an average of 50 feet wide).

Given that only 6 percent of the anticipated number of acres of surface disturbance has occurred in the last two decades, the Forest Plan revision analysis has considered and analyzed effects on more than 690 acres of disturbance per decade than has actually been occurring. This means that

surface disturbance associated with the limited amount of anticipated Marcellus shale exploration and development, in combination with that of any other gas drilling, would still be expected to fall within Forest Plan revision-analyzed amounts. As such, we conclude that the overall area of NFS land that could be impacted by gas exploration and development, including that of Marcellus shale gas, is not expected to exceed predicted and analyzed amounts during the planning period. Forest staff will continue to monitor any new gas exploration and development on a regular basis to ensure this conclusion is valid.

How are MNF resources protected from potential impacts from drilling and producing Marcellus Formation gas?

People have expressed concerns about a variety of potential surface-impacting activities on an oil and gas lease area associated with Marcellus shale exploration and development. However, Forest Service and BLM regulations (36 CFR 228 E and 43 CFR 3160); authority in the lease (BLM form 3100-11, Section 6 Conduct of Operations); the additional conditions attached to a lease (USDA Forest Service Standard Stipulations, and included Oil and Gas Lease Stipulation/Notifications, Monongahela National Forest, West Virginia); and the NEPA process of reviewing, approving, and applying mitigation to proposals to address site-specific concerns raised and anticipated for Marcellus shale gas, as well as other foreseeable gas exploration and development, provide environmental protections and surface use controls to ensure that any proposed operations could be designed and mitigated to comply with the MNF Forest Plan standards.

Summary of Environmental Protections applicable to proposed gas developments on a federal lease:

1. Federal oil and gas leases contain environmental protection requirements as in Section 6 of the standard lease term:

“Conduct of operations – Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water, to cultural, biological, visual, and other resources, and to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures.”
2. Environmental protections to which proposed lease operations are subject include a wide range of laws and regulations, including the Endangered Species Act, Archaeological Resources Protection Act, Federal Water Pollution Control Act, Clean Water Act, Clean Air Act, National Environmental Policy Act, as well as all the other environmental protection laws and regulations applicable to NFS land. For example, when an operation is proposed on a federal lease, the Forest Service, under a federal law such as Archaeological Resources Protection Act, can control or prohibit surface occupancy, when justified, without a lease stipulation.
3. In addition to the environmental analysis conducted prior to leasing, a site-specific environmental analysis under NEPA is required for proposed lease operations within the

MNF. The leaseholder cannot construct a road, drill a well, or conduct ground-disturbing operations without approval from the federal government. The leaseholder must submit an Application for Permit to Drill (APD), including Drilling Plan and Surface Use Plan of Operations, which must be reviewed and approved by the BLM and the Forest Service, respectively, before ground-disturbing operations can occur.

4. Proposed lease operations are subject to environmental protection requirements in BLM regulations, including Onshore Oil and Gas Onshore Orders. BLM regulation Onshore Oil and Gas Order No. 1 contains environmental protection requirements for the Drilling Plan and Surface Use Plan of Operations in the APD. For example, Drilling Plan requirements include that “The Drilling Plans must be in sufficient detail to permit a complete appraisal of the technical adequacy of, and environmental effects associated with, the proposed project” (Onshore Oil and Gas Order No. 1, Section III.D.3). BLM regulation Onshore Oil and Gas Order No. 2 contains environmental protection requirements for Drilling Operations, including, “The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, abnormally pressured zones, and any prospectively valuable deposits of minerals” (Section III.B).
5. Proposed lease operations are subject to environmental protection requirements in Forest Service regulations, including the 36 CFR 228E regulations that implement the Federal Onshore Oil and Gas Leasing Act of 1987. For example, Forest Service oil and gas regulation surface use requirements at 36 CFR 228.108 require environmental protections relating to access facilities, cultural and historical resources, fire prevention and control, fisheries, wildlife and plant habitat, soil erosion and sedimentation, safety, management of wastes, watershed protection, and reclamation.
6. Federal oil and gas leases on the MNF are conditioned such that proposed lease operations are subject to standards in the Forest Plan. Federal leases contain the following special notification:

Operations under this lease will be consistent with the standards found in the Monongahela National Forest Land and Resource Management Plan (Forest Plan), as revised or amended, and are hereby incorporated into this lease in its entirety. Forest Plan standards include restrictions on location, timing and methodology of oil and gas lease operations, and requirements for special surveys that provide for protection of National Forest land and resources. A copy of the Forest Plan is available for inspection from:

USDA Forest Service
200 Sycamore Street
Elkins, West Virginia 26241
7. In addition, proposed federal lease operations are subject to West Virginia laws and regulations governing oil and gas operations, including those requirements for environmental protection and regulation.

Examples of how the environmental protections would work to control effects from Marcellus shale gas drilling and development on federal oil and gas leases on the MNF

With regard to concerns associated with large volumes of freshwater required for horizontal well hydraulic fracturing, the Forest Service has complete authority for approving, not approving, or approving with conditions, the source timing or method of freshwater withdrawal on NFS land within a federal oil and gas lease. The Forest Plan standards that condition leases (see item # 6 above, which is also Oil and Gas Lease Stipulation/Notifications, Monongahela National Forest, West Virginia, Special Notification #1) provide direction for Forest Service use in reaching a decision on the proposed surface use. For example, a proposal to operate on a federal lease would be evaluated with consideration given to the Forest Plan soil and water Goal SW30, “Maintain surface and ground water sources to support healthy riparian and aquatic habitats, wetlands, channel function, and downstream uses”. Additional protection of surface and groundwater quantity is found in West Virginia Division of Environmental Protection (WVDEP) Industry Guidance on Gas Well Drilling/Completion, for Large Water Volume Fracture Treatments (<http://www.dep.wv.gov/oil-and-gas/Resources/Pages/default.aspx>) that addresses issues of water use and withdrawal statewide. This State-issued guidance, coupled with the requirement to submit an addendum to the State well work permit application showing proposed water source(s) location(s) and volume, provides for protection of water and aquatic resources not on NFS land from being substantially adversely impacted by large volume water withdrawals.

Similarly, the Forest Service has authority to approve, not approve, or approve with conditions, proposals for disposal of used hydraulic fracturing water on NFS land with a federal oil and gas lease area as part of completing the site-specific or project level NEPA analysis. This means a proposal to operate on a federal lease, including the proposed method of fluid disposal, would be evaluated for effects with consideration given to the Forest Plan direction and standards. WVDEP’s Industry Guidance (WVDEP Office of Oil and Gas, 03/2011) provides direction that is applicable statewide as well, including a prohibition on applying Marcellus shale formation hydraulic fracturing flowback fluids on the land (WVDEP Office of Oil and Gas 2010), and a discussion of options such as underground injection control, recycling fracture treatment flowback fluids, and disposal at approved, publicly owned treatment facilities. Operators must submit an addendum to the State well work permit application for large volume water use (greater than 210,000 gallons) that identifies the proposed water disposal method to be reviewed and approved as part of the Well work permitting process.

People are also concerned about possible impacts to groundwater from Marcellus shale well drilling and hydraulic fracturing. On NFS land, the BLM has authority to review the drilling plan portion of an application for a permit to drill (APD) on the federal oil and gas lease area, in order to ensure that the drilling plan meets national standards for well control and protection of fresh water zones (43 CFR 3160, Onshore Oil and Gas Order No. 1). A proposal to drill a well on a federal oil and gas lease must address protection and/or isolation of all usable water zones in the well casing design (43 CFR 3160, Onshore Oil and Gas Order No. 2, Section III.B.). As part of the Forest Service’s role in review and approval of a Surface Use Plan of Operation, effects to groundwater will be considered, analyzed and documented as part of the NEPA process completed on a proposal to operate on a federal lease. The review and analysis of the proposed

casing design provides the opportunity to take a hard look at potential for impacts to groundwater, and the authority to approve the casing design or not provides the mechanism for assuring the casing design addresses potential groundwater quality impacts. Thus, this authority provides the means for conditioning the drilling permit to ensure casing design and integrity of the installed casing is adequate to protect fresh groundwater resources from contamination or loss of quantity due to hydraulic fracturing. Hydraulic fracturing for deep gas wells has been occurring on MNF land for several decades with no known instances of groundwater contamination or reports of reduction in flow.

Conclusions

The impacts to NFS land and resources predicted in the Forest Plan revision RFDS continue to represent foreseeable impacts during the planning period, even with the possibility of limited Marcellus shale gas exploration and development.

The Forest Service has the authority to address environmental concerns, including those surrounding Marcellus shale gas drilling and development, when a proposal is made to drill or develop gas resources within a lease. The Forest Plan standards, which are incorporated into, and therefore binding on, federal oil and gas leases, provide the direction for controlling impacts to NFS land and resources to acceptable levels.

Based on the findings in the ***Evaluation*** section (above), at this time there is no justifiable reason to discard as a basis for effects, or amend the Forest's foreseeable gas development scenario, and/or re-analyze effects of Marcellus shale gas exploration and development on MNF resources. The Forest Plan Revision FEIS (2006c) contains the appropriate level of NEPA analysis and documentation to support moving forward with federal oil and gas leasing. At this time there would be no reason to change the Plan Implementation direction for federal oil and gas leasing on the MNF.

Recommendation: Continue to monitor whether or not estimates of MNF resource impacts associated with gas development, which provide the basis for effects analysis related to a variety of MNF resources, are exceeding predicted amounts.

Monitoring Question 22. Are minerals, especially energy-producing minerals, available for exploration, development, and production at predicted levels?

Progress toward achieving Goals MG01 and MG03, and Objective MG06 can be determined by examining whether there have been changes to Forest management direction, standards and guidelines, or the application of standards that would change the amount of federally owned energy-producing minerals available for exploration, development and production. Since these types of changes are not routine, evaluation may not be needed on an annual basis. Rather, examining each year and reporting every five years or when triggered by a change in Forest Plan management direction or standards should indicate progress in the achievement of these Forest Plan goals and objective for minerals.

The 2006 Forest Plan identifies goals and an objective related to ensuring that minerals are available for exploration and development, with emphasis on energy-producing minerals (MG01, MG03, and MG06). The goals are to make minerals available for exploration, development, and production consistent with other appropriate uses and protection of the environment, emphasizing energy minerals (MG01), and provide for reasonable access to and use of NFS land for mineral activities (MG03). The objective (MG06) is to keep 70 to 80 percent of federally owned oil and gas available for exploration, development and production. The 2006 Forest Plan EIS estimated that 74 percent of the federally owned natural gas is currently considered available for exploration, development, and production (USDA FS 2006c, p. 3-375).

Monitoring Question 22. Evaluation, Conclusions, and Recommendation

In the Monongahela National Forest FY 2009 Monitoring and Evaluation Report for Mineral Resources, the amount of federally owned natural gas currently considered available for exploration, development, and production was estimated to be 74 percent, the same amount as shown in the Monongahela NF Environmental Impact Statement for Forest Plan Revision (September 2006, page 3-375). The monitoring and evaluation frequency for this item is 1-5 years, and the FY 2009 Mineral Resources monitoring recommended that we address Monitoring Question 22 in 5 years or when circumstances come about that result in the possible change in the amount of federal oil and gas available for exploration, development and production. There has been no change in circumstances that would change the amount of federal gas available for exploration, development and production, therefore no new figure to report.

Recreation Resources

Introduction

The Monongahela National Forest (MNF) offers a wide variety of recreation settings and opportunities. The Forest manages 38 Recreation sites. These sites are comprised of 20 developed camp areas (594 individual sites); 44 managed river sites; 9 picnic areas; 3 observation towers; 1 National Scenic Highway, 2 Civil War sites, 2 visitor centers, 4 developed lake sites, 1 cabin rental; an estimated 60 concentrated use areas (areas of high general dispersed recreation activities); numerous dispersed sites across the Forest; the Spruce Knob-Seneca Rocks National Recreation Area (57,000 acres); 260 miles of eligible Wild and Scenic Rivers; and 862 miles of trail. Many recreation special uses for outfitter/guides, organization camps, and recreation events are also permitted on the Forest. In March 2009, the Public Lands Management Act was passed by Congress. Due to this Act and the subsequent land management changes, Administrative Correction #10 was completed on the Forest in September 2010. With this Administrative Correction, the Forest now manages 8 Wildernesses (116,000 acres) and 13 Semi-primitive Non-motorized recreation areas (96,000 acres).

Monitoring occurs to ensure that forest plan and agency direction are followed, health and safety standards are met, facilities are designed appropriately, resources are protected, public demand is met, operations/systems are efficient, laws and regulations are followed, and the public is educated about our recreation opportunities and resources.

2010 Program Accomplishments

Fiscal Year 2010 Recreation, Trails, and Wilderness Program activities are summarized below.

RECREATION

The Forest managed developed sites, concentrated use areas, and developed dispersed camping areas to meet critical health and safety standards during the operating season.

Recreation fee sites on the Forest were managed either through concessionaire or Federal Lands Recreation Enhancement Act (REA). REA revenues supplemented the Forest Recreation allocation to complete critical deferred maintenance projects.

The Gauley Ranger District Youth Conservation Corps program accomplished 912 hours of work and the Marlinton Ranger District accomplished 1,014 hours of work. Basic operation and maintenance projects in recreation and trails were completed.

An estimated 15,209 hours of volunteer work were completed on the Marlinton/White Sulphur Springs Ranger District, 1,979 hours on the Cheat-Potomac District, 4,082 hours on the Gauley District, and 14 hours on the Greenbrier RD, for a total of 21,284 hours.

The Roy Moose interpretive program provided 63 programs, serving approximately 7,600 people in the state of West Virginia, through a participating agreement between the Forest Service and Eastern National Forests Interpretive Association (ENFIA).

The Cranberry Mountain Shindig had approximately 1,800 people participate. The Cranberry Mountain Nature Center (CMNC) Kids Night included about 600 people.

The Gauley Ranger District partnered with Pocahontas County Convention and Visitors Bureau on CMNC staffing.

Interpretive programs were provided at CMNC on demand, including videos in the auditorium and Cranberry Glades tours, to approximately 500 people.

Sales in the ENFIA outlet at CMNC exceeded \$52,000. The Gauley District share of the profit allowed CMNC to provide programs at Kids Night and entertainment and port-a-potties at the Cranberry Mountain Shindig and also Roy Moose's interpretive programs.

Paving for the gate/entrance station was completed at Lake Sherwood.

A new shower building and playground were installed at Blue Bend Campground.

New gates were installed at Tea Creek Campground.

Bear resistant garbage facilities were improved and/or installed at Lake Sherwood, Bishop Knob, and Red Creek Campgrounds.

Old toilet facilities were removed and new CXT toilets buildings were installed at Cranberry Campground, Woodbine Picnic Area, Spruce Knob Lake, Spruce Knob Campground, and Spruce Knob Observation Tower parking area.

Over 8,600 hours of Hosted Program work was completed on the Marlinton/White Sulphur Springs Ranger District by the Anthony Correctional Center and AmeriCorps. This work included maintenance of recreation sites, trails, and wilderness.

Over 1,200 hours of Hosted Program work was completed on the Potomac RD by AmeriCorps. This work included special use permit compliance and operation of the Seneca Rocks Discovery Center (SRDC).

Sales in the ENFIA outlet at the Seneca Rocks Discovery Center exceeded \$92,000. The Cheat-Potomac District share of the profit was used for operation of Sites Homestead and various artists to demonstrate hand-crafted items. Sites Homestead provided a wide range of interpretive programs and interactive events for visitors.

An interpretive sign, benches, and gathering area were constructed in Thomas, WV.

Job Corps students removed flagstone at Lake Sherwood beach house and replaced it with concrete. Over 150 picnic tables, 150 fire rings, and 7 shelter grills were constructed and replaced throughout the Forest. All new features meet accessibility guidelines.

Bird Run Campground was closed. Island Campground was closed to motor vehicle use due to bridges in campground failing inspection. The campground remained open to walk-in traffic.

Accessibility training was provided by the National Accessibility Program Manager. Over 50 Recreation staff, Engineering staff, and visitor center employees participated.

A pollinator garden was constructed at Stuart Recreation Area.

TRAVEL MANAGEMENT

The Forest revised the Motor Vehicle Use Map. The map was divided into north and south portions of the Forest, and it designated roads available for highway legal vehicles, both year-round and seasonally. No trails or areas were designated for off-highway vehicles.

WILDERNESS

All wilderness areas on the Forest were managed to standard in accordance to the 10 Year Wilderness Stewardship Challenge. Air Quality monitoring plans were completed for all wilderness areas.

AmeriCorps focused on completing campsite surveys in all wilderness areas. Sites were monitored, rehabilitated when appropriate, and photo documentation was completed.

Soil sampling occurred in the Dolly Sods Wilderness in partnership with the Army Corps of Engineers, to determine if there are any potential concerns related to chemicals in the soil from unexploded ordinance blast in place program.

Seven miles of road in the Cranberry Expansion, Big Draft, and Spice Run Wildernesses were completed. Roads were shaped to match topography, culverts removed, and area seeded. Reassurance markers were removed in newly designated wilderness areas. New bulletin board signs were created and installed for the Big Draft Wilderness.

Six individuals were trained in Leave No Trace, and educational material was purchased and used for programs at developed recreation sites.

In partnership with the Appalachian Forest Heritage Area, a brochure was completed identifying all the wilderness areas on the Forest and the importance of wilderness.

TRAILS

The Forest completed over 225 miles of trail maintenance and approximately 300 miles of trail clearing. Both the North Zone and South Zone had a dedicated trail crew.

Two grants were received for trail projects on the Forest, Gauley Mountain Trail and the Allegheny Trail (North Zone).

The Forest partnered with West Virginia University to develop an interactive website for visitors to comment at managed and designed uses of trails throughout the Forest.

Major trail construction projects were completed on the West Fork Trail and Spruce Knob Lake Trail. Construction started on the West Side Trail.

New trail junction signs were installed in the Dolly Sods Wilderness.

Trail Assessment and Condition Surveys were completed on 2.1 miles of trail.

Monitoring and Evaluation

Recreation-related monitoring questions come from the Land and Resource Management Plan (2006) and Administrative Correction #8 (2008).

Monitoring Question 5 - To what extent is the Forest providing Recreation Motor Vehicle (RMV) opportunities; what are the effects of RMVs on the physical and social environment; and how effective are Forest management practices in managing RMV use?

Monitoring Question 23 - Are Forest facilities and recreation sites safe for employee and public use and enjoyment?

Monitoring Question 24 - To what extent does the Forest provide a range of motorized and non-motorized recreation opportunities that incorporate diverse public interests yet achieve applicable Management Prescription goals?

Monitoring Question 25 - To what extent are Forest management activities within the Recreation Opportunity Spectrum Objectives (ROS)?

Monitoring Question 26 - To what extent do Forest recreation facilities and opportunities meet accessibility, cost, and maintenance needs to achieve resource and social objectives?

Monitoring Question 27 – Are Forest management activities providing scenic quality as defined by the Scenic Integrity Objectives?

Monitoring Question 28 - Does management of recreation/wilderness and other special use permits meet Forest Plan and Agency direction?

Monitoring results for these questions are reported below.

Monitoring Question 5. To what extent is the Forest providing Recreation Motor Vehicle (RMV) opportunities; what are the effects of RMVs on the physical and social environment; and how effective are Forest management practices in managing RMV use?

Recreation Motor Vehicles are allowed on designated routes. The MNF Motor Vehicle Use Map (MVUM) is the tool used to designate roads, trails or areas for motor vehicle use, and it also determines the types of vehicle use allowed. In 2010, the Forest revised the MVUM and only designated existing open and seasonally open roads for motorized use for licensed and highway legal vehicles. No Off-Highway Vehicle (OHV) use is currently allowed on the MNF.

Monitoring Question 5. Evaluation, Conclusions and Recommendations

Driving for pleasure continues to be one of the top reasons people visit the MNF and is one of the main forms of motorized recreation that occurs on many open and seasonally open roads. Maintenance issues result from road use during wet/snowy weather, mainly in the form of surface rutting. Seasonal closures of roads like Forest Road 75 next to Dolly Sods Wilderness are needed to protect resources and public safety. Signs identifying major routes in which snow removal does not occur need to be checked regularly to ensure they are not vandalized or stolen.

Illegal motor vehicle use, mainly in the form of Off Highway Vehicles (OHVs), occurs in areas close to private land or on Forest roads that are mistaken for State roads where OHV use is allowed. Better signs with restrictions are needed where the public leaves State Roads and enters Forest Service roads. Additional law enforcement is also needed to address illegal OHV use.

Over-snow vehicles are permitted on the Highland Scenic Highway, which is not plowed during the winter months. Few issues have resulted from snow vehicle travel on the Highland Scenic Highway. This highway is closed to all other licensed motorized vehicles during winter months.

Monitoring Question 23. Are Forest facilities and recreation sites safe for employee and public use and enjoyment?

Identification of site deterioration and maintenance needs is now an accepted and fully integrated management practice on the Forest. Site monitoring and condition surveys for buildings, water systems, waste water systems, and constructed features (e.g., tables, grills, fire rings) provide much needed information to prioritize and implement site maintenance or improvements.

A Recreation Facility Analysis (RFA) was completed in July 2008. The RFA helps the Forest prioritize funding toward deferred maintenance and adjust operations toward high quality sites that meet the recreation niche for the Forest.

Forest personnel regularly patrol recreation sites to enforce rules as well as identify hazards.

Gaudineer Scenic Area is signed for caution during wind events due to the potential for blow down in the old growth forest through which the recreation trail meanders.

Potential hazards resulting from construction operations are dealt with through contract clauses, site closures, seasonal restrictions on construction, and field identification of hazards.

The Forest Service has taken a more active role in identifying hazards at recreation sites, specifically flooding. The following actions occurred in 2010 regarding recreation site safety.

- **Flooding:**
 - Most developed recreation sites which have experienced flooding are posted with warning information. Signs are posted at each site informing visitors of the potential for flooding from local heavy rains or upstream rains.
 - New signs have been ordered to post at developed recreation sites which currently were not adequately signed.
 - Forest/Concession personnel close the gate at Stuart Day Use Recreation Area during flooding events until the site is safe for public use.
 - Forest personnel monitor regularly flooded recreation sites during and after flood events.
- **Hazard Trees:**
 - Hazard tree identification and removal occur regularly. As dying trees or limbs are identified, they are removed.
 - Treatment of trees with the risk of insect infestation are treated to prevent mortality and treated when signs of infestation occur. This identification and treatment program is to prevent tree mortality, thus becoming a hazard tree. Both Gypsy moth and Hemlock woolly adelgid are actively treated in developed recreation sites.
 - The Forest is working with State and Private Forestry entomologists to improve public awareness about transporting insects with notices in campgrounds.
- **Wildlife:**
 - The Forest is within black bear habitat. The Forest has been installing bear proof garbage cans, as funding allows, for several years. Bear proof garbage cans or fenced garbage drop off locations are installed at several developed recreation sites and along heavily used dispersed recreation corridors.
 - A food storage order is in effect at one developed recreation site (requires food and garbage to be properly stored) and the order will be expanded to all developed recreation sites on the southern end of the Forest by 2011.
 - Forest staff provides handouts at developed recreation sites in which bear encounters are a concern. The Forest is also working on improving public outreach on camping in bear country.
- **Wildfire/Extreme Fire Danger:**
 - In the rare occasion the Forest/State are in extreme fire danger, a fire ban is implemented.
 - Forest staff, campground hosts, and Law Enforcement inform public of bans or fire danger.
- **Winter Travel:**
 - Warnings signs and caution lights are posted on the Highland Scenic Highway, SR 150, to alert travelers that the Highway is not maintained for winter travel.
- **Swimming Areas:**
 - No Lifeguard On Duty signs are posted at swimming areas

- Visitor Safety:
 - Forest/Concession personnel close gates at all campground at 10:00 pm to keep non-campers from entering the area.

Monitoring Question 23. Evaluation, Conclusions, and Recommendations

There were no major public health and safety issues reported in FY 2010.

Recommendations: Condition surveys of water, waste water, building, and recreation facilities are valuable and should continue. Procedures for hazardous weather situations at recreation sites should be written and posted at recreation sites. New signs and improved monitoring for hazardous weather will be implemented for 2011. Since Island Campground needs significant improvement and funding to re-open the site, moving the campground from the 100-year floodplain needs to be closely considered. Procedures for hazard tree removal, mitigating daily hazards, mitigating construction hazards, and monitoring of other resource activities are sufficient at this time.

Implement the RFA 5-year program of work. This program of work identifies where to focus funds based on use, efficiency, and sustainability.

Monitoring Question 24. To what extent does the Forest provide a range of motorized and non-motorized recreation opportunities that incorporate diverse public interests yet achieve applicable Management Prescription goals?

The distribution of recreation opportunities on the Forest was analyzed and reported in the 2006 Final EIS for Forest Plan Revision (pages 3-403 through 3-405). To summarize this analysis, Management Prescription changes in plan revision shifted the amount of Semi-Primitive Non-Motorized areas from 21 percent of the Forest to 41 percent, while Roaded Natural areas shifted from 44 percent to 41 percent. Thus, the amounts of primarily motorized and non-motorized recreation opportunity areas are virtually the same. Most of the remaining area of the Forest (18 percent) is now classified as Semi-Primitive Motorized (SPM). Although SPM areas can allow motorized recreation, in most cases these areas on the Forest have roads that are currently closed to public motorized access, although development activities such as timber harvest may occur. Therefore, SPM areas offer a mix of recreation opportunities and settings. Administrative Correction #10 did not affect the overall distribution of within the Recreation Opportunity Spectrum (ROS).

The ROS distribution on the Forest reflects current uses and demands from the public. Motorized use on the Forest focuses on driving for pleasure, riding trains for pleasure, viewing scenery, and visiting historic sites, developed recreation sites, and dispersed areas. There are no motorized trails or motorized areas designated on the Forest.

Non-motorized use is a major emphasis on the Forest, including activities such as viewing natural features, fishing, hiking, downhill skiing, hunting, relaxing, backpacking, viewing wildlife, gathering forest products, and mountain biking.

According to the National Visitor Use Monitoring (NVUM) data from 2004 and 2009, horseback riding, motorized water activities, off-highway (OHV) use, resort use, and snowmobiling do not play a major role on the Forest.

Activity trends within the market zone for the Forest show demand for the following activities, all of which are provided (National Survey on the Recreation and Environment): Developed Camping, Fishing, Non-motorized Water, Hiking, Backpacking, Hunting, Downhill Skiing, Picnicking, Primitive Camping, and Nature Center activities.

Monitoring Question 24. Evaluation, Conclusions, and Recommendations

People visiting the Forest find a wide spectrum of recreational opportunities. Diverse landscapes offer a variety of settings for recreational activities, ranging from semi-primitive non-motorized to more roaded and rural settings. Administrative Correction #10 did not change the balance of motorized and non-motorized recreation opportunities on the Forest. Even though there were changes between MP 5.0, 5.1, and 6.2, all of these areas were managed as semi-primitive non-motorized areas. The Administrative Correction did not affect the ROS distribution.

NVUM took place on the Forest in FY 2009. Data from this monitoring was available in 2010 but user preferences showed very little change between 2004 and 2009.

Monitoring Question 25. To what extent are Forest management activities within the Recreation Opportunity Spectrum Objectives (ROS)?

Forest management activities are screened during project planning efforts. When projects are proposed, a recreation specialist looks at the management prescription and ROS category they fall under. The physical, social and managerial settings, desired conditions, and standards and guidelines help determine which management activities are appropriate for the ROS, or whether a Forest Plan amendment is needed to allow an activity to temporarily change the ROS setting.

Monitoring Question 25. Evaluation, Conclusions, and Recommendations

In FY 2010 there were no Forest activities that required a change in ROS settings or objectives.

User (satisfaction) data from the NVUM surveys were helpful to evaluate how well the public accepts management activities, facilities, and services in meeting Forest Plan objectives.

Monitoring Question 26. To what extent do Forest recreation facilities and opportunities meet accessibility, cost, and maintenance needs to achieve resource and social objectives?

Accomplishments for accessibility were listed in the accomplishment section of this monitoring report. A significant number of the projects within developed recreation areas in 2010 were targeted at improving accessibility. Forest staff participated in training that will greatly improve the ability of field level technicians to identify issues and make improvements for accessibility.

Accessibility for people with disabilities is considered during all maintenance and improvement activities. All newly constructed or altered facilities meet accessibility requirements.

In 2008 the Forest completed a Recreation Facility Analysis (RFA) process that had the primary goals of:

- Provide recreation opportunities consistent with the Forest's recreation niche and focus resources on sites that best fit the recreation niche.
- Operate and maintain financially sustainable recreation sites to national and regional quality standards with available revenue stream.
- Reduce deferred maintenance backlog by 20% by 2010, 70% by 2015, and 90% by 2020.
- Improve customer satisfaction.

Monitoring Question 26. Evaluation, Conclusions, and Recommendations

Recreation sites and picnic areas should have some units with accessible furnishings such as tables, grills, lantern posts, and fire rings. As these items deteriorate, they should be replaced with accessible features. Replacement of these features has been slow, and a significant improvement on increased accessible elements needs to occur.

Trail users have not complained of trail overcrowding. No new Forest trails were constructed in FY 2010 (a couple existing trails were reconstructed), and little if any new trail construction has occurred since 2001. The trails program has focused on maintaining the 860+ miles of existing trails to standard.

In 2010, the Forest partnered with West Virginia University to create an interactive website so trail users could provide feedback on appropriate trail uses to provide background data for the Forest to develop a Trail Plan. This plan will help managers determine trail management objectives and trail maintenance priorities for the next several years. The Forest started working on a trails planning process several years ago, including a 2-day workshop with a number of trail users. With the passage of the Public Lands Management Act of 2009, the MNF was directed by Congress to develop a plan for nonmotorized trail opportunities on the Forest (Public Law 111-11, Section 1004). The main concern is to maintain trails for the uses they receive. Currently, all trails on the Forest have a Designed Use and Managed Use of Hiker/Pedestrian (except the West Fork Rail Trail has a Designed Use and Managed Use of Bicycle). All other uses (Pack/Saddle and Bicycle) are considered Allowed Uses. The problem is, uses that require higher design requirements (Pack/Saddle and Bicycle) are not being managed, only the user group with the lowest design requirements (Hiker/Pedestrian) is being managed. Another concern is some trails are not properly located due to soils types and slope, based on the Allowed Uses that are occurring. The Forest will finalize the Trail Plan in 2011.

Although the RFA effort was only completed in late 2008, the result is that costs for developed recreation sites should be sustainable within the next 5 years.

Recommendations: Continue to monitor trail maintenance needs and public trail concerns through work planning, site-specific trail use monitoring, Forest trail management planning efforts, and other Forest project comments. Trail maintenance Objective RC04 in the Forest Plan

for within (75 miles) and outside (350 miles) wilderness areas far exceeds targets and accomplishments (220 miles). If budgets remain stable or decline, this objective should be reduced to reflect more realistic numbers. The trails plan has been in limbo for a year and needs to be revitalized.

Maintenance and improvements at sites should continue to incorporate accessibility needs.

Adverse effects from dispersed recreation, especially dispersed camping near rivers and streams, need to be monitored and controlled. Specifically, the Gandy Creek and Lower Glady areas need to have management plans developed to determine long-term management of the areas.

Monitoring Question 27. Are forest management activities providing scenic quality as defined by the Scenic Integrity Objectives?

Scenic Integrity Objectives were assigned and mapped for the Forest during Forest Plan revision and are now used at the project level. How Forest management activities affect these Objectives is considered during the planning stages of activities that have the potential to alter scenic quality. As a result, management activities are designed to provide appropriate scenic quality.

Monitoring Question 27. Evaluation, Conclusions, and Recommendations

The Forest worked with the National Park Service to analyze the effects of the Potomac Appalachian Transmission Highline Viewsheds were mapped, photo points collected, and concerns regarding visual impacts were noted as part of the analysis. Scenic Integrity Objectives were considered in several other projects, but no negative effects were identified.

Monitoring Question 28. Does management of special forest products, recreation/wilderness and other special use permits meet Forest Plan and Agency direction?

Recreation/wilderness special use permits usually meet Forest Plan and Agency direction because all special use requests are pre-screened with applicants to ensure they follow Forest Plan direction. In total, 15 recreation special use permits were monitored, including recreation events for ultra runs and triathlon, outfitter/guides for a variety of outdoor activities, concessionaire services, and organization camps.

The Forest also routinely conducted pre-award compliance reviews to ensure equal opportunity for all Forest visitors and to prevent program discrimination complaints for all outfitter/guide and recreation event requests.

Monitoring Question 28. Evaluation, Conclusions, and Recommendations

Monitoring of recreation events showed that most permits stayed within the requirements of their permits and operating plans. Minor infractions were noted on some evaluations.

Special Uses

Introduction

The Monongahela National Forest manages approximately 300 Special Use Permits in a given year, an estimated 64 recreation uses and 236 land uses. These permits vary in complexity and include uses such as organization camps, campground concessions, golf course, recreation events, outfitter/guide permits, vendor/peddlers, ski slope, cultivation, natural gas pipelines, power line permits, road right-of-way permits, communication sites, and water uses.

2010 Program Accomplishments

The following Special Use Program activities were accomplished in FY 2010:

Lands Permits Processed – Target: 60 Accomplished: 30

The Forest accomplished 50 percent of the assigned 2010 target for Lands Permits Processed. This shortfall stemmed from the following factors:

- The 2010 target was 40 percent higher than typical accomplishments even though funding and staffing actually decreased. The 2010 target assigned to the Monongahela appeared to be based on the Forest's unusual 2009 accomplishment of 58 Lands Permits Processed. Since 2006, the Forest's annual Lands Permit Processed accomplishment has been 35 to 37 permits, averaging 36. In 2009, however, the Forest was able to accomplish 58 Lands Permits Processed because over half of the processed authorizations were simple, straight-forward permit amendments to document the inclusion of newly completed communication site plans. Such amendments take little time to process compared to most special use authorizations.
- Increased number of complex and time-consuming permits to process. The Forest is actively working toward consolidating power line, phone line, and gas line permits. As permits expire, or as new requests are received, the Forest has been coordinating with utility permit holders to develop one "Master Permit" for each company to replace the 6-21 separate permits they currently hold. Developing these "Master Permits" takes a significant amount of time because the Forest is gathering field-validated information from Holders to update the Forest's GIS information, permit maps, and permit descriptions, and to develop effective operating plans.
- Increased personnel time spent coordinating maintenance activities of existing Special Use Permits instead of authorizing new permits. In 2010, numerous maintenance activities were proposed for existing authorized Special Use Permits, requiring staff to spend a considerable amount of time administering existing permits instead of processing new permits.

Lands Permits Administered to Standard – Target: 58 Accomplished: 79

To ensure authorized uses of National Forest System lands remain consistent with Forest Plan and agency direction and do not adversely affect natural resources, the Forest attempts to have at least one-third of its lands permits administered to standard each year. In 2010, 33 percent of the lands Special Use Permits authorized on the Monongahela National Forest were considered administered to standard, exceeding the regionally assigned target by 21 permits.

Recreation Permits Administered to Standard – Target: 38 Accomplished: 37

The Forest attempts to ensure at least half of its recreation permits are administered to standard each year. In 2010, 58 percent of the Forest's recreation permits met Administered to Standard criteria, 97 percent of the Forest's regionally assigned target.

Monitoring and Evaluation**Monitoring Question 28. Does management of special forest products, recreation/wilderness, and other special use permits meet Forest Plan and agency direction?**

This item is monitored at twice: first at the time a Special Use proposal is submitted and before it is accepted as an application; and second, after a permit has been issued and an onsite inspection is completed. Onsite inspections of Special Uses are completed on an annual, biennial, and triennial bases, depending on the type of use and as defined in the Forest Service Special Use Manual (FSM 2716.53). Monitoring ensures that Permit Holders comply with SUP terms and conditions and evaluates what, if any, resource effects result from the authorized land use.

All 2010 proposals were screened to determine if they met Forest Plan and agency direction and were rejected or modified to ensure consistency. All permits authorized in 2010 met Forest Plan and agency direction.

Onsite inspections revealed that some authorized uses needed to be brought back into compliance with Special Use Permit terms and conditions (e.g., some authorized roads needed grading or improvements to bring them into compliance with permits terms and conditions; some gas equipment was showing rust and needed painting or replacement; rodent occupancy was evident at some communication sites; some Holders had failed to submit required insurance information in a timely manner, etc.) but all inspected uses met Forest Plan direction.

Monitoring Question 28. Evaluation, Conclusions, and Recommendations

Screening Special Use proposals and field monitoring authorized uses is working to ensure Special Use authorizations meet Forest Plan and agency direction. It is recommended that personnel continue to address public demand of National Forest System lands and ensure Special Use Program objectives are met. Special Use inspections need to continue to be completed to document conditions of concern and ensure improvements are made as needed.

Transportation System

Introduction

The following desired conditions for the Forest's road transportation system are taken from Page II-54 of the 2006 Forest Plan.

The road network matches the level of management activities occurring on the Forest and supplies the transportation system needed for recreation, special uses, timber harvest, range management, minerals development, fire protection, and other resource management needs. The transportation network is managed, using a variety of tools, to reduce adverse effects to resources. Roads needed for long-term objectives are maintained to provide for user safety and resource protection. Roads not needed for long-term objectives are decommissioned and stabilized.

There are a number of assumptions built into these desired conditions relative to safety, cost-effectiveness, and the minimum road system necessary for administrative and public use. First, a well-maintained road system is safer than one where maintenance and improvement do not occur in a timely and comprehensive manner. Second, the Forest has more roads now than it can properly maintain, not only due to the amount of roads present but also because of flat or declining funding to pay for maintenance. Third, eliminating unnecessary roads can make the maintenance and improvement of the remaining road system more cost-effective over time. Put another way, fewer roads means that a higher percentage of those roads can be properly maintained or improved with the same amount of funding, which in turn means that a higher percentage of roads will be safer for public and administrative use. Well-maintained roads should also have fewer impacts on other resources, such as soil, water, and fish habitat.

Of course, the same assumptions also apply to the trail transportation system. Trail maintenance is discussed in the Recreation Resources section of this report.

2010 Accomplishments

The Transportation System accomplishments for FY 2010 included:

- Budget and work planning, including out-year planning.
- Providing input, analysis, and review for various Forest projects.
- 707 replacement road signs.
- 216 miles of existing road improvement (reconstruction, paving).
- 3.1 miles of new road construction.
- 24.8 miles of road decommissioning. (7.4 miles system roads, 17.4 miles non-system roads)
- 1,487 miles of road maintenance by Forest, 127 miles of maintenance by gas well operators.
- Monitoring and evaluation efforts as described below.

Monitoring and Evaluation**FOREST PLAN MONITORING FOR TRANSPORTATION SYSTEM**

The 2006 Forest Plan has two specific monitoring questions for transportation, found on page IV-10. These questions were numbers 32 and 33 in the Plan, but they have been changed to numbers 29 and 30 due to an administrative correction to the Plan that occurred in 2009.

29. To what extent is the Forest, in coordination with other public road agencies, providing safe, cost-effective, minimum necessary road systems for administrative and public use?

30. To what extent are road and trails closures effective in prohibiting unauthorized motor vehicle use?

Both questions respond to Goal RF01 in the 2006 Forest Plan:

Goal RF01 - Provide a transportation system that is safe, cost efficient, meets access needs, and minimizes adverse impacts to natural resources.

Monitoring Questions 29 and 30 are to be monitored every 1-5 years.

Monitoring Question 29. To what extent is the Forest, in coordination with other public road agencies, providing safe, cost-effective, minimum necessary road systems for administrative and public use?

No specific monitoring occurred related to transportation system safety, cost-effectiveness, or size. This report is based on monitoring and evaluation of the accomplishments listed above.

Monitoring Question 29. Evaluation, Conclusions, and Recommendations

The Forest road transportation system was made safer in FY 2010 through various activities. The 707 replacement road signs increase motorist safety by providing additional or more easily read information about road names, hazards, restrictions, and distances to destinations. The 216 miles of road improvement and the 1,487 miles of road maintenance were completed by the Forest to enhance user safety and comfort. Improvements included the completion of paving roads to Spruce Knob (the highest point in West Virginia) and along Williams River (a very popular fishery). In addition, 127 miles of road were maintained by gas well operators.

During FY 2010 an estimated 24.8 miles of road were decommissioned (permanently closed and removed from the transportation system), of which 7.4 miles were system roads and 17.4 miles were non-system roads. Conversely, 3.1 miles of new road were constructed, resulting in a 21.7 mile net reduction in the Forest roads. This net reduction in the overall road system is cost-effective because the Forest will no longer have to pay to maintain, improve, or reconstruct the net loss of 21.7 road miles. This reduction also moves the Forest closer to the “minimum road system necessary for administrative and public use” and returns 65 net acres to land productivity.

The road improvement, maintenance, and decommissioning numbers cited above were unusually high in FY 2010 due primarily to a robust infusion of funding from the American Recovery and Reinvestment Act (ARRA) of 2009. This funding helped the Forest accomplish 4 times the road maintenance, 6 times the road decommissioning, and 16 times the road improvement miles in FY 2010 compared to FY 2009. The Forest was also able to accomplish 5 times the amount of sign replacement than in FY 2009. Although this amount of accomplishment is not to be expected every year, it does reflect what the Forest can do when provided with needed funding.

Recommendations: The Forest should continue to look for opportunities to improve road and traffic safety, and to move toward a more cost-effective and efficient road transportation system.

Monitoring Question 30. To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use?

One of the Chief's Four Threats to national forests in the 21st century is unmanaged recreation, particularly related to off road vehicle (ORV) use. The Monongahela's policy regarding ORV use is best expressed by Standards RF19 and Guideline RF20 in the Forest Plan:

Standard RF19 - Public motorized vehicle use is allowed on roads and trails designated open for use. Off road or trail use is not allowed. Off road motor vehicle travel restrictions do not apply to: 1) military, fire, emergency, law enforcement or administrative vehicles when used for official or emergency purposes, and 2) other vehicle use allowed by written authorization from the Forest Supervisor or District Ranger.

Guideline RF20 - Vehicle use on closed roads by permittees, contractors, or other cooperators may be authorized to conduct official business or to perform resource management activities.

The Forest currently has an estimated 894 roads of various types and maintenance levels. Only 155 (17 percent) of these roads are open to public motorized use year-round. Another 107 roads (12 percent) have seasonal closures. That means that 71 percent of Forest roads are closed year-round to public motorized use. Although these closures are useful management tools to provide remote wildlife habitat, reduce watershed and other resource impacts, and lower maintenance bills, they also frustrate and anger some members of the public who feel they have a right to access public lands whenever and however they see fit. The result is often illegal motorized use.

To help control illegal motorized use off roads or trails, or use on roads or trails closed to motor vehicles, the Forest uses road and trail closures that are typically a combination of signing and a physical barrier. Barriers may include gates, boulders, large earthen berms and ditches, or other means to physically prevent the passage of motorized vehicles. However, many barriers have been compromised, damaged, or removed, and they have not been repaired or replaced in a timely fashion.

The Forest also uses law enforcement to help control illegal motorized use. Indeed, the Forest's Law Enforcement Officer estimated that more than 20 percent of his time was spent on ORV and

road closure incidents in FY 2008. More telling may be the fact that 63 of the 147 total incident reports he generated that year were ORV/closure related.

Monitoring Question 30. Evaluation, Conclusions, and Recommendations

Illegal motorized use is not occurring on most of the Forest roads and trails that are closed to motorized vehicles. However, illegal use is still occurring, and it is dispersed across the Forest. Signs and barriers help control use but they are not infallible. Where users do not respect closures, signs and barriers are often destroyed, removed, or circumvented.

Law enforcement can also help control illegal use through periodic patrols, violation citations, and public education. In FY 2007, however, there was only one Forest Law Enforcement Officer to cover over 919,000 acres, 896 roads, and 850 miles of trail. Thus, his influence was limited. In FY 2008, the Forest hired two additional officers. Forest protection officers are also doing a better job of detecting and addressing illegal use. Incidents seem to be decreasing; however, problems are still occurring and the following recommendations are still applicable.

Recommendations: Forest law enforcement officers offer the following recommendations to address the ongoing problems caused by illegal motorized use:

- Replace damaged or stolen signs in a timely fashion, and provide new signs where needed. Enforcement actions may be limited or ineffective where system or user-created roads and trails and not signed to specify use restrictions.
- Upgrade barriers where needed. There are many places on the Forest where barriers have been damaged, removed, or circumvented to the point where they are no longer effective. This would be a good task for the Forest's road crew.
- Have Forest Protection Officers (these are regular employees who have a specified amount of law enforcement training) do more patrolling in problem areas and report findings to Forest Law Enforcement Officers in a timely fashion.
- Continue to educate the public about the problems that illegal motorized use can cause. Use posters, media messages, hunting/fishing regulations, and other outreach methods.
- Employ more Law Enforcement Officers or train more employee Forest Protection Officers to patrol road closures and regularly inspect barriers and signs.
- All Forest personnel need to pass on any observations of illegal off-road and gated road use to a Law Enforcement Officer and/or District Ranger.
- Explore innovative ways to procure funding or partnerships to help address concerns related to illegal motorized use.

Botanical Resources

Introduction

The inventory and monitoring items presented here for Fiscal Year (FY) 2010 are parts of ongoing efforts to protect the Threatened, Endangered, and Sensitive (TES) plant species on the Forest and to build on our knowledge of their habitats on the Monongahela National Forest (MNF). Also covered in this report are non-native invasive species (NNIS) of plants and vegetation diversity issues. NNIS have been recognized at the national level as one of the four major threats to the ecological sustainability of NFS lands. Vegetation diversity is a primary goal in the Forest Plan and is a major driver of many Forest projects.

2010 Program Accomplishments

BOTANICAL SURVEYS

Enterprise Team Surveys – A Forest Service Enterprise Team conducted botanical inventories on 1,657 acres of proposed timber harvest units in the Big Mountain project area on the Cheat-Potomac District. The Enterprise team also surveyed an estimated 181 acres of prescribed fire units in the Big Mountain project area. These surveys were made in areas proposed for active management in the near future. Three sensitive plant species—Canada yew (*Taxus canadensis*), butternut (*Juglans cinerea*), and robust fire pink (*Silene virginica* var. *robusta*)—were located in several locations. The surveys also located five high-priority nonnative invasive plants: crown vetch (*Securigera varia*), Japanese barberry (*Berberis thunbergii*), Morrow’s honeysuckle (*Lonicera morrowii*), garlic mustard (*Alliaria petiolata*), and Japanese stiltgrass (*Microstegium vimineum*). Extensive infestations of Japanese stiltgrass and garlic mustard were found.

In addition to locating TES or NNIS plants, the survey specifications required that a check list of plants encountered in the survey areas be filled out. This list was not meant to be quantitative and it may not be all-inclusive. However, the list does serve as a general overall depiction of the herbaceous and shrub component of the surveyed areas and may be helpful in designing projects or looking for specific habitat for other plants or animals. The results could also be used for determining indicator species, and could provide clearance documentation in the event that new species are added to the TES lists.

Contract Surveys – The Forest did not contract any surveys directly in FY 2010. However, Berry Energy contracted a survey of a pipeline replacement project in the Middle Mountain area of the Greenbrier District. The surveys covered two small stream/wetland crossings. No threatened, endangered, or sensitive species were found.

Cooperator Surveys – The West Virginia Division of Natural Resources conducted one botanical survey on the Forest in association with the Upper Shaver’s Fork aquatic/riparian habitat enhancement project. The survey covered an estimated 31 acres of riparian habitat. Numerous new locations or sub-sites were found for the following sensitive species: Arctic

bentgrass (*Agrostis mertensii*), long-stalked holly (*Ilex collina*), thread rush (*Juncus filiformis*), and Canada yew (*Taxus canadensis*).

Forest In-house Surveys - Every year, some areas proposed for active management are not included in the contracted survey areas. Generally these areas are associated with small projects, or they are added to a large project after award of the TES survey contract, or they are areas for which funding is not available for contract surveys. In FY 2010, these areas were reviewed for TES plant individuals or potential habitat by the Forest's botany technicians. Table BT-1 displays the areas covered by Forest personnel in FY 2010.

Table BT-1. Acres of In-house Surveys for TES and NNIS in 2010

Location/Project Name	Acres	TES Plants Found	Priority NNIS Plants Found
Big Mountain proposed prescribed fire units, Cheat-Potomac District	4,354	Appalachian oak fern Butternut White alumroot (possible) Canada yew	Garlic mustard Morrow's honeysuckle Reed canary grass
Upper Shaver's Fork aquatic/ riparian habitat enhancement project, Greenbrier District	651	Shriver's frilly orchid Arctic bentgrass Long-stalked holly	Reed canary grass
Upper Greenbrier North proposed road decommissioning, Greenbrier District	38	None	Garlic mustard
Cheat-Potomac District range allotments	417	Allegheny onion Butternut Appalachian blue violet	Japanese stiltgrass Yellow iris
Dolly Sods bogs, Cheat-Potomac District	95	None	None
Barton Knob proposed road and radio tower, Greenbrier District	3	None	None
Shale barren sites proposed for NNIS treatment, Marlinton-White Sulphur District	3	Shale barren rockcress Virginia mountain pimpernel	Autumn olive Tree of heaven Japanese stiltgrass Multiflora rose Morrow's honeysuckle

NEW SITES FOUND

Several TES plant occurrences found in FY 2010 represent new populations of these species:

- Most of the Canada yew locations in the Big Mountain project were previously unknown. Although this species was previously known to occur in the project area along Big Run, the 2010 surveys discovered more locations along Big Run, Cold Spring Run, Sawmill Run, Hemlock Run, and Owl Knob Hollow. The locations along Big Run and Sawmill Run may represent the largest known element occurrence of Canada yew in the central Appalachians.
- Several new locations for butternut were discovered in the Big Mountain project area and the Cheat-Potomac range allotments.
- The location for robust fire pink in the Big Mountain project area constitutes a new element occurrence for that variety, expanding its known range several miles to the southwest.

- Appalachian oak fern (*Gymnocarpium appalachianum*) was found at several locations in the Big Mountain project area that probably represent two element occurrences, both of which are new.
- Most of the butternut locations in the Big Mountain project area are new, as are all of the butternut locations in the Cheat-Potomac range allotments.
- The Shriver's frilly orchid (*Platanthera shriveri*) locations in the Upper Shaver's Fork project area are all new.
- If the possible white alumroot (*Heuchera alba*) found in the Big Mountain project area is confirmed, it would represent a new site for this species.
- The Allegheny onion (*Allium allegheniense*) found in the Cheat-Potomac range allotments is a new element occurrence and a westward expansion of the known range of this species.
- The Appalachian blue violet (*Viola appalachiensis*) found in the Cheat-Potomac range allotments represents a new element occurrence.

The remaining TES species locations occur at or near previously known locations, so these new micro-sites likely are part of the populations that were already known to exist.

INVENTORY DATA MANAGEMENT

Over the past few years, the Forest's lead botany technician has worked to enter newly collected botanical inventory data and old legacy data into the Forest Service's corporate database system (NRIS). As of the end of FY 2010, new inventory data through the 2009 field season had all been entered, and much of the Forest's legacy data dating back to about 2004 had also been entered. In addition, the Forest Ecologist worked with Regional Office staff to migrate various electronic cuff records for NNIS into the appropriate NRIS module. Much legacy data remains to be entered, but as this backlog begins to clear, we anticipate that newly collected data will be entered within a few months of its collection.

Monitoring and Evaluation

FOREST PLAN MONITORING ITEMS FOR BOTANICAL RESOURCES

The 2006 Forest Plan monitoring chapter (Chapter IV) contains three monitoring items related to TES plants and NNIS plants:

- **Monitoring Question 37. Are non-native invasive plants located and treated to prevent or limit further spread?**
- **Monitoring Question 38. To what extent is Forest management contributing to the protection and recovery of threatened and endangered species?**
- **Monitoring Question 39. To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?**

TES PLANT SPECIES

The Forest's botany/terrestrial ecology staff provided planning input for threatened, endangered, and sensitive plants for every project on the Forest that went through the NEPA process during FY 2010, including categorical exclusions, Environmental Assessments, and Environmental Impact Statements. Where TES plants were present, the ecologists recommended project design criteria to protect these occurrences from adverse effects. In most cases, these recommendations were incorporated into the project design. Therefore, projects on the Forest are being designed to contribute to the conservation of sensitive species and the protection and recovery of threatened and endangered species.

In FY 2010, monitoring to assess project effects on sensitive species was conducted for three sensitive species on one project. These monitoring efforts are described below.

Rock Skullcap Monitoring in Prescribed Fire Units – The Forest continued its collaboration with the Northern Research Station to monitor rock skullcap (*Scutellaria saxatilis*) in the Ramshorn prescribed fire project area. Rock skullcap and associated vegetation are being monitored in a series of 1 m² plots in a burn unit and a control area. Baseline data were collected in 2008 and 2009, and the first post-fire data were collected in 2010. The Northern Research Station intends to publish the results of this monitoring after multiple years of post-fire data are collected and trends can be analyzed. A preliminary assessment of the 2010 post-fire data seems to indicate an increase in the cover of rock skullcap. At this point the reason for the apparent increase is not known, nor is it known whether the apparent increase is temporary or long term.

White Alumroot and Allegheny Onion Monitoring in Prescribed Fire Units – The Forest Ecologist continued monitoring several populations of white alumroot (*Heuchera alba*) and one population of Allegheny onion (*Allium allegheniense*) in the Ramshorn prescribed fire project area. This monitoring is being conducted using a census of populations in the burn unit and a control area. For Allegheny onion, only one treatment population in a burn unit is being monitored because it is the only known population in the vicinity. Pre-burn baseline data were collected in 2009 and the first post-burn data were collected in 2010.

Conclusions cannot be drawn easily from one year of post-burn monitoring. Interpretation is also complicated by potential errors in the baseline survey due to heavy vegetation that may have obscured the subject plants from view. However, the data collected suggest the following conclusions:

- Where the fire burned at high intensity, the structure of the *Heuchera alba* population appears to have shifted toward smaller plants. This apparent shift could be due to topkill and resprouting, germination of new seedlings, increased detectability of small plants, or some combination of these factors.
- High intensity fire did not extirpate *Heuchera alba* or cause a major population decline.
- Low intensity fire appears to have had no impact on *Allium allegheniense*.

The field notes from the monitoring contain more details. These notes are included in the Forest monitoring files.

TES Plants at NNIS Treatment Areas – NNIS treatment sites in the Smoke Hole area of the Cheat-Potomac District are located adjacent to populations of several sensitive plant species. Species present at or near these sites include Cooper’s milkvetch (*Astragalus neglectus*), tall larkspur (*Delphinium exaltatum*), Smoke Hole bergamot (*Monarda fistulosa* var. *brevis*), yellow nailwort (*Paronychia virginica* var. *virginica*), lance-leaved buckthorn (*Rhamnus lanceolata* ssp. *lanceolata*), Virginia mountain pimpernel (*Taenidia montana*), and Kate’s Mountain clover (*Trifolium virginicum*). The NNIS decision that authorized these treatments requires monitoring where treatments occur within or adjacent to TES sites. In 2010 treatments were limited to areas outside the TES sites, so no follow-up monitoring was needed. Monitoring is scheduled to occur in conjunction with treatments in 2011 because these treatments may occur within TES sites.

NNIS TREATMENT MONITORING

Over 400 acres of NNIS plant infestations were treated during FY 2010 (Table BT-2).

Table BT-2. NNIS Treatment Monitoring for 2010

Site	District	Species Controlled	Acres Treated	Acres Monitored	Percent Effective
Greenbrier Ranger Station	Greenbrier	Canada thistle	0.5	0.5	100
Big Bend Campground	Cheat-Potomac	Garlic mustard	0.02	0	NA
Big Bend Limestone Barren	Cheat-Potomac	Viper’s bugloss	29	29	50
Blue Rock Geological Area	Cheat-Potomac	Japanese stiltgrass	209	150	90
Blue Rock limestone barren	Cheat-Potomac	Viper’s bugloss	10	0	NA
Big Mtn south	Cheat-Potomac	Tree of heaven	21.22	0	NA
Big Mtn central	Cheat-Potomac	Tree of heaven	29.25	0	NA
Big Mtn north	Cheat-Potomac	Autumn olive	4.15	0	NA
Camp Pocahontas and vicinity	Greenbrier	Garlic mustard	4	0	NA
Seneca Rocks trailhead area	Cheat-Potomac	Garlic mustard	0.06	0	NA
Stuart Recreation Area	Cheat-Potomac	Garlic mustard	0.06	0	NA
Middle Mountain Road	Greenbrier	Garlic mustard	0.03	0	NA
FR 1560 – Chestnut Ridge	Greenbrier	Garlic mustard	0.05	0	NA
Gaudineer Scenic Area	Greenbrier	Garlic mustard	0.74	0	NA
Summit Lake Road	Gauley	Garlic mustard	3	0	NA
Tea Creek Campground	Marlinton-WSS	Garlic mustard	0.03	0	NA
Middle Fork Trailhead	Gauley	Garlic mustard	0.1	0	NA
Turkey Pen shale barren	Marlinton-WSS	Tree of heaven	1.4	0	NA
Meadow Creek shale barren	Marlinton-WSS	Autumn olive	1.2	0	NA
Middle Mtn shale barrens	Marlinton-WSS	Autumn olive	0.1	0	NA
Allegheny Battlefield allotment	Greenbrier	Nodding thistle	14	14	75
Cunningham Knob	Greenbrier	Meadow knapweed	21	21	90
Glady Fork – Highway 33 wetland restoration	Cheat-Potomac	Garlic mustard	0.37	0	NA
FR 735	Gauley	Garlic mustard	11.4	11.4	85
FR 82	Gauley	Garlic mustard	6.4	6.4	85
FR 82A	Gauley	Garlic mustard	1.8	1.8	85
FR 82B	Gauley	Garlic mustard	2.4	2.4	85
FR 429	Gauley	Garlic mustard	5.8	5.8	85
FR 101	Gauley	Garlic mustard	9.1	9.1	85
FR 735	Gauley	Japanese stiltgrass	11.4	0	NA
FR 82	Gauley	Japanese stiltgrass	6.4	6.4	95

Site	District	Species Controlled	Acres Treated	Acres Monitored	Percent Effective
FR 82A	Gauley	Japanese stiltgrass	1.8	1.8	95
FR 429	Gauley	Japanese stiltgrass	5.8	0	NA
Blister Swamp	Greenbrier	Pale yellow iris	1.7	1.7	96
Cranberry Mt Nature Center	Gauley	Oriental bittersweet	0.007	0.007	100

Most of the treated acreage lies within the recently-formed Potomac Highlands Cooperative Weed and Pest Management Area. Much of the treated acreage was monitored for “percent kill” during 2010. All treatments that were monitored were estimated to have been at least 50 percent effective, and most treatments were estimated to have been at least 85 percent effective.

GENERAL VEGETATION MONITORING

Forest Plan monitoring also contains the following questions related to other forest vegetation:

- **Monitoring Question 34. To what extent is the Forest providing a range of vegetative communities that address diverse public interests and needs while contributing to ecosystem sustainability and biological diversity?**
- **Monitoring Question 35. To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?**
- **Monitoring Question 36. To what extent is the Forest meeting vegetation composition and age class objectives and desired conditions for MPs 3.0, 4.1, and 6.1?**

These monitoring questions are jointly addressed by the Silviculture and Ecology staffs because they include elements related to tree vegetation as well as understory vegetation and ecological structure and function. For most projects, the Forest did not have funding or personnel available for monitoring the botany and ecology-related parts of these items in FY 2010.

Plot-based monitoring is ongoing to track changes in vegetation in the Ramshorn burn project and the White Sulphur prescribed fire project. Baseline set-up and monitoring was conducted on the Ramshorn project in 2008 and 2009 and on the White Sulphur project in 2009. Post-fire data is scheduled to be collected for the Ramshorn project beginning in 2011 and for the White Sulphur project beginning in 2012. Therefore, no data were collected on these projects in 2010.

Monitoring of effects on vegetation is scheduled for the Lower Williams liming project. This monitoring is to include pre-liming baseline work and several years of post-liming follow up. To date the baseline monitoring has not been completed due to lack of available staff to conduct the monitoring. Some flexibility exists in completing this monitoring because not all of the units will have lime applied in the same year.

FOREST BOTANICAL PRODUCTS MONITORING

Although the Forest Plan monitoring chapter does not include specific monitoring items for forest botanical products, the Forest does conduct some limited monitoring for these products.

The monitoring is intended to evaluate the sustainability of harvest and long-term population trends.

During FY 2010, the Forest began a program to monitor ginseng (*Panax quinquefolius*). Wild ginseng has been harvested in the eastern U.S. and sold for export for over 200 years. In recent decades, concern about over-harvesting led to the regulation of ginseng under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The export of CITES-listed species is regulated by the U.S. Fish and Wildlife Service, and decisions regarding harvest on National Forest lands are made at the Regional level. As part of a renewal of the Forest's harvest permit program during 2009, the Forest agreed to establish a population monitoring program for ginseng.

For consistency and comparison purposes, the ginseng plot monitoring protocol follows the same protocol that is used on the Wayne National Forest and the National Forests in North Carolina. Plot size is 30 x 30 meters, and each plot is divided into 4 quadrants of 15 x 15 meters (N/S/E/W orientation). Plots are monitored twice each year (June and August) to allow an estimate of losses due to deer browse and out-of-season harvest. All ginseng plants within the quadrants are noted, and the following information is collected for each plant:

- Number of prongs
- Height
- Total leaf width x length (for 3 prong plants only, largest leaf)
- Number of flowers/fruits

Percent cover is also noted for the following species that are sometimes subject to permitted or unauthorized harvest: ramps (flowering/fruitletting individuals only due to time of year), black cohosh, blue cohosh, goldenseal, and bloodroot.

The first plots were established and monitored during the 2010 growing season. Two plots were established and sampled during 2010. One plot is in the vicinity of Mikes Run on the Cheat-Potomac District; the other is near Stewart Run on the Greenbrier District.

Because data have been collected for only one year, analysis of trends is not possible at this time. The size class data show that both populations are dominated by small plants with low fecundity. One plot contained 18 plants and the other contained 62. Fewer than half of the plants were 3-prong plants, and most were less than 20 cm tall. The largest plant recorded was 27 cm tall, and no four- or five-prong plants were encountered. Fruit production averaged about 0.6 fruits per plant. The size class data suggest that both populations have been subject to a history of harvest, although no evidence of recent harvest was found at either site. Alternatively, dominance of the populations by small individuals could be indicative of some other stressor, such as heavy deer browse or marginal habitat quality.

In addition to the plot-based monitoring, ginseng trends are also monitored by requiring each harvest permittee to fill out and return the harvest record on the permit. Based on the permits that were returned to us, we documented a minimum of 847 ginseng plants harvested during the fall of calendar year 2009 and 546 plants harvested during the fall of calendar year 2010. However, only a little more than half of the permits that were issued were returned. Based on the

number of plants harvested per permit for the ones that were returned, the actual harvest was estimated at 1,547 plants in 2009 and 917 plants in 2010. Both numbers are far below the 36,300-plant harvest that we estimated should be sustainable on the Forest. Because each ginseng harvest season includes parts of two fiscal years (September 1 through November 30), it is difficult to separate the harvest numbers by fiscal year. Therefore, the numbers presented above represent parts of fiscal years 2009, 2010, and 2011.

Monitoring Questions 34-39. Evaluations, Conclusions, and Recommendations

Several important new TES species observations were made, and design features were incorporated into project planning to protect other known locations. Effects of a few selected management actions on TES plants were monitored. NNIS continue to be a growing concern on the Forest, as populations are found in many of the places surveyed or monitored. Effective monitoring of TES and NNIS plants is a difficult challenge due to inadequate staffing and budgets.

The monitoring items discussed above are all still in the early stages of data collection and interpretation. Trends are not yet apparent, so conclusions cannot be drawn yet. As the monitoring continues, we anticipate that future reports will contain more interpretation of the biological meaning and management implications of the data.

Recommendations: First priority should be given to the TES, NNIS, and vegetation monitoring that is required by project decisions. Several fire projects, timber projects, and NNIS treatments that are currently in the implementation phase require such monitoring. Other projects that are currently in the planning stages are likely to require monitoring also. The Forest Ecologist keeps a master spreadsheet that tracks botany/ecology monitoring needs for several years into the future. This spreadsheet should be consulted during the Forest's annual workload planning.

Carefully consider the need for additional monitoring of TES, NNIS, and vegetation as part of future projects. Before adding new monitoring requirements, consider the extent to which current monitoring can represent situations that are likely to occur in new projects. While every effort should be made to monitor novel situations, care must be taken to ensure that redundant monitoring requirements do not exceed workload and funding capacities.

Continue monitoring existing ginseng plots and add plots as time allows.

Additional NNIS inventory should be conducted across the Forest to allow better prioritization of control efforts. Inventory should be conducted in a systematic fashion and should concentrate on high probability establishment sites (roads, utility corridors, trails, recent timber harvests) and high value ecosystems that have not been surveyed in recent years.

Continue ongoing efforts to collect new TES and NNIS data in the appropriate corporate databases. Continue clean-up and entry of legacy data as time allows.

Rangeland Resources

Introduction

The Monongahela National Forest currently manages 46 grazing allotments comprising approximately 6,000 acres. The average size of an allotment is 140 acres; allotments range in size from 18 to 993 acres. Not all allotments are actively grazed every year. An allotment may intentionally be excluded from grazing due to resource concerns or ongoing repairs to facilities. All grazing on the Forest is seasonal, from May to October. These allotments are offered under competitive bidding, with the highest bidder receiving the grazing permit. Grazing permits are 1 to 10 years in length depending on the type of permit issued.

Grazing allotments on the Monongahela National Forest are unusual in that they offer large, mostly non-forested openings in an otherwise forested setting. They provide livestock owners with a place to graze their livestock during the summer months so that they may use their own lands to produce winter feed for their herds. They also provide visual diversity and vistas in the primarily forested landscape of West Virginia; allow for wildlife viewing; and are popular hunting areas for some game species.

In FY06, the Range Program was restructured so that the Forest Soil Scientist is now also the Forest Range Program Manager. The Assistant Forest Soil Scientist is the Assistant Range Program Manager; however this position is vacant, and currently a successful partnership with the USDA Natural Resource Conservation Service has resulted in a shared employee position. This employee specializes in pasture management and conservation practices in West Virginia. This partnership has existed for 2 years with a commitment to continue into FY11.

2010 Program Accomplishments

The following Range Program activities were accomplished in FY 2010:

1. District technicians worked cooperatively with permittees or contractors and:
 - a. Administered 27 fee credit agreements (27 allotments) worth approximately \$18,112,
 - b. Advertised available allotments, awarded high bidders, prepared and processed annual operating instructions for all operable allotments, and
 - c. Conducted compliance checks on allotments.
2. Completed and tracked range bills.
3. Updated the Range INFRA database with year-end reporting information.
4. Conducted program management activities in range, noxious weeds, and rangeland vegetation (work planning, budget tracking and input, accomplishment reporting, and the Annual Monitoring Report).
5. Administered 4,994 acres to standard (140 percent of target acres).
6. Improved over 1,900 acres of habitat/range condition by mowing brush and noxious weeds in range allotments. Wildlife also provided input to the above allotments for the mowing so as to enhance range allotment habitat for sensitive species such as the golden-winged warbler.

7. Completed a total of 18,000 feet of fencing maintenance and repair projects .

FY 10 Range Accomplishments Forest Wide Summary			
Activity	Fund Code	Acres	Comments
Hazardous Fuels Reduction in Range	NFRG	2,586	
Fertilization and Liming	NFRG and NFVW	157	
Seeding and Planting	NFRG	12	
Range Vegetation Control/Manipulation/Tree Encroachment	NFRG, NFVW, Fee Credits, WRHR	1900	
NNIS Treatment	NFVW	49	
Engineering Staff Assistance	NFRG	N/A	Maintained ponds, culverts, and access roads on Cheat-Potomac RD

The 2011 budget was developed. The Range Program Manager worked with the Forest Program Managers and District Rangers to help prioritize where limited funds should best be used across the Forest in order to meet assigned targets. The 2010 targets were monitored and reported to the RO at the end of the FY.

The 2010-2011 NEPA schedule for range was negotiated and developed by the District Rangers. In FY10, the Forest completed an environmental assessment (EA) for 8 allotments in the South Zone of the Forest on the Marlinton District. This EA completes the schedule for NEPA for the allotments in the south zone. The decision for the 2010 EA was delayed at the request of the Regional Office until the first quarter of FY11. This delay resulted in a shift of the NEPA Range schedule and adjustments were made to the MNF Five Year Plan. The North Zone will start surveys in FY11 for the last round of NEPA on the Cheat/Potomac District but completion is not anticipated until FY12.

Monitoring and Evaluation

FOREST PLAN MONITORING ITEMS FOR RANGE RESOURCES

There are no monitoring questions in the 2006 Forest Plan that are specific to Range Resources. However, there are three required monitoring questions applicable to Range Management that come from the Code of Federal Regulations, as follows:

1. *How close are projected outputs and services to actual?* [from CFR 219.12(k)(1)]
2. *How close are projected costs to actual costs?* [from CFR 219.12(k)(3)]
6. *Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?* [from CFR 219.12.(k)(2)].

Monitoring results for these items are reported below.

Monitoring Question 1. How close are projected outputs and services to actual?

The outputs and services projected in the 2006 Forest Plan (pages II-43 and II-44) are generally captured in the goals stated for Rangeland Resources:

Goal	RA01	Manage grazing allotments to provide open areas for forage, wildlife habitat, visual diversity, and dispersed recreation.
Goal	RA02	Establish grazing capacities based on sound range inventory and analysis processes. Vary forage utilization between allotments based on grazing management systems in use, Management Prescription emphasis, and other factors, such as the dominant forage species.
Goal	RA03	Manage grazing disturbance at levels that support movement toward desired ground cover conditions and maintenance or restoration of inherent soil quality and function.
Goal	RA11	Maintain or improve existing range allotments by: a) Refining or implementing more appropriate grazing systems, b) Applying lime and fertilizer where needed, c) Seeding to improve vegetation quality, and/or d) Selectively controlling undesirable vegetation, such as brush or non-native invasive species.

These goals are primarily achieved through NEPA and allotment planning and implementation. As noted above, in FY10 the Forest worked on NEPA planning and effects analysis for eight range allotments on the South Zone. The decision document for these allotments will be completed in FY11, and the activities, resource mitigation measures, and design features from the NEPA documents will be transferred into allotment management plans for implementation over the next 10-15 years.

The Outputs and Services section of this Monitoring Report shows that, for FY10, the Forest exceeded accomplishment targets for Acres of Grazing Allotments Managed to Standard and Acres of Rangeland Vegetation Improved. Particularly for Acres of Rangeland Improved, the Forest was able to greatly exceed the target due to funding received from the American Recovery and Reinvestment Act of 2009 (ARRA). The Forest was able to identify and implement approximately 1,900 acres that matched ARRA criteria in the allotments for mowing and wood vegetation removal.

Specific livestock-related outputs for FY10 are displayed in Table RA-1.

Table RA-1. FY 2010 Livestock Outputs on the MNF

Indicator	2010
Animal Unit Months (AUM) Grazed ¹	4,707
Head Months Grazed ²	3,724
Permittees	33
Cattle Grazed	963
Horses Grazed	24
Sheep Grazed	0
Total Animals Grazed	987
Active Allotments	45

¹ An animal unit month is the amount of forage required by a 1,000-pound cow, or the equivalent, for one month. For example, a bull eats more than a cow. A mature cow eats more than a yearling.

² A head month is the time in months that livestock spend on National Forest System land.

Monitoring Question 1. Evaluation, Conclusions, and Recommendations

The numbers shown in Table RA-1 are quite a bit lower than historic levels of grazing, which reflects that the need for allotments on federal land is not as great as in the past, and that the Forest has taken some allotments out of grazing for resource protection and other reasons. However, the table figures also indicate that the Range program is gradually moving toward more stability and equilibrium as livestock numbers and grazing capacities are adjusted to strike a balance between providing social and economic outputs and services while executing the program in a sustainable manner in order to meet a number of resource needs.

Recommendations: Continue working to meet Range Resources desired conditions in the revised Forest Plan. Desired conditions describe the goal of having well-maintained and operated allotments and properly functioning ecosystems.

Figure RA-1. ARRA Funded Shrub Removal in FY10

**Monitoring Question 2. How close are projected costs to actual costs?**

Costs of management practices, such as those done under fee credit agreements (fence repair, pond restoration, etc.) and those repairs that are done by district staff, volunteers, and regular permittee maintenance are tracked by district technicians. At the Supervisor's Office level, we budget for yearly projects to be done by Forest personnel or contractors, such as herbicide application and brush-hogging. The cost of administering the range program has gone down since 2008, as there is no longer one full-time position dedicated to running the program.

In FY 2010, the Range program received funding through the ARRA to address hazardous fuels buildup in range allotments. These dollars were unexpected but greatly needed. Over the decades, range allotments have been slowly giving way to encroaching vegetation, both native and non-native. The Range program had an identified need of restoring the vegetative condition across all allotments, reducing the buildup of fine fuels defined as hazardous fuels for wildfire, and treating noxious invasive shrubs/weeds and some native shrubs that had invaded the allotments. We have been slowly working toward addressing this need via multiple avenues such as fee credit agreements, small contracts, and district staff work. Also, the allotments were

losing habitat structural characteristics that are needed for many bird species especially neotropical birds that migrate to or through the Forest each year and may nest here. The Forest was able to identify approximately 1,900 acres that matched ARRA criteria in the allotments for mowing and wood vegetation removal.

The anticipated cost of treating all acres designated as part of the range allotments was more than expected because of the specialized equipment needed to clear the woody vegetation and the number of acres that needed treatment. However, the 1,900 acres that were treated were the acres of most value to address interdisciplinary livestock, wildlife, and botany (non-native invasive species control) needs. The accomplishment of this work has greatly improved range allotments and vegetation for livestock and wildlife use.

The ARRA funds were separated out into multiple contracts for the districts and according to the specialized equipment needs for vegetation treatment. A single Appalachian family-owned small business won all six bids and was awarded the contracts. Approximately 90 percent of the work was completed in FY10 and reported in accomplishments for Range, Wildlife, and Hazardous Fuels (Fire) for the Region.

Implementation of Fee Credit Agreements

In FY10, the Forest Supervisor directed Ranger Districts to maximize efforts with permittees to enter into Fee Credit Agreements (FCA). The Range Assistant worked with each District to develop an approach for each allotment and its permittee to establish a viable FCA that would result in improvements to the allotment. The Marlinton District was very successful with this strategy and initially received 100 percent participation by its permittees. The Cheat-Potomac and Greenbrier Districts had some success but some permittees in these parts of the Forest are not local landowners and live outside the region, or they had other reasons for not participating.

One benefit of FCAs is that dollars obtained for the permit are not sent to the National Treasury but rather are directly reinvested into the allotment. Thus, it would appear that FCAs provide a direct boost in project dollars for the Range program. However, the cost of administering FCAs is not accounted for in work plans. FCAs are time-intensive for oversight and inspection. District technicians reported a large increase in time spent in administering oversight for allotments this FY. Seven FCAs did not actually occur, and an additional amount of time was spent on disciplinary letters, rebilling permittees, and collecting funds. It was acknowledged by the Forest that even though FCAs result in on-the-ground improvements in Range, the Forest is short-handed in staff to oversee these agreements from beginning to end. If the strategy to continue to engage permittees in FCAs is to continue, more salary days will need to be provided for administration. However, the Forest will continue to pursue FCAs with permittees that are willing and eager to reinvest in the maintenance and improvement of their permitted allotment.

Monitoring Question 2. Evaluation, Conclusions, and Recommendations for Costs

Prior to this year, there has developed a large backlog of range improvements/facilities that need replacement. Inventories indicate there are an estimated 132 miles of boundary and interior fences on Forest allotments. At the end of FY09, the Forest was able to take advantage of

unobligated regional NFVW funds and purchase \$30,000 worth of fencing material to be utilized across the Forest in range allotments. Multiple types of fencing were purchased with the intent to build according to need and maintain or replace fencing that has deteriorated to the point of making several allotments unusable.

Range staff members have worked with permittees, adjoining land owners, and local small contractors to install an estimated 18,000 feet of new fence line and make multiple repairs elsewhere across the allotments. Labor was provided through fee credit agreements, cost challenge agreements with adjacent private landowners, and other sources. These efforts were just the beginning of upgrading existing fence line and addressing much-needed repairs.

For example, there are 26 corrals on the Forest, so only about half of the allotments have corrals/loading chutes. Many livestock watering facilities, such as ponds or spring developments, are also in need of work. Since FY09, the Range Staff has been planning Engineering Staff time to assist with some of the repairs particularly with ponds and access roads. It is more affordable to conduct this work in-house and provide salary funding on Forest with budget short falls. Additional watering facilities are needed on some allotments but must first be approved through the NEPA process.

The future costs of maintaining these improvements and vegetation treatments exceed projected funding in the Range budget. Unless, a substantial change is made in the distribution of NFRG funds nationally, and the MNF receives greater funding in the years to come, these vegetation improvements will not be sustainable.

In September of FY10, the Range Program Manager and Forest Supervisor met with the Washington Office Range Staff to discuss budgets, eastern range issues, and strategies for how to continue to manage range in the east with limited budget and resources. Ultimately, the Forest and Region sees a need to examine how the Range budget is distributed nationally. From a 34 million dollar budget, less than 1 million dollars are allocated to the East (both Regions 8 and 9). If more funding does not come to the East, the Range program will be in jeopardy of dissolving slowly away as a result of not being able to keep pace with allotment maintenance needs. Lack of maintenance will eventually result in no use. This meeting resulted in the need for a FY11 Washington Office field trip to the Forest planned for the spring of FY11.

Recommendations: Continue to prepare environmental analyses for grazing allotments to allow for additional improvements to be made to grazing allotments and to comply with the Rescissions Act of 1995.

Continue to use fee credit agreements as well as Forest Service funds to replace, repair, and/or upgrade range improvements. Place more emphasis on using fee credit agreements to replace fence, to upgrade other failing facilities, and to lime and fertilize pastures. District technicians should continue to encourage, develop, and administer fee credit agreements each year with permittees on their units. The Forest Supervisor gave special direction in FY09 to Range Staff to prepare to undertake as many fee credit agreements in FY10 as possible and this effort had varying degrees of success.

The Forest should request additional funding in range through the out-year budget process and through Congressional requests. The Forest should request from the Regional Office that deferred maintenance funding be provided for range work, in addition to deferred maintenance funding for roads. In cooperation with the Regional Office, the Forest is moving toward a more direct strategy for bringing the needs of Eastern Range Management to the attention of the Washington Office that generates the National budget and distributes regional allocations.

Figure RA-2. New Fence Constructed in FY10



Monitoring Question 6. Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?

This item is primarily monitored through on-site allotment visits or inspections. Each year selected allotments are visited/inspected by Forest technicians. In many instances, these visits are done specifically to inspect the allotment and are referred to as compliance checks.

Examples of the questions that the inspectors look to answer during compliance checks include:

- Have range improvements/facilities—such as fences, watering facilities, gates, mineral feeders, and corrals—been maintained by the permittee, and are they functioning properly?
- Has there been vandalism to improvements or facilities?
- Have any livestock escaped the allotment?
- Is the permittee complying with the permit and annual operating instructions regarding number and kind of livestock permitted and season of use?
- If the annual operating plan calls for rotational grazing, are livestock being properly rotated?
- Is the area being overgrazed?
- Are erosion, slides and slumps occurring?
- Are riparian areas being damaged?
- Is woody brush encroachment or non-native invasive species infestation a problem?

Observations are recorded in field notes or inspection reports. If technicians discover problems, they report them to the District Ranger and the District contacts the permittee if immediate action is needed. Problems that require repair to facilities are placed on a list of future improvement work to be accomplished. Depending on such factors as the timing, available funding, and

personnel availability, repair work may be scheduled and accomplished that fiscal year or placed in future year work plans for accomplishment. Work may be done by the permittee through fee credit agreements, by the Forest Service through contracts, or by Forest employees.

Sometimes technicians visit allotments in conjunction with other duties. For example, while Forest Service personnel are on an allotment inspecting a contractor's eradication of non-native brush, they also look at other aspects of the allotment. The entire allotment may not get inspected as it would under a compliance check, but portions of the allotment and its facilities are observed, and problems are noted and reported as needed.

Due to other duties and lack of range funds, not every allotment is visited or inspected every year. However, some allotments are visited more than once in a particular year. Most visits to allotments are done during the grazing season, but some occur before or after the grazing season.

Monitoring Question 6. Evaluation, Conclusions, and Recommendations

There were no significant effects or changes to land productivity reported from FY 2010 inspections. A number of minor concerns were noted (NNIS, improvement needs, etc.), and these will be addressed through a combination of operational processes described above. There is still a need in some allotments to address restricting livestock from riparian areas. The South Zone Range EA documented several affected riparian areas in FY10, and it also proposed to move allotment perimeters based on pasture management and riparian concerns. The results should be reflected in the 2011 Monitoring Report.

Recommendations: Continue allotment visits/inspections to document conditions of concern and needed repairs as a basis for future work project priorities.

Continue to control noxious weeds, non-native invasive species and brush by cutting/mowing until the use of more effective and longer-lasting control measures such as herbicides is approved through the environmental analysis process.

Work more closely with Wildlife staff to continue to implement methodologies for improving sensitive species habitat that coincides with grazing objectives.

Implement decisions from recent NEPA documents. Continue to build partnerships with entities that are interested in sponsoring conservation practices in openings.

Follow-up on Ours Allotment resource concerns as documented in the 2006 Monitoring Report – and to be addressed in FY 2011 NEPA.

Work in the fall and summer of FY 2011 to GPS and document existing conditions of allotments that are scheduled for the FY 2012 NEPA in the North Zone of the Forest.

Wildlife Resources

Introduction

The Land and Resource Management Plan (Forest Plan) for the Monongahela National Forest (MNF) acknowledges the importance of monitoring (data collection) and subsequent evaluation of that data to keep the Forest Plan current and responsive to changing conditions and issues, and to provide feedback mechanisms for adaptive management. The 2006 Forest Plan describes the need for monitoring and evaluation to meet four categories: 1) required monitoring items related to the National Forest Management Act (NFMA); 2) attainment of goals and objectives set forth in the Plan; 3) implementation of Plan standards and guidelines; and 4) effects of prescriptions and management practices.

Monitoring of wildlife resources is required as part of NFMA, to determine to what extent Forest Management is moving toward desired conditions for Management Indicator Species (MIS) and other wildlife species associated with MIS habitats. Wildlife and habitat monitoring also are required to address questions related to Forest-wide direction and management practices and Plan goals and standards. Chapter IV of the Plan Revision provides a monitoring matrix with questions designed to focus monitoring efforts toward achieving these stated needs. In addition to the four categories noted above, wildlife monitoring is required to address questions related to the viability of species included or proposed for inclusion on the Federal Endangered Species List. Monitoring is also essential to ensure that Forest management practices do not adversely impact the viability of Regional Forester Sensitive Species' (RFSS) populations.

2010 Accomplishments

The Forest works with the West Virginia Division of Natural Resources (WVDNR) to accomplish wildlife management objectives, including habitat restoration and enhancement, through a cooperative agreement between the two agencies. The Forest conducts inventory and monitoring of federally threatened and endangered species, MIS, RFSS, and other species groups (e.g., breeding birds and bats), while the WVDNR tracks populations of most of the game species on the Forest. The MNF cooperates with other Federal and State agencies, universities, and NGOs through formal and informal agreements and consultations, to develop and implement monitoring plans and conservation strategies for threatened, endangered and sensitive (TES) species. The wildlife program and its partners accomplished a wide range of activities in 2010 associated with the management and monitoring of wildlife resources on the Forest, in accordance with applicable laws, USFS policies, and Forest Plan direction. This document will focus primarily on the monitoring aspects of our accomplishments. However, the wildlife program, in cooperation with our partners and other Forest programs, also accomplished habitat restoration and enhancement activities on over 6,800 acres on the Forest. Forest biologists and bio-technicians also developed and participated in conservation education and other outreach activities and inter-agency studies. General accomplishments are summarized in Table WL-1.

Table WL-1. Wildlife Resource Accomplishments, FY 2010

Activities, Products and Services	Quantity
Early-successional habitat maintenance and enhancement	1,960 ac
Wetland/open water habitat created or restored	3,060 ac
Forested habitat restoration or enhancement (e.g., snag creation, spruce thinning)	570 ac
Plantings of native trees, shrubs and herbaceous species	1,240 ac
Structures (e.g., water tanks, fences) installed	7
Habitats inventoried for mapping/planning purposes (e.g., ESH, wetlands, spruce)	67,320 ac
Wildlife TES clearance surveys for proposed forest management projects	3,920 ac
Wildlife surveys associated with long-term monitoring for TES species	106,130 ac
Cooperative wildlife studies (with Universities or other research groups)	4
Wildlife educational programs (outreach events/approx. number attending)	17 / 4,000
Temporary employees (students hired for wildlife inventory/monitoring work)	3

Many of these activities and accomplishments also are tied directly to Management goals and objectives and standards and guidelines as set forth in the Forest Plan for Threatened, Endangered, and Proposed Species (FP, p. II-22) and Wildlife and Fish resources (FP, p. II-29).

Monitoring and Evaluation

The Forest Plan outlines monitoring to address wildlife concerns and goals and objectives for Management Indicator Species (MIS); Threatened, Endangered, and Proposed (TEP) species; Regional Forester Sensitive Species (RFSS); and other wildlife and habitats of concern or interest. In addition to addressing the goals and objectives associated with management and conservation of these species, the Forest Plan sets forth specific monitoring questions developed to ensure that monitoring and evaluation address information essential to measuring items related to Forest Plan direction. The 2006 Forest Plan Monitoring Matrix (Chapter IV) includes eight questions that are related to wildlife resources, as follows:

10. *To what extent is Forest management moving toward desired habitat conditions for MIS and species associated with MIS habitats?*
38. *To what extent is Forest management contributing to the protection and recovery of threatened and endangered species?*
39. *To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?*
43. *To what extent is Forest management influencing the viability of native and desired non-native species or otherwise affecting species composition and habitat productivity?*
44. *To what extent is management on Forest lands influencing populations of terrestrial or aquatic non-native species that threaten native ecosystems?*

30. To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use and associated impacts?

45. Is Forest management providing adequate habitat diversity and structure through maintenance or enhancement of snags, culls, leave trees, and downed woody debris?

46. Is the Forest providing adequate habitat to meet the demand for wildlife and fisheries related social and recreational opportunities?

The wildlife program, in cooperation with other Forest programs and outside partners, has been actively engaged in management actions and monitoring across the Forest to move toward desired habitat conditions for a variety of wildlife species and to meet other related Plan management goals and objectives. Inventory, monitoring and evaluation efforts, and ongoing studies in support of TES, MIS, RFSS and other species and habitats of interest are described in more detail in the following sections, along with the monitoring questions to which they most directly relate. In most cases, additional monitoring questions are addressed as part of those summaries.

FEDERALLY THREATENED/ENDANGERED SPECIES

Monitoring Question 38. To what extent is Forest management contributing to the protection and recovery of threatened and endangered species?

The Forest Plan direction for Federally Threatened, Endangered, and Proposed (TEP) species is to provide habitat capable of contributing to the survival and recovery of species listed under the ESA, and to provide habitat that may help preclude Proposed species from becoming listed. Toward that end, the Forest has been actively monitoring the species noted above, while concurrently participating in studies designed to better understand the ecology of these species. In addition, the Forest develops management plans and implements activities to restore and enhance TEP habitats. To ensure that the best science is used in our management efforts, Forest biologists coordinate and cooperate with state and other federal agencies, NGOs, and universities on developing and implementing wildlife studies and monitoring programs. We also participate in regional working groups on proactive habitat conservation topics and initiatives.

Three federally listed vertebrate species currently inhabit the MNF: the Cheat Mountain salamander (*Plethodon nettingi*), Indiana bat (*Myotis sodalis*), and Virginia big-eared bat (*Corynorhinus townsendii virginianus*). The WV northern flying squirrel (*Glaucomys sabrinus fuscus*), formerly a federally endangered species, was delisted in September of 2008; however, the squirrel is still considered a RFSS, and a Management Indicator Species (MIS) for the Forest, and direction set forth for the species in the 2006 Forest Plan remains in effect. In addition to the general direction for TEP noted above, the 2006 Forest Plan lists specific goals and standards associated with each of these TE species.

Cheat Mountain Salamander, *Plethodon nettingi*

The Cheat Mountain salamander (Figure WL-1) is a federally threatened species, whose current range lies primarily within the proclamation boundary of the MNF.



Figure WL-1. Cheat Mountain Salamander at a control site on Stuart Knob, MNF

Dr. Thomas Pauley of Marshall University has delineated known and potential habitat for the Cheat Mountain salamander (CMS) and has conducted surveys across much of the Forest since the species was listed, in addition to conducting independent research associated with the salamander on the Forest. The Forest has also worked with the University of Wisconsin to develop additional CMS mapping and modeling for use in conservation planning and project impact assessment.

In FY 2010, Dr. Pauley conducted surveys at the Timberline Four-Season Resort on Forest Service land in Tucker County, as part of a long-term study to examine effects of the Salamander Run ski trail on a population of CMS. Based on historical information from that study, several mitigation measures were begun in 2008-10 to mitigate for CMS habitat that was lost or degraded during construction and operation of the Resort's ski slope. These measures included installation of leaf fences and irrigation via sprinklers; cover board arrays were also placed in this area and a nearby control area to assess whether these habitat measures were successful. Sixteen acres of habitat were inventoried during 2010 as part of the restoration project.

Administrative studies: The MNF continued work associated with a Participating Agreement with Marshall University to investigate the effects of Forest trails and gated roads on CMS populations and, if appropriate, recommend management actions to ameliorate the potential for negative impacts from existing or proposed trails. Cover board and time-constrained visual surveys were conducted four times during the summer at 20 sites across the Forest along trails, roads, and control sites within known CMS habitat. Environmental data (e.g., microclimate measures, soils and vegetation data) also were taken in association with the amphibian surveys. In FY 2010, an estimated 528 acres of CMS habitat were inventoried as part of this study.

In 2010, cover-board surveys resulted in a total of 717 salamanders captured. Of the 139 CMS caught, 62% were new captures and 30% were recaptured animals (the remainder either escaped or were too small to be marked). The presence of CMS varied by month of survey and site, and CMS were never observed at seven of the sites (35%) during 2010. In May, 55% of the sites had known CMS presence, 40% in June, 40% in July, and 50% in August. CMS occupancy and

activity may have been influenced by the unusual dry field season experienced in 2010. Nighttime transects yielded approximately 2,000 salamanders of nine species; *Plethodon nettingi* accounted for approximately 56% of these individuals. Data analysis will be conducted in FY 2011 and final results and management recommendations, available in FY11 or FY12, will be used to assist the MNF in developing protocols to minimize the impact of roads and recreational-use trails on *Plethodon nettingi* populations, and to develop mitigation and/or habitat restoration plans for this federally listed species where practicable.

Evaluation, Conclusions, and Recommendations for the Cheat Mountain Salamander

Inventory and monitoring data and mapping developed in association with CMS studies on the Forest have been used in management decisions and planning efforts for both the MNF and other non-Forest Service projects (e.g., energy corridor planning and conservation land acquisition). However, because most of the CMS surveys to date have been associated with project clearance or research studies, there remains a need to conduct more systematic inventory for this species across potential habitats across the Forest to ensure that our management is contributing to the protection and recovery of the species. In addition to assisting us in our Forest management and conservation goals for the Cheat Mountain salamander, the above-mentioned efforts also address our responsibilities under the Endangered Species Act [Section 7(a)(1)], and should contribute to the recovery of this species.

It is recommended that inventory efforts be increased across the Forest, particularly in areas not surveyed as part of historical or ongoing studies or project clearance, to increase understanding of the distribution of the Cheat Mountain salamander on the MNF and to develop more refined mapping for use in CMS habitat restoration/conservation projects and other Forest planning efforts. Results of the current trails and roads study should be used to modify management and implement conservation measures in the vicinity of Forest roads and trails where appropriate.

Endangered Bat Species

Two endangered bat species, the Indiana bat and the Virginia big-eared bat (VBEB), are found on the MNF. The MNF conducts forest-wide inventory and monitoring of these and other bats on an annual basis. The purpose of this program is to inventory watershed areas for all species of forest bats and to clear project areas as part of Section 7 consultation, as well as to monitor long-term sites across the forest. Long-term monitoring will help us to detect any unusual changes in bat populations, which may or may not be associated with management activities so that we can act appropriately to ensure continued species viability on the Forest. The WVDNR also has been conducting hibernacula and summer colony cave surveys on the Forest and elsewhere in WV for 25 years. The combined efforts of the Forest and WVDNR provide an exceptional long-term database for bat populations across the state.

Winter hibernacula counts and White-nose Syndrome. During the 2008-09 hibernacula counts, the fungus associated with White-nose Syndrome (WNS) was detected in several caves located in Pendleton County, including caves used as hibernacula by VBEBs and Indiana bats, providing the first documentation of WNS in the state of West Virginia. White-nosed syndrome is considered to be responsible for massive die-offs of bats, including Indiana bats, in other northeastern states.

In the winter of 2009-2010, WVDNR biologists conducted scheduled winter bat surveys at several caves to examine the spread of WNS in West Virginia. In addition, entrance surveys were conducted by Forest Service, WVDNR, the National Park Service (NPS), and volunteers from the caving community to note the presence of bats outside the cave entrance. Suspect bats were collected and sent to the Southeast Cooperative Wildlife Disease Study for analysis, where it was determined that WNS was present in six additional WV counties: Greenbrier, Hardy, Jefferson, Mercer, Monroe, and Pocahontas (Endangered Species Federal Assistance Performance Report, WVDNR, 2009-2010). On April 15, 2010, the MNF Forest Supervisor signed an emergency closure order, prohibiting entry to all caves on the Forest until June 30, 2012 to protect endangered, threatened and sensitive bat species.

Summer mist-netting surveys. As part of the Forest's bat monitoring program, and to meet our obligations in regard to the Endangered Species Act (as noted in the USFWS Biological Opinion associated with Forest Plan Revision), mist-netting is conducted annually both within proposed project areas and across the Forest in long-term monitoring sites. In 2010, mist-netting was conducted at 30 long-term sites on the MNF; captured Indiana bats that met certain criteria were fitted with a radio-transmitter. A total of 609 bats of eleven species were captured, including seven male Indiana bats, nine Virginia big-eared bats, and 14 small-footed bats (*Myotis leibii*, RFSS). Three bridges also were surveyed; however no bats were captured at those sites. Data from these surveys provide general information regarding Forest habitat use by a variety of bat species, as well as critical information regarding the occurrence of TEP and RFSS bat species and the potential for Indiana bat maternity colonies on the Forest.

The mist-net data from our long-term sites provides valuable baseline information for use in assessing potential changes in bat species composition or abundance that may result from Forest management or broader regional issues affecting bat populations. In addition, the historical mist net data developed by the MNF provides a unique dataset for assessing impacts to the Forest's bat populations as a result of WNS. By far the most numerous species caught during long-term site monitoring to date has been the northern long-eared myotis (*M. septentrionalis*), with the little brown bat (*M. lucifugus*), red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), and tri-colored bat (*Perimyotis subflavus*) also common captures. Several of those species, particularly the *Myotis*, have been hard-hit by WNS.

Preliminary analyses of long-term site data on the Forest by MNF biologists indicate that, while the abundance of individual species have not declined significantly across the Forest since the discovery of WNS in WV caves, a reduction in numbers of *M. lucifugus* was observed in the vicinity (five miles) of caves where WNS was observed in Pendleton County, West Virginia in 2008-09 (Figure WL-2). In addition, significant increases in the proportion of non-reproductive females and concurrent decreases in the proportion of pregnant and post-reproductive female little brown bats were observed across the Forest. A lower proportion of scrotal males (as opposed to non-reproductive) also was noted in the vicinity of known WNS caves, though this difference was not significant across the entire Forest. As the number of caves with WNS increases across the state, we expect that our long-term data will indicate more significant changes in the demographic characteristics of *Myotis* and other bat species across the MNF.

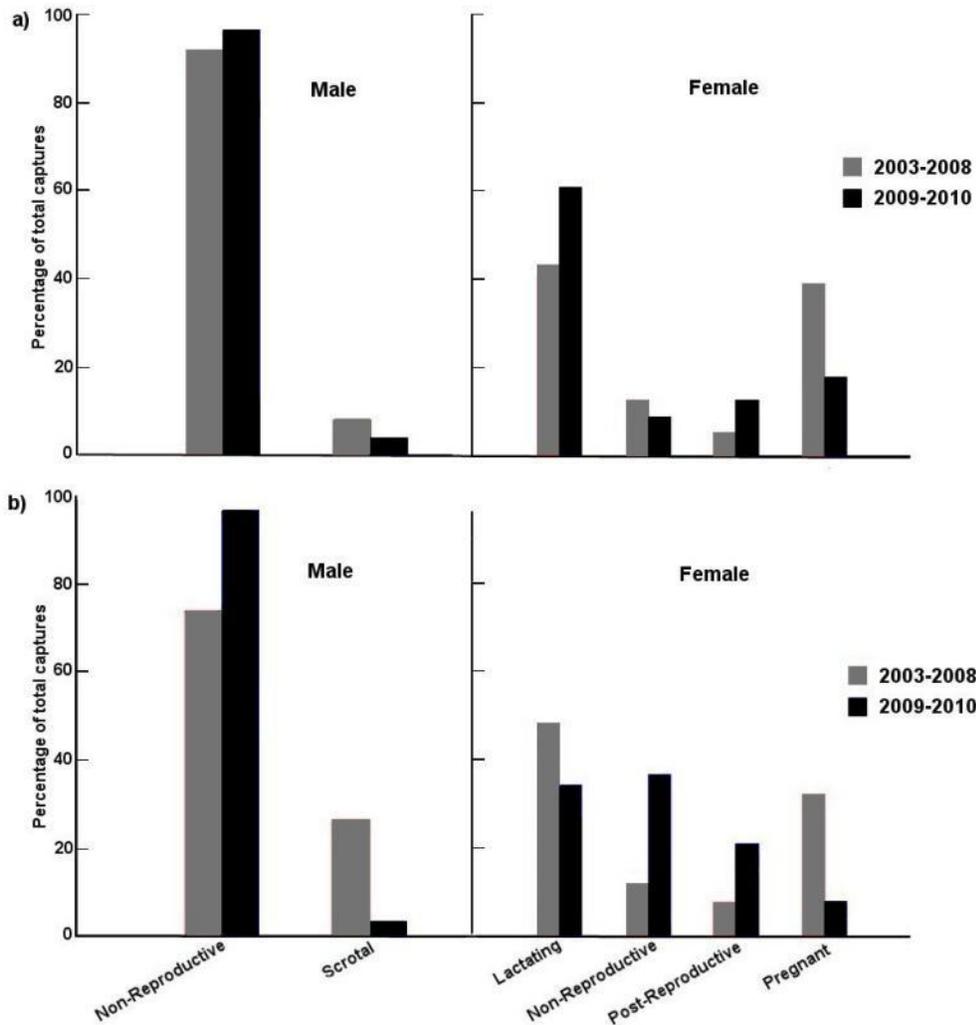


Figure WL-2. Proportion of adult little brown bats in reproductive condition categories during surveys prior to and after the first observations of WNS in Pendleton County, WV across: a) the majority of the Forest and b) mist-net sites located within 5 miles of known WNS caves

Acoustic monitoring. In 2009, the MNF and other National Forests in the region began conducting acoustic monitoring as part of a regional effort to track bat populations at large spatial scales in response to the rapid spread of WNS. That year, the State of WV also began running widespread survey routes. This year, MNF biologists and Americorps personnel working at the Forest joined with the WVDNR and other collaborators to complete surveying of approximately 85 acoustic transect routes across the state. These routes were each run 2-3 times during the summer, using ultrasonic detectors and following a standardized acoustic sampling protocol, for a total of over 5,400 miles of survey effort in 2010. Data were sent to the WVDNR and Eric Britzke for analysis of species and habitat information. This acoustic work should help state and federal biologists better document changes in species distribution across broad landscapes and identify possible concentrations of individuals or species in key habitats. Documenting bat distribution numbers (indices) during the summer and across broad landscapes may provide an additional estimate of the effects of white-nose syndrome on overall bat populations on the MNF, in West Virginia, and region-wide.

Outreach programs. Forest biologists presented educational programs about bats, including TES bat species, and bat conservation to schools and other youth groups throughout the year. The Forest has developed a “Bat Trunk” that has been very helpful in these presentations. The trunk is available at no cost for teachers and other environmental educators to borrow for use in their own programs. In addition, the Forest has a 60-foot inflatable cave that is brought to events where children are encouraged to don hardhats with headlamps and crawl into the cave and learn about cave ecosystems, including the wildlife species that depend on them and the threat of white-nose syndrome. In FY 2010, in addition to presenting to individual classrooms and groups, the MNF worked with the WVDNR, USFWS, and local cavers to develop and staff an educational booth at the 79th Mountain State Forest Festival in Elkins, WV. Over 2,600 children and adults participated in the cave visit and other educational bat and cave-associated activities.

Indiana Bat, *Myotis sodalis*.

Summer monitoring on the MNF. Historical Indiana bat capture locations are included as sites in our long-term monitoring program. As part of that ongoing mist-netting effort, transmitters are attached to selected bats, and radio-telemetry is used to gather information about habitat use by Indiana bats on the Forest.



Figure WL-3. Indiana bat being fitted with a band after capture

As a result of mist-netting efforts in 2010, seven male Indiana bats were banded (Figure WL-3), fitted with transmitters, and tracked to roost trees. One of these bats was followed to a forested floodplain along the Buffalo Fork of the Little River where it remained through the life of the transmitter, using several different roost trees in the same area. The remaining six Indiana bats were captured and tracked to roost trees in the Reeds Creek area (northeastern part of the Forest), the same area where post-lactating females were captured in 2008 and 2009. No maternity roost was found in either of those years, and emergence counts at the roost trees identified for the male Indiana bats tracked in 2010 also failed to indicate the presence of a maternity roost. Additional mist-netting will be conducted in FY11 in an attempt to locate a maternity colony and, regardless

of the results of those surveys, we expect that the long-term mist-net sites in the area will continue to be surveyed on a regular basis in the future.

Winter monitoring/Hibernacula counts. Eleven Indiana bat hibernacula are located within the MNF proclamation boundary, but only three (Big Springs Cave, Cave Hollow/Arbogast Cave, and Two-Lick Run Cave) have all or most of their entrances on Forest Service land. Big Springs was only partially surveyed in 2009-10 (only the front portion of the cave); however, the number of Indiana bats using that hibernacula had shown a general increase over the last 22 years (Fig. WL-5). Cave Hollow/Arbogast and Two-Lick Cave, neither of which were monitored in 2009-2010, have been less consistent, with Two Lick fluctuating from a high of 12 in 1995, to zero Indiana bats detected in 2003 (Figure WL-4). Cave Hollow has experienced a general upward trend in number of *M. sodalis* found wintering in the cave since the early 1990's.

A total of 12 caves in 7 counties were surveyed by the WVDNR during the winter of 2009-10. Nine of these caves contained *M. sodalis*, with a total count of 19,479; a 39.9% increase over the total in those same caves during previous surveys at those sites (WVDNR 2010). However, the percent changes in individual caves ranged from -41.1% to +44.3% at Hellhole, which had an increase of 5,699 Indiana bats as compared to the last survey there.

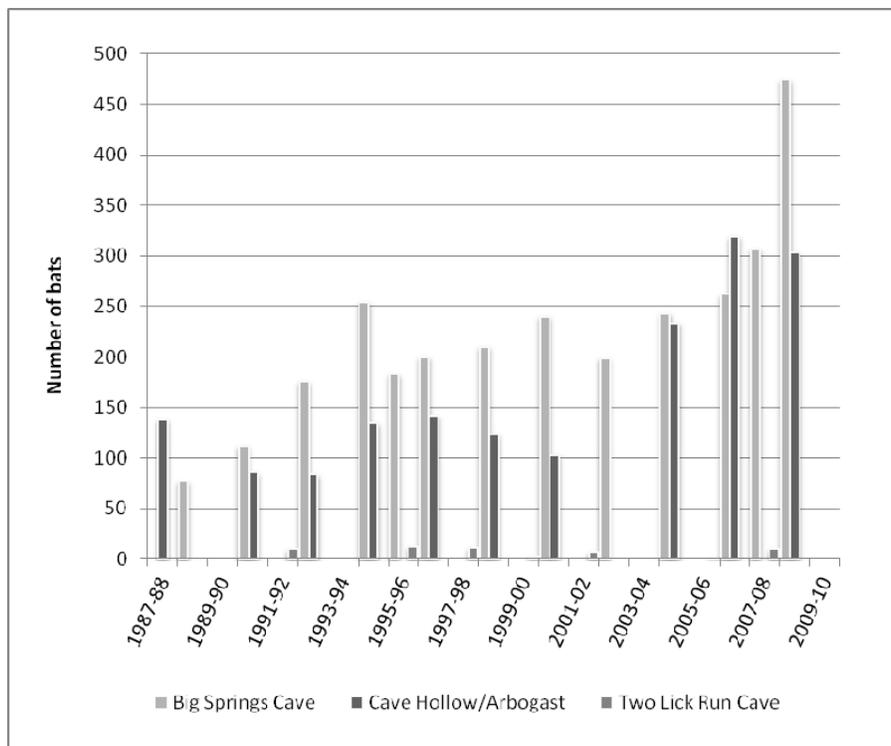


Figure WL-4. Hibernacula counts from three caves with entrances on the MNF, 1987-2010

Management. Snag creation projects were planned and implemented within the Forest to improve foraging, roosting and fall swarming habitat for Indiana bats by reducing canopy closure to a more optimal level and increasing available roost sites over time. It is expected that these projects also will help generate mature forest structure characteristics for a variety of wildlife

species. Trees identified for snagging were girdled with an axe or chainsaw, to ensure a supply of snags on approximately 500 acres of land across the Forest in FY10. Ponds, vernal pools, and other water sources also were created and/or maintained on approximately 500 acres of ridge tops and other potential bat habitats to provide habitat enhancement for bats. In addition to active habitat management, existing cave gates put in place to conserve critical bat habitat were monitored to ensure that they were still functional.

Virginia Big-eared Bat, *Corynorhinus townsendii virginianus*.

Virginia big-eared bat populations are surveyed in cooperation with WVDNR, and the MNF has an ongoing program of mist-netting and telemetry work to gather information about habitat use by bats on the MNF (see above). The Virginia big-eared bat (VBEB) is a cave-obligate species, with its largest populations located in West Virginia. A WVDNR census of 10 VBEB maternity colonies across the state was conducted in June of 2010 and resulted in an estimate of 7,142 bats – slightly less than the 2009 count, but still the second highest total on record for these sites since the counts began in 1983 (Endangered Species Federal Assistance Performance Report, WVDNR, 2009-2010).

Changes in summer colony population size at individual caves ranged from -26.6% at Cave Hollow/Arbogast (following a 16.8% increase at that cave last year) to +15.7% at Mill Run Cave. Six of the ten colonies censused have entrances location within the Forest Proclamation Boundary, including Cave Hollow/Arbogast. The changes in VBEB estimates associated with the other five caves from 2009 to 2010 are: Cave Mountain (-14%), Mystic -4.9%), Peacock (+9.8%), and Schoolhouse Cave (+4.9%).

As noted previously, hibernacula counts revealed the presence of WNS in several additional caves in the winter of 2009-10. While some of these caves are used as hibernacula by VBEBs, no sign of WNS was found on any VBEB bats. Of particular interest was Hellhole Cave, which supports the largest VBEB maternity colony in the world. Approximately 10,000 Virginia big-eared bats were noted in Hellhole during this hibernacula count, the highest count ever recorded for the species, yet despite the presence of WNS on other bat species in the cave, no VBEB showed evidence of the fungus.

Evaluation, Conclusions and Recommendations for Indiana & Virginia Big-eared Bats

Cave monitoring results over the recent past indicate that numbers of both Indiana bats and Virginia big-eared bats in maternity colonies and hibernacula on or near the Forest are generally stable or increasing. These results indicate that Forest management practices are not having any large-scale detrimental impacts to these species or their habitats, and in many cases (e.g., snag and wetland creation and gating or closing of select caves) may be having positive influence on populations. However, the spread of WNS through West Virginia caves could drastically alter that outlook. As such, continued intensive monitoring is needed to assess population viability on an annual basis, particularly in the face of this and other broad-scale threats to bats.

The repeated Indiana bat captures, including post-lactating females, at two general locations in the Forest, indicate the presence of maternity colonies that likely would not have been identified without the implementation of the long-term mist-netting program on the Forest. Because these two areas are separated by approximately 20 miles, it is likely that additional maternity colonies

may be present on the Forest. The general habitat associated with both capture areas consists of a patchwork of Forest Service land and private land with a mosaic of both forested and agricultural land use types. The inclusion of openings of various types, including range allotments, streams and old skid roads, in the immediate vicinity of roost trees indicates that management within specific forested habitats likely would be beneficial for the bat. In addition, mist-netting work in the vicinity of created vernal pools indicates that development of such water sources can provide an important summer habitat resource for a wide variety of bat species. Data collected as part of the mist-netting and telemetry work will be analyzed in FY2012 to make recommendations regarding best management practices for enhancing habitat across the MNF for the Indiana bat and other tree-roosting bats.

Furthermore, based on the results of mist-netting and Indiana bat telemetry work over the years and a review of the literature, the Forest should continue to plan and implement pro-active bat management activities (e.g., timber management, snag creation, and wetland creation and restoration). Given the potential impacts of WNS on wintering bat populations, conservation efforts in the form of both cave protection and summer habitat enhancement should be a focus for a variety of bat species, along with focused monitoring to ensure that those efforts are directed appropriately. Monitoring of summer and winter populations, using a variety of techniques (i.e., hibernacula counts, mist-netting and acoustic monitoring) should be continued.

MANAGEMENT INDICATOR SPECIES

Monitoring Question 10. To what extent is Forest management moving toward desired habitat conditions for MIS and species associated with MIS habitats?

Forest Plan direction is to monitor Management Indicator Species (MIS) and their relationships to habitat affected by management to determine whether Forest management is moving toward providing desired habitat conditions for MIS and associated species. This item is addressed through the monitoring of MIS and their habitats, and the creation or enhancement of suitable conditions for these species. MIS species for the Forest include the WV northern flying squirrel, wild turkey (*Meleagris gallopavo*), cerulean warbler (*Dendroica cerulean*), and wild brook trout (*Salvelinus fontinalis*). The brook trout is addressed in the Aquatic Resources portion of this report. Game species, such as the wild turkey, are monitored by the WVDNR via both the collection and analysis of harvest data and ongoing DNR research projects that provide forest-wide population indices. In addition, the Forest and WVDNR cooperate in songbird point count monitoring and breeding bird surveys that provide additional forest-wide data on both the wild turkey and cerulean warbler. The Forest has also been involved in a Participating Agreement with West Virginia University (WVU) specific to the cerulean warbler.

West Virginia Northern flying squirrel, *Glaucomys sabrinus fuscus*

The WV northern flying squirrel (NFS) was listed as a federally endangered species in 1985. Since that time, thousands of flying squirrel nest boxes have been placed and monitored on the MNF, which encompasses the vast majority of this species' habitat, and live trapping surveys have been conducted in proposed project areas. In December 2006, following a review of the squirrel's status, the USFWS formally proposed removing federal protection for the flying squirrel. The species was officially removed from the list in October of 2008. A NFS pilot study designed and conducted by MNF biologists resulted in the capture of over 100 NFS, including a

large number of recaptures, through the fall of 2008. This capture data was used, in association with other historical NFS capture data, in the USFWS's decision to delist the species. It is also being used to inform the Forest's long-term monitoring efforts, which will contribute to the collaborative survey and monitoring plan (with the WVDNR and USFWS) included as part of the Service's post-delisting monitoring plan for the species.

As part of our NFS long-term monitoring plan implementation, an additional 250 nest boxes were installed at ten new sites across the Forest, in addition to the ten already in place as part of the pilot project. In FY2010, the Forest and WVDNR monitored these new boxes as well as historic nest boxes across the MNF and elsewhere. Despite this continued monitoring, no NFS were captured by MNF biologists during either the fall of 2009 or spring of FY2010. The WVDNR also had less success than in previous years, with no NFS caught in the fall of 2009 and only six captures (at three sites) during the following spring (Endangered Species Federal Assistance Performance Report, WVDNR, 2009-2010).

Other studies continue on the Forest and surrounding lands to gain additional information regarding NFS life history and habitat requirements. In addition, the Forest is actively involved in spruce restoration/enhancement efforts in support of the Forest Plan long-term objective of increasing mid-late and late-successional spruce forest acreage to provide optimum habitat for the NFS and other high-elevation spruce and spruce-hardwood species. The Forest Plan's inclusion of a Management Prescription focused on restoration of spruce and spruce-hardwood habitats on the MNF (MP 4.1) is expected to have a positive influence on the viability of the species in the future, and so played a large role in USFWS's decision to delist the northern flying squirrel. In FY2010, the Forest completed an estimated 74 acres of understory spruce release and an additional 75 acres of land were planted with spruce seedlings.

Evaluation, Conclusions, and Recommendations for the WV Northern Flying Squirrel

Establishment of a long-term monitoring program for this species began in FY2009 and we completed nest box set-up at sites (with one exception) in 2010. The paucity of captures in 2009 and complete lack of captures on-Forest during FY2010 is cause for some concern, particularly given the relative consistent captures at some of those sites previously. Continued monitoring should provide a better indication of the current status of the species in the monitored area. If next box monitoring in FY2011 continues to result in a lack of NFS captures, it is recommended that a more concerted effort (e.g., returning to a higher level of box checks combined with trapping similar to that implemented during the pilot study) be employed in FY2012.

Continued monitoring of NFS will help the Forest determine population occupancy patterns and refine our understanding of suitable habitat, thus allowing us to better manage for the protection and further recovery of this species. Monitoring for the NFS on the Forest also will contribute to the needs and goals set forth in the USFWS's Post-delisting Monitoring Plan for the NFS. In addition to landscape-level monitoring for the NFS, both the species and habitat should be monitored in areas managed for spruce restoration and enhancement (i.e., using adaptive management to ensure that habitat modifications are beneficial to the NFS and associated wildlife species). The Forest Plan's MP 4.1 is designed to aid in the recovery of the NFS and other TES species associated with these habitat types. Within suitable squirrel habitat, spruce and spruce-hardwood stands would generally be allowed to grow older and develop uneven-aged

structure over time. Areas within MP 4.1 (and other appropriate areas) may be managed to encourage spruce regeneration and promote desired habitat characteristics, while minimizing ground disturbance. However, it is recommended that no management be implemented in known or suitable NFS habitat for the purposes of enhancing habitat for the species without specific research indicating that the proposed management will improve or maintain habitat for that species, per Forest Plan guidelines (FP II-27, TE64).

Wild Turkey, *Meleagris gallopavo*

As a game species, wild turkey populations on the MNF are regulated by both available habitat, which can be affected by Forest land management, and by harvest pressure from hunters, which is affected by state (WVDNR) regulations as well as by weather and other conditions during the hunting season. The WVDNR's data indicated a fall 2009 harvest of 1,208 wild turkeys, almost exactly the same as that of the previous year. The 2010 spring gobbler harvest was 10,209, about 4% higher than the 2009 harvest. The turkey brood survey count for 2010 was down 25% as compared to 2009, indicating that the 2012 harvest will likely be lower than the 2011 harvest (as the number of gobblers born two years prior to a spring turkey season generally provides a good forecast of that spring's gobbler harvest).

While the 2009 WV mast survey showed a considerable decrease in the majority of mast species compared to the previous year, the 2010 mast survey indicated a strong mast year. Indices for all oaks (except scrub oak) were over 100% higher than in 2009, black cherry production increased 124%, and the statewide index for combined hard mast species and black cherry was well above the 40-year average. Because of the irregular patterns of abundance we should be cautious when comparing these indices. However, the increase in acorn production can be an important predictor in harvest because oak are the most valuable mast species in West Virginia, and in a good acorn year, turkey tend to disperse across larger foraging areas. Mast conditions impact over-winter survival and reproductive success of many wildlife species, including wild turkey.

The MNF works with the WVDNR, National Wild Turkey Federation (NWTf) and other groups to plan and implement management for wild turkeys across the Forest. In 2010, over 1,900 acres of early successional habitat was created or maintained adjacent to forested lands to enhance the value of these areas for wild turkey, ruffed grouse, woodcock, and other important game and non-game species. In addition, the Forest inventoried over 5,600 acres of wildlife openings and other early successional habitat for entry into an updated Forest-wide spatial database.

Evaluation, Conclusions, and Recommendations for the Wild Turkey

Population indices based on harvest data should be viewed cautiously, as many factors that have little to do with the overall populations of game animals may affect harvest success (e.g., hunting season variations, changes in hunting regulations, weather, hunter participation, access). Also, although harvest data is a fairly good indicator of hunter success rates, the harvests only complicate the Forest's ability to determine what effects Forest activities or management may be having on game populations. In fact, good harvest can be an indicator of poor habitat conditions, in terms of mast production, because turkeys are then clustered in the fewer good habitat patches in higher densities, allowing for easier hunting. The mast survey data collected by the DNR is perhaps a better barometer for how Forest management is meeting the needs of the wild turkey and similar species. However, mast survey results have shown considerable annual fluctuation.

Thus, more focused monitoring for this and other game bird species may be needed in the vicinity of existing and proposed project areas in order to get a better understanding of how management on the Forest is affecting wild turkey populations overall.

Cerulean Warbler, *Dendroica cerulea*

Breeding Bird Survey data from 1966-2005 indicate a decline of about 3% per year throughout the cerulean warbler's breeding range, -3.2% annually during the ten-year period from 1996-2005. These data also show that the species' highest population densities occur in the central Appalachian Mountains. West Virginia is in the core of the species' breeding range, with relatively high densities, though numbers have been steadily declining in the state's breeding populations as well. The Partners In Flight plans for the three physiographic areas located in West Virginia identify the cerulean warbler as the species of highest conservation concern within mature deciduous forest habitats. This warbler was a candidate for federal listing in 2002. However, the USFWS determined that listing the species as threatened under the ESA was not warranted. Instead, the USFWS will pursue cooperative conservation initiatives designed to reverse population declines and prevent the need to list this migratory songbird.

The MNF conducts annual breeding bird point count surveys (PCS); these data, along with Breeding Bird Survey (BBS) data, provide us with general information regarding the distribution of breeding birds, including the cerulean warbler (CEWA), across the Forest. Figure WL-6 indicates the general distribution of CEWA observations on the Forest (as compared to the overall distribution of PCS routes on the Forest), with CEWA found primarily in mixed-mesophytic hardwoods and oak forest types.

It is not known how CEWA populations respond to various silvicultural treatments and differing levels of harvest intensity, though studies to date indicate that the species requires some level of heterogeneity within the forest canopy. As such, timber harvesting methods that provide low levels of canopy disturbance may prove to be effective in managing forested habitats for the warbler. In an effort to help develop information on the effects of different harvest techniques on the warbler, the MNF partnered with the USGS (West Virginia Cooperative Fish and Wildlife Research Unit) and West Virginia University on a study to assess the responses (e.g., densities and nesting success) of CEWA populations and other forest bird species to differing levels of timber harvesting intensity. This study is part of a larger effort involving researchers, land managers and NGOs in states throughout the species' breeding range; two other study sites are located in WV on state and private lands.

The study involves pre-treatment, immediate post-treatment and longer-term post-treatment monitoring of CEWA populations responses to differing harvest activities. Harvest treatments, implemented in the fall of 2006, included: 1) reference stand, undisturbed by harvesting, 2) single-tree selection harvest, 3) shelterwood harvest, and 4) regeneration (clearcut) harvest. Post-treatment monitoring began in spring 2007 and continued in 2008-10, with the collection of territory mapping data, nest monitoring, and the collection of habitat metrics.

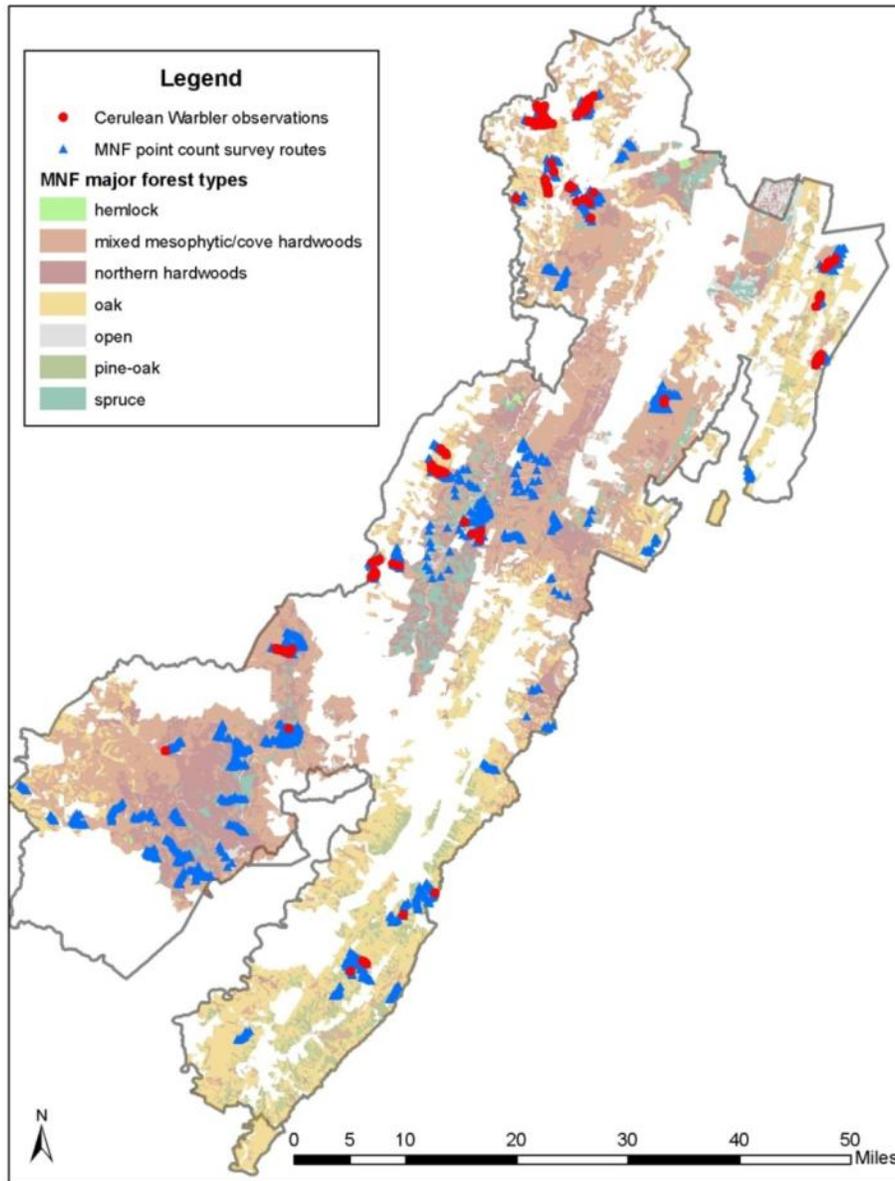


Figure WL-6. Point count survey routes and cerulean warbler observations on the Monongahela NF

The greatest, most consistent response of CERW relative to the number of pre-treatment territories across all the WV sites has been in the intermediate treatment. For the MNF, where CEWA territory densities are overall quite low and variable, the increase from zero territories (per 10 ha area) in 2006 to four in 2009 (3.75 in 2010) in the intermediate harvest was the most substantial change observed. Positive CEWA population response was also apparent in the light harvest treatment. Across all study areas in the regional project, significant treatment effects also were noted for overall species richness and edge (guild) species abundance (highest in the heavy harvest treatments). Similar effects were noted for individual species abundance estimates, including the eastern towhee, indigo bunting, brown-headed cowbird, and cedar waxwing.

However, the abundance of several forest interior species (e.g., the ovenbird and black-throated green warbler) was lower in harvested treatments, particularly the heavy harvest.

Data analysis and the production of a Final Report for the MNF and other WV sites will be completed in FY11. Those data also will be incorporated with data from the other four study areas to inform a broader regional analysis. The WV portion of this study already has resulted in the production of several theses and dissertations and other publications, as well as many presentations, providing valuable information regarding the effects of forest management on these and other forest bird species. The portion of the study conducted on the MNF will provide important information regarding local CEWA populations and habitat use on the MNF that can be used by the Forest in planning management to maximize desired habitat conditions for this and associated species in suitable areas.

Evaluation, Conclusions, and Recommendations for the Cerulean Warbler

Data from Forest-wide bird surveys (BBS and PCS) indicate a continued presence of cerulean warblers across the Forest, in both managed and unmanaged areas. Preliminary results of the study described above indicate that some harvest treatments, particularly the “intermediate” shelterwood harvest, appeared to result in increased numbers of cerulean warblers. A point count route established by MNF biologists in the CEWA study area prior to the initial cuts provides additional support for that conclusion. No ceruleans were observed along the route from 2006-2008; however, ceruleans were encountered at two of the points in the vicinity of the shelterwood harvest in 2010 counts.

These findings are similar to those of other studies, which prompted several groups to make preliminary conservation and management recommendations, including maintenance of large, unfragmented tracts of mature deciduous forest of at least 600 acres, and the practice of forest management techniques that result in a broken canopy and open understory. However, given the differences in habitat types used by this species across its breeding range, we await the conclusion of the regional study to make specific recommendations regarding harvest and other management techniques to benefit CEWA populations on the MNF.

REGIONAL FORESTER SENSITIVE SPECIES

The Forest Plan directs that the Forest will provide habitat diversity that supports viable populations of native and desired non-native wildlife and fish species and keeps Regional Forest Sensitive Species (RFSS) from a trend toward federal listing. Thus, RFSS species monitoring should provide information that will lead to a better understanding of the viability of current RFSS populations and how Forest management can or is contributing to the conservation of these species and their habitats.

Monitoring Question 39. To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?

Terrestrial vertebrate wildlife species currently on the list are shown in Table WL-2. Sensitive species' surveys, project mitigation monitoring, and other data collection are done on an ongoing basis as part of Manual/Handbook and Regional direction. In addition to Forest-wide monitoring

that tracks a number of RFSS (e.g., breeding bird surveys and point counts, goshawk surveys, and bat surveys), project-specific clearance efforts are focused on unique habitats that support many of the Forest's sensitive species (e.g., rock outcrops).

Northern Goshawk, *Accipiter gentilis*.

In addition to being a RFSS, the northern goshawk is a species of concern for the State of WV and the US Fish and Wildlife Service and is considered an indicator of healthy forested habitats. MNF personnel survey for northern goshawks annually to determine if and where the species occurs. That information is used to help manage for the species and its habitat and to protect known locations when making land management decisions. In 2010, MNF biologists inventoried over 9,000 acres for northern goshawks using standardized survey protocol within potential habitat in proposed project areas or watersheds, within high quality habitat elsewhere on the Forest, and in the vicinity of reported sightings from 2009. In addition, all known historic nest sites were surveyed to determine if those nests were currently active. Despite extensive survey efforts, no active nests were found in 2010, making it the third consecutive year without a known active nest site and the 4th year without known successful breeding on the Forest.

Table WL-2. Regional Forester Sensitive Species (FRSS) for the Monongahela NF (vertebrate wildlife species, excluding fish)

Scientific Name	Common Name
Mammals	
<i>Glaucomys sabrinus fuscus</i>	WV northern flying squirrel
<i>Myotis leibii</i>	eastern small-footed bat
<i>Microtus chrotorrhinus caroliniensis</i>	southern rock vole
<i>Neotoma magister</i>	Allegheny woodrat
<i>Sorex palustris punctulatus</i>	southern water shrew
<i>Spilogale putorius</i>	eastern spotted skunk
Birds	
<i>Accipiter gentilis</i>	northern goshawk
<i>Falco peregrinus anatum</i>	American peregrine falcon
<i>Ammodramus henslowii</i>	Henslow's sparrow
<i>Pooecetes gramineus</i>	vesper sparrow
<i>Contopus cooperi</i>	olive-sided flycatcher
<i>Lanius ludovicianus migrans</i>	migrant loggerhead shrike
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker
<i>Vermivora chrysoptera</i>	golden-winged warbler
Amphibians	
<i>Aneides aeneus</i>	green salamander
<i>Cryptobranchus alleghensiensis</i>	hellbender
Reptiles	
<i>Glyptemys (Clemmys) insculpta</i>	wood turtle
<i>Crotalus horridus</i>	timber rattlesnake

Golden-winged Warbler, *Vermivora chrysoptera*

The golden-winged warbler (GWWA) is a neotropical migrant that has experienced significant declines across most of its range for over 40 years. These warblers generally breed in patches of early successional habitat with a forest edge. This type of habitat is uncommon on the Forest and is in decline throughout the species' range. In order to better assess the occurrence of existing habitat on the MNF and to determine appropriate management actions, additional point count survey routes were added within range allotments and other early successional habitats.

In addition, the Forest is working with West Virginia University and the WVDNR on a project designed to examine the response of GWWA and other early successional bird species to different management strategies. Potential habitat on the Forest and nearby land was surveyed for GWWAs in 2008 and 2009, with the highest number of birds located on several grazing allotments on the Forest, which were then included as intensive study areas. Allotments were treated with brush hogging and selective tree harvest to open up patches within areas of heavy brush and restore or improve habitat conditions for GWWA (Figure WL-5). Nest searches, mist-netting, and spot-mapping efforts were conducted in these areas from 2008-2010, and nests were monitored throughout each breeding season. General species point count surveys also were conducted annually, and habitat data were taken at varying spatial scales. In addition, genetic samples were taken from adult GWWA captured in mist nets, along with corresponding habitat data. These samples were sent to the Cornell Laboratory of Ornithology for analysis in an attempt to correlate habitat characteristics with levels of introgression for GWWA and blue-winged warblers (BWWA).



Figure WL-5. Creation of patch openings in a GWWA study area on the Monongahela NF; picture on left is immediately after management (2008), picture on right is 2 years later (2010).

Over the three seasons of nest searching, 21 successful GWWA nests were found (~45%), along with 18 depredated (38%) and 8 abandoned (17%) nests. Overall nest success was 45.4%, though success varied considerably by year and site. No nests were trampled by livestock, although the vegetation surrounding two nests was disturbed by cattle and subsequently the nests were depredated. Return rates of banded adults was high with almost 50% of adults recaptured, and almost all adults returning to the same territory in subsequent years. Territory density

averaged 3 males/10 ha of suitable habitat, and declined from ~5.4 in 2008 to 4.7 in 2009 to 3.3 males/10 ha in 2010 at the four sites that were monitored all three years. These decreases in mean territory density were comparable to recent BBS trends in West Virginia, and are not likely a result of habitat management since males have disappeared from both treated (brush-hogging and tree harvest) and untreated areas of study sites.

On point counts at eight of the study sites, 91 bird species were detected from 2008-10. chestnut-sided warblers, field sparrows, and indigo buntings were the most frequently detected species associated with GWWA. Allotments occupied by GWWA and other nongame species also were used by game species; the American woodcock, ruffed grouse, and wild turkey are confirmed breeders on the study allotments, and hooded merganser, northern bobwhite (likely stocked for hunting or dog training), and Wilson's snipe also were observed.

Grazing allotments occupied by GWWA from 2008-10 were 6-180 ha in size. Generally the smaller patches or those with convoluted shapes had higher densities of GWWA, likely because of the proximity of scrub/shrub habitat to a forested edge. Based on the proportion of suitable habitat on 12 allotments studied, approximately 1,000 of the 2,700 ha of grazing allotment on the MNF are potentially suitable habitat for GWWA. Results from vegetation sampling indicated that GWWA territories generally have more woody vegetation cover and higher vegetation density than random plots, with much of the ground covered by grasses, forbs (especially goldenrods), and *Rubus*.

In 2011, research will continue on intensively monitored study sites with populations of golden-wings. If time and funding allows, other sites will be periodically monitored for GWWA and surveyed with point counts. General point count surveys also will continue, with the incorporation of woodcock singing ground counts in 2011. Results from this study and others in the region will provide information to help us determine the best management strategies for range allotments, wildlife openings and other early successional habitats across the Forest to better meet the needs of the GWWA and other bird species. Information on upland game bird demographics, behavior, and the habitats within which they occur, will help to demonstrate that management for golden-wings is beneficial for a variety of birds, including game species.

From a management perspective, GWWA and livestock alike could benefit from creating a more complex, patchy habitat. To maximize benefits to golden-wings, managers should attempt to create a structurally complex and patchy environment within range allotments. Mowing in long straight lines should be avoided because it can potentially diminish habitat complexity and increase nest predation since predators may follow edges in search of prey.

Grazing allotments on the MNF may be of great importance to the conservation of GWWA and other early-successional associates, as they provide a stable source of early successional habitat and isolation from BWWAs, while still providing grazing opportunities for local livestock, thus allowing the Forest Service to accomplish multiple use objectives on those lands. Furthermore, shrubland comprises only about 1.0% of MNF lands and open areas with grasses, forbs, or other herbaceous ground cover comprise about 2.2%, with the remainder forested. Given that the desired vegetation conditions described in the Forest Plan generally call for considerable more early successional habitat than is currently available, particularly in Management Prescriptions

3.0 (Vegetation Diversity) and 6.1 (Wildlife Habitat Emphasis), maintenance, creation and enhancement of early-successional habitat on the Forest to ensure the viability of GWWA and associated non-game and game species should be a priority.

Other RFSS birds

The Forest currently has eight bird species on the list of Regional Forester Sensitive Species, more than any other vertebrate group. While species-specific annual surveys are conducted for the northern goshawk, most of our information for other bird species comes from general breeding bird surveys (point counts and breeding bird survey routes). Point count surveys (PCS) are conducted, among other reasons, to document species habitat use, gather information regarding sensitive species' trends, and assess population responses to habitat management across the Forest. In 2010, 30 point count transect routes were surveyed across the Forest by MNF biologists and contracted ornithologists; the WVDNR conducted additional surveys along routes within the Forest proclamation boundary. These surveys were conducted using standard protocol and data sheets were sent to the WVDNR for inclusion in a statewide database. The location of avian survey routes in undisturbed forested habitat as well as actively managed lands should provide important data for adaptive management on the Forest, particularly in reference to bird species of concern.

Since 1993, over 170 species of breeding birds have been observed on the Forest during point count surveys. Of the eight birds on the RFSS list, four have been detected in point count routes on the Forest, the olive-sided flycatcher, red-headed woodpecker, vesper sparrow, and golden-winged warbler. Unfortunately, the woodpecker has only been detected once on a PCS route (though ancillary observations of red-headed woodpeckers are fairly common across the Forest) and the vesper sparrow has only been detected twice on a single PCS route. However, the vesper sparrow has also been observed on two of the range allotments as part of the GWWA study. The flycatcher was detected as part of a research study on several routes in 1996, but only one of those routes has since been run, and the species has not since been detected there. Golden-winged warblers are also rarely encountered on Forest PCS routes, though the current GWWA study has increased our knowledge of the species' distribution on the MNF. Because of the placement of the vast majority of our point count routes in heavily forested habitats, it is not surprising that these sensitive species were rarely encountered, or that the other sensitive species associated with grasslands and other open habitats were not detected in those counts. In addition to the point count surveys detailed above, MNF personnel, the WVDNR and private groups and individuals have conducted Breeding Bird Survey (BBS) routes and Christmas bird counts on or near National Forest Land. Mist-netting and bird-banding also are conducted at the Allegheny Front Migration Observatory at Dolly Sods on the Cheat-Potomac Ranger District.

Evaluation, Conclusions, and Recommendations for Avian RFSS

Bird survey efforts are, and will continue to be, useful in providing baseline data for development of long-term trend information regarding certain RFSS bird species on the Forest. However, the current PCS routes target fairly common forested habitats on the Forest, while the habitats frequented by several of our RFSS species are less common. Additional routes should be added that target RFSS species' habitats (e.g., early successional habitat, wetlands, and open woodlots); the inclusion of playback calls for some species (e.g., golden-winged warbler) in addition to standard PCS route methodology also would be beneficial. In addition, the short-

term inclusion of more PCS routes within proposed timber management or prescribed burn areas is recommended, including both pre- and post-management survey data collection, to provide information regarding the effects of different types of management on bird communities.

Results to date from the WVU study on Forest range allotments indicate that GWWAs are more common on the Forest than indicated by previous PCS results; the addition of early successional habitat routes as part of our annual survey efforts will allow us to better track this species and other sensitive species using this type of habitat. The GWWA study also indicated that this species should benefit from creating a more open and complex habitat. Thus, it is recommended that management within high-elevation range allotments and other high-elevation Forest openings > ~ 6 acres in size should be implemented to create a structurally complex environment with an abundance of edge habitat. Adaptive management monitoring following such efforts will help us to further refine the best management strategies for these habitats on the Forest.

While many of our sensitive bird species can be reasonably tracked using standard breeding bird surveys (e.g. PCS, BBS and Christmas bird counts), some species require more intensive, species-specific survey and monitoring. Two RFSS examples of this are the peregrine falcon and the northern goshawk. The peregrine falcon has been the subject of much attention in West Virginia, with successful hacking projects at the New River Gorge, and occasional observations in the vicinity of the MNF. The WVDNR organizes an annual survey for peregrine nests in known and suitable cliff habitats. There have been two known nesting sites on the MNF in the last 20 years. In 2010, a pair of peregrines was observed at a cliff on North Fork Mountain near Seneca Rocks, but the pair was not successful in raising young.

The northern goshawk also requires species-specific survey efforts to locate potential nest sites. As noted previously, the MNF conducts goshawk surveys annually using a modification of the USDA Forest Service's 2006 Northern Goshawk Inventory and Monitoring Protocol. The paucity of recent nest activity records on the Forest, despite tracking of historic sites and concerted survey efforts, suggests that the local goshawk population may be at a low ebb. This could be the result of cyclic population fluctuations, or may be indicative of a more serious situation resulting in contraction of the species range in the northeast. Continued long-term monitoring of local and regional populations should provide better insight into whether populations are indeed trending downward and, if so, what the potential causal factors might be. The Forest will continue its annual monitoring efforts and outreach to the public for information on observations of this species. Meanwhile, efforts to conserve and restore large expanses of spruce and spruce-hardwood forest types on the forest should benefit the goshawk and other high elevation, forest interior species on the MNF.

Non-avian RFSS

Many of the non-avian sensitive species on the Forest are associated with rocky outcrop and ledge or talus habitats. The small-footed bat is addressed as part of the forest-wide bat survey effort (described in the TEP bat species section above); however, the green salamander, timber rattlesnake, Allegheny woodrat, and southern rock vole also use these rocky habitats and are not currently part of a Forest-wide inventory effort. As a result, a special attempt is made to locate and survey these discrete habitats as part of clearance surveys associated with planned management activities or other proposed projects.

Given logistic and financial constraints, it is virtually impossible to target Forest-wide surveys for all RFSS on the MNF, though many species are encompassed as part of our breeding bird and bat surveys. As a result, we have very little data regarding the distribution and abundance of many RFSS; without such data it is very difficult to make assessments as to whether a project will affect some of these species and, if so, to what extent. Project-related clearance surveys provide our best opportunity to collect distributional data for many of the species not targeted by Forest-wide efforts. These surveys should be conducted in as quantitative and consistent a manner as possible, targeting habitats such as rock outcrops and riparian zones to search for RFSS. Thus, it is recommended that a Forest-wide wildlife survey and monitoring protocol be developed for the Forest for use in individual project and watershed assessments, as well as ancillary survey efforts completed across the MNF.

SUMMARY

The Monongahela Wildlife Group will continue to monitor wildlife species and their habitats on the Forest in accordance with Federal and State Laws, Forest Service policies, and Forest Plan direction. Most of the monitoring projects noted above will continue, despite challenges posed by decreasing budgets. There is a clear need to continue existing monitoring efforts, particularly for species groups such as bats, which are experiencing widespread threats. In addition, some survey efforts should be started for RFSS species with little or no current data (e.g., some amphibian and small mammal species and birds whose primary habitat is not forested habitat) in order to gain information regarding species habitats and life histories and the potential effects that Forest management activities may have on them.

Aquatic Resources

Introduction

The Land and Resource Management Plan (Forest Plan) for the Monongahela National Forest (MNF) includes expectations to monitor and evaluate Forest management activities. Monitoring and evaluation help determine whether: 1) Forest Plan implementation is consistent with the goals, objectives, standards, and guidelines provided in Forest Plan direction; 2) Forest Plan direction is effective in bringing about desired results without causing undesired consequences; and 3) Forest Plan direction remains valid in light of new information or changed conditions. Results from implementation, effectiveness, and validation monitoring can be used to continue existing Forest Plan direction and practices or to recommend changes in the Forest Plan.

Direction in the Forest Plan contains eight monitoring questions that are directly or indirectly related to aquatic resources management. The following report addresses the eight questions and summarizes the aquatic monitoring efforts conducted during the 2010 fiscal year (FY).

2010 Accomplishments

The Forest conducted various activities during FY 2010 for the purpose of managing aquatic resources in accordance with Federal and State laws, USDA and Forest Service policies, and Forest Plan direction. Table AR-1 identifies FY 2010 accomplishments that are most directly related to aquatic resources management on the Forest.

Table AR-1. Aquatic Resource Accomplishments in 2010

Products, Services, and Activities	Quantity
Temporary Summer Employees (college students employed for aquatic resources inventory/monitoring)	3
Randolph County Outdoor Education Programs (aquatic modules)	12
Free Fishing Clinics and Other Aquatic Resources Outreach (events)	4
Mid-scale Resource Analyses (Watershed Assessments)	0
Project Level Aquatic Resources Coordination (Biological Evaluations reported in WFRP)	14
Road Decommissioning (miles of Forest System Road) – Upper Williams River ARRA Projects, WildMon Roads Project (FR171, FR1797, FR272, FR719, FR934)	7.4 ^a
Road Decommissioning (miles of Forest non-System Road) – Upper Williams River ARRA Projects, WildMon Roads Project	17.4
Road Storage (miles of Forest System and non-System Roads) – Upper Williams River ARRA Projects, WildMon Roads Project	7.3
Wetland Restoration (acres) – Phase II to restore hydrology in former Queens range allotment	4
Limestone Treatment to Acid Impaired Streams (miles) – Lambert Run and Coats Run Maintenance	7
Limestone Treatment to Acid Impaired Lakes (acres) – Summit Lake Maintenance	38
Aquatic Passage (Sites Improved) – Poca Run, Cove Run (2)	3 ^a
Cooperative Administrative Studies (Participating Agreements) – Brook Trout Study	1
Cost Share Agreements – WildMon Roads Project, Poca Run AOP Project	2

a = contribute toward specific Forest Plan objectives for aquatic resources management

Many of the accomplishment items listed in Table AR-1 represent products and services provided for public benefit. Some accomplishments include environmental assessments that provide a foundation for making land management decisions with the knowledge of potential effects to the condition and trend for aquatic resources. Other accomplishments consist of implementing specific land management projects designed to address particular Forest Plan objectives (Table AR-2) or issues related to the condition and trend of the aquatic environment. Environmental assessments and project implementation are often the culmination of various forms of monitoring efforts that range from specialist reviews of site-specific conditions to watershed-scale surveys and evaluations of ecosystems processes and conditions.

Table AR-2. Forest Plan Objectives Directly Related to Aquatic Resources Management

Forest Plan Objective	Fiscal Year 2010 Accomplishment	Total Accomplished under 2006 Forest Plan
Actively restore aquatic and riparian habitat conditions in 30-50 miles of stream.	0 miles	7 miles
Maintain at least 560 miles of coldwater stream habitat capable of supporting wild, naturally reproducing brook trout.	560 miles	560 miles
Decommission or reclaim at least 30 miles of roads that are no longer needed for achieving access management objectives.	24.8 miles	33.5 miles
Reduce aquatic habitat fragmentation associated with the Forest transportation system by correcting 30-50 passage barriers, according to aquatic priorities.	3 sites	3 sites

Monitoring and Evaluation

The Forest Plan identifies regulatory and discretionary requirements for monitoring the Plan implementation. To help answer monitoring questions about aquatic ecosystems, eight specific monitoring items have been identified based on key aquatic resource issues that surfaced during the Forest Plan revision process in 2006 (Table AR-3). These eight aquatic resource monitoring items are listed in the Forest’s Monitoring Implementation Guide (MIG) along with other details that indicate the Forest’s expectations for monitoring the Forest Plan and its implementation.

Aquatic resource monitoring issues are discussed in this report. The relationship between aquatic resource monitoring questions and monitoring issues is provided in Table AR-3. Current and future efforts to monitor aquatic resources on the MNF will increasingly strive to address these questions or modify them as needed to provide an effective feed-back mechanism for future planning and implementation of the Forest Plan.

The first two questions in Table AR-3, #10 for management indicator species and #39 for sensitive species, are addressed through the monitoring conducted for questions 40, 41, 42, 43, and 44, which assess habitat conditions for these species.

Table AR-3. Forest Plan Monitoring Questions and Aquatic Resource Monitoring Issues

Monitoring Questions from Chapter IV of the MNF Forest Plan that are Related to Aquatic Resources	Monitoring Issues Addressed by each Question	Aquatic Resource Monitoring Issues from the Monitoring Implementation Guide
10. To what extent is Forest management moving toward desired habitat conditions for MIS and species associated with MIS habitats?	1, 2, 3, 4, 5, 7	1. Stream Water Chemistry
39. To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?	1, 2, 3, 4, 5, 6, 7	2. Stream Temperature
40. To what extent are Forest management and other external influences (such as acid deposition) beneficially or adversely affecting water quality or quantity?	1, 2, 3, 4, 7	3. Stream Sedimentation
41. To what extent is Forest management beneficially or adversely affecting soil erosion and stream sedimentation processes?	3, 4, 7	4. Aquatic Habitat Quality
42. To what extent is Forest management beneficially or detrimentally affecting the physical conditions of aquatic ecosystems, including riparian ecosystem function and health?	1, 2, 3, 4, 5, 6, 7	5. Aquatic Habitat Connectivity
43. To what extent is Forest management influencing the viability of native and desired non-native species (e.g., RFSS and MIS) or otherwise affecting species composition and habitat productivity?	1, 2, 3, 4, 5, 6, 7, 8	6. Aquatic Nuisance Species
44. To what extent is Forest management influencing populations of terrestrial or aquatic non-native species that threaten native ecosystems?	6	7. Clean Water Act Compliance
46. Is the Forest providing adequate habitat to meet the demand for wildlife and fisheries related social and recreational opportunities?	1, 2, 3, 4, 5, 7, 8	8. Recreational Fishing

In addition, the Forest Plan establishes a monitoring framework and suggests prioritization criteria to help focus monitoring efforts. Monitoring efforts pursued for aquatic resources during FY 2010 help address various monitoring elements described in the Forest Plan. Table AR-4 lists the focused aquatic resource monitoring efforts conducted during FY 2010.

Table AR-4. Aquatic Resource Monitoring Efforts in FY 2010

Monitoring Activity	Quantity
Stream Water Chemistry (sites)	97
Aquatic Ecological Unit Inventory and Monitoring – Aquatic Habitats/Populations (sites)	17
Aquatic Organism Passage Inventory/Assessments (sites)	0
Summer Stream Temperature Profiles (sites)	29
East Gauley Mountain Monitoring – Aquatic Habitats/Aquatic Populations/In-stream Sediment	5

Following are descriptions, evaluations, conclusions, and recommendations associated with monitoring efforts conducted during FY 2010 for aquatic resources.

Monitoring Question 40. To what extent are Forest management and other external influences (such as acid deposition) affecting water quality or quantity?

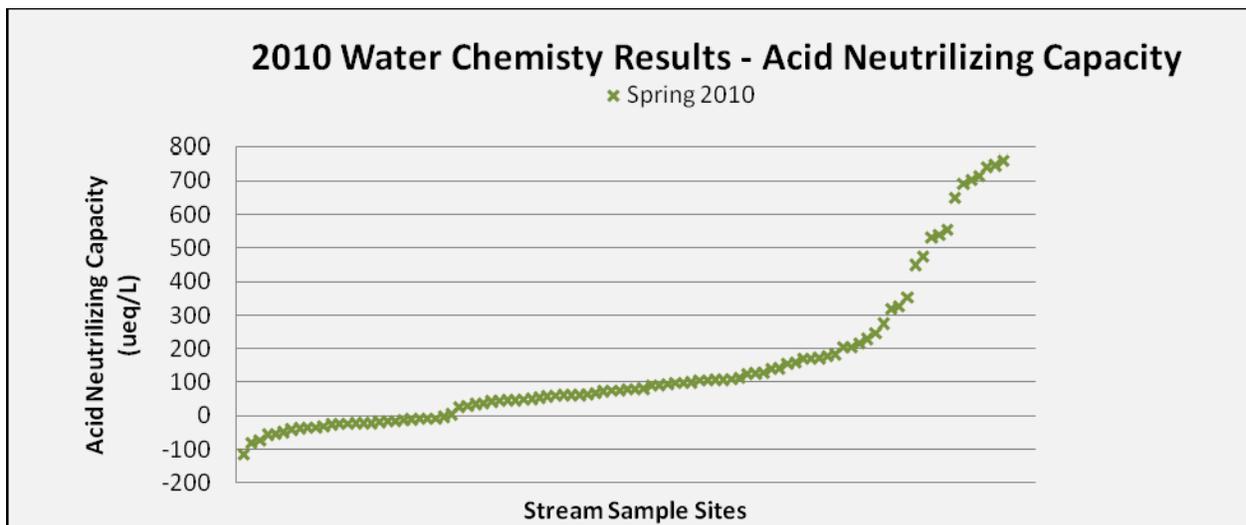
Water Chemistry and Acid Deposition

The MNF has routinely monitored water chemistry conditions in streams across the Forest since 2001. Forest-wide water chemistry monitoring is typically conducted semi-annually – in the spring during relatively higher run-off conditions and in the fall during lower base flow conditions. Water samples are analyzed for measures of pH, acid neutralizing capacity (ANC), major cations and anions, and conductivity. Stream water samples collected during the spring run-off period generally exhibit lower ANC and pH values when compared to values of fall base flow samples collected at the same sites. Water chemistry measures such as these are helpful in assessing the condition and health of aquatic ecosystems and in monitoring the sensitivity of these ecosystems to acid deposition.

Since the fall of 2001, the MNF has developed a water chemistry dataset from nearly 1100 water samples collected at more than 260 different stream locations distributed throughout the Forest. Water samples were collected at 97 stream locations during the spring of 2010. Fall samples would normally be collected at the same sites. However, due to renovation of the laboratory where Forest water samples are normally processed (Fernow water laboratory) and insufficient funds to pay for laboratory fees elsewhere, no water samples were collected during the fall of 2010. Details of the chemical analyses of the spring 2010 stream water samples are available in project files at the MNF Supervisor’s Office. A brief summary is provided in this report.

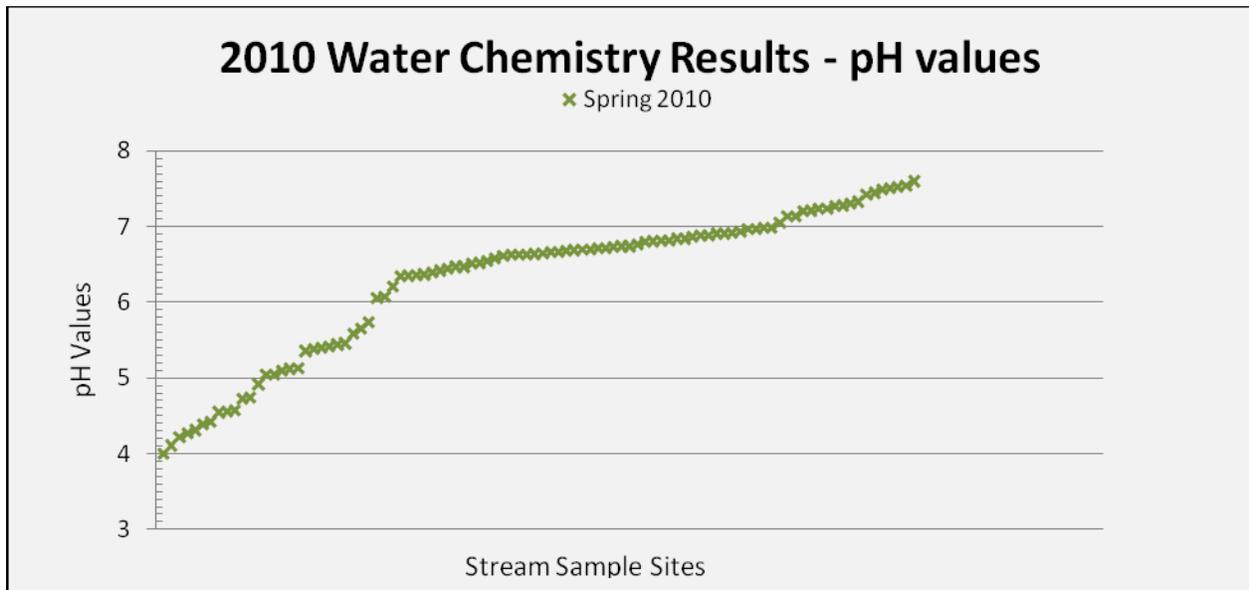
Figure AR-1 shows ANC values for stream samples collected during spring 2010. In the spring, ANC values ranged from a low of minus (-) 114.9 in Yellow Creek, a tributary to Otter Creek, to a high of 760.1 in Long Run, a tributary to the South Branch Potomac River.

Figure AR-1. Acid Neutralizing Capacity (ANC) for Stream Samples Collected during Spring 2010



During the spring of 2010, measures of pH ranged from a low of 4.0 in Yellow Creek (Otter Creek Wilderness) to a high of 7.60 in Big Branch (Becky Creek-Tygart Valley River). Figure AR-2 displays the range in pH values for the streams sampled in 2010.

Figure AR-2. Plot of pH values collected in the spring and fall of 2010.



As noted in previous Forest monitoring Reports, some chronically acidic streams are treated with limestone sand to help mitigate detrimental effects to aquatic biota associated with stream acidification. Acidified streams treated with limestone sand subsequently exhibit increased values for water chemistry parameters such as ANC and pH. As a result, these streams become better suited to accommodate acid-sensitive aquatic biota that otherwise may not exist or occur at much reduced levels. Several streams treated with limestone sand are sampled as part of the Forest's water chemistry monitoring efforts.

Monitoring Question 40. Evaluation, Conclusions, and Recommendations

Water Chemistry and Acid Deposition

The Aquatic Resources section of the 2007 Monitoring and Evaluation Report for the Monongahela National Forest (pages 94-97) provides a broader discussion of the interpretation and application of stream water chemistry monitoring results from the MNF. However, it is important to reiterate in this report that aquatic communities are, in part, a reflection of the water chemistry associated with their environment. Results from water chemistry monitoring document a considerable range in water quality conditions in streams across the Forest. This information provides insight into one environmental consideration (*i.e.* stream acidification) that can constrain the productive potential for these aquatic ecosystems.

Recommendations: It is recommended that stream water chemistry continue to be monitored semi-annually across the Forest. This information is needed to continue to characterize a baseline for the Forest's diverse aquatic ecosystems, enable long-term trend monitoring for stream water chemistry, compliment similar efforts to monitor the effects of acid deposition on soil nutrient levels and air quality, and facilitate efforts to analyze and model scenarios that may offer unforeseen management options that address issues associated with stream acidification.

It is recommended that data from stream water chemistry monitoring be used along with data from other aquatic ecosystem assessments to develop an aquatic ecological classification system or otherwise characterize aquatic communities across the Forest and monitor their trends.

Stream Temperature

Stream temperature is another environmental factor that influences the species composition of aquatic communities and the relative health of individual populations. Stream temperature affects various bio-physical functions and physicochemical properties (such as respiration rates of organisms and dissolved oxygen capacity for water). Stream temperatures can be a limiting factor for aquatic organisms in otherwise suitable habitat types. Further discussion of the ecological significance of stream temperature profiles and the implications associated with land management considerations can be found in the Aquatic Resources section of the 2007 Monitoring and Evaluation Report for the Monongahela National Forest (pages 98-101).

Since 2003, the Forest has annually deployed temperature logging devices in streams across the Forest. In FY 2010, temperature loggers were placed in 30 streams to record data from June to October. Data was successfully retrieved from 29 of the 30 temperature loggers. Table AR-5 displays a summary of the data collected from the temperature loggers. Since the Forest Plan identifies wild brook trout (*Salvelinus fontinalis*) as the only aquatic management indicator species, stream temperature data are summarized in Table AR-5 in terms of optimal and lethal stream temperature ranges described for brook trout (Raleigh 1982).

Table AR-5. Summary Data of Stream Temperatures Monitored during Summer 2010

Stream Name	Max. 24-hr Minimum (°Celsius)	Maximum Temperature (°Celsius)	Total Days Monitored	Days w/Avg. Exceeding Optimal (18°C)	Days w/Max Exceeding Sub-lethal (>22°C)	Days w/Max Exceeding Lethal (>25°C)
Laurel Run	19.53	21.01	116	42	0	0
Dogway Fork	18.37	20.65	109	8	0	0
South Fork Cranberry	19.51	23.35	110	58	9	0
Long Run	18.06	18.51	110	2	0	0
North Fork Deer Creek	18.13	20.32	114	12	0	0
Big Run (Buffalo Fork)	18.01	19.65	114	10	0	0
Elleber Run	17.06	18.63	114	0	0	0
Sutton Run	17.96	19.46	114	9	0	0
Tacker Fork	17.7	18.99	114	4	0	0
Big Run of Gandy Creek	18.77	20.06	119	10	0	0
Adkins Roadhouse	18.99	19.53	113	20	0	0

Stream Name	Max. 24-hr Minimum (°Celsius)	Maximum Temperature (°Celsius)	Total Days Monitored	Days w/Avg. Exceeding Optimal (18°C)	Days w/Max Exceeding Sub-lethal (>22°C)	Days w/Max Exceeding Lethal (>25°C)
Branch						
Gauley River NF	17.51	22.73	106	18	4	0
Redman Run	18.41	19.94	118	25	0	0
Cochran Creek	19.29	20.56	123	53	0	0
Knapp Creek	20.15	21.49	125	66	0	0
Hunters Run	18.75	19.63	109	13	0	0
Seneca Creek	20.15	23.57	121	78	28	0
Big Run allotment trib	17.06	20.87	107	3	0	0
Hemlock Run	18.06	18.65	110	6	0	0
Galford Run	18.15	21.10	112	13	0	0
Stony Run	16.84	17.92	114	0	0	0
Stony Run, unnamed trib	17.18	18.15	114	0	0	0
Little Black Fork	19.44	20.91	121	36	0	0
Beaver Creek	17.37	18.70	108	0	0	0
Rocky Run	16.92	18.82	111	0	0	0
Mike Run	18.70	19.32	124	25	0	0
Panther Run	21.18	22.68	120	60	2	0
Laurel Run	17.63	18.01	98	0	0	0
Williams River - Little Fork	18.77	19.46	103	13	0	0

Of the 29 streams monitored in FY 2010, six had 24-hour average stream temperatures that remained within the optimal range for brook trout populations (less than 18 degrees Celsius, °C) and 25 streams remained below 22°C. Streams meeting this temperature criterion do not exceed stream temperatures that are reported to be lethal for brook trout given various durations of exposure. Therefore, temperature regimes associated with these 25 streams are expected to be adequate to support year-round brook trout populations. The remaining four streams had some days (from 2 to 28 days) exceeding sub-lethal temperatures of 22°C, but zero days exceeding the lethal limit of 25°C.

Temperature loggers record stream temperatures specific to the site where they are placed. However, streams often possess micro-habitats associated with cooler water inputs from tributary streams, groundwater up-welling, or springs where water temperatures may deviate from those recorded at the location of the monitoring device. Thus, coldwater biota may be able to seek refuge associated with micro-habitats within streams that would otherwise appear to be uninhabitable for these species. In situations where micro-habitats are relied upon to provide thermal refuge from conditions that are less tolerable but more ubiquitous throughout the stream, stream temperature regimes may remain a primary limiting factor for the health and productivity of coldwater communities.

Recommendations: It is recommended that stream temperature monitoring continue on an annual basis in streams across the Forest. A more complete analysis of the developing stream temperature dataset is needed to help explain variations in the dataset. An increased understanding of the relationships between various environmental conditions, management

actions, and stream temperature characteristics can help identify opportunities to better manage watersheds for desired conditions. Given the range of predicted increases for air and stream temperatures due to effects associated with climate change, knowledge of current stream temperature profiles and their trends will be vital to making informed decision regarding management actions that may affect aquatic resources today and into the future.

Monitoring Question 41. To what extent is Forest management beneficially or adversely affecting soil erosion and stream sedimentation processes?

Stream sedimentation is a primary issue associated with the management and protection of water resources. Sediment originates mainly from upland sources delivered to streams through various transport processes (*e.g.* surface erosion, gully erosion, mass wasting), as well as from within-channel sources of erosion and sediment transport (*e.g.* bank failures, head cuts, channel erosion). Management actions have the potential to increase stream sedimentation by increasing rates of soil erosion, triggering mass wasting events, or altering flow patterns that can accelerate sediment production and delivery to streams. Increased rates of stream sedimentation over an extended period typically leads to impaired water quality, reduced aquatic habitat conditions, and detrimental effects to native fish populations and other desired aquatic biota.

Various land management actions can disturb soils and lead to increased soil erosion and stream sedimentation. It is routinely observed and commonly accepted, however, that roads are a predominant contributor to increased soil erosion and sediment delivery to streams. Roads occur in many forms, such as State highways, Forest system roads, temporary timber haul roads, skid roads and trails, and legacy woods roads. Collectively, these features represent the dominant form of soil disturbance on the Forest and, by far, are the greatest land management-related source of accelerated sediment delivery to streams.

In FY 2010, the Forest performed numerous actions to help reduce long-term sediment production from roads to streams. As reported in Table AR-1, more than 24 miles of existing roads were decommissioned and the areas were rehabilitated to virtually eliminate the effect of these roads on watershed conditions. More than 7 additional miles of existing roads were put into a stored condition during FY 2010 to substantially reduce watershed impacts from these features and eliminate the need for recurring maintenance until such time that these roads may be re-opened for use some time in the future. Stream culverts and associated fill material that were at imminent risk of failing catastrophically were either removed entirely or replaced with upgraded structures at four stream crossing locations. In addition, hundreds of miles of existing roads were maintained by re-grading road surfaces, cleaning out drainage structures (road ditches and culverts), and replenishing road surface gravels. Collectively, these actions help reduce the incidence of soil erosion and sediment production to streams.

Monitoring the effects of Forest management activities on soil erosion and stream sedimentation has previously included project level monitoring to assess sources of stream sedimentation. However, stream sedimentation monitoring in FY 2010 was primarily limited to in-stream sediment assessments that are routinely conducted as part of Forest Plan monitoring for aquatic resources. To help address stream sedimentation issues, these surveys investigate the particle size distribution of stream sediments (pebble counts), the percentage of fine sediments within

samples of potential trout spawning gravels (percent fines), the stability of stream channel sediments (Riffle Stability Index – RSI), and the stability of stream banks (bank instability). Results from initial stream surveys are necessary to characterize habitat conditions. Results from repeated surveys can be compared through time to assess changes to resource conditions.

Monitoring Question 41. Evaluation, Conclusions, and Recommendations

Table AR-7 provides a summary of preliminary results from stream sediment assessments conducted on various streams during FY 2010. Bank instability, riffle stability index, and the percent of fine sediment in spawning gravels are the primary parameters used to assess stream processes and prevailing characteristics associated with in-stream sediments.

Table AR-7. Summary Data for Aquatic Ecological Unit Inventory and Monitoring Conducted during FY 2010

Stream	Rosgen Type	% Fast Habitat	% Slow Habitat	RPD ¹	Bank Instab. ²	Riffle Stab. Index	% Fines	Cover ³	LWD ⁴	Fish Biomass (lbs/acre)
Adkins Rockhouse Branch	B3a	58.8	41.2	.15	O	70.4	N/A	P	S	9.3
Beaver Creek	C3b	74.5	25.5	.11	O	79.1	25	P	S	8.9
Big Run	C4	65.2	34.8	.3	O	89.7	N/A	F	A	21.6
Bird Run	B4c	73.8	26.1	.1	O	90.4	11	P	S	5.4
Clover Run Left Fork	C4	37.4	62.7	.31	C	99.6	7	P	S	13.5
Clover Run Right Fork	C4	64.7	35.3	0	O	82.4	N/A	P	S	6.8
Cochran Creek	C4	4.4	95.7	.64	C	96.3	16	P	A	44.7
Cranberry River South Fork	C3	47.3	52.8	.3	O	93	N/A	P	S	10.1
Desert Branch	A2	78	22	.35	C	69.1	27	P	S	10.2
Elleber Run	C3b	89.7	10.3	.58	C	84.9	19	F	S	34.3
Hemlock Run	B4a	100	0	0	O	75.5	9	P	M	4.5
Knapp Creek	F4	44.6	55.4	.65	C	92.6	14	P	S	13.3
Leatherwood Creek	C2b	55.2	44.8	.35	R	70.7	47	F	M	3.7
Mountain Lick Run	C3b	85	15	.41	C	69.3	N/A	F	S	31.2
Rocky Run	C3	74.7	25.2	.22	C	83.1	27	P	S	11.9
Teeter Camp Run	C3b	77.5	22.5	.17	C	78.7	7	P	S	37.1
White Oak Fork	B1a	28.4	71.6	.36	C	47.7	33	P	M	22.7

- 1: Residual Pool Depth - measure of pool quality
 2: Bank Instability - R = rare; O = occasional; C = common
 3: Instream Cover - G = good; F = fair; P = poor
 4: Large Woody Debris - A = abundant; M = moderate; S = scarce

Measurements of bank instability during FY 2010 stream surveys suggest that nine of seventeen surveyed streams possess common bank instability, seven streams have occasional instability, and one stream has mostly intact stream banks (rare bank instability). Numerous factors can contribute to bank instability but the degree to which stream banks are instable is often indicative of the extent of chronic sources of in-stream sediment production.

Riffle stability indices (RSI) for the same streams surveyed in FY 2010 reveal that more than half (nine streams) of the surveyed streams have RSI values greater than 80%. This index reflects the percentage of stream sediment particles that are mobile during bankfull discharge. Higher RSI values typically indicate a lower degree of channel stability. This is often the case when streams are processing (sorting, transporting, and storing) a relatively persistent supply of sediment inputs to the channel.

Measurements of the percentage of fine sediments in potential trout spawning gravels (percent fines) are another indicator of sediment characteristics associated with aquatic habitats. However, percent fines measurements are more indicative of the prevalence and potential effects associated with very small sediment particle sizes that are more likely to be processed as suspended sediments in streams. Because these very small sediment particles are easily transported during most stream flows, persistently high levels of fines in spawning gravels suggest a steady supply of this material to stream systems. Fine sediments were sampled in only 12 streams that were surveyed during FY 2010. Five of these streams possess values that are greater than 25% fine sediment and one stream (Leatherwood Creek) has more than 45% fines in potential spawning gravels. Elevated levels of fine sediments can impair the health and productivity of coldwater communities but levels that are greater than 25% are particularly detrimental to the reproductive success of native trout.

Recommendations: Efforts to monitor in-stream sediments characteristics as part of the Aquatic Ecological Unit Inventory should be continued annually to allow for an assessment of trends as the Forest heads into a new plan revision cycle. In addition, a periodic review of project decisions made during the life of the Forest Plan should be conducted in order to provide a more comprehensive review of the potential influence that Forest management actions are having on soil erosion and stream sedimentation processes. Such a review could attempt to quantify and compare authorized activities that can create detrimental, chronic sources of sediment production (for example, new road construction) with watershed improvement actions designed to protect or rehabilitate soil resources (for example, road decommissioning). Though a complete inventory of soil disturbance on the Forest is not available for the 2010 monitoring year, activities that contribute in a beneficial or adverse manner to soil erosion and stream sedimentation processes are disclosed in official decision documents for individual projects in accordance with the National Environmental Policy Act (NEPA) of 1976. Project-level monitoring should be available to help address questions concerning implementation of NEPA decisions, effectiveness of project actions at achieving objectives, and validation of design criteria and mitigation actions.

Monitoring Question 42. To what extent is Forest management beneficially or detrimentally affecting the physical conditions of aquatic ecosystems, including riparian ecosystem function and health?

Direction in the Forest Plan includes standards and guidelines that are designed to protect and restore aquatic and riparian resources. Several actions were conducted in FY 2010 that relate to this Forest Plan direction and help address the question posed by Monitoring Question 42. These actions include field monitoring of project implementation, Forest level inventories of aquatic

and riparian resource conditions and trends, and watershed improvement activities that contribute to the restoration of healthy watersheds and aquatic ecosystems activities.

Project-level Monitoring

Forest activities were observed during FY 2010 to assess whether projects were being implemented in a manner that is consistent with the project decision and Forest Plan direction for aquatic and riparian resources management. Due to time and funding constraints, project-level monitoring during 2010 for aquatic and riparian resources was not conducted systematically but occurred primarily as incidental observations from different watershed personnel while conducting other field work. Projects that were reviewed include prescribed fires, road treatments (construction, maintenance, and decommissioning), wetland restoration, timber harvests, and special uses.

Generally, field observations during FY 2010 indicate that Forest activities are being implemented in a manner that is consistent with and considerate of Forest Plan direction intended to protect and restore aquatic and riparian resources. Forest Plan direction pertaining to protective stream channel buffers was reported to have been met or exceeded by the projects that were reviewed. When project actions resulted in noticeable adverse impacts to aquatic resources, the source of these impacts were typically associated with circumstances located outside of compliant stream channel buffers. For example, closed-out skid roads associated with timber harvest units were observed to be contributing a considerable quantity of sediment to stream channels despite these roads being located outside of recommended stream channel buffers. Situations such as these are typically identified and documented as potential risks to aquatic resources during project analysis, and ultimately accepted when the project NEPA decision is signed.

Aquatic Ecological Unit Inventory and Monitoring

The MNF uses standardized survey protocols to conduct aquatic ecological unit inventory and monitoring (AEUI) of stream ecosystems across the Forest. Surveys for AEUI are designed to expand on existing knowledge of conditions and trends associated with physical and biological components of aquatic ecosystems on the Forest and to contribute toward long-term monitoring needs. During 2010, the Forest dedicated a summer watershed crew to conduct surveys of valley segments, stream reaches, and channel units in 17 stream systems across the Forest.

Physical dimensions were measured for flood prone area, stream channel dimensions and aquatic habitats. Measurements were also taken of stream substrates in riffle habitats and gravel bar formations to assess channel stability. Potential spawning substrates were sampled to determine the percentage of fine sediment composition that can serve as an index for the quality for brook trout spawning habitat and aquatic macro-invertebrate habitat. The overall composition of stream substrates and aquatic cover attributes were visually assessed within reference reaches. Large woody debris was inventoried according to size classifications to assess structural diversity within streams. Fish population assemblages were sampled to assess species composition and other population characteristics used to evaluate the health of biotic communities.

Preliminary results of AEUI surveys on the MNF during 2010 are summarized in Table AR-7. Surveyed stream reaches represent B, C, E, and F type channels (Rosgen 1994). Channel types characteristically exhibit inherent physical properties as a function of geofluvial channel-forming processes. However, inherent channel properties can deviate considerably for a given channel type in response to influential disturbance mechanisms that vary in nature, extent, and duration. Results from the 2010 AEUI surveys reflect stream conditions that have been altered by a variety of natural and human-induced disturbances.

Aquatic habitat composition is a measure of different types of habitats such as cascades, riffles, runs, glides, and pools. Each type of aquatic habitat offers unique habitat elements for various aquatic inhabitants. Therefore, it is desirable for streams to possess a diversity of habitat types to support healthy aquatic communities. Habitat types have been generally categorized as slow water and fast water habitats for purposes of analysis in this report.

Slow water habitats that also tend to be deeper, such as pools and glides, provide critical rearing and over-wintering areas for brook trout and other aquatic species that are native to streams on the Forest. Fast water habitats, such as riffles and runs, are also important for many of the Forest's aquatic inhabitants. The physical composition and quality of aquatic habitats is naturally a reflection of dynamic channel processes that influence stream channel integrity. Slow water habitats can be compromised and potentially converted to shallow, fast water habitats in stream systems that become unstable and function outside of an established dynamic equilibrium. As streams recover from destabilizing influences and re-establish dynamic equilibrium, slow water habitats can reform to become more abundant and of better quality. General stream conditions across the Forest indicate that slow water habitats are frequently limited in abundance, poorly developed, or both. By contrast, shallow, fast water habitats are typically over-represented in streams on the Forest.

Habitat composition data from 2010 indicate that 12 of 17 streams surveyed (70%) were dominated by fast water habitats and 67% of those (8 streams) had at least 70% of their surface area in fast water habitat. These findings are generally consistent with surveys of other streams across the Forest during previous years. Consequently, habitat composition for stream on the Forest is expected to reflect conditions similar to this until channel structure, especially in-stream large woody, and channel integrity improve. Habitat composition is also a function of landscape level, fluvial geomorphic processes that are reflected in the channel type. The surveyed streams represent a range of Rosgen channel classifications that serve as a baseline from which altered conditions may be measured using repeated surveys through time.

Residual pool depth (RPD) is a measure of pool development and can serve as an index of pool quality. The data collected on RPD also forms baseline data for the streams surveyed and can be used as an indicator of changes in pool quality associated with changes in channel conditions. It is expected that as channel structure and channel integrity improve, so will pool quality. This condition would likely be reflected in higher RPD numbers when streams are re-surveyed.

The integrity of stream channels is often measured in terms of stream bank erosion and stream bed stability. Measures of stream bank integrity indicate 53 percent (or 9 reaches) of stream

reaches surveyed during 2010 have common occurrences of bank instability, 41 percent (or 7 reaches) have occasional bank instability, and only one reach has rare instances of bank instability. Riffle stability indices (RSI) (Kappesser 2002) suggest that stream bed substrates are mobile and very unstable in more than 70 percent (or 12 reaches) of stream reaches surveyed during 2010. Seven of the surveyed streams have RSI scores that are equal to or greater than 85, indicating highly unstable channels and poor continuity of habitat composition through time.

Other characteristics surveyed during 2010 to help assess the condition and trend of streams on the Forest include the percentage of fine sediment in potential brook trout spawning gravel, the composition of in-stream cover, and inventories of LWD. Over 40 percent of the stream reaches analyzed for fine sediment possess levels in excess of 25 percent. Results of in-stream cover composition show that 76 percent of the stream reaches surveyed received a poor rating. Inventories of LWD indicate that 71 percent of the stream reaches surveyed possess scarce amounts of LWD, 18 percent of the stream reaches surveyed have moderate amounts of LWD, and the remaining 12% has abundant levels of LWD.

Information about fish populations can be useful for assessing and monitoring the health and productivity of aquatic ecosystems. Fish population assessments were conducted in conjunction with AEUI habitat assessments during 2010. Fish biomass was calculated for each fish species encountered during the population surveys. Results of this data show that total fish biomass ranged from a high of 34.3 lbs/acre in Elleber Run, a tributary to the North Fork Deer Creek, to a low of 3.7 lbs/acre in Leatherwood Creek. Brook trout populations were present in 59 percent of the stream reaches surveyed; they were not captured in seven streams. Biomass of brook trout ranged from a high of 30.1 lbs/acre to a low of 0.1 lbs/acre in streams where they were sampled.

Variation in fish biomass highlights differences in productivity between streams. Variation in productivity between some streams may partially be explained by more obvious differences, such as stream size or geologic setting. However, productivity for most streams on the Forest is also believed to be a function of the quality of in-stream habitat conditions and general health of the stream system as a whole. Results from AEUI surveys are critical for addressing these and other questions related to aquatic habitats and populations across the Forest and for monitoring aquatic resource trends through time to determine if Forest goals and objectives are being met.

Watershed Improvement Activities

Road Decommissioning/Storage: Forest Plan Objective RF03 states, "...decommission or reclaim at least 30 miles of roads that are no longer needed for achieving access management objectives." Approximately 32 miles of road were treated during FY 2010 to address watershed health issues associated with soil erosion, stream sedimentation, modified hillslope hydrology, aquatic passage, stream channel conditions, and riparian/floodplain form and functions (Table AR-8). Nearly 25 miles of roads were decommissioned and more than 7 miles of roads were put into a stored condition.

With the additional miles of road decommissioning from FY 2010, the minimal requirement of Forest Plan Objective RF03 has been attained. A total of 33.5 miles of road have been decommissioned since the current 2006 Forest Plan was signed.

Table AR-8. Summary of Road Decommissioning and Storage Treatments for Watershed Improvement during FY 2010

	Road Decommission (miles)		Road Storage (miles)		Total
	Forest System Road	non-Forest System Road	Forest System Road	non-Forest System Road	
Upper Williams River	2.5	17.1	6.2	1.1	27.0
WildMon Roads	4.9	0.3			5.2
FY 2010 Totals	7.4	17.4	6.2	1.1	32.2

Aquatic Passage: Annual and seasonal variation of habitat conditions such as stream flows, stream temperature, and water chemistry can bring about shifts in species distribution as aquatic organisms migrate to seek more favorable habitat conditions. The ability for aquatic populations to move between habitats in response to environmental conditions or other instinctive behavior is dependent on the availability and accessibility of these habitats. Stream crossings associated with features such as roads and trails frequently inhibit or prevent aquatic organism passage between suitable habitats. Goal WF04 of the Forest Plan is to identify artificial aquatic passage barriers and eliminate these features as sources of habitat fragmentation where risk of genetic contamination, predation, or competition with undesired fish species is not a concern. Forest Plan Objective WF07 states, “Reduce aquatic habitat fragmentation associated with the Forest transportation system by correcting 30-50 passage barriers, according to aquatic priorities ...”

The Forest eliminated aquatic passage barriers at three sites in priority watersheds during FY 2010. One site was located in Poca Run (a tributary to the East Fork Greenbrier River) where a road crossing with two perched culverts was removed and the stream channel was restored using logs and rock structures. Access was restored to more than two miles of coldwater stream habitat by eliminating this passage barrier.

The other 2 sites that were treated to correct aquatic passage barriers were located near the mouth of Cove Run – a tributary to the West Fork Greenbrier River. One site was associated with Forest Road #44 and the other site was associated with the former railroad grade that has been converted to Forest Trail #312. The perched culverts at these two sites were removed and replaced with box culverts. An estimated 1.5 miles of stream habitat were reconnected by eliminating these two aquatic passage barriers.

Monitoring Question 42. Evaluation, Conclusions, and Recommendations

Aquatic and Riparian Ecosystem Function and Health

Monitoring efforts during FY 2010 suggest that riparian ecosystem function and health are being protected when implementing Forest activities according to Forest Plan standards and direction. Adverse impacts to riparian areas are unavoidable in some cases, such as at stream crossings by roads. In instances such as these, attempts are made to minimize the potential for impacts to the extent practicable. Riparian ecosystem health continues to be impacted by existing uses and facilities, such as existing roads of various types, some recreation developments, and grazing

allotments. However, the Forest continues to annually assess aquatic resource conditions and utilize this information to develop watershed improvement strategies that prioritize opportunities to restore healthy aquatic and riparian conditions, functions, and processes. To the extent that funding allows, the Forest routinely implements watershed improvement projects, such as road decommissioning and riparian rehabilitation, which are designed to address Forest Plan goals and objectives associated with aquatic and riparian ecosystems.

Recommendations: Aquatic ecological unit inventory and monitoring data is an important element to understanding the condition, trend, processes, and functions of aquatic ecosystems and their contributing watershed areas. Continue to conduct surveys of aquatic and riparian ecosystems and utilize this information to help meet Forest Plan goals for these resources.

Continue to actively pursue restoration opportunities for aquatic and riparian ecosystems to reduce sources of stream sedimentation, improve water quality, address modifications to hillslope hydrology, rehabilitate aquatic habitats, and restore healthy, functioning riparian areas.

Use an interdisciplinary team to conduct project-level monitoring annually. Develop a systematic approach to project selection and monitoring protocol.

No changes in Forest Plan direction are recommended at this time.

Monitoring Question 43. To what extent is Forest management influencing the viability of native and desired nonnative species (e.g., RFSS and MIS) or otherwise affecting species composition and habitat productivity?

Aquatic species viability was assessed during Forest Plan revision and reported in the Final Environmental Impact Statement for Forest Plan Revision and its Appendices (2006). It is not reasonable or practical to conduct species viability assessments for all species on an annual basis to address this monitoring question. Addressing questions about species viability is more meaningful when assessed over a much greater time span, such as that which is used for Forest Plan revision. In the interim, potential incremental effects to species viability can be considered by synthesizing information from all the other monitoring questions related to Aquatic Resources. This is because species viability is essentially the end result of managing for clean water, healthy riparian areas, and productive aquatic ecosystems as examined by the other monitoring questions related to aquatic resources management.

Monitoring Question 43. Evaluation, Conclusions, and Recommendations

Recommendations: It is recommended that the MNF continue to work with the West Virginia Watershed Management Framework and WV-DEP to: 1) ensure Forest activities are conducted in a manner that facilitates compliance with water quality criteria in the CWA; and 2) identify opportunities to improve water quality in stream segments placed on the state's 303(d) list of impaired water bodies. It is also recommended that a standardized process be developed for implementation, effectiveness, and validation monitoring of Forest Plan standards and guidelines with respect to water quality issues.

Monitoring Question 44. To what extent is Forest management influencing populations of terrestrial or aquatic non-native species that threaten native ecosystems?

In FY 2008, *Didymo geminate* (didymo), a freshwater algae, was first reported on the Forest in the Glady Fork and Gandy Creek. Since that time, additional populations have been identified in other streams, on and off Forest, and the initial spread appeared to be fairly rapid. The MNF has been actively working with the West Virginia Division of Natural Resources and other partners, to increase public awareness about didymo to reduce the spread.

Monitoring Question 44. Evaluation, Conclusions, and Recommendations

During FY 2010, the Forest was not aware of any information that would indicate that didymo has spread beyond its distribution in 2009. Nonetheless, didymo posters were distributed to strategic locations across the Forest once again to aid with public awareness and outreach on the threats associated with didymo.

Recommendations: It is recommended that the Forest continue to work with researchers and other partners to identify issues related to aquatic nuisance species and develop action plans to protect native and desired non-native aquatic species from being deleteriously affected.

Monitoring Question 46. Is the Forest providing adequate habitat to meet the demand for wildlife and fisheries related social and recreational opportunities?

The WVDNR has developed a procedure to directly apply limestone sands to surface waters to help mitigate some of the effects of acid deposition on stream water chemistry. In FY 2010, the Forest continued on-going cooperative efforts with WVDNR to treat the effects of stream acidification on various recreational fisheries across the Forest. Lambert Run is a tributary to the Shavers Fork, which is a popular recreational fishing destination on the Forest. Limestone sand treatment to Lambert Run helped mitigate the effects of acid deposition in this tributary stream as well as segments of the Shavers Fork downstream from the mouth of Lambert Run.

Coats Run is a tributary to the North Fork Cherry River and is the primary water source for Summit Lake. This stream is treated with limestone sand primarily to help mitigate the effects of acid deposition on the water chemistry of the 38-acre lake. Summit Lake serves as a popular recreational fishery that supports a seasonal coldwater fishery for stocked trout and a warm water fishery for bass and sunfish. The effects of limestone treatments to the lake are likely transferred to downstream reaches of Coats Run and the North Fork Cherry River below Coats Run.

In addition to treating a number of other acid-sensitive streams on the Forest with limestone sands to promote recreational fishing opportunities, WVDNR also utilizes numerous high-profile streams on the MNF to stock hatchery-reared fish for recreational fishing. Though habitat conditions in some stocked streams are not ideally suited for a quality year-round trout fishery, they are sufficient for a seasonal put-and-take fishery.

Monitoring Question 46. Evaluation, Conclusions, and Recommendations

Various efforts are continuously pursued by the MNF and others to provide and promote sustainable recreational fishing opportunities across the Forest. Efforts span a range of management issues including aquatic habitat protection and enhancement, aquatic population assessment and conservations, and public outreach and educational activities. As a tribute to these efforts, streams on the MNF are popular destinations, particularly for many trout fishing enthusiasts.

Recommendations: It is recommended that the MNF continue to coordinate with WVDNR in efforts to manage fisheries resources and provide for recreational fishing opportunities across the Forest.

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