

White Mountain National Forest



United States
Department of
Agriculture

Forest Service

Eastern
Region



Monitoring and Evaluation Report 2008



Cover: Ryan Harvey conducts a *Potentilla* census on Franconia Ridge.
WMNF photo by Chris Mattrick

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From the Forest Supervisor

Monitoring is a critical part of National Forest management, providing much of the information we need to properly care for a wide variety of natural resources and meet the needs of our users, partners, and other interested publics. It allows us to learn how specific resource conditions are changing over time, how the landscape and our ecosystems are evolving, how our management affects these resources and systems, and how well we are meeting the demands of the public.

That is why monitoring is an essential piece of our workload every year, combined with maintaining and improving recreation facilities and services, planning and administering timber sales, improving wildlife and plant habitat, and all the other activities that are part of National Forest management. In fiscal year 2008 (FY08), our employees and partners continued several long-term monitoring efforts and began new monitoring protocols. They also reviewed many projects to ensure they were implemented properly and to document the effects of our management.

I am pleased to share with you the most recent White Mountain National Forest Monitoring Report, which summarizes many of our monitoring efforts in FY08. In addition to describing on-going monitoring activities, as past reports have done, this year's report considers how some of the management direction in the Forest Plan is being applied and whether we are achieving our goals. This monitoring is the basis for periodic evaluation of the Forest Plan and consideration of whether an amendment is needed. As this report indicates, the standards and guidelines we evaluated in FY08 are working effectively, and Forest Plan goals and objectives are being met.

I am satisfied with the findings and thoroughness of this Monitoring Report, and believe that it meets the intent of both the Forest Plan (Chapter 4) and the planning regulations contained in 36 CFR 219. I appreciate the continuing commitment of our partners, who lend invaluable assistance as we "Care for the Land and Serve People."

Thomas G. Wagner
Forest Supervisor

Introduction

Effective monitoring and evaluation helps the Forest Service and the public determine how well a Forest Plan is being implemented, whether Plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid. It helps us improve our management and determine when we need to adjust desired conditions, goals, objectives, standards, and guidelines.

Monitoring and evaluation are separate, sequential activities required by National Forest Management Act regulations. Monitoring involves collecting data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data. The annual monitoring and evaluation report summarizes and, at scheduled intervals, evaluates, monitoring results. It also provides the public with updated information about Forest Plan implementation.

The White Mountain National Forest’s monitoring and evaluation plan (Chapter 4 of the Forest Plan) describes what we will monitor and what we expect to learn from that monitoring. The Monitoring Plan identifies several types of required monitoring, including monitoring of sustainability, outputs, services, and costs, management indicator species, objective attainment, standard and guideline implementation, and effects of management practices (pages 4-8 to 4-10). Those identified in Tables 4-02 through 4-04 are required by the National Forest Management Act regulations (36 CFR 219) under which the WMNF Forest Plan was revised. Our monitoring and evaluation plan also acknowledges the need to conduct monitoring on a variety of topics or resources to evaluate resource conditions and ecosystem health, and help answer the question “Are we accomplishing the overall goals of the Forest Plan?”

Monitoring is not performed on every activity, nor is most of it expected to meet the statistical rigor of formal research. Some monitoring is conducted annually, some is done periodically to track changes over time, and other items are monitored when funds and staffing are available. Monitoring that is specifically required by law or regulation is always given the highest priority.

Some monitoring yields conclusive results in just one or two years, while other topics require a decade or more of data collection to produce informative results. As a result, our annual monitoring report changes every year and the level of detail provided varies by topic. This year’s report is divided into seven sections:

- **Sustainability**

This section addresses topics in Table 4-02 (Sustainability) of the Forest Plan. This year, we monitored the two annual items, restocking success and insect and disease levels.

- **Outputs, services, and costs**

Appendix B of the Forest Plan displays expected goods and services to be provided in the 10-20 years following Forest Plan revision. Annually, this report discloses actual accomplishments for items identified in Tables B-02 through B-04.

- **Management indicator species**

Although Chapter 4 of the Forest Plan indicates the results of management indicator species monitoring will be evaluated every five years, this section documents our on-going efforts to monitor habitat and population conditions for these key species.

- **Objective attainment**

Forest Plan objectives are specific steps or expected accomplishments designed to move the Forest toward our Forest Plan goals. Each year, we examine several of these objectives to determine whether we are progressing as expected toward their achievement. If we are not moving toward objective attainment, we will evaluate why not and whether that indicates a need to change our management or the Forest Plan.

- **Standard and guideline implementation**

Standards and guidelines are the specific, technical direction for managing forest resources. They help guide where and how management actions may occur across the Forest. Each year, we examine several of these standards and guidelines to determine whether we are implementing them appropriately.

- **Effects of management practices**

In addition to knowing whether we are implementing the management direction in the Forest Plan, we need to know whether our management is having the effects we expected and that were disclosed in our environmental analyses. Each year, we examine a few standards, guidelines, or specific practices and evaluate whether the outcomes are what we expected.

- **Other monitoring**

Every year, we conduct monitoring on a variety of topics to evaluate resource conditions, management needs, and ecosystem health. This section summarizes many of these monitoring activities. It provides a detailed evaluation where results are available and ready for analysis. For other monitoring, there is a simple discussion of what we are monitoring and why.

Figure 1. Wild River Wilderness, taken during the annual insect and disease aerial detection flight. WMNF photo by Terry Miller.



Sustainability

Are lands adequately restocked following harvest?

Annual monitoring of seedling stocking after regeneration harvests, such as clearcut, shelterwood seed cut, single or group selection cut, is required by the Monitoring Plan (Plan, p. 4-8, Table 4-02). This monitoring helps ensure adequate restocking of tree species in compliance with the National Forest Management Act (16 U.S.C. 1604). Within five years following such harvests, we must certify that we expect an adequate number of seedlings to be established. We typically conduct a field survey about 3 years after the harvest.

In 2008, Forest staff surveyed 1586 acres, walking through the harvested area and counting the number of seedlings in several mil-acre (1/1000th of an acre) plots. The number of seedlings needed to be adequately stocked varies by forest type (e.g., northern hardwood or spruce-fir). All stands surveyed in 2008 were found to be adequately restocked.

Our temperate climate typically ensures adequate restocking after regeneration harvests. Some portions of stands that are very wet, or areas with summer skid trails, may take longer to regenerate. However, these areas are usually a minor part of any harvested area, so the overall stand qualifies as being adequately restocked.

To what extent have destructive insects and disease organisms increased?

Monitoring of destructive insects and disease organisms is required annually to track trends in insect and disease activity (Plan, p. 4-8, Table 4-02). The results are also used to determine whether management action is needed to control insects or diseases.

The State and Private Forestry branch of the Forest Service, in Durham, New Hampshire, conducts an aerial detection survey over the WMNF annually. No serious incidents of defoliation or damage were detected during the flight in the summer of 2008.

There is continued concern about the potential risk from invasive pests, including emerald ash borer, hemlock wooly adelgid, Asian longhorned beetle, and balsam wooly adelgid, to name a few. An infestation of Asian longhorned beetle was found in Worcester, Massachusetts in 2008. This is the closest location to the WMNF to date. The Forest is working with the State of New Hampshire to restrict the import of firewood to campgrounds within the state since specialists feel this would be the most likely way an infestation would arrive here. Hemlock wooly adelgid continues to gradually spread north but as expected, cold winters do seem to slow the spread.

The WMNF will continue to work with the Northeast Area Association of State Foresters and the Northeast Area State and Private Forestry to develop a landscape approach to invasive species control.

Outputs and Services

Appendix B of the Forest Plan identifies expected outputs and accomplishments for the first decade, as well as some limits. Most of these measures can be found in the resource goals and objectives in Chapter 1 of the Plan. Table 1 shows the status of each measure for fiscal year 2008 and to date for the first decade of Plan implementation.

Table 1. Outputs and Accomplishments for FY08 and First Decade

Activity or Product	Unit of Measure	Estimate for the First Decade	FY08 Accomplishment	First Decade Accomplishment, to Date
Aquatics				
Stream habitat restoration	Miles	30	1	7
Restore fish passage	Road crossings	10	1	3
Fire Management				
Wildland Fire Use	Fires	4 – 8	1	1
Forestry				
Volume sawtimber harvested	MMBF	137	4.4	11.2
Volume pulp harvested	MMBF	106	5.3	13.9
Even-aged regeneration harvest	Acres	9,400	321	1,243
Even-aged Intermediate harvest	Acres	5,600	298	1,004
Total harvest	Acres	34,300	1,511	3,824
Recreation				
Net increase hiking trail construction	Miles	Up to 25	0	0
Net increase snowmobile trail construction	Miles	Up to 20	.0	.2
Net increase developed campground sites	Sites	Up to 32	0	0
Net increase backcountry facility capacity	PAOT	Up to 40	0	0
Soils				
Improved watershed/soil conditions	Acres	At least 250	25	55
Transportation				
Road construction	Miles	10	0.9	1.6
Roads reconstructed	Miles	70	6.4	14.7
Roads decommissioned	Miles	5 - 40	0.13	0.13

Aquatics

Staffing changes resulted in fewer miles of stream restoration in 2008, but expected activities in future years should enable us to remain on-track to meet proposed outputs for the first decade. Fish passage is being restored at predicted rates.

Fire Management

In 2008 there were no fires on the Forest that met the criteria to be considered as wildland fire use events.

Forestry

Similar to 2006 and 2007, our Forestry outputs were less than Forest Plan expectations. Harvested acres are a function of both how much timber we are selling and market conditions for our timber sale purchasers.

Our volume sold is about half the allowable sale quantity (ASQ) in the Forest Plan. The Forest sold the volume that we were funded to produce in 2008. However budget allocations have not been high enough in recent years to enable us to meet the ASQ. The allocations are based on national priorities for where funds are most needed each year and our capability to complete project environmental analyses and prepare and award timber sale contracts. In recent years, national priorities have been elsewhere and our capabilities have been limited somewhat by legal challenges of our projects. Our intent is to gradually increase the volume sold so we can better meet Forest Plan objectives, such as providing a sustained level of quality sawlogs to local businesses and enhancing important wildlife habitat.

The last several years have been some of the most difficult in memory for the forest products industry. The recession has the market for all wood products except wood and biomass used for heating and electrical generation to fluctuate. The biomass markets are steadily expanding, and are likely to continue growing due to the increased emphasis on combating climate change.

Recreation

The management objectives for recreation allow for only limited construction or expansion of trails and facilities in order to maintain the overall recreational experience, minimize resource effects, and keep a system that it is feasible to take care of over time. In FY 2008, our emphasis was on maintaining and repairing existing facilities and trails, including trail relocations to make them safer or stop negative impacts to resources.

Soils

Our annual accomplishments are on target with those predicted in the Forest Plan.

Transportation

Road construction has occurred at a low level each year, staying within Forest Plan estimates. Road reconstruction has been very slightly higher than the expected annual average, but is still within the levels analyzed for in the Forest Plan FEIS. Decommissioning of system roads has been limited, largely because it is evaluated in concert with other management actions, and the system roads in the areas we have entered in the last three years are necessary for long-term management. In FY08, we decommissioned 2.2 miles of unauthorized roads. These are roads that exist on the ground, but are not part of the official WMNF transportation system and are not needed for long-term management according to a project-level transportation analysis. In some cases, decommissioning involved physically closing the road to traffic, removing drainage structures, etc. For other roads, past management actions or nature have closed the road and the decommissioning was simply updating our database to reflect that the road is no longer open and will not be available for future use.

Management Indicator Species (MIS)

In 2008, all five WMNF MIS species (chestnut-sided warbler, scarlet tanager, magnolia warbler, blackburnian warbler, and ruffed grouse) were monitored through breeding bird surveys. These surveys occurred on 16 fixed 15-point transects covering a broad range of habitats across the lower elevations of the Forest. Transects were located in management areas that emphasize general forest management, as well as those that promote semi-primitive recreation. Three replicates were completed for each transect, with surveys completed within a five week period in late May–June. All species of birds seen or heard were counted. This was the 14th survey completed in a 17-year period.

Since the data is not assumed to be normally distributed, a non-parametric statistics method was used to evaluate trends. For each species, count data was ranked by year and transect to obtain mean ranks by year. Then a standard regression analysis was performed on the mean ranks to obtain a slope, along with 95 percent confidence intervals. Raw data was also plotted to visually discern trend patterns.

Based on the time period 1992–2008, all five MIS species showed negative regressions (i.e., declining trends), although only chestnut-sided warbler was significant ($p < .05$). Visual examination of the data did not reveal an obvious trend for this warbler. The statistical trend for chestnut-sided warbler may be resulting from several transects in the northern part of the Forest that showed very high numbers early in the survey period and have since fallen, probably as a result of early successional habitat on these transects growing out of optimal conditions and not being replaced (see Table 2). On the other hand, two other transects started with high numbers, then fell during the middle of the survey, and have since returned with higher numbers in 2008. Finally, one transect started with low numbers early on, but showed increasingly higher counts as treatments cut in the late 1990s regenerated into optimal habitat. The chestnut-sided warbler data is a good example of how numbers can change over time in response to changing habitat conditions, and emphasizes the importance of long-term datasets and adequate survey coverage across the Forest.

Table 2. Number of chestnut-sided warblers seen or heard on WMNF permanent plot transects, 1992 to 2008.

TRANSECT	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2004	2006	2008
Beaver Brook A	10	9	3	2	4	4	6	2	3	2	1	0	0	9
Beaver Brook B	13	16	9	2	6	11	2	6	1	1	0	0	0	5
Bull Brook A	8	7	6	4	2	4	1	1	3	4	4	1	1	0
Bull Brook B	12	8	5	2	3	13	0	1	5	4	3	3	1	0
East Branch B	1	0	0	0	0	0	1	0	0	0	0	0	0	0
GaleR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Lary A	20	15	20	9	0	10	3	7	6	10	3	9	8	5
Little Lary B	17	14	13	12	10	10	6	3	8	8	8	5	5	1
Lost River	13	16	14	7	2	6	0	1	0	0	0	0	1	1
Meserve Brook A	4	3	2	2	1	1	1	1	1	0	2	5	0	2
Meserve Brook B	1	2	1	0	0	0	0	0	0	0	0	1	0	0
Mill Brook A	17	21	15	10	7	10	7	5	9	7	1	1	1	1
Mill Brook B	5	3	3	5	4	3	1	0	2	1	2	5	4	6
North Fork	0	0	0	0	0	0	3	0	2	0	1	0	0	0
Rocky Branch B	4	0	0	0	0	1	1	0	0	0	0	0	0	0
Walker Brook	4	4	4	2	0	1	0	1	3	5	6	14	10	11



Figure 2. White-tailed deer in an opening created by a group cut. Hillock sale, part of the Batchelder project. WMNF photo by Andy Colter.

Objective Attainment

Non-native Invasive Species

Forest Plan, Page 1-8

Objective 1: Prevent non-native invasive species (NNIS) not currently on the Forest from becoming established.

No new non-native invasive species have become established on the Forest since implementation of the 2005 Forest Plan began. Past and on-going efforts to train staff and volunteers in the identification of these species have proven valuable. Although the entire Forest is not surveyed annually, the areas of most likely infestation by new species (trailheads, campgrounds, timber sale areas, etc.) are observed. These survey efforts are often coupled with another activity such as trail monitoring or timber stand inventory. These efforts continue and are re-focused each year. The Forest is in the path of many potential species infestations such as Japanese stiltgrass, mile-a-minute vine, and Asian longhorned beetle, so continued monitoring is imperative.

Objective 2: Eradicate new species infestations as quickly as possible. This may include, but is not limited to, physical/mechanical, biological, or chemical treatments.

New infestations of species known to exist on the Forest are reported each year. The implementation of the WMNF Non-Native Invasive Plant Control Decision in 2007 has allowed the Forest the flexibility to rapidly respond to newly discovered infestations. In 2008, only two new infestations were reported on the Forest (one by a District Law Enforcement Officer and another by a heavy equipment operator). Both infestations occur on the margins of Forest system roads on the Pemigewasset Ranger District. These infestations were documented and herbicide treatments applied to each within one week of their initial reporting.

Recreation

Forest Plan, Page 1-13 Developed Recreation.

Objective: 1. Allow for a net increase of up to 32 new campground sites.

No new campground sites have been added since the 2005 Forest Plan was completed. However, while analyzing campground development levels in 2007 and the Recreation Facility Analysis in 2008, changes were proposed to campgrounds that could result in an increase of campground sites. It will be important for the Forest to monitor progress closely as we move forward with potential campground changes, ensuring that we stay within the objective as effectively as possible.

Forest Plan, Page 1-14 Winter Motorized Dispersed Recreation

Objective: 1. The winter motorized trail system will be managed cooperatively with the states of New Hampshire and Maine.

Forest Service staff meet regularly with representatives of the New Hampshire Bureau of Trails and the Maine Department of Conservation, ORV Division.

Since 2005, numerous snowmobile bridges have been replaced. Each season, over 400 miles of snowmobile trails on National Forest land are maintained by local snowmobile clubs through the State Grant and Aid programs in both New Hampshire and Maine. The White Mountain National Forest is also an active member of New Hampshire’s Statewide Trails Advisory Committee (STAC).

Wilderness

Forest Plan, Page 3-9 Wilderness

Objective: Manage the areas to standard in accordance with the Wilderness Management Plan and national direction.

Based on an evaluation of primary output elements, all six Wilderness areas met the minimum standards for the Chief’s 10-Year Wilderness Stewardship Challenge in 2008. In addition, as directed by the WMNF Wilderness Plan, the Forest holds an annual “State of the Wilderness” meeting with wilderness rangers and managers. This meeting focuses on a review of the previous field season, monitoring results, and any identified issues or management concerns.

Highlights from the 2008 meeting include: accomplishments by volunteers, “unofficial” trails in the Wilderness and ways to deal with them, and monitoring. New volunteer efforts in three Wildernesses included monitoring, site rehabilitation, trail maintenance, and sign inventory occurred. This year saw an increase in volunteers and partnerships which we hope to continue in future years. The group also discussed “unofficial” trails in the wilderness and ways to deal with them. Monitoring efforts were a large focus of the meeting; we looked at the last three years of data and discussed protocols to ensure data is collected and stored in a consistent manner.

Wildlife

Wildlife Habitat – vegetation composition and age class objectives p. 1-21

The WMNF forest stand database (FSVeg) was queried to determine progress made towards composition and age class objectives. Composition objectives set in the Forest Plan are intended to be very long-term in nature, so rapid changes are not expected. Table 3 shows a comparison of composition objectives in 2004 (existing conditions at time of Forest Plan revision) and today, as well as the long-term objectives prescribed by the Forest Plan.

Table 3. Percentage of Management Area 2.1 acreage by habitat category.

	2004	Forest Plan Objectives	Current
Northern hardwood	54	45	55
Mixedwood	21	11	21
Spruce-fir	12	32	12
Aspen-Birch	5	5	5
Wildlife opening*	1	1	1
Other**	7	6	6

*All numbers rounded up to whole numbers

**Hemlock, oak-pine, wetlands, and other non-vegetated habitats

Environmental effects described in the Forest Plan’s accompanying EIS suggested vegetation composition would remain essentially stable for the first 20 years of Forest Plan implementation, which the above numbers validate. Composition objectives are very long-term and transition to them is expected to take decades at minimum.

Age class objectives are more short-term in nature, although the Forest Plan recognized that there would need to be some accelerated harvest early in the life of the Forest Plan in order to regenerate aspen-birch before it converted to other forest types. Table 4 compares Forest Plan objectives to current conditions and also shows conditions in 2004 for comparison.

Table 4. Percentage of Management Area 2.1 acreage by habitat and age class categories.

	2004	Forest Plan	Current
Northern Hardwood			
Regeneration	1	3-4	1
Young	22	15-20	21
Mature	65	61-67	63
Unsuited (old)	12	15	15
Mixedwood			
Regeneration	1	1	0
Young	11	5	9
Mature	74	73	70
Unsuited (old)	14	21	21
Spruce-fir			
Regeneration	1	1-2	0
Young	6	3-6	6
Mature	69	66-70	67
Unsuited (old)	24	26	27
Aspen-Birch			
Regeneration	3	12-15	2
Young	25	36-45	25
Mature	18	18-30	51
Unsuited (old)	21	22	22

In all habitat types, the amount of regeneration age-class is well below Forest Plan objectives and, in fact, appears to be below even the amount existing in 2004. However, the 2008 numbers may be slightly below actual harvest totals. The Forest moved to a new accomplishment database a few years ago, and it was recently discovered that the field holding age class information was not being updated at time of harvest. A remedy for this situation is being developed, but has not yet been implemented. A rough count of total acres (not broken into habitat types) using the corrected acreage did not appear to be sufficiently different to change the percentages in the above table.

Of most concern is the aspen-birch situation. The Forest Plan intentionally planned for higher levels of regeneration in this important wildlife habitat type

because the Forest is at risk of losing much of it. Aspen and birch are pioneer species that require some form of disturbance (e.g., fire, wind, commercial harvest, etc.) to persist, otherwise longer-lived species will out-compete them. Once gone, both aspen and birch are difficult to introduce to the landscape without a high level of disturbance (e.g., catastrophic wildfire). The majority of the Forest's paper birch was established in the early part of the 20th century following widespread timber harvest and wildfire. Much of this type currently occurs in management areas where timber harvest is precluded, and it is expected that paper birch (and incidental aspen) in these areas will disappear in the next few decades.

It was understood at the time the revised Forest Plan was signed that achieving the age-class goals, particularly for regeneration, would be challenging. In order to help track progress toward this objective, the Forest Service has begun documenting the reasons why a particular stand that could have been proposed for even-aged regeneration harvest ultimately was not treated that way. The data collected for four project areas revealed that the most common reasons for not clearcutting a stand (or dropping harvest entirely) were: 1) to instead promote high quality northern hardwood sawtimber; 2) to mitigate visual concerns where proposed harvests were located near hiking trails; 3) to instead promote a higher component of softwood through uneven-aged treatments; and 4) presence of steep or rocky conditions, which makes equipment operation questionable. Of the four projects evaluated, only one stand of aspen (no paper birch) regeneration was included in a final decision.



Figure 3. The Sandwich Range from the UNH trail. Old clearcuts in the middle ground are revegetating. WMNF photo by Lauren Oswald.

Standard and Guideline Implementation

Air Quality

Forest Plan, Page 3-12 Wilderness Management Area

G-1 The Great Gulf and Presidential Range/Dry River Wilderness Class I Airsheds should be managed to protect air quality related values (AQRVs) such as visibility, vegetation, and water quality.

G-2 The IMPROVE (Interagency Monitoring of Protected Visual Environments) site at Camp Dodge, or similar substitute technology, should be maintained to monitor air quality in Class I Wilderness in the White Mountain National Forest.

Two Class I areas on the White Mountain National Forest, the Great Gulf and the Presidential Range-Dry River wildernesses, were designated by the Clean Air Act Amendments of 1977. The Forest Service has the responsibility for protecting AQRVs such as vegetation, water, and visibility within these two areas.

A high concentration of ozone during the growing season of some plants is known to cause visible injury to foliage, reduce photosynthesis and growth, and result in premature leaf senescence. Ozone-sensitive plants occur in the Class I areas on the White Mountain National Forest, and monitoring data is needed to track effects of ozone on the vegetation AQRV. Currently the New Hampshire Department of Environmental Services, through an agreement with the WMNF, manages ozone monitors at Camp Dodge and near the summit of Mount Washington, both with support from the Appalachian Mountain Club (AMC).

Mount Washington (elevation 1,914 m) is located less than one km from the southern perimeter of the Great Gulf Wilderness and approximately one km from the northern perimeter of the Presidential Range-Dry River Wilderness. Camp Dodge (elevation 460 m), located at the base of Mount Washington, is less than 2 km from the Great Gulf Wilderness and approximately 8 km from the Presidential Range-Dry River Wilderness. Analysis of the AMC's long-term data reveals that the average daily ozone levels on Mount Washington's summit are two to five times higher than at Camp Dodge. This difference is largely because air quality on Mount Washington's summit area is more heavily influenced by sources that are far away. Over the 17-year period of ozone data collection, no significant temporal trend has been established for either the maximum hourly or maximum daily 8-hour average ozone levels.

For the water AQRV, the AMC samples high elevation stream water every two weeks during the summer in both Class I areas through an agreement with the WMNF. The AMC also collects cloud and rainwater samples during summer months at a high elevation site adjacent to the Class I areas. These data are currently being reviewed.

To measure for the visibility AQRV, the WMNF maintains an IMPROVE site at Camp Dodge that consists of an aerosol visibility monitor. On a national scale, visibility impairment in Class I areas is managed, in part, because the 1990 amendments to the Clean Air Act identified numerous sources of air pollution

that were contributing to “regional haze,” a visibility impairment caused by the cumulative air pollution emissions from numerous sources over a wide geographic area. The initial Regional Haze Rule, proposed by the Environmental Protection Agency (EPA) in 1997 and finalized in 1999, requires all states to submit implementation plans to the EPA for improvement of visibility in Class 1 areas. The Forest Service has been active in reviewing these state implementation plans across the United States; the WMNF has focused on reviewing and commenting on the state implementation plans that have the greatest likelihood of affecting the air quality in its Class I areas. Given that Mount Washington is located near and between the two Class I airsheds, air quality there should benefit from work on these SIPs.

In Figure 4, seven years of data from the WMNF IMPROVE site are graphed, with the 20% worst visibility days per year (a metric established by the Regional Haze Rule) shown. The graph illustrates that some progress has been made over this period. Graphed in blue is a measure called Beta-extinction (Bext); its units of measure are in inverse megameters (Mm-1) on the left vertical axis. Bext uses mathematical techniques with the IMPROVE data to estimate how much sunlight is scattered and absorbed as it passes through the atmosphere. The higher the Bext value, the poorer visibility conditions are. Typically, a large Bext value indicates that human-caused emissions are impacting the visibility at the Class 1 area. For the seven years in Figure 4, Bext values range from approximately 130-80 Mm-1. On a day with no pollution, a Bext value of approximately 22 MM-1, which is roughly equivalent to a visual range of 170 km, would be possible. Deciviews, on the right vertical axis and in green on the graph, also measures visibility extinction. On a particle-free, pristine day, the deciview index has a value of zero. For each 10 percent increase in light extinction, the deciview index goes up by one. Therefore, higher deciview values

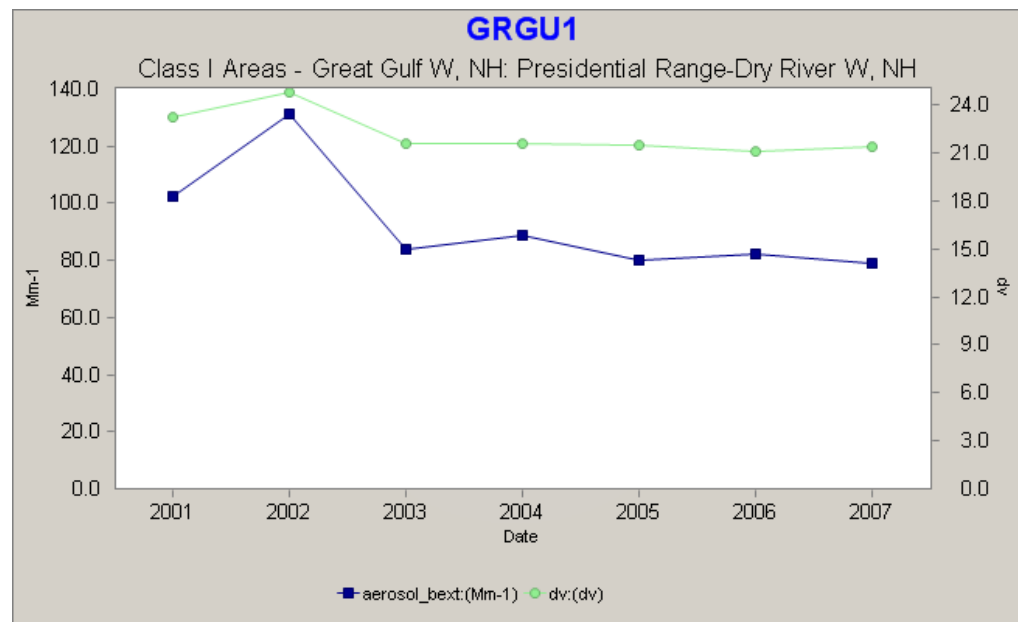


Figure 4. Aerosol Beta-extinction values in blue (Mm-1), and deciview values in green <<http://vista.cira.colostate.edu/dev/web/AnnualSummaryDev/Trends.asp>>.

equate to reduced visibility. Under many scenic conditions, a change of one deciview is considered to be just perceptible by the average person.

Figure 5 compares three mathematical metrics used to measure visibility and can be used to interpret Figure 4, showing the effects of extinction and deciview values on visual range.

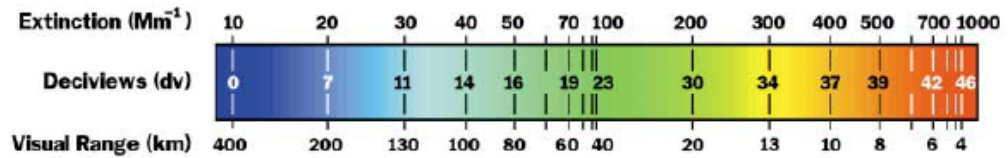


Figure 5. Comparison of three mathematical metrics: extinction values, deciviews, and visual range in kilometers. (*Introduction to Visibility*. William Malm. May 1999 <http://vista.cira.colostate.edu/improve/Education/intro_to_visibility.pdf>).

Many other environmental parameters related to air quality are measured on the WMNF by the Northern Research Station at the Hubbard Brook Experimental Forest (HBEF) in Woodstock, NH. HBEF hosts a National Atmospheric Deposition Program (NADP) site that measures precipitation chemistry; a Clean Air Status and Trends Network site that measures dry atmospheric deposition; and a Soil Climate and Analysis Network site that measures air, soil, and snow parameters. HBEF also has a network of precipitation and stream-gaging stations, weather instrumentation, and soil and vegetation monitoring sites on small first order watersheds. HBEF trends include NADP data, which show that annual nitrate and sulfate concentrations have been decreasing over the past 30 years in precipitation.

Lands

Forest Plan, Page 2-8 Land Status/Adjustments/Acquisition

S-4 The following procedure must be used in assigning management area prescriptions for newly-acquired National Forest System (NFS) lands:

1. The tract should have the same management area classification as the surrounding National Forest land (if it has similar attributes); or
2. If the land has attributes that are unique or different than the surrounding land, the acquired tract will be evaluated by an integrated team to decide its management area designation.

In 2008 the Forest established, and documented in the Land Adjustment Plan, a process for assigning management area prescriptions for newly-acquired lands that implements this Forest Plan standard. Prior to closing, or as soon as possible following an acquisition, the appropriate District Ranger will have an interdisciplinary team assess resource protection needs of each tract acquired through purchase or exchange. Assessments will describe the minimum and

desired work needed to adequately protect resources, provide for user safety, and demonstrate the quality of National Forest management the public has come to expect. A management area designation will be assigned as based on management area classification of adjacent land and the results of that assessment.

In 2008, the Forest Service acquired a 360-acre tract in Benton, NH. In addition, three tracts of land that were acquired in recent years were assigned management area designations in compliance with Forest Plan direction. This process will continue to be used in the future as additional lands are acquired.

Non-native Invasive Species

Forest Plan, Page 2-12

S-7 Non-native invasive plants or their parts removed during eradication efforts must be disposed of in a manner that prevents new infestations elsewhere.

Every effort to conduct eradication projects at a time of year when propagules or other reproductive materials are not present is made. If this is not possible, plant material containing viable reproductive parts is either transported in a covered vehicle to a designated disposal site or disposed of on site in an area where it can be monitored for re-growth. Designated NNIS disposal sites exist on each Ranger District and material brought to these locations is incinerated at least annually.

Figure 6. Invasive plants await burning at the Pemigewasset Ranger District disposal site.



Rare and Unique Features

Forest Plan, Page 2-13

S1 All project sites must be investigated for the presence of TES species and/or habitat prior to beginning any authorized ground-disturbing activity at the site. TES plant surveys must be completed for all new ground disturbing projects, unless biologists/botanists determine TES species occurrence is unlikely (e.g., no habitat exists).

In 2008, all project areas were evaluated for the presence of TES plant occurrence or habitat. The vast majority of these evaluations took place on-site involving multi-day field investigations. A few small projects only received database checks and reviews of previous field reports. This type of review occurs when a substantial amount of data already exists for an area or there is a determination that no suitable habitat exists at the site. All projects are reviewed by the Forest Botanist and field work is conducted by seasonal botanists, botanically trained Forest Service staff from other resource areas or the Forest Botanist.

Six new TES (Regional Forester sensitive species) and three new state-listed plant occurrences were discovered during project surveys in 2008. At least 14 proposed project areas were surveyed in 2008 including several large integrated projects such as the Oliverian Stewardship Project, Crawford Integrated Project, and the Wild Ammonoosuc HMU. Survey work was also conducted for the Chatham Land Exchange, Moat Mountain Bike Project, and McCrillis Path. These are just a few examples of specific projects addressed via TES plant surveys in 2008. These activities are conducted each year for ground-disturbing projects across the Forest.

Forest Plan, Page 2-15 Canada lynx

G-1 In lynx habitat, no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU is allowed unless:

- a. The designation serves to consolidate unregulated use and improves lynx habitat.*
- b. Existing snowmobile trails must be temporarily rerouted to avoid conflicts around active timber sales.*
- c. Preexisting trails or corridors on private land come into National Forest ownership.*

Groomed or designated over-the snow routes include the following: designated winter route, groomed winter route, and authorized winter route/use area. Groomed or designated over-the-snow route routes are generally compacted during the winter season, but do not include plowed roads or roads/trails accessing private land. Winter logging and alpine ski area are not subject to this guideline. Nordic ski areas should have a "concentrated trail area" delineated by a Forest Service biologist within which existing trails are so networked that a competitive advantage for lynx does not likely exist. These "concentrated trail areas" are not subject to this guideline.

G-2 For trails constructed primarily for summer use but which may also be used in the winter (e.g. hiking trails), new construction should result in no net increase in trail mileage in lynx habitat by LAU. Designating or grooming these routes for winter use should include closures of other similar routes in lynx habitat so no net increase in routes occurs by LAU.

a. Exceptions to this guideline may be considered when an increase in over-the-snow routes would not increase the potential for competitor to gains access to an area, e.g., constructing a snowmobile trail that closely parallels an existing winter road. Exceptions may also be allowed in areas where snow depth or snow conditions is insufficient to limit competing predators in winter, and consistent presence by competing predators off-trail is documented, Exceptions must be recommended by a Forest Service wildlife biologist.

Since the Forest Plan was revised, there have been several proposals to relocate snowmobile trails. These have primarily occurred outside lynx habitat so these guidelines did not apply. The Twin Mountain Bike Path was a proposed new trail in lynx habitat that had the potential for conflicting with the ‘no net increase’ guideline. During project planning and analysis, however, alternatives were considered that would keep the new trail close to Highway 3 and to close a portion of the Franconia Notch snowmobile trail. In addition, the District Biologist evaluated data from local winter mammal track surveys and determined competing predators were already present in the area, negating a competitive advantage for lynx. In addition, the District Ranger chose an alternative that placed the new trail close to an existing highway, decreasing the chance of creating additional winter access for competing predators.

Forest Plan, Page 2-16 Bicknell’s thrush

S-1 Projects must not result in a net decrease of suitable Bicknell’s thrush habitat.

Bicknell’s thrush is a migratory songbird that breeds in montane fir-dominated forests of the northeast, wintering in the Greater Antilles. It is the only bird endemic to the northeastern U.S. and adjacent Canada. The White Mountains support approximately 45% of the total breeding range for this species, making it one of highest priority wildlife species for the Forest in terms of conservation responsibility.

In 2008, the WMNF completed an environmental assessment to exchange approximately 100 acres at the summit of the old Mittersill Ski Area for a parcel owned by the State of New Hampshire near Sentinel Mountain. This exchange proposal came at the request of the New Hampshire Department of Resources and Economic Development (DRED), who envisioned a reopening of the former Mittersill Ski Area in conjunction with ongoing operations at adjacent Cannon Mountain. Although Mittersill previously operated under a special use permit from the WMNF, it was felt a land exchange would result in more efficient operations. However, the standard to protect Bicknell’s thrush habitat required careful consideration, since the Mittersill exchange area is suitable habitat and Bicknell’s thrush had been documented there consistently in previous years.

Because the proposed exchange was with the State of New Hampshire (who has similar policies on protecting rare species and their habitats), it was felt that an agreement could be reached whereby the Forest Plan objectives could

still be accomplished. Like the Forest Service, the New Hampshire Fish and Game Department (NHFG) also considers Bicknell's thrush an important species for conservation effort (see the New Hampshire Wildlife Action Plan). After much discussion with various parties, including Bicknell's thrush experts, a Memorandum of Understanding was agreed to and signed by four parties: the White Mountain National Forest, New Hampshire Fish and Game Department, New Hampshire Division of Resources and Economic Development, and the Audubon Society of New Hampshire. Through the agreement, the State will pay the Audubon Society to monitor Bicknell's thrush and their habitat at Mittersill to track population changes and to assure the habitat remains suitable. All four parties agreed to keep each other informed and to meet periodically to assess the Bicknell's thrush situation at Mittersill and identify conservation actions if needed.

In this case, the Forest could have chosen to implement the standard by denying the proposed land exchange, but this agreement will allow the intent of the standard to continue being implemented and also meet other Forest and partner objectives.

Recreation

Forest Plan, Page 2-17 General

G-2 The Forest Service should collaborate with partner organizations to provide recreational opportunities, conservation education, and visitor information programs.

We continue to work closely with partner organizations to provide services such as trail maintenance, conservation education, interpretive programs, campsite rehabilitation, search and rescue, and hikeSafe programs. In 2008, active partnerships continued with the Appalachian Mountain Club, Dartmouth Outing Club, Harvard Mountaineering Club, Maine Division of Parks, Maine Forest Service, Maine Project Learning Tree, Mount Washington Volunteer Ski Patrol, New Hampshire Department of Environmental Services, New Hampshire Fish and Game, New Hampshire Forest and Lands, New Hampshire Project Learning Tree, Randolph Mountain Club, Plymouth State University, Retired Senior Volunteer Program (RSVP), The Rey Center, SAU (School Administrative Unit) 9, SAU 13, Student Conservation Association, White Mountain Interpretive Association, and Wonalancet Outdoor Club,

Forest Plan, Page 2-17 Developed Recreation

S-3 The Forest Service capital investment process must be guided by desired development levels.

Capital Improvement projects are analyzed for their consistency with the Recreation Management Approaches, as outlined in the Forest Plan. In addition, the Forest completed a review of campground development levels in 2007. Campground projects submitted for Region 9's 2008 Integrated Project Proposals list and the Concessionaire Granger-Thye offset are consistent with the Forest's draft Campground Development Level document.

Although there is a desired development level outlined for campgrounds, a review of the remaining developed recreation facilities remains to be completed.

Forest Plan, Page 2-19 Trails

S-2 Trailhead and interior identification and directional signs must conform to standards identified in FSH 2309.18 and EM 7100-15.

A review of the WMNF trail sign program was initiated in the fall of 2003. A number of meetings and conversations have taken place over the past few years with many of the Forest's most active trail cooperators. Partway through this process, an updated version of the agency's sign manual (EM 7100-15) was released. This, along with changes in Forest personnel, has slowed the movement toward completion. Although sign standards for the WMNF have not been finalized, the current draft is being used by Forest employees and cooperators, and are consistent with the standards identified in FSH 2309.18 and EM 7100-15. Completion of the WMNF sign standards will further help in continuing to meet this standard.

Forest Plan, Page 2-20 Overnight Facilities

G-1 Forest Protection Areas (areas where restrictions such as limits on camping, use of wood or charcoal fires, and limits on party size are applied) should be established around all overnight facilities to prevent uncontrolled increases in use and size.

In 2007/2008, Forest Supervisor Orders were updated to establish Forest Protection Areas (FPAs) around all overnight facilities. Also in 2008, a Forest-wide effort was completed to create consistent maps for informational kiosks and message boards to inform the public of the FPAs.

Figure 7. Snowmobilers on East Royce Mountain. WMNF photo by Jen Olmsted.



Vegetation

Forest Plan, Page 2-29

S-2 Whole tree removal is limited to soils with sufficient nutrient concentration and nutrient replenishment capacity to support the new or residual stand of vegetation, maintain soil productivity, and meet other resource objectives.

Whole tree harvest was not implemented on any of the sales monitored in 2008.

S-3 All tops and limbs from harvested trees must be scattered and left on-site when harvesting on outwash sands or soils shallow to ledge.

S-4 State of Maine and State of New Hampshire Best Management Practices must be met or exceeded.

Site visits to four timber sales (Hillock, Hatchery, Right Angle, and Priest Hill) documented that New Hampshire best management practices (State of NH 2004) were being implemented as appropriate. Slash was layered across skid trails during implementation to minimize rutting and compaction impacts (see Figure 8). Logging slash also was left scattered across units to help maintain soil productivity (see Figure 9).



Figure 8. Main skid trail at the Hillock sale on the Pemigewasset Ranger District. The photo was taken in the fall, and looks towards the landing. Slash is layered according to BMPs to minimize rutting and compaction impacts. WMNF Photo by Andy Colter.



Figure 9. Slash is left on a unit in the Right Angle project, Pemigewasset Ranger District for soil productivity. This unit was harvested during the winter. WMNF photo by Andy Colter.

Wilderness

Forest Plan, Page 3-11 Wilderness

S-6 The minimum tool concept must be used to guide management actions, including motorized administrative use in non-emergency situations.

A two-step decision making process is used to determine the least intrusive method of accomplishing a proposed action in Wilderness. The first decision determines if the proposed action is needed in Wilderness. If it is considered necessary, the second step leads to selection of the way to implement that action that will have the least physical and experiential impact on Wilderness. For example, can it be done with hand tools or are chainsaws or other motorized tools necessary to do the job safely or effectively? Cost and convenience are not deciding factors in determining the appropriate minimum tool.

The minimum tool analysis (Minimum Requirements Decision Guide – MRDG) has been used in several situations across the forest to guide management actions occurring in Wilderness. In 2008, the MRDG was used to provide information to the decision maker for shelter removal in the Wild River Wilderness and bridge repair in the Great Gulf Wilderness.

Wildland Fire

Forest Plan, Page 2-32

S-1 Wildland fire use (WFU) implementation criteria must be described in the Fire Management Plan before fire is managed under WFU. Wildland fires that do not meet the established criteria will be managed using the full range of suppression options available to confine, contain, and control the fire.

As required by this standard, wildland fire use implementation criteria were added to the Fire Management Plan in 2007. These criteria are reviewed and updated annually. In 2008, the only wildland fire that occurred on the Forest was not started by lightning, so it did not meet the wildland fire use criteria and was managed using suppression tactics (see page 31 of this document).



Figure 10.
Firefighters
at work on
the 2008
Rattlesnake
fire. WMNF
photo by
Alexis
Jackson.

Effects of Management Practices

Non-native Invasive Species

NNIS Eradication Effectiveness Monitoring

Each year the Forest conducts NNIS treatment activities at multiple locations. The number of sites treated annually has risen steadily from roughly seven sites in 2005 to 34 sites in 2008. Monitoring the effectiveness of the treatments applied is a required and valuable step in NNIS eradication projects. All sites treated are monitored annually and two measures of effectiveness are recorded: change in area occupied and percent cover. Photo monitoring is used to enhance the analysis of written data. The data is not collected in a fashion that allows for any type of statistical analysis. Given the small nature of most infestations on the Forest, statistical analysis is not necessary to observe trends or patterns in the collected data.

There are a wide array of invasive plants on the Forest. These species can be grouped by their biology, life history, and reproductive method. They can further be grouped by the threat they pose to ecosystem function on the Forest. These species and species groupings respond in differing ways to treatments. Woody species infestations on the Forest respond differently than herbaceous species infestations. Large infestations respond differently (in terms of effectiveness) than small infestations when the same treatment is applied. It is important to realize that the effectiveness of a treatment is not always equal to the absence of the target species from a site following that treatment. In the case of woody species, particularly the berry producing shrubs (honeysuckle, buckthorn, etc) the successful eradication of large individuals often releases small seedlings or causes seeds to germinate. This may result in the same area being occupied and sometimes an increase in the percent cover of the target species. Without reference to accompanying annual photo monitoring the treatment may superficially appear to be ineffective.

Two species on the Forest show a very distinct pattern in response to chemical treatments. Both Japanese knotweed (one of the most well distributed species on the Forest) and common reed (one of the least common invasive plants on the Forest) are large herbaceous perennials that spread primarily via underground rhizomes, and in the case of common reed, above ground runners. The initial treatment applied to these species is known as a cut and drip herbicide application, where the species is cut off low to the ground and a concentrated solution of herbicide is dripped into the hollow stem. Follow up treatments in subsequent years are often a combination of cut and drip and foliar applications.

The results from several knotweed sites and two common reed sites are provided for comparison (Table 5).

Table 5. Comparison of Results from Knotweed and Reed Sites

Route 3 Japanese knotweed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2005			First Treatment
2006	Unknown	Unknown	No Treatment
2007	- 50%	None	Yes
2008	- 90%	- 20%	Yes
York Pond knotweed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2007			First Treatment
2008	-80%	- 10%	Yes
Cape Moonshine knotweed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2007			First treatment
2008	- 70%	None	Yes
Carr Mountain Road knotweed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2007			First Treatment
2008	- 70%	None	Yes
Adam's Farm Road common reed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2005			First Treatment
2006	- 80%	- 60%	Yes
2007	- 20%	- 80 %	Yes
2008	- 90%	- 50%	Yes
Route 3 common reed			
	Change in Percent Cover	Change in Area Occupied	Treatment applied
2005			First Treatment
2006	Unknown	Unknown	No treatment
2007	-80%	None	Yes
2008	- 90%	- 80%	Yes

The data covers a brief period of time, but both the tabular data and photo monitoring (Figures 11–15) reveal consistent and significant reductions following the first year's treatment. This is revealed more obviously in the change in percent cover, than in the area occupied. Reductions in area occupied are more variable and seemingly significant in common reed infestations. The slower response in the change in area occupied is likely related to the biology of these two species. Each has a large, deep and aggressive root system that, when cut, sends up new shoots from dormant buds on the root system. As the actively growing stems above ground are treated, the plant may be abandoning these "dead" portions of the root system and concentrating energy and growth into untreated areas the following season. It may take several years to exhaust the root system of its accumulated photosynthetic energy, thereby eliminating this



Results of eradication of a Japanese knotweed infestation along Route 3.

Figure 11 (above). Before first treatment in 2005.



Figure 12 (top right). The site in 2007.

Figure 13 (middle right). The site in 2008.



Figure 14 (bottom left). A Japanese knotweed infestation along Carr Mountain Road before treatment in 2007.

Figure 15 (bottom right). The same site in 2008.

See Table 5 for details.

WMNF photos by Chris Mattrick.



ability to sprout from dormant buds. The data is beginning to show impacts to the area occupied for these species, but several years of additional treatment and monitoring are needed to clearly demonstrate this.

Recreation

During 2008, the Forest conducted activity reviews of several recreation projects. Two of these are summarized here.

A review of the Rocky Pond Snowmobile Trail project on the Androscoggin Ranger District was completed. This project designated five miles of new snowmobile trail, including 0.5 miles of new trail construction, to connect existing trails and provide access to local communities. The reviewers looked to see if the on-the-ground results were as expected and if the project objectives were met. Although this project was implemented in 2003 under the 1986 Forest Plan, it is consistent with the 2005 Forest Plan's goal to maintain the Forest's role as part of the statewide and regional snowmobile trail network, and the objective to manage the trail system cooperatively with the states of NH and Maine (Forest Plan, Page 2-14).

The trail is within Management Area (MA) 2.1. The recreation management guideline within this MA is that recreation match Recreation Opportunity Spectrum (ROS) class objectives. The trail is within semi-primitive motorized and rural ROS classes, and is consistent with the objectives for these classes.

The review found that there was erosion occurring in several places on the segment just south of Route 110 because construction did not meet some Forest Service design standards. There was also evidence of illegal ATV use of the trail at the northern end. Follow-up actions have been identified to remedy these issues, including relocating a segment of the trail south of Route 110, installing improved cross-drains, and installing and relocating gates.

A review of the Lawrence Trail relocation on the Saco Ranger District was also conducted. This project consisted of building three 500-foot switchbacks to address existing erosion and sedimentation concerns and reduce long-term deferred maintenance costs. The on-the-ground results were quite similar to what was anticipated. The relocation eliminated several sections of trail that would have needed rock stairs to address safety and erosion concerns. The new switchbacks will be much easier to maintain and safer for the public. Monitoring of similar relocations on the same trail in 2006 showed success in reducing erosion, so similar results are expected for the 2008 project. The project area will be revisited over the next few years to verify the effectiveness of the relocation in reducing resource damage.

Vegetation

An interdisciplinary team review of the Right Angle timber sale examined whether implementation of Forest Plan direction, New Hampshire Best Management Practices (NH 2004), and project mitigation measures adequately protected soil, wildlife, and cultural resources. Direction on road and skid trail use and post-project stabilization was determined to be effective. Skid trails seeded in well and no erosion was seen anywhere, despite heavy rain in the month preceding the review (see Figure 16). A no-harvest buffer around the known goshawk nest protected the nest and nest tree from damage during harvest and met habitat objectives. Mitigation measures to protect cultural resources were successful. Known resources were visited during the review and no damage from harvest operations was observed. No activities or effects that were not analyzed for in the Environmental Assessment were noted on this sale; no adverse impacts to these resources were seen.

Figure 16. Stone walls from early agricultural use of the Forest are typical cultural features found today. This one marks a boundary of the recently-acquired Oliverian land. WMNF photo by Ken Crevier.



Wildland Fire and Wildlife

Forest Plan, Page 2-33

G-2 Fire suppression and prescribed fire impacts should be minimized by implementing Minimum Impact Suppression Tactics as described in the Interagency Standards for Fire and Fire Aviation Operations.

Forest Plan, Page 2-33 Wildlife Habitat Management

S-3 Known active raptor nest areas must be protected. Extent of the protection should be based on proposed management activities, human activities existing before nest establishment, species, topography, vegetative cover, and other factors. A no-disturbance buffer of at least 66 feet is required around nest sites from nest-site selection to fledging (generally March through July); exceptions may occur for some management activities when animals are adapted to human activity. At many sites, conditions will result in the need for a larger buffer to provide adequate protection.

Peregrine falcons are on the Regional Forester's sensitive species list and are state-listed as an endangered species. Human disturbance during the peregrine falcon nesting season, typically April–June, can result in nesting failure. For a portion of every spring and summer, in collaboration with the NH Audubon Society and state and federal agencies, the WMNF closes specified areas of Rattlesnake Mountain, a very popular rock-climbing. Likely as a result of climbers' compliance with this closure, Rattlesnake Mountain is one of the most successful peregrine falcon breeding sites in New Hampshire.



Figure 17 (left). A helicopter brings water to the 2008 wildfire on Rattlesnake Mountain.

Figure 18 (inset). A Peregrine falcon chick (named "Ember" by the firefighters), survived the ordeal in good shape.

WMNF photos by John Williams.

In May and June of 2008, more than 130 firefighters from the WMNF and other agencies, along with helicopter support, worked for seven days to extinguish a wildland fire which ultimately burned 54 acres on Rattlesnake Mountain. Minimum impact suppression tactics were used, and the Wildland Fire Situation Analysis and Incident Action Plan each included objectives for protecting the falcon nest and mitigating fire fighting actions near it. Firefighters were cautioned against building fire line near the edge of the cliff to keep debris from falling on the nest or the parent birds and their chick. Helicopter pilots also were asked to avoid low flights and water drops near the nest to prevent rotor wash from interfering with the falcons' feeding and incubating activity.

Despite the fire and suppression efforts, the falcons on Rattlesnake Mountain successfully fledged one chick in 2008.

Effects to Wildlife Habitat from Timber Harvest

During project planning, an assessment is made to determine effects to wildlife based on habitat changes resulting from proposed stand prescriptions. The Saco Ranger District has designed and implemented a monitoring project to determine if expected wildlife is present in certain habitat types after timber harvest has been implemented.

The protocol involves breeding bird point count surveys in harvested and control units, and includes both pre-treatment and post-treatment counts. Between 2000 and 2008, a sample of stands in two different timber sale areas (Kearsarge/Burnt Knoll and Iron Maple) was surveyed. Harvest treatments included clearcut, shelterwood, commercial thinning, and single tree selection, with one uncut stand also included in each project area to serve as a control. In each of the nine surveyed stands, three survey plots were placed far enough apart to eliminate double counting, and each plot was surveyed once per year for one to three years before harvest and for three to seven years post-harvest. All birds seen or heard were recorded and identified as either being within or outside of the cut unit.

Tables 6 and 7 show data for a sample of species, including:

- Black-throated blue warbler (BTBW) — prefers mature hardwood stands with shrubby understory.
- Ovenbird (OVEN) — prefers mature northern hardwood stands.
- Scarlet tanager (SCTA), Management Indicator Species — prefers mature hardwood stands
- Chestnut-sided warbler (CSWA), Management Indicator Species — prefers regenerating hardwood stands
- Magnolia warbler (MAWA), Management Indicator Species — prefers regenerating softwood stands

Table 6. Kearsarge II Project Area.

Kearsarge Unit 9 Commercial Thin. Mixedwood									
Species	2000	2001	2002	2003*	2004	2005	2006	2007	2008
BTBW	0	0	3	3	2	3	4	1	4
OVEN	1	1	0	3	0	2	1	6	3
SCTA	0	0	0	0	0	0	0	0	1
CSWA	0	0	0	0	0	0	2	0	0
MAWA	0	0	0	0	0	0	0	0	4
Kearsarge Unit 7 Clear Cut. Hardwood									
Species	2000	2001*	2002	2003	2004	2005	2006	2007	2008
BTBW	1	0	1	3	3	2	4	2	1
OVEN	1	0	2	3	0	0	0	0	0
SCTA	0	0	0	0	1	0	0	0	0
CSWA	0	0	5	6	8	12	6	11	12
MAWA	0	0	0	0	1	0	0	1	1
Burnt Knoll Unit 22 Single Tree Selection. Mixedwood									
Species	2000	2001	2002	2003*	2004	2005	2006	2007	2008
BTBW	0	0	0	3	1	3	4	4	3
OVEN	0	1	1	3	3	3	6	1	3
SCTA	0	0	1	0	0	0	0	0	0
CSWA	0	0	0	0	0	0	0	0	0
MAWA	0	0	0	0	0	0	0	0	1
Kearsarge Control. Hardwood									
Species	2000	2001	2002	2003	2004	2005	2006	2007	2008
BTBW	0	1	2	0	0	0	1	0	1
OVEN	2	1	1	0	1	3	2	2	0
SCTA	0	0	0	0	0	0	0	0	0
CSWA	0	0	0	0	0	0	0	0	0
MAWA	0	0	0	0	0	0	0	0	1

* denotes year harvest occurred

Table 7. Iron Maple II Project Area.

Iron Maple Unit 4 Single Tree Selection. Mixedwood						
Species	2003	2004*	2005	2006	2007	2008
BTBW	0	2	3	3	3	3
OVEN	4	1	0	0	3	1
SCTA	0	0	0	0	0	0
CSWA	0	0	0	0	0	0
MAWA	0	0	0	0	0	0
Iron Maple Unit 9 Clear Cut. Hardwood						
Species	2003	2004*	2005	2006	2007	2008
BTBW	1	3	2	0	0	0
OVEN	6	6	3	0	0	0
SCTA	1	0	0	1	0	0
CSWA	0	0	0	3	3	7
MAWA	0	0	0	0	0	2
Iron Maple Unit 10 Shelterwood Residual BA of <30. Red oak retained						
Species	2003	2004	2005*	2006	2007	2008
BTBW	3	1	0	1	0	0
OVEN	2	1	1	1	0	0
SCTA	1	1	0	1	0	1
CSWA	0	0	0	0	4	4
MAWA	0	0	0	1	0	2
Iron Maple Unit 12 Commercial Thin. Hardwood						
Species	2003	2004*	2005	2006	2007	2008
BTBW	2	0	1	1	5	5
OVEN	0	1	0	0	0	3
SCTA	0	0	0	0	0	0
CSWA	0	0	0	0	0	1
MAWA	0	0	0	0	0	1
Iron Maple Control. Mixedwood						
Species	2003	2004	2005	2006	2007	2008
BTBW	0	1	3	2	1	1
OVEN	3	2	1	2	1	2
SCTA	0	0	0	0	0	1
CSWA	0	0	0	0	0	0
MAWA	0	0	0	0	0	0

* denotes year harvest occurred

Observations indicate that clearcuts (harvests that remove most of the mature trees) and shelterwoods that leave less than 30 square feet of basal area (Iron Maple Unit 10) do provide breeding habitat for chestnut-sided warblers, in some instances as soon as a year or two after harvest (Kearsarge Unit 7, Iron Maple Unit 9).

Clearcut harvests, as predicted, do appear to reduce suitable breeding habitat for ovenbirds, as noted in Kearsarge Unit 7, although black-throated blue warblers were still documented consistently after harvest in or near this unit. It should be noted that during the early years of this monitoring project, birds outside of the harvest unit may have been recorded. This was because the individual plots were spaced as far apart as possible, and the plot-transect protocol the WMNF has been conducting since 1992 was used. This may have picked up birds within 50 meters of plot center, but that were outside the harvest unit. Surveyors in later years corrected this issue and designated if birds were within the harvest unit or outside the harvest unit.

Commercial thinning and single-tree selection harvests retained suitable habitat for black-throated blue warblers and ovenbirds (Kearsarge Unit 9, Burnt Knoll Unit 22, Iron Maple Unit 4). These species prefer interior forests or mature trees and canopy cover. Chestnut-sided warblers that prefer shrubby vegetation were not found in these areas prior to harvest or after.

Interestingly, scarlet tanagers were not abundant in any stand, even the control units. This species is generally common (although not particularly abundant) throughout hardwood stands in the Forest. The lack of magnolia warbler observations was less surprising, given these stands were hardwood or mixedwood types and magnolia warbler tends to prefer softwoods.

In summary, timber harvesting has been providing suitable habitat for a variety of wildlife species, including those that prefer regenerating conditions and those that prefer mature stands. The expectations stated in the Forest Plan appear to be consistent with supporting research studies. Wildlife biologists' statements in project analyses regarding species' use of certain habitat types and expected results of management were verified.

Other Monitoring Goals

Rare and Unique Features

Alpine Plants

This long term monitoring project is designed to evaluate the effects of hiking trails in the alpine area on alpine plant species and communities. The final trail monitoring plots were installed in 2008 on Mt. Eisenhower, Mt. Jefferson, Mt. Lafayette, and in Alpine Garden on Mount Washington. Data will be gathered from these locations in 2013 and compared to the 2007/2008 data. It became apparent even without replicates of data or statistical analysis that species composition in and close to the trails is obviously impacted by foot traffic. Certain species were found in or near the trail in greater numbers, while other species were completely absent from trailside locations but very abundant away from the trail. This finding was consistent in all ten study plots.

Cliff Plant Communities

Phase 1 of the cliff plant monitoring study was completed in 2008, and involved the survey of plant communities on more than 20 cliffs used for recreational rock climbing on the Forest. This initial survey was a screening process to identify ten cliffs to be further studied in Phase 2. Phase 1 also developed and refined the monitoring protocols to be used in Phase 2. It is anticipated that Phase 2 will be conducted during the 2009/2010 field seasons. The study is designed to evaluate if recreational rock climbing is having an adverse effect on native plants and plant communities found on cliffs within the Forest.

TES Plants

Forest staff and partners monitor known occurrences of Regional Forester sensitive and state listed plant species each year to assess population health and trends. In 2008, 21 occurrences were monitored by volunteer botanists from the New England Wild Flower Society, Maine Natural Areas Program, New Hampshire Natural Heritage Program, Appalachian Mountain Club, as well as White Mountain National Forest staff. No significant change was noted in any of these populations. Nine new occurrences of TES plants were discovered on the Forest in 2008.

Threatened, Endangered, and Sensitive (TES) Wildlife Monitoring

TES species are routinely tracked to document their continued presence on the Forest and to periodically evaluate population trends. In addition, Forest biologists run fixed transects each winter looking for tracks of rare species such as Canada lynx and American marten, as well as more common carnivores such as fox, fisher, coyote, and various weasels. In 2008, biologists also conducted surveys for bald eagle, common loon, peregrine falcon, and wood turtle. No new sites for any rare species were found, although some rare species were found in repeat locations. No obvious trend was noted for any species.

Substantial work was completed in 2008 on two sensitive alpine butterflies: the White Mountain arctic (= White Mountain butterfly) and the White Mountain fritillary. These two butterfly species are only found in the alpine zone in the White Mountains, but very little is known about their actual population numbers. Monitoring of these species has historically proven difficult for a number of reasons: 1) frequent windy or rainy weather that is notoriously unpredictable in the alpine zone; 2) butterflies are different than other species in that adults emerge over a period of weeks, so the population cannot be accurately counted in a single visit; and 3) logistical challenges in physically getting monitoring crews to the alpine zone.

In 2008, the Forest partnered with the Vermont Center for Ecostudies (VCE) to test and recommend a monitoring protocol for each butterfly species to be implemented in the future. Several data collection methods were evaluated, including random point counts in suitable habitat, long (500m) transects, short (100m) transects, and targeted counts at hilltops (leks). A variety of statistical approaches was also examined.

After testing each of the methods and evaluating the data, the recommended approach is to complete 250m transects in suitable habitat for each species. Adding mark-release-recapture efforts would be useful in determining rates of survivorship and detection. For the White Mountain arctic, hilltop/lek counts at specific locations using double observers are also suggested to get a more accurate count of the total population and determine detection probabilities for statistical analysis. Transect and hilltop counts would need to occur at least weekly over approximately 11 weeks during the summer to obtain accurate population data.

Riparian and Aquatic Habitats

Habitat Improvement Project Effectiveness

The WMNF has worked on several stream habitat restoration or improvement projects in recent years, placing large wood in streams to create or improve habitat conditions. After completing the first large project in 2006, in the Great Brook watershed, monitoring began to determine whether our efforts increased habitat complexity and wild trout productivity.

This monitoring of the Great Brook stream restoration project continued in 2008. All seven monitoring stations were sampled for the first time since the habitat work was completed. Monitoring of both fish and habitat responses to habitat improvement efforts will continue in the summer of 2009. After two years of post-treatment sampling of all seven monitoring stations, a thorough evaluation of fish and habitat responses will be presented in the next monitoring report.

Stream Invertebrate Communities

Sampling continued in 2008 for two Regional Forester's Sensitive Species of the mayfly genus *Ameletus* and other stream invertebrates. The Forest continued its partnership with the University of New Hampshire to learn more about the aquatic insect communities of the White Mountains. The total number of sites

sampled in 2008 doubled from previous years in an attempt to locate *Ameletus browni*, which was not collected in bigger streams during 2006-07.

After three years of sampling, the status of *Ameletus tertius* is becoming well known, while *Ameletus browni* is still a mystery. Dr. Don Chandler of UNH concluded: "The patterns of distribution of *Ameletus tertius* are becoming clear. It is a Forest-wide species, found in first to third order streams, but generally in quite low numbers. Populations are highest in the relatively acidic streams of the Swift River drainage." Despite the addition of several small stream sampling sites, only one *Ameletus browni*, an adult, was collected in 2008 — during the early season (May). In 2009, sampling will be attempted, immediately following ice-out, to determine if the species normally hatches before typical mid-May sampling is conducted. Our current hypothesis is that the species is found in small, coldwater streams and hatches very early in the year, shortly after ice-out.

Vernal Pools

Like deeryards, vernal pools are unique habitat features for which Forest Plan standards and guidelines prescribe some level of attention. Vernal pools are depressions in the forest that temporarily fill with water during the spring. They are critical to a number of amphibians and invertebrates because they offer suitable breeding conditions without fish (which are often predators). Although vernal pools have always been viewed as important features to be conserved, the Forest has recently attempted to more formally find and track these sites. As part of the Forest's ongoing soil survey project, Forest biologists met in 2008 with Natural Resources Conservation Service partners and the New Hampshire Soil Scientist to determine if the soil survey protocol could be modified to identify potential vernal pool sites based on soil types (vernal pools are more likely to be found on wetter soils that are less permeable). This would allow inventory over a large area throughout the entire spring/summer/fall field season. Then biologists could target these locations during the few weeks in spring when evidence of true vernal pool indicator species would be present. This new protocol will be implemented for the first time in 2009.



Figure 18 (above). Wood frog eggs.
WMNF photos by Leighan Prout
Figure 19 (left). Vernal pool in
Albany, Maine.

Soils and Fire

The Forest Plan permits prescribed burning to reduce hazardous fuel loading; create, maintain, or improve wildlife habitat; and prepare sites for restoration of species. Prescribed burning typically occurs either in late spring, when the snow cover has melted, or in late summer/early fall, when temperatures have cooled. The effects of a prescribed fire are of much lower magnitude than those of a wildfire, since the former is typically of low severity (Landsburg and Tiedemann, 2000). However, there is still a potential for negative impacts on soils, particularly soil erosion and the loss of nutrients.

Wildland fires result in calcium depletion through the loss of soil organic matter from the Oa horizon. Although prescribed fires may result in some loss of surface soil organic matter from the Oi horizon, very little is lost from the Oa horizon. Thus, soil calcium would not be reduced as a result of the burn.

Erosion can also cause calcium to be removed from a site; however, previous experience has shown that prescribed fires on the White Mountain National Forest tend to be quick, cool burns of low severity, so soil erosion is not a concern. Some soil nitrogen would be lost when organic matter from any soil horizon burns, but nitrogen is not considered to be a limiting factor in tree growth on the Forest.

We monitored prescribed burning adjacent to Lake Tarleton to determine the amount of soil organic matter in the Oa horizon consumed by the fire and the effect of erosion on the soil. The monitoring indicated that some of the Oi and Oe horizons were consumed, but the Oa horizon did not burn and no erosion occurred. Our expectations were confirmed: no detrimental soil effects resulted.

Figure 20 (right). The soil and organic matter before the prescribed burn at Lake Tarleton in early spring. Notice the amount of organic matter. WMNF photo by Andy Colter.



Figure 21 (left). After the prescribed burn at Lake Tarleton, the organic matter is still on the surface, showing how fast the burn was and the minimal effect to the soil. WMNF photo by Andy Colter.

Recreation

Trail Use

The Forest Service has been monitoring WMNF trail use intermittently for the past ten years. The years sampled include 1999, 2000, 2001, and 2008.

A random sampling technique, coupled with the installation of self-registration boxes at selected trailheads, was chosen to provide a statistically reliable sample and cost efficient methodology for collecting trail and backcountry use data. Sampling results are being analyzed at this time.

Wilderness

The WMNF Wilderness Plan provides specific monitoring protocols consistent with the Limits of Acceptable Change (LAC) process as a means of ensuring different values are managed as set forth in the Wilderness Act. The Wilderness Plan is designed to maintain a balance among primitive recreation, ecological integrity, and other wilderness values, even in the context of a heavily-used urban national forest.

In 2008, the Forest continued collecting data to analyze campsite density, campsite size, visitor trail use, and visitor destination use. Using Forest Service staff and volunteers, sampling was conducted throughout the summer in all Wilderness areas. After three years of collecting visitor use data, we did not find any clear indication of significant changes in visitor use numbers. Campsite monitoring is only in its second year of data collection, however, and more data is required before any conclusions can be made.

Wildlife

Deeryard Monitoring

Deer wintering habitat has long been a resource of concern on the Forest. Deer require areas of thermal cover with access to forage in order to survive northern New England winters and Forest Plan standards and guidelines emphasize conservation of this resource.

Each year, biologists monitor a sample of the Forest's known deeryards, noting habitat quality and evidence of use. In 2008, an additional effort was undertaken to compile all known deeryard locations into a single GIS shapefile. Using data provided by the New Hampshire Fish and Game Department and Maine Department of Inland Fisheries and Wildlife, as well as the Forest's current and historical data, a shapefile with associated habitat data was created and shared with partners. It provides a never before seen picture of the spatial arrangement of deer wintering habitat within the White Mountains and will be useful in prioritizing future monitoring and habitat work.

Figure 22. Biologist Lesley Rowse documents conditions in a Maine deeryard. WMNF photo by Jay Milot.



Other Research and Monitoring

The Forest Service actively manages a database that documents research activities occurring within the National Forest. These short- and long-term studies continue to improve our understanding of forest ecosystems and the landscape of the White Mountains. More than 30 student or individual research projects were ongoing in 2008. They covered a variety of topics, including soil calcium, structural geology, hemlock stands in riparian corridors, invasive black locust, lichen studies, effects of climate change on community composition, alpine pond physical characteristics, and range and habitat selection of wood turtles.

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