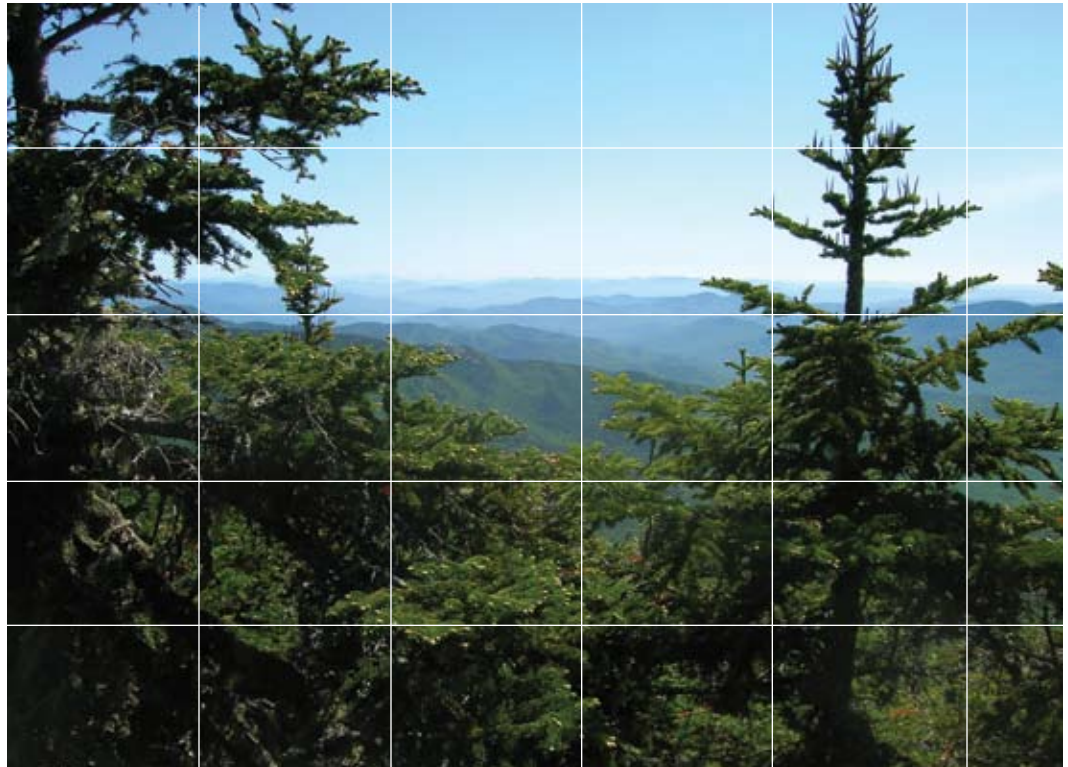


# White Mountain National Forest



## Monitoring and Evaluation Report 2006



*Cover: Looking toward the new Wild River Wilderness from the Carter Range. WMNF photo by Lesley Rowse.*

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## From the Forest Supervisor

I am pleased to share with you the White Mountain National Forest's 2006 Monitoring Report. This report is intended to describe how well we have implemented our new Forest Plan, how effective our resource protection measures are, and provide recommendations for the future. This is our first monitoring report since revising our Forest Plan in 2005. With one notable exception regarding vegetation management to meet forestry and wildlife objectives, implementation of our Forest Plan is progressing as we expected. As you will read on the following pages, our monitoring is showing that standards and guidelines are working effectively, we've had good success in restoring aquatic habitats, providing opportunities for recreation, improving our knowledge through research partnerships, and controlling invasive plants.

In addition, we recently celebrated the passage of the New England Wilderness Act of 2006. This legislation created the Wild River Wilderness and expanded the Sandwich Range Wilderness. The Act followed the recommendations in our revised Forest Plan.

The Wilderness recommendations and other Forest Plan decisions were based on striking a balance between designated Wildernesses, backcountry areas, and general forest where wildlife habitat can be managed, highly developed recreation can occur, and forest products are harvested. This balance was struck after years of planning, 55 public meetings, and carefully considering over 18,000 public comments.

A few of the decisions made through the Forest Plan include:

- Recommended to Congress the addition of 35,000 acres of Wilderness. This was enacted into law in 2006 and when added to existing Wilderness Areas amounts to 18% of the Forest.
- Added two new management areas -- the Alpine Zone and the Appalachian National Scenic Trail.
- Expanded the Bartlett Experimental Forest and Research Natural Areas to assist in our ability to conduct broader-scale research activities.
- Used professional experience and computer-modeled information to identify an allowable sale quantity of 24 million board feet of timber per year, which is about 30% less than allowed in the previous Forest Plan.
- Provided clearer direction and standards and guidelines to protect Wilderness and dispersed recreation experiences in the face of expanding and changing public use.
- Minimized investments in new campgrounds and trails in favor of maintaining our existing extensive infrastructure.
- Prohibited summer ATV use during this planning period.
- Identified approximately thirty-five percent of the Forest where it would be suitable to encourage the creation of forest wildlife habitat and conduct sustainable forestry activities.

It is on this last item where our implementation efforts have been challenged. Three timber sale decisions designed to implement the Forest Plan were appealed. A number of concerns were raised. One deals with how the Forest Plan allocated certain lands to different management prescriptions.

During the revision of the Forest Plan, all lands on the WMNF were re-inventoried to determine their Wilderness potential. As a result, the 2005 inventory of lands with Wilderness potential grew from 241,000 acres identified in the Roadless Area Conservation Rule to 403,000 acres. The revised Forest Plan recommended that 34,500 acres be designated Wilderness and the remainder of the inventory was allocated to one of the other fourteen management areas defined in the Plan. The appellants are challenging the decision to allow timber harvest, wildlife habitat management, and road construction in any of these areas.

At this time, I do not believe we need to amend the Plan. At some point we will need to update our plan to make a few corrections and update the management area assignments for newly designated Wilderness lands.

This FY 2006 Monitoring and Evaluation Report for the White Mountain National Forest was prepared by our resource specialists and I am satisfied with the findings and thoroughness of their examinations. I intend to consider the recommendations and continue monitoring our land management approaches, activities, and results. I am also satisfied that this report meets the intent of both the Forest Plan (Chapter IV) as well as the planning regulations in 36 CFR 219.

I encourage you to review this document and welcome any thoughts you may have. I also encourage you to become active in commenting on proposed projects. These can be found on our web site.

Thomas G. Wagner  
Forest Supervisor

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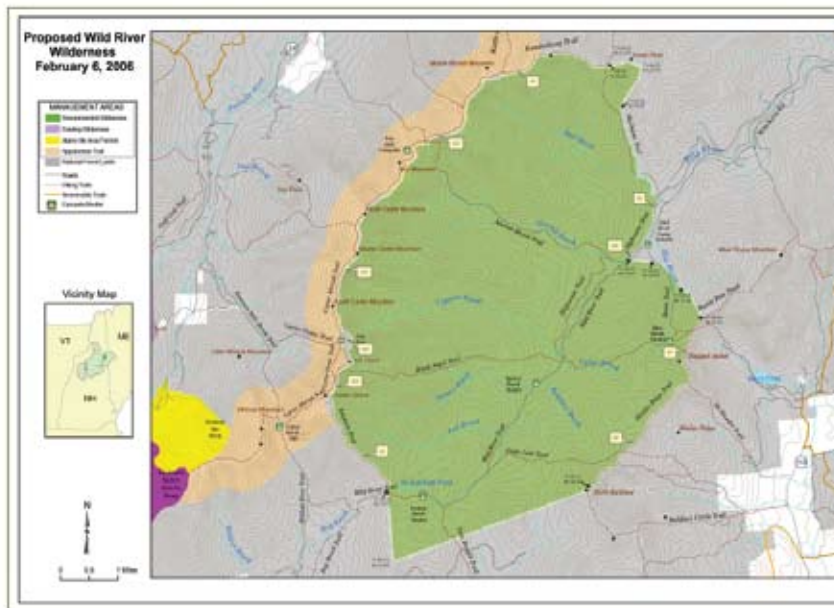
## Special Events

### Lynx Presence Confirmed



In January 2006, a contractor with the Audubon Society of New Hampshire identified Canada lynx tracks just outside the National Forest boundary. DNA testing of nearby scat confirmed the animal as a female pure lynx. Two months later another set of tracks was found and although these could not be confirmed with DNA testing, the quality of the tracks provided strong evidence they were created by a lynx. Our Forest Plan analysis anticipated the presence of lynx and includes protective standards and guidelines which are based on national lynx conservation guidelines. The U.S. Fish and Wildlife Service concurs that our current set of standards and guidelines is sufficient to protect lynx should a population become established on the Forest, and so no changes in the Forest Plan are needed at this time. See the TES – large mammal monitoring results for additional information.

### Wilderness Designated



The New England Wilderness Act of 2006 was signed into law on December 1, adding 34,500 acres of the White Mountain National Forest to the National Wilderness Preservation System. The Act designates lands currently assigned as “Recommended Wilderness” in the Forest Plan, specifically by creating the new 23,700 acre Wild River Wilderness and expanding the Sandwich Range Wilderness by 10,800 acres. The Forest Service immediately began managing the areas as Wilderness. Structures are being analyzed

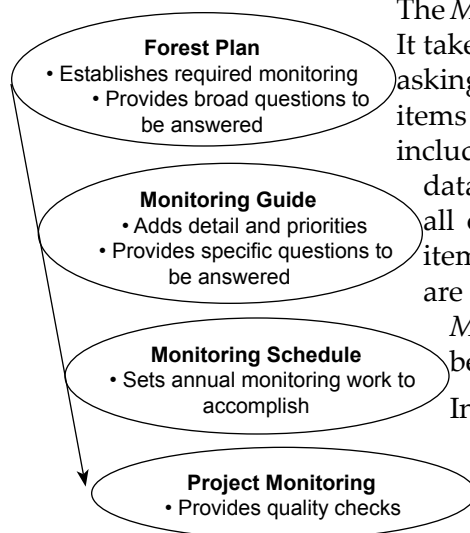
for removal; motorized use and mountain biking have been prohibited. Wilderness Zones are being designated to help guide management in the new additions, and baseline data is being collected to monitor trends in dispersed campsite use and impacts. An administrative update of the Forest Plan, changing the management area allocation from Recommended Wilderness (MA 9.1) to Wilderness (MA 5.1), will be required.

## Introduction to Monitoring

Management of the White Mountain National Forest is guided by three broad goals as described in our Forest Plan: to manage for sustainability, using the best science available to manage for ecosystem viability; to provide recreation and other opportunities, experiences, and benefits that may not be readily available elsewhere; and to recognize the Forest's support to local economies while realizing the importance to society of a natural appearing landscape distinct from the human-altered environments otherwise common in the East.

We also established goals and objectives to guide management of our individual resources. In order to meet the broad Forest goals and the more specific resource goals, the Forest was “zoned” into distinct management areas, each with a vision for a desired condition and an array of allowable activities that are compatible with the resource goals and the desired condition. Standards and guidelines the specific, technical direction for managing resources -- were established to protect natural resources and help insure we obtain the outcomes intended.

Chapter 4 of the Forest Plan — Monitoring and Evaluation — comprises the *Monitoring Plan* and describes how we will determine how well we are obtaining our predicted outcomes, protecting resources, and moving toward the desired conditions of the land. The Monitoring Plan identifies the information needed to make this determination, and guides our monitoring with broad questions to be answered.



The *Monitoring Guide* is built from the overall guidance in Chapter 4. It takes the broad questions and links them to monitoring items by asking more specific questions. The Guide lists specific monitoring items and explains why it's important to ask the questions. It includes a database that describes the methodology, costs, timing, data storage location, and priority of each monitoring item. Not all of the items in the database are monitored annually. Some items are scheduled to be monitored less frequently and some are dependent on available funding. Each year we create a *Monitoring Schedule* that identifies and prioritizes the items to be monitored that year.

In addition to monitoring the items listed in the annual *Monitoring Schedule*, individual project monitoring occurs on a daily basis. *Project Monitoring* helps insure that implementation is occurring as described in project plans and decisions.

Most of this project monitoring is not formally compiled and reported in the Monitoring and Evaluation Report, but is invaluable in ensuring quality work on the ground. Project monitoring may not result in changes to the Forest Plan, but it can affirm our approaches or encourage timely adaptation in our management activities to protect resources.

The following sections summarize the results from the 2006 monitoring items and some of the project reviews conducted throughout the year. Each of the resource areas includes background, the monitoring question(s) with findings, and conclusions and recommendations.

## Monitoring By Resource

### Air



*The IMPROVE site at Camp Dodge monitors air quality on the Forest. (WMNF photo by Livia Crowley)*

### Monitoring Air Quality

Air monitoring on the White Mountain National Forest measures the level of air emissions and their impact on Air Quality Related Values (AQRVs) such as water quality, visibility, aquatic life, and human health. The monitoring data collected also helps in evaluating new emission sources for potential impacts on Class I airsheds. The evaluations can lead to suggestions for improving the design of these new sources.

One of the Forest Plan objectives is to participate in national air monitoring efforts. We established an a monitoring item to track our progress by asking this question:

***Are the IMPROVE protocols or similar technology being implemented?***

IMPROVE is a national network, coordinated by the Environmental Protection Agency, that monitors air quality condition and AQRV trends. (For additional information about the IMPROVE program and access to the data collected, visit their website: <http://vista.cira.colostate.edu/improve/>.)

At the Forest's Camp Dodge IMPROVE site, aerosol samplers measure particulate matter and chemicals such as sulphates, ozone, and nitrates. The State of New Hampshire also operates equipment at this site through a cooperative agreement. Less intensive measurements are also made in the alpine zone — from Lake of the Clouds and from the Mt. Washington summit — through an agreement with the Appalachian Mountain Club. Other air-related data is collected at Hubbard Brook Experimental Forest. Once we have the data we then need to understand how air quality values are being affected.

***Are air emissions affecting Air Quality Related Values?***

Once we have the data, we then need to understand how AQRVs are being affected.

The AMC is a cost-share partner with the Forest Service in the monitoring, and provides an annual report that interprets the ozone levels, other AQRVs, and Wilderness area water quality results. In 2005, their report showed a decrease in maximum 1-hour and 8-hour ozone concentrations from 2004 to 2005. None of the sites measured exceeded the federal National Ambient Air Quality Standards for the 8-hour period. Peak, mean, and



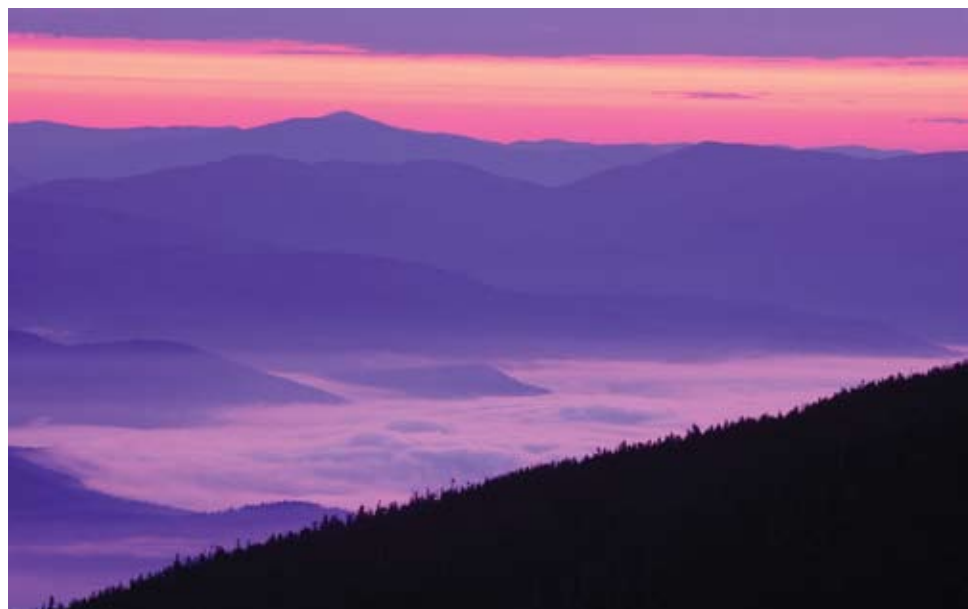
average background hourly ozone concentrations were consistently two to five times higher at the summit of Mt. Washington than at the base, or at the other two ozone monitoring sites in New Hampshire. In addition, the lower elevation ozone levels vary during the day and night, while those at the summit do not show this daily change. This indicates that ozone concentrations at the summit are related to upper atmospheric ozone rather than from motor vehicles and other regional and local emissions.

A research project examining the mercury levels in high elevation birds is planned for this year (also see the Wildlife section). The study, as related to air quality and climate change, will analyze population trends of forest indicator bird species in relation to mercury deposition using long-term (1992-2003) bird survey data collected on the White Mountain National Forest. Secondly, it will analyze shifts in species elevation ranges over a fifteen-year period using the Forest's fifteen-year dataset, and will test the hypothesis that observed shifts are consistent with those expected if climate change were influencing montane spruce-fir bird abundance. Participating with the WMNF in the project are the maine Center for Toxicology and Environmental Health, New Hampshire Fish & Game, American Bird Conservancy Forest Service Northern Region Research Station, and the University of Massachusetts. Findings are expected in two to three years.

## Conclusions and Recommendations

Past monitoring has shown that some AQRVs are being impacted by air emissions. There has been a decrease in some emissions, such as sulphates, while others remain unchanged. Long-term, continued monitoring at the IMPROVE site will contribute to our understanding of how effective our national actions are in cleaning the air. Monitoring should be continued if budget and priorities allow.

*Sunrise from Airline Ridge. (WMNF photo by Nate Peters)*



## Aquatics

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One of our goals for fisheries management is to provide a balance between wild and stocked indigenous fish species. New Hampshire Fish & Game and the Maine Department of Inland Fisheries and Wildlife are responsible for stocking game fish in their respective state waters, including those within the White Mountain National Forest.

Monitoring and mapping productivity of wild eastern brook trout populations began in 2003. Data collected helps us rank the condition of wild brook trout populations by watershed across its historic native range, as is being done by many states in the eastern United States.

### Wild Fish Inventories

#### *How are fish populations changing over time?*

Within the White Mountain National Forest, eight of 55 watersheds have been inventoried for wild eastern brook trout to date. In 2006, wild trout inventories were completed in the Mill Brook watershed (Stark) and initiated in the Gale River watershed.

Preliminary results to date indicate higher wild trout densities occur within 1<sup>st</sup> and 2<sup>nd</sup> order streams (small tributary streams) than in 3<sup>rd</sup> and 4<sup>th</sup> order streams (larger rivers). Inventories are scheduled to continue in future years to determine 1) if this trend continues across the Forest, 2) if wild trout productivity varies across the Forest within similar stream orders, and 3) if fisheries management or land management practices need to be adjusted to ensure long-term conservation of wild trout populations.

### Fishing Opportunities

#### *Is the Forest providing a range of fishing opportunities that meets demand and protects wild stocks?*

An angler survey conducted by New Hampshire Fish & Game in the 1990s found that 73 percent of anglers supported the management of wild trout exclusively in some streams. While the eastern brook trout is the only trout species indigenous to the eastern U.S., rainbow trout and brown trout have been stocked in the region for many decades. Currently, domestic strains of brook trout are the dominant fish planted within waters of the National Forest. Fish with lengths of 8-12" are generally planted in rivers and streams, while most wild trout rarely exceed 8" in length.

In 2006, a total of 160 miles (15 percent of the perennial waters on the Forest) were stocked with various species of trout. Most of the stocked waters are 3<sup>rd</sup> and 4<sup>th</sup> order streams, while the majority of un-stocked waters are 1<sup>st</sup> and 2<sup>nd</sup> order streams. Fish inventories on the Forest to date have found substantially higher wild trout densities in these smaller streams than in the major rivers on the Forest where most of the trout stocking occurs.

## Conclusions and Recommendations

Although the effects of stocking domesticated strains of trout on wild fish has received attention in many areas of the U.S., it is unclear whether current stocking regimes on the National Forest have impacted wild populations of brook trout. Current stocking distributions by NHF&G can be dated back to the 1930s, and little is known about the interaction of domestic and wild brook trout or the impact of non-indigenous species such as rainbow trout on wild brook trout populations in the White Mountains. As more wild trout inventories are completed and more is learned about the interactions between stocked and wild trout, the WMNF will be in a better position to determine the best balance between them. We can then coordinate with state fisheries agencies to adapt fish management practices that will ensure long term conservation of wild brook trout populations, as well as provide enhanced fishing opportunities.

### Habitat Restoration/Improvement – Fish productivity

#### *Are stream habitat restoration/improvement projects increasing wild trout productivity?*

The WMNF has demonstrated regional leadership in aquatic habitat restoration and improvement work. Land managers across New England have begun to adopt techniques used in the White Mountain National Forest. With several completed projects, one in progress, and more planned, there is much to be learned and applied in the future. Our current monitoring is designed to help us determine if habitat improvements are effectively improving fish productivity.

We are monitoring two multi-year habitat projects involving placement of large wood within stream channels and floodplains. The Great Brook



*Great Brook before and after restoration.  
WMNF photos by Jay Milot.*

stream restoration project began in 2003 and was completed in 2006. Pre-treatment sampling was completed in 2004 and post-treatment monitoring will initiate in 2007. The Mill Brook stream restoration project began in 2006 and is scheduled for completion in 2008. Pre-treatment sampling is ongoing and will be completed in 2007.

Estimates of both density and biomass of wild trout are made at permanent sample sites within treatment reaches and control reaches. At each station, population estimates are made annually for three years before project treatments occur. After implementation, estimates are made for an additional three years. Differences in population estimates between treatment and control sites are then compared before and after project treatments were applied.

### Conclusions and Recommendations

It is too soon to evaluate the effect of our restoration efforts on fish productivity. Pre-treatment data has been summarized for the Great Brook project and will not be evaluated until after one year of post-treatment data has been collected in 2007. Pre-treatment data collection is scheduled to be completed on the Mill Brook project in 2007, with post-treatment data collection planned to start in 2009.

#### *Are stream habitat restoration/improvement projects resulting in increased habitat complexity?*

Another goal of stream habitat work is to improve habitat complexity of streams and floodplains. In conjunction with our efforts to measure changes in fish populations in the projects noted above, we will also be measuring changes in both the proportion of and quality of habitat types. Parameters that will be compared are habitat type frequency, pool habitat area, pool depth, pool cover, and pieces of wood. Changes in fish population estimates can then be linked to changes in stream habitat conditions. Post-treatment habitat data is scheduled to be collected for the Great Brook project in 2007 and for the Mill Brook project in 2009.

### Conclusions and Recommendations

Unlike fish productivity, qualitative changes in fish habitat can be observed more easily. Field observations of the Great Brook project indicate that increases in habitat diversity, pool depth, and pool cover have been realized in the short-term. These changes in habitat will be quantified in 2007 and compared with pre-treatment data during the winter of 2007-08.

### Stream Invertebrate Communities

#### *Are management activities influencing the distribution of aquatic stages of sensitive mayflies and their related communities?*

Recent additions to the Regional Forester's Sensitive Species list include two mayfly species of the genus *Ameletus*. Little is known about these mayflies except for their dependence on coldwater streams. Our monitoring will



A University of New Hampshire biologist conducts invertebrate sampling. WMNF photo by Mark Prout.

help us determine if national forest standards and guidelines and state best management practices provide adequate protection for these sensitive species.

The Forest has partnered with the University of New Hampshire to learn more about the aquatic insect communities of the White Mountains. Sampling for aquatic insects across the National Forest is occurring bi-weekly throughout the spring and summer. Sampling locations cover a range of WMNF management areas, including experimental forest and wilderness stream sites. Some sites will occur downstream from areas where future management actions may take place, such as stream restoration, culvert replacement, or forestry practices. This approach will allow us to document the variability of the aquatic insect community both from watershed to watershed, and also from year to year. This will then allow us to determine if management practices are altering aquatic communities, and also the presence of *Ameletus* species, outside of the range of natural variability.

Sampling was conducted in five different watersheds in 2006 to establish baseline inventories of aquatic insect diversity, including the distribution of *Ameletus*. *Ameletus tertius* was found in four of the five watersheds sampled.

### Conclusions and Recommendations

Sampling in future years should continue, depending on availability of funds, to determine the year to year variability in invertebrate populations of White Mountain streams. *Ameletus tertius* appears to be present in most coldwater perennial streams, after being found in 4 of 5 watersheds sampled.

One watershed that contained the species in 2006 and the watershed where it was not found will be re-sampled in 2007 to determine if presence varies from year to year.

## Stream Temperatures

### *Is the proportion of coldwater and warm water streams changing during the planning period?*

Monitoring will help determine if we are meeting one of the primary Forest Plan goals for riparian and aquatic habitats “to provide for coldwater, coolwater, and warmwater aquatic communities within the ecological capability of the landscape.” Species composition of the fish community is strongly influenced by the extremes in water temperatures a stream experiences during the summer months.

It is presumed that most White Mountain streams would be classified as coldwater if turn-of-the-century logging had never occurred. Small- to medium-sized brooks that drain the mountains and are shaded by the adjacent forest are generally expected to be coldwater streams. As water flows down to the larger valley bottoms, a stream eventually reaches a width where mature forest canopy cannot shade the entire stream bed. These reaches generally begin to warm more during the summer months. Our monitoring effort will classify streams into an ecologically-based thermal classification. This will allow us to track changes over time and determine if Forest Plan guidance is ensuring that we are meeting riparian goals.

Three classifications are generally accepted to indicate how stream temperatures affect aquatic life communities: cold, cool, and warm. Studies have shown that average July stream temperatures correlate well with species composition of the fish community. The following average July temperature ranges are being used to predict the fish community present in a stream:  $<18^{\circ}\text{C}$  for “cold”,  $18\text{-}21^{\circ}\text{C}$  for “cool”, and  $>21^{\circ}\text{C}$  for “warm”.

For the 2005-2006 monitoring period, five watersheds encompassing mostly M.A. 2.1 lands were selected: Mill Brook (Stark), Upper Ammonoosuc River (Berlin), North and South Branches of Gale River (Bethlehem, Franconia), Sawyer River (Livermore), and Wild Ammonoosuc River (Benton, Easton, Landaff). A total of 32 sampling locations were measured on a variety of stream sizes, including 1<sup>st</sup> through 4<sup>th</sup> order streams (small tributary streams to large rivers).

The table summarizes the number of sample sites by stream order and thermal classification.

Stream Order	Cold	Cool	Warm	Total
1	7	0	0	7
2	8	2	0	10
3	10	2	0	12
4	1	2	0	3
<b>Totals</b>	<b>26</b>	<b>6</b>	<b>0</b>	<b>32</b>

The majority of streams were classified as coldwater streams. Two 2<sup>nd</sup> order streams were ranked as coolwater streams. Given the presence of ponds and beaver activity, and the low gradient nature of these two streams, they probably are not capable of being coldwater streams. Four 3<sup>rd</sup> and 4<sup>th</sup> order streams were ranked as coolwater streams. These sites were larger rivers with dam influences, road corridors that paralleled the streams, and private land ownership within the riparian areas. Most of these alterations that have reduced riparian forest shade occurred many decades ago. Some of these sites may have always ranked as coolwater under the current climate due to the amount of solar radiation that these larger river sites receive.

### Conclusions and Recommendations

This baseline information suggests that National Forest land management in the watersheds monitored has resulted in well shaded stream habitats. The Forest will monitor stream temperatures in additional watersheds in 2007 to expand the baseline dataset for the Forest’s revised Land Management Plan and determine if Forest Plan standards and guidelines are effective.



Patte Marsh.

## Fire Management

### Prescribed Fire



*Firefighters control a prescribed burn. WMNF photo by Erin Small.*

Prescribed fire is used as a tool on the White Mountain National Forest to enhance ecosystem resiliency and address resource management objectives. Specifically, it helps maintain fire-adapted communities, restore fire to its natural role, provide wildlife habitat, reduce fuel loads, and maintain scenic vistas. The fire program aims to treat between 80 and 300 acres annually using both prescribed fire and mechanical methods.

Monitoring helps us ensure that the use of fire as a tool is meeting Forest Plan objectives as well as effectively meeting our resource objectives as described in each site-specific burn plan. We examine the results of each burn to determine if the results are as expected, and adjust future fire plans as necessary. In addition, monitoring can address some of the concerns raised during the environmental analysis process, such as fuel reductions, particulate matter output, invasive species invasion, survival rates of scorched mature trees, and effects on soil in burned areas.

Priority for monitoring prescribed burns has been placed on understory burns used to maintain the viability of certain fire-adapted communities of pine, oak, birch and/or aspen. The intent of the fire is the preparation of sites for the restoration and regeneration of these species and the removal of competing vegetation.

***Is prescribed fire being effectively used as a tool to meet management objectives set forth in the Forest Plan? Are prescribed burns meeting the fire effect objectives set forth in each burn plan?***

Each burn plan states specific project objectives which can be measured through monitoring and evaluation. Not all indicators will be important to measure on every project. The following are project-specific attributes of interest which can be used as indicators or qualitative measures of success:

- Duff and litter reduction (expressed in a percentage of reduction from pre-burn)
- Seedling establishment (relative change by species through time)
- Herbaceous cover (increases and reductions by key species, specifically non-native invasives and/or economically significant species such as blueberry)
- Fuel loading (often measured in volume reduction after the fire)
- Mature tree attributes (growth, crown and bole scorch, mortality)



- Canopy cover (percent reduction to determine the opening of growing space)
- General stand changes (can be assessed by photo point and ocular interpretation)

During the summer and fall of 2006, baseline data on prescribed fires was collected, and monitoring and implementation guides created. Preliminary data on three understory burn sites was collected.

- Moat Burn, on the Saco Ranger District, was measured for pre-burn status in four units. One unit was burned in 2006 and post-burn data was collected.
- Harriman Brook, on the Androscoggin Ranger District, was burned in 2004 and 2005. Some pre-burn data was collected in the early 1990s and can be compared to the post-burn data collected in 2006.
- Batchelder Brook, on the Pemigewasset Ranger District, is planned for a future prescribed burn. Pre-burn data was collected for two units, and post-burn data will be collected in the future.

Specific data collection was conducted using methods set forth in a national monitoring system called FIREMON which was designed to store and analyze fire effects data. Spatial data of monitoring points are also documented within the Forest's GIS data storage system.

One objective of the Harriman Brook burns was to reduce understory hardwoods and increase conifers and oaks. Examination of the data shows no significant reductions in hardwoods, but white pine seedlings increased



*FIREMON monitoring.  
WMNF photo by Erin  
Small.*



Canopy mirror used to measure openings in the forest canopy. WMNF photo by Erin Small.

by more than 200%, red oak increased by 100%, and hemlock increased by more than 4000%. It's too early to determine the success or failure of meeting objectives related to species composition; additional monitoring will occur on this site.

One Moat unit was measured both pre- and post-burn and produced some very preliminary results showing a significant reduction in one-hour fuels, litter volume, and depth — all of which were stated objectives for this burn. There were also significant changes in seedling species composition: most importantly was

the 185% increase in red oak seedlings. The promotion of oak species is a stated objective in the Moat units as well as many other understory burns. While it is too soon to tell if these seedlings will succeed and contribute to true ecosystem change, this data is encouraging.

The results of prescribed fire, when considered together with the weather and fuels condition on the day of burn, can influence future burn plans as fire managers determine on which sites and under what conditions prescribed burning appear to best meet ecological or silvicultural objectives.

### Wildland Fire Use (WFU)

The new Forest Plan allows the management of naturally-ignited wildland fire to function as a natural ecosystem process to meet resource objectives. The main objectives of Wildland Fire Use on the White Mountain National Forest include restoring fire to its natural role in the ecosystem, as well as maintaining the viability of fire-adapted communities (such as the pine-oak woodlands and aspen and paper birch). The specific actions required to meet the objectives and protect people, property, and other resources are spelled out in the Forest Fire Management Plan and in individual prescribed fire plans.

#### Management Areas on WMNF where WFU is allowed according to current policy.

MA	Description
5.1	Wilderness
6.1	Semi-Primitive Recreation
6.2	Semi-Primitive Non-Motorized Recreation
6.3	Semi-Primitive Winter-Motorized Recreation
8.1	Alpine Zone
8.3	Appalachian Trail (only when adjacent MA allows WFU)
8.4	Research Natural Areas
9.1	Recommended Wilderness
9.3	Candidate Research Natural Areas

Monitoring the effects of a wildland fire is critical for assessment of ecosystem changes and rehabilitation needs. We will ask the following questions: In 2006, work began on an implementation plan for Wildland Fire Use events, and is expected to be completed in the 2007 Fire Management Plan. Post-fire protocols will be developed.

### Monitoring Process

*Do wildland fires managed using Wildland Fire Use successfully meet objectives set forth in the Forest Plan and Fire Management Plan? Did the fire stay within the allowed management areas and fire behavior parameters presenting low risk to firefighter and public safety? Did the fire function as a natural ecosystem process to restore or maintain natural plant communities? Were hazardous fuels reduced?*

During Fiscal Year 2006, the WMNF Fire Management Plan was updated to include Wildland Fire Use. This plan now specifies how and when wildland fires can be used to meet management objectives. While Forest personnel have met all the procedural requirements, no opportunity occurred during 2006 to use this tool.

### Conclusions and Recommendations

Long term monitoring of prescribed fire in the northeast has been limited. Interagency data sharing is critical in the determination of how our prescribed fire programs are affecting ecological attributes on both site specific and landscape scales.

In 2006, we provided training in the FIREMON methodology at New Boston Air Force Station. Participants included natural resource managers from Department of Defense, The Nature Conservancy, Durham Field Office, as well as Green Mountain and White Mountain National Forest employees.

To improve interagency data management, FIREMON is merging with the National Park Service monitoring system called Fire Ecology Assessment Tool (FEAT).

Data collected in 2006 is stored and available through the FIREMON database. Protocols have been established for the WMNF and can be reviewed in the document, "WMNF Prescribed Fire Monitoring (FIREMON) Manual". Direction can also be found in the "WMNF Prescribed Fire Monitoring Implementation Guide."

This monitoring process will need to be continued into the future. Fifty percent or more of key understory burns should be measured once pre-treatment and again at post-treatment intervals (1 year, 5 years, and 15 years). Continual re-evaluation could be useful for studying long term effects of prescribed burns.

All pertinent Forest Plan standards and guidelines are being applied, and it appears that progress is being made in meeting objectives. Formal monitoring will continue, and informal monitoring through fire mangers' field visits before and after burning will also continue.

## Forestry

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Monitoring regeneration after a harvest is a legal requirement to ensure adequate restocking of tree species following harvests such as clearcuts and shelterwood seed cuts. 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 three years after the harvest.

Monitoring destructive insects and disease organisms occurs annually to track trends in insect and disease activity. It can be used to determine when management action should take place.

### *Are lands adequately restocked following harvest?*

Surveys are conducted by Forest staff as they walk through the harvested area and count the number of seedlings in several mil-acre (1/1000<sup>th</sup> of an acre) plots. The plot is considered adequately stocked if it has at least a certain number of seedlings present depending on the forest type, e.g. northern hardwood or spruce-fir. Forest staff then calculate the percentage of plots adequately stocked. All 759 acres surveyed in 2006 were found to be adequately stocked.

Historically, our temperate climate ensures adequate restocking after regeneration harvest. Some portions of stands that are very wet or areas of summer skid trails sometimes take longer to regenerate, however these areas are usually a minor part of any harvested area.

Regeneration of oak and pine has been of interest as it can be challenging at times. Research by the University of New Hampshire, among others, has indicated that prescribed burns and shelterwood harvests can be effective in regenerating these species. The WMNF has begun to use prescribed fire to help address the regeneration of these forest types. We are monitoring the effects of a few earlier burns. The results thus far are summarized in the Fire Management section.

### *To what extent have destructive insects and disease organisms increased?*

The State & Private Forestry branch of the Forest Service conducts an aerial flight detection survey over the WMNF annually. The 2006 flight report is due in the near future. The March 2006 report covered the summer 2005 flight. Conditions were similar to most years, reflecting small outbreaks of foliar damage or tree mortality caused by insects — well within the normal range of experience.

One difference was about a 5,000 acre area of defoliation in the North Conway area due to gypsy moth infestations. Hardwood trees can withstand several years of defoliation depending on conditions such as drought. This area will be monitored in future flights for detection of possible mortality.

We began attending meetings of the New Hampshire Forest Pest Advisory Board this past year. As part of that effort, an action plan was drafted in case the emerald ash borer enters New Hampshire.



*New growth oak and other species regenerate after the prescribed fire at Harriman Brook. WMNF photo by Pat Nasta.*

We continue to see mortality in primarily paper birch, resulting from the 1998 ice storm.

To date, there have been no outbreaks of hemlock woolly-adelgid and emerald ash borer on the Forest. These are two potentially devastating, non-native invasive insects that threaten forests in the northeast and elsewhere.

### Conclusions and Recommendations

We are considering adding a 10-year regeneration survey in hardwood stands, as research indicates that the ultimately dominant species in the new regeneration usually do not exhibit their dominance until up to 10 years after the harvest.

We will continue to monitor our efforts to regenerate pine and oak species. This will take approximately 10 years to conduct and evaluate prescribed burns and cuttings, and will have to take into account other influential factors such as periods of drought or poor seed crop years.

## Heritage

We monitor our heritage sites to identify and address damage by any form of disturbance, including project activities, vandalism, or erosion.

We monitor our significant sites and structures whenever there is a project or other potential form of disturbance in the area. We have initiated a shovel test program for likely prehistoric site locations which may be impacted by project actions. Project designs may be adjusted as a result of shovel tests, with follow-up monitoring conducted after project implementation. Since there is potential for cultural materials in the areas between our shovel test locations, post-project monitoring is an important part of our compliance and data recovery work.

To date no deposits requiring halting of work and further systematic investigation have been found.

A Passport in Time (PIT) volunteer project accomplishes monitoring and maintenance work at cemeteries on a biannual basis.

### *What are the impacts to cultural and historic sites?*

We are addressing the compliance requirements of laws regarding heritage resources and meeting Forest Plan objectives. Our approach has been to focus on Section 106 of the National Historic Preservation Act as amended. Other needs, such as non-project supportive survey, evaluations of sites and historic buildings, interpretation, and heritage site management plans are being addressed as time and budgets permit.

Guidance in our Forest Plan has served us well in addressing legal requirements for preservation and protecting our heritage resources. Thus far we have seen the expected results of project implementation: our surveys protocols, mitigations, and standards and guidelines are designed to provide for site avoidance and protection.

### Conclusions and Recommendations

Continue with the present course of action and look for opportunities to form partnerships that will allow us to address site evaluation needs.



*Shovel testing to locate potential cultural resources. Inset: stoneware pottery fragment. WMNF photos by Sarah Jordan.*

## Geologic

### Monitoring Rock and Mineral Collecting



Hobby rock and mineral collecting is a popular activity on the White Mountain National Forest, especially in areas where crystals have been found. Monitoring measures whether sites are being maintained to safety and resource protection standards, and focuses on fee sites. It specifically evaluates whether the Deer Hill fee site is being maintained, and whether the collecting activity itself meets Forest Plan standards and guidelines. This helps managers determine if additional actions are needed to protect the sites.

#### *Are recreational mineral collecting areas being maintained? Do they meet standards and guidelines?*

On average, mineral sites were visited once or twice a week through the summer. A log was kept identifying what was found and noting if corrective action would be needed or had been taken.

An annual mineral report summarizes hobby collection areas visited, status of individual sites, and the effectiveness of closures. It also lists the number of permits issued.

Sites appear to be meeting standards, and corrective actions have been taken promptly to maintain sites and address safety hazards.

### Conclusions and Recommendations

Monitoring has shown that sites are being maintained and users seem satisfied. Forest Plan standards and guidelines are being met. As a result of decisions made in the 2005 Forest Plan, legal requirements are now clearer for both permit holders and law enforcement.

Forest staff participated in the 2006 Maine Mineral Symposium with an informational poster and handout to help educate people on proper collecting techniques that will minimize impacts. A brochure has been drafted for use in 2007.

*Above: A Forest Service minerals specialist checks on young mineral collectors at Deer Hill. Right: Summer maintenance at the Deer Hill site. WMNF photos by Livia Crowley.*



## Plants

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### TES Plant Population Trends



Monitoring threatened, endangered, and sensitive plants helps us answer several questions and adapt our management as needed to ensure these species persist on the Forest. Are specific rare species populations declining, increasing or remaining stable? Are there any species-wide declines? Are declines or increases part of a natural fluctuation or caused by a change in site conditions or the surrounding environment? Evidence of declines in species populations may indicate the need for management action to stem or reverse population declines. Without monitoring, species populations may reach a point from which recovery would not be possible.

The health and trend of rare plant populations are often excellent indicators of overall ecosystem condition and health. By monitoring these species and exploring the cause of population changes, we not only get a greater understanding of the condition of the rare species, but also may gain insight into condition and trends of water quality, effects of human and natural disturbance, air quality, and even global warming.

#### *Are individual known occurrences on the Forest increasing, stable, or decreasing?*

*Monitoring rare plants in Tuckerman Ravine. Photo by Doug Weihrauch, Appalachian Mountain Club.*

The White Mountain National Forest supports 54 species of threatened, endangered, and sensitive (TES) plants, which includes federally listed plants and Regional Forester sensitive species. Additional species, considered rare by the states of Maine and New Hampshire, also occur on the Forest.

Taken together, these species account for hundreds of plant populations across the National Forest landscape. Monitoring is assigned at one-, five-, ten-, or sometimes twenty-year intervals, depending on the species and habitat for all current populations. Extensive site data is collected, compared to previously collected data, and analyzed for trends, management needs, and population stability. Forty-five rare plant populations were monitored in 2006.

The Forest Service partners with state and federal agencies, as well as non-governmental organizations, to acquire information on plant population trends. These organizations include New Hampshire Natural Heritage Bureau, Maine Natural Areas Program, United States Fish and Wildlife Service (USFWS), the Appalachian Mountain Club (AMC), and The Nature Conservancy (TNC). Our largest single partner in gathering this data is the New England Wild Flower Society (NEWFS) through its Plant Conservation Volunteer Program and New England Plant Conservation Program. Data collected is recorded on the appropriate rare plant data form and entered into USFS, Maine or New Hampshire Natural Heritage Program



(NHP), and NEWFS databases. Copies of the actual data collection forms and associated maps are also sent to NHP and NEWFS.

In 2006, a framework to establish conservation approaches for all TES plants was established. Several outstanding natural communities were identified and conserved through project-based survey work. On the Androscoggin Ranger District, an additional example of a northern white cedar seepage forest was discovered and is being permanently protected through land management designation. This community, only the second of its type on the Forest, is designated by the 2005 Forest Plan as an Outstanding Natural Community. Several areas of suspected Old Growth Forest were discovered during timber sale survey work. These areas were reserved from timber harvest, are being evaluated to determine their actual age, and will be permanently protected if determined to be Old Growth Forest.

## Federally Threatened

### *Small Whorled Pogonia (Isotria medeoloides)*



Monitoring results for small whorled pogonia reveal that the population is small and scattered with infrequent and low levels of flowering and fruiting. The population is stable, but potentially subject to extirpation if impacted by a catastrophic event. In response to this potential threat, and as a result of monitoring over the past ten years, the Forest has developed a plan to manage the area surrounding this population to create a more open forest condition, which should benefit the plants.

Research by the WMNF, TNC, and the USFWS is seeking to answer the question, “What are the necessary conditions under which small whorled pogonia will successfully break dormancy and/or flower and fruit?” This research will provide Forest resource managers with the methods to ensure stable or increasing population levels for this species.

## Delisted

### *Robbin’s cinquefoil (Potentilla robbinsiana)*

*Small Whorled Pogonia. Photo by Dorothy Long, New England Wild Flower Society.*

In 2001, Robbin’s cinquefoil became the first plant species to be removed from the federal threatened and endangered species list. The Appalachian Mountain Club, under contract with the WMNF and the USFWS, completed the five year, post-delisting monitoring of all natural and introduced populations of Robbin’s cinquefoil. The data they collected and analyzed provide trend information on Robbin’s cinquefoil populations occurring on the Forest, as well as detailed information on population status, recruitment, and the success of introduction efforts for the species.

These results indicate that, overall, the natural and introduced populations are stable, with several showing signs of natural growth. Only a small subset of introduced populations shows declines or failure, and the failure appears to be caused by sub-optimal habitat for the species. Introduction of additional plants is continuing in a small viewing garden through a partnership with the New England Wildflower Society.

## Other Rare Plants



*American ginseng.*  
WMNF photo by John Williams.

Other populations of rare species monitored in 2006 appear to be stable, with several showing distinct increases. Of note, in addition to several previously unknown populations of American ginseng being reported in 2006, one population increased from seven plants in 2000 to 104 plants in 2006. Another species, three birds orchid, was also discovered at two new locations in 2006. One already-known population increased nearly 1,000 percent since 1997.

It is often difficult to discern, even with regular monitoring, a trend in plant populations. Is a noted increase in populations numbers the result of a change in environmental conditions, population growth, or more detailed search efforts? Additionally, small to moderate increases or decreases may be due to natural population variation that occurs from year to year.

Data gathered by the Forest Service and our collaborators provide enough information to understand and track the population trends of some rare plants. For other species, it is too early to determine population trends. For individual populations, trends are difficult to establish due to natural fluctuations. For species population levels, it is much easier to establish trends. Historical monitoring data, from 1990 to the present, reveals that most, if not all, rare species occurring on the Forest are either stable or increasing in population numbers. There appears to be no need to alter the level or intensity of current management of these species. Plant populations are dynamic and variable; as climate, use, and land management activities change, so does the potential impact on plant populations. Continued regular, long-term monitoring is necessary to protect and continually evaluate rare plant population trends on the Forest.

## Cliff Plant Ecological Indicator

### *What are the effects of cliff-related recreation use on cliff plant abundance and rare plant persistence?*

Cliff plant communities contain unique assemblages of species that are often rare and/or uncommon, and occur nowhere else on the WMNF. The areas at the base of cliffs are often enriched and laden with perennial or seasonal moisture which fosters the development of unique plant communities containing rare species. Conversely, the dry, thin soils of cliff summits are exposed to the extremes of heat, cold, and wind, and here the plants, some rare, have adapted to these unforgiving conditions, although they can be damaged by rock climbing and other recreational use of cliffs.

Monitoring cliff communities is relatively new; past efforts have been species-specific and have not accurately, if at all, assessed the impacts of recreation activities. The gathering of baseline data on species diversity, abundance, distribution, and health, along with recreation activities, level and season of use, and an assessment of past impacts, will allow resource managers to continue to provide recreational opportunities in these areas while protecting fragile natural communities and rare species.

The Forest collaborated with local and regional experts on rare species and rock climbing to develop a monitoring protocol based on similar efforts conducted elsewhere in North America. Monitoring will look at plant diversity, percent cover, and abundance, comparing areas on the same cliff face that are subject to climbing use to those areas where climbing does not occur. Our partners in the development and review of the monitoring protocol included New Hampshire Natural Heritage Bureau, Hubbard Brook Experimental Forest, and The Nature Conservancy.

The process for determining which cliffs to monitor is in progress, and site monitoring is expected to begin in 2008.

## Conclusions and Recommendations

All Forest Plan standards and guidelines designed to protect rare plants are being applied in WMNF management activities. The Plan requires that all project sites be surveyed for TES plant species and habitat, and that site prescriptions designed to protect these species be established. Results to date indicate the approach is effective.

## Non-Native Invasive Species

The spread of non-native invasive species (NNIS) across the landscape is recognized as a significant threat to the health of our nation's ecosystems. Here in the Northeast, the presence and eradication of NNIS is a point of discussion among land managers, town governments, state agencies, and non-profit organizations such as the New England Wild Flower Society. NNIS threaten the ecological and economic health of the both the White Mountain National Forest and the greater White Mountain region. Large, uncontrolled infestations of NNIS have the potential to disrupt ecosystem

*Japanese knotweed along  
Route 3 in Franconia.  
WMNF photo by Kori  
Marchowsky*



function, impact wildlife, reduce the recreational values, disrupt forest regeneration, and reduce the value of timber products produced on the Forest.

Non-native invasive plants are the main concern on the White Mountain National Forest, including such species as glossy buckthorn, Japanese knotweed, Oriental bittersweet, and purple loosestrife. The species impacting the WMNF are terrestrial or wetland species. No true invasive aquatic plants or animals have been documented on the Forest. Although outbreaks of some forest pest insects, such as fall web worm and eastern tent caterpillar, *do* occur on the Forest, these are native to North America and therefore not considered invasive. The Forest is currently free of infestations of any of widely-accepted NNIS insect species such as Hemlock Woolly Adelgid or Emerald Ash Borer.

Preventing NNIS spread, and efforts to eradicate populations, are increasing in scope and effectiveness on the Forest. The Non-Native Invasive Plant Control Project Environmental Assessment was completed in 2006, and the Decision Notice signed in January 2007. This document provides the necessary permitting and flexibility to respond rapidly and effectively to existing and new incursions of NNIS.

### *What portion of the Forest is infested with non-native invasive species?*

Extensive surveying by the Forest Service and the NEWFS from 2000 to 2003 established a baseline inventory of infested areas on the National Forest and in the greater White Mountain region. Data were collected on the location, abundance, density, percent cover, habitats impacted, and a variety of other ecological factors relating to the NNIS infestations located. The status of non-native invasive species is constantly changing as new infestations are discovered while existing infestations are eradicated or controlled. We continue to survey as a routine part of project planning, and regularly receive updates from the NEWFS, the Appalachian Trail Conservancy, and local citizens about previously known and newly-discovered NNIS infestations. Data regarding NNIS are maintained in the Forest Service's Terra database, which currently stores information about 203 infestations on lands managed by the White Mountain National Forest.

Twenty-three new infestations occurring on lands managed by the Forest Service (including a portion of the Appalachian Trail corridor) were reported in 2006. These are more likely newly-discovered areas of established infestations rather than new infestations resulting from recent spread.

The current level of monitoring and annual collection of data regarding the status of invasive species in the WMNF is adequate and necessary in order to prevent large-scale infestation. Currently, National Forest lands are less infested than the surrounding lands. Overall, the situation in northern New Hampshire and western Maine is better (fewer infestations) than in regions to the south and west. The dynamic nature of NNIS spread, control, and data collection means that conclusions concerning the level of infestation on the Forest will likely vary from year to year, and it may take a decade or more to determine whether we are gaining or losing ground to NNIS infestations.

## Eradicating Non-Native Invasive Species

### *To what extent have objectives been attained?*

Effective treatment of NNIS infestations is imperative for limiting the spread of NNIS, both on and off the National Forest. Eradicating NNIS is a relatively new activity on the WMNF, and one which will be monitored closely as we determine which methods are effective and which are not. Treatment protocols will be adjusted as necessary to achieve successful results and to meet our objectives for restricting the spread of NNIS.

Most locations of invasive species on the WMNF occur in areas where recent disturbance (either human-induced or natural) is evident. These include roadsides, river and stream banks, wildlife openings, cultural sites such as cellar holes and abandoned homesteads, and areas being developed surrounding the Forest. Humans, birds, other wildlife, and vehicles all disperse invasive plants to these locations, bringing them from areas outside the Forest that have already been invaded. Approximately 80 percent of invasive plant species were intentionally introduced and spread by humans as horticultural, landscape, or wildlife plantings. Today, the use of most of these species has been discontinued, but a few of the most highly invasive are still readily available for use in some states.

The Terra database is evaluated annually to determine which infestations are of greatest risk to the Forest and White Mountain region, and these are targeted for control the following year.

In 2005, we treated six infested sites with herbicides (glyphosate, the active ingredient in such products as Roundup®, Rodeo®, and Accord®), one site with the release of *Galarucella* beetles (which feed on purple loosestrife and



*Controlling Japanese knotweed infestation in Albany, ME, by covering with black plastic. WMNF photo by Jay Milot.*



*Controlling glossy buckthorn, in Jackson, NH. WMNF photo by Leighlan Prout.*

communities. A series of photographs of each site was taken to show conditions prior to treatment, and this will be repeated annually to provide a visual analysis of treatment effectiveness.

The effectiveness of the 2005 herbicide treatments was mixed, but generally positive. All but two of the treatment sites showed significant (between 80 and 100 percent) reductions in stem counts and percent cover. Two sites showed little effectiveness and it was determined that both sites were accidentally mowed prior to treatment, which drastically reduced the treatment efficacy.

The release of beetles has been on-going at a single site for two years, with the second release in 2006. Feeding beetles and damage to purple loosestrife plants was observed in September 2006. A noticeable reduction in purple loosestrife resulting from these biological control agents typically takes four to six years of beetle release and feeding.

The 2005 mechanical treatments were repeated in 2006. The overall effectiveness is low and the method requires annual application simply to maintain the status quo. Mechanical treatment is considered a stopgap measure for limiting spread until a more effective treatment can be applied.

## Conclusions and Recommendations

At this time, with only one or two years of monitoring data, it is difficult to reach any conclusions regarding the effectiveness of invasive species treatments on the WMNF. Early results show that the methods employed are highly effective, but the longer-term efficacy is still unknown. We will continue treating and monitoring, and will apply new techniques when called for. There is much research taking place across the country, although no significant findings were released in 2006 that would alter our management approach, and none of our results indicate a change is needed in the coming year.

## Recreation

Recreation on the White Mountain National Forest covers many activities, settings, and opportunities, and is enjoyed by a wide range of visitors. The Forest Plan outlined recreation management approaches to guide us in providing a quality experience for the many visitors to the Forest. These approaches include:

1. The Forest Service will emphasize concentrating use at specific sites or locations rather than dispersing use within the area or to other areas.
2. Forest Management actions will not disperse use from high to low use areas.
3. Current development levels in the backcountry will be maintained or lowered where appropriate.
4. Current low use areas and facilities will be managed, where necessary, to meet visitor needs and resource requirements through education and management controls.
5. High use areas and facilities will be managed for high use to meet visitor needs, while ensuring that they can be sustained over the long term. Appropriate mitigation will be provided to manage the effects of high use. Use will not be allowed to increase indefinitely in high use areas.
6. The Forest Service and partner organizations will collaborate to provide recreational opportunities, conservation education, and visitor information programs.

Monitoring efforts on the Forest area designed to track our progress in meeting these approaches.



*Backcountry ranger talks with hikers in the Alpine Zone.*



*Campsite at Hancock Campground. WMNF photo by Forrest Seavey.*

***How is the amount of use at Forest developed campgrounds, day use areas, developed facility permits and ski area changing over time?***

In 2006, use data was collected at developed campgrounds as number of sites sold and at ski areas as number of tickets sold.\*

Campgrounds – 44,211 sites sold

Alpine Ski Areas – 783,374 tickets sold

Nordic Ski Areas – 16,723 tickets sold

The number of sites sold at the campgrounds shows a decline over the last five years, with 11,115 fewer sites sold in 2006 than in 2002. While we do not have specific use numbers by day use site, we can get a broad picture of use by looking at sites which sell daily fee passes under the Recreation Enhancement Act. This figure does not however reflect those visitors who have already obtained recreation passes through other means (i.e., at another site or annual or weekly passes). This broad look has shown a decline in use at some sites over the last few years.

\*None of these figures reflect discounted admission such as Golden Age passes at campgrounds or season pass holders at ski areas.



*Over time is there a change in use at permitted Forest backcountry facilities?*

Partners have been collecting use figures and providing it to the Forest as a requirement of their special use permits. The following figures are for 2006. AMC hut system – 38,120 overnight guests

AMC Joe Dodge Lodge – 17,584 overnight guests

AMC backcountry shelters – 10,600 overnight guests

Hermit Lake Shelters – 5,109 overnight guests

RMC backcountry facilities – 3,212 overnight guests

At present, the trend shows that use of backcountry facilities has decreased in recent years, and we do not know the cause of this decline. We *have* noticed that use is being spread out over more months in the year, with an increase in winter use. At this point, the changes do not justify altering management practices.

*Where and how much backcountry use is attributed to permitted outfitter/guides?*

In 2006, 154 permits were issued for outfitter/guide use. As a requirement of their permit, outfitters submit a Summary of Use form at the end of their season which shows actual client days and itineraries used. Analyzing trends in these data can give an indication of whether the proportion of use by outfitters/guides is increasing or decreasing.

## Conclusions and Recommendations

The recreation management approaches (RMAs) have given us the basis to take a closer look at use across the Forest to better manage the quality of recreation opportunities. The RMAs provide guidelines for preventing unbridled recreation growth or development. By monitoring recreation use, we are in a better position to take needed management action before the quality or range of recreation opportunities declines. At this time, based on use figures, outfitter/guide monitoring, and dialogue with Forest Service staff, indications are that the RMAs are being implemented and are guiding recreation management on the Forest. In order to most effectively track the wide range of use that occurs, we need to develop a database or some other way to store this data consistently in one place. In addition, we need to develop a mechanism to engage partners in assisting with the collection of data. Monitoring use is labor intensive, and with limited Forest personnel it will be difficult to accomplish this task on our own.

## Socioeconomic

The White Mountain National Forest is the largest area of public land in New Hampshire and a small but unique piece of Maine’s public lands. It is a highly-visited outdoor recreation destination that also serves as a working forest. The Forest Plan was designed to balance the broad range of high quality recreation opportunities that visitors seek with the active forest management that provides jobs and commodities to local communities. Our monitoring tracks the economic and social contributions the Forest Service makes to communities and determines whether implementing the Forest Plan is affecting them as was anticipated in the FEIS.

***What are the key social and economic contributions of the Forest to local communities?***

Data gathered from national and forest-level databases cover funds provided directly to local communities (payments to states and payments in lieu of taxes), income brought in by the Forest Service (stumpage value of timber harvested, special use permit receipts, and recreation pass receipts), and data on Forest Service budget and staffing.

<b>Indicator</b>	<b>FY06</b>
Payments to States, New Hampshire	\$745,305
Payments to States, Maine	\$41,424
Payments in Lieu of Taxes, New Hampshire	\$1,002,338
Payments in Lieu of Taxes, Maine	\$57,212
Timber Harvested – Stumpage Value	\$2,547,972
Special Use Permit Receipts	\$526,702
Recreation Pass Receipts	\$598,218
WMNF Budget	\$12,837,844
WMNF Permanent Staff	120

### Conclusions and Recommendations:

While it is possible now to gather data from past years to provide trend information, using information from activities implemented under the previous Forest Plan would not meet the intent of this monitoring. It will thus be several years before there is enough information to reach any conclusion about the social and economic effects on local communities of the current Forest Plan. To be most effective, an evaluation of socioeconomics should be conducted and reported on every five years.

The monitoring guide calls for collection of the information in the table above to evaluate the socioeconomic role of the Forest. However, this information does not give a complete picture of the social or economic importance of the Forest Service in New Hampshire and Maine or all its contributions to local communities. This year’s monitoring indicates that a new protocol should be developed, not only to evaluate the funds brought in or shared with local communities directly, but also to consider the effect of recreational and other uses of the Forest on local economies.

## Soils

Soil survey teams at work. WMNF photo by Robert A. Colter.



### Monitoring Soil Productivity

One or more monitoring questions were developed to focus our monitoring in soils to address the issue of soil productivity as addressed in the Forest Plan. Soil compaction is an element of soil productivity that we monitor because we need to know if soil compaction is taking place, and if so, how detrimental is it, and does it disappear when the research data suggests it should. This is important because soil compaction can stunt future regeneration of tree stands and create more water runoff and less water retention, both of which ultimately affect soil productivity.

***Is soil compaction occurring? If so, are there indirect effects on forest productivity and/or forest health?***

Soil compaction and soil productivity are two conditions that are closely followed on the White Mountain National Forest. The data collected in 2006 was point data, that is, information obtained from soil pits dug randomly, from different projects, and resulted from studying soils in the 4 to 8 inch depth range. Specifically, we were looking for a loss of 15 percent soil porosity, which is our regional standard. A hole was dug, with the difficulty of digging noted, and the soils were examined to see if they showed evidence of compaction.

During the year, soil productivity was monitored by observing the condition of trees at several management projects, including the Stevens Brook, Whitetail, Chaise Hill, Priest Hill, Mill Brook, Than, Peabody,



Soil monitoring test pit. WMNF photo by Robert A. Colter.

Farwell, Rocky Branch, and Wildwood timber sales; and the Falling Waters, Franconia Ridge, Bridle Path, Wild River, Rattler River, and Slippery Brook hiking trails.

Monitoring revealed that the hiking trails were compacted in the trail width, which is to be expected and is the desired condition, but were not compacted outside the trail width. Monitoring the timber sale areas prior to harvest showed very little compaction from prior sales on those lands, and this gives the Forest good base data to compare with post-harvest monitoring in those areas.

A considerable body of research concerning soil conditions in the Northeast exists, dating from the late 1980s and early 1990s. Two studies, *Soil Disturbance by Logging in New England – Review and Management Recommendations*, by C. Wayne Martin, and *Harvesting Causes Only Minor Changes in Physical Properties of an Upland Vermont Soil*, by John Donnelly, John Shane, and Harry Yawney, concluded that compaction should be very limited on the White Mountain National Forest. One goal of monitoring in 2006 was to ensure that this information is still relevant.

## Conclusions and Recommendations

As pointed out above, research indicates that compaction from timber harvest on the WMNF should be very limited. In addition, 2006 monitoring of past sales indicates this to be true. In 2006, soils were also examined in planned timber sales. Follow-up monitoring on these sales once harvest has occurred can determine if any unexpected changes occur.

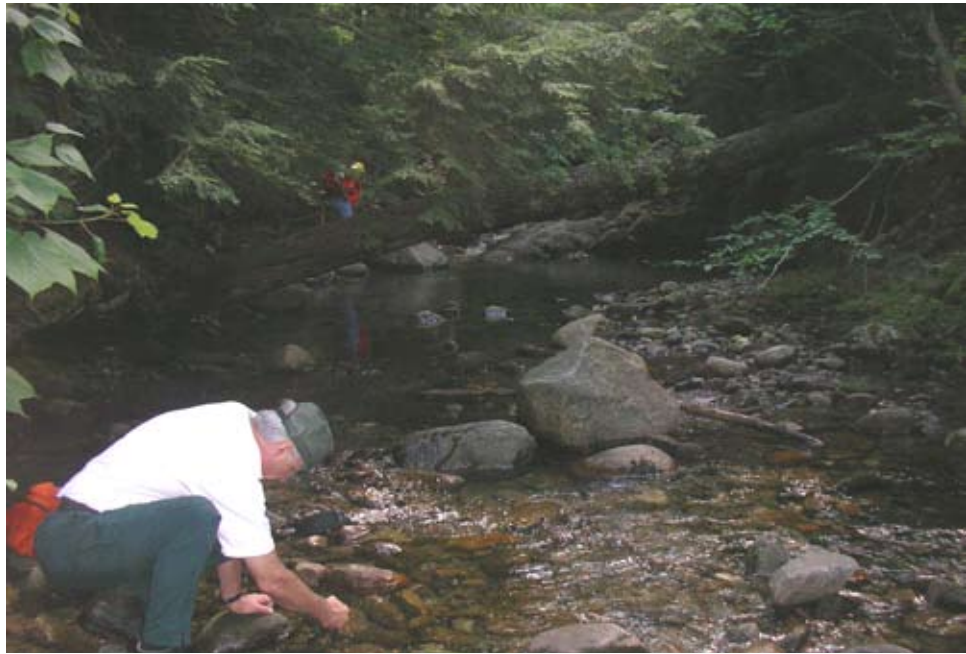
From a soils perspective, it is too early to tell if the objectives in the 2005 Forest Plan are being achieved. We are continuing work on partnerships for soil nutrient monitoring, and to implement measures that will minimize the effects of off-site soil erosion on Forest projects.

On all management projects, Forest Plan standards and guidelines are being followed and Best Management Practices (BMPs) are being implemented. Whole-tree harvest is being watched very carefully, and no whole-tree harvest is occurring on outwash sands or soils shallow to ledge. Management activities are not scheduled for seasons when soils are very wet.

BMPs appear to be producing the desired results, as no excessive erosion from monitored skid trails and hiking trails is taking place that could effect soil productivity. Tree health appears to be productive, because all clearcuts continue to revegetate and we have not seen an unusual degree of mortality on the Forest that could be an indicator of a nutrient deficiency.

## Water

*Taking a water sample at Steven's Brook. WMNF photo by Livia Crowley.*



### Water Quality Monitoring

Monitoring for water quality assesses the effectiveness of Forest Plan standards and guidelines, and is often accomplished by formal partnerships with researchers and other groups to study specific effects of management practices.

Less formal monitoring, to measure bacteria levels at Franconia Falls where there is high recreation use, is planned if funding becomes available. Monitoring of the Wildcat Wild and Scenic River helps to indicate whether management actions are sufficiently protecting the quality of that river.

We also monitor for the effectiveness of Best Management Practices. This monitoring assesses if mitigation has been incorporated into project plans. It evaluates whether such things as dust abatement, reduction in vehicle use, and prescribed fire timing considerations were used when needed. More specifically for water quality, it includes evaluation of whether protection measures for riparian zones, limits on harvest acreages in watersheds, and erosion control measures were used. The monitoring tends, for the most part, to be informal, and conducted through project reviews.

***What are the effects of management practices on water quality? In addition, is the Wildcat Wild and Scenic River water quality being maintained?***

In 2006, the Steven's Brook watershed was selected to assess how different timber harvest techniques and mitigations effect water quality. This cooperative project with Hubbard Brook Experimental Forest researchers samples different points in the watershed: pre-sale, during the sale, and

post-sale. Pre-harvest samples were gathered in 2006, and additional samples will be taken in 2007. The pH, temperature, and conductivity of the stream points are measured in the field; and samples are also sent for lab analysis, where metals such as aluminum, cations, and anions are measured.

In addition, samples collected in other watersheds where projects are planned will also help characterize these streams, and may help apply the Steven's Brook results across a wider range of stream conditions.

Field samples gathered in 2006 on the Wildcat River will be used to characterize the river and will help in determining trends in river conditions.

Lab data for the samples is not yet available and the field data is not yet ready to be summarized. Preliminary characterizations of the streams are planned for 2007 and 2008, with final results for the Steven's Brook project expected two years after the timber sale is complete.

A related macroinvertebrate research project, studying how these populations change with changes in water chemistry, has also begun on Stevens Brook, and will help show how water quality trends can impact aquatic life.

The site-specific monitoring described above, when combined with the relatively new studies cited below, will help the WMNF ensure that impacts on water quality are acceptable. Current analysis indicates that management activities are protecting water quality.

- Wang, Xing, D.A. Burns, R.D. Yanai, R.D. Briggs, and R.H. Germain. 2006. "Changes in Stream Chemistry and nutrient export following a partial harvest in the Catskill Mountains, New York, USA." *Forest Ecology and Management*, 223, pp103-112. Showed an effect on stream chemistry from a shelterwood harvest removing 33 percent of the watershed basal area.
- B.P. Baldigo, P.S. Murdoch, D.A. Burns. 2005. "Stream acidification and mortality of brook trout (*Salvelinus fontinalis*) in response to timber harvest in Catskill Mountain watersheds, New York, USA." *Can. J. Fish. Aquat. Sci.* 62:1168-1183. Showed an effect on water chemistry and trout mortality when 73 percent of basal area was harvested. No effects shown at 5 percent and 14 percent basal area harvest levels.
- Palmer, Sheila M, Brian I. Wellington, Chris E. Johnson, Charles T. Driscoll. 2005. "Landscape influences on aluminum and dissolved organic carbon in streams draining the Hubbard Brook valley, New Hampshire." Most streams showed a pattern of increasing pH and decreasing monomeric aluminum (Al) with decreasing elevation and increasing distance from the watershed divide.
- Palmer, Sheila M, Charles T. Driscoll. Chris E. Johnson. 2004. "Long-term trends in soil solution and stream water chemistry at the Hubbard Brook Experimental Forest: Relationship with landscape position." This research shows that while reductions in atmospheric deposition have resulted in improvements to acid neutralizing capacity and pH at high elevations, these improvements decrease with elevation.

- B.P. Baldigo; P.S. Murdoch; G. Lester. 2003. "Response of water quality and macroinvertebrate communities to forest harvests in small watersheds of the Catskill Mountains, New York, USA." Presented at the NABS Annual meeting, Athens, GA. In *Disturbance Ecology*. Showed an effect on macroinvertebrate species and water chemistry when 73 percent of basal area was removed through clearcutting, and no effect when 20 percent of basal area was removed through timber stand improvement treatments.

## Monitoring Implementation and Effectiveness of BMPs

### *Are best management practices prescribed and implemented for activities?*

Activity reviews were accomplished throughout the year by District personnel as well as specialists and the Forest Leadership Team. For a sampling of the results, see Chapter 6, Project Level Monitoring – Monitoring Through Activity Reviews.

Project environmental analysis in 2006 continued to prescribe protection measures and assess harvest thresholds. Informal and formal field reviews indicate that Best Management Practices (BMPs) are being prescribed, and that measures are working. Field reviews have been effective in discovering problems and correcting them.

Related research has developed some processes in the Northeast to aid in evaluating the use of BMPs, and these are being field tested on private lands in New Hampshire and Maine.

## Conclusions and Recommendations

At this time, neither the monitoring results nor the research indicates a need to change the Forest Plan regarding water quality.

Best Management Practices are being applied and appear to be effective in minimizing impacts. As for other Forest Plan implementation, one of the Plan's objectives is to maintain outstanding resource waters. Two projects are moving us forward: the CERCLA work at the abandoned Ore Hill mine, and the study begun on Lily Pond.

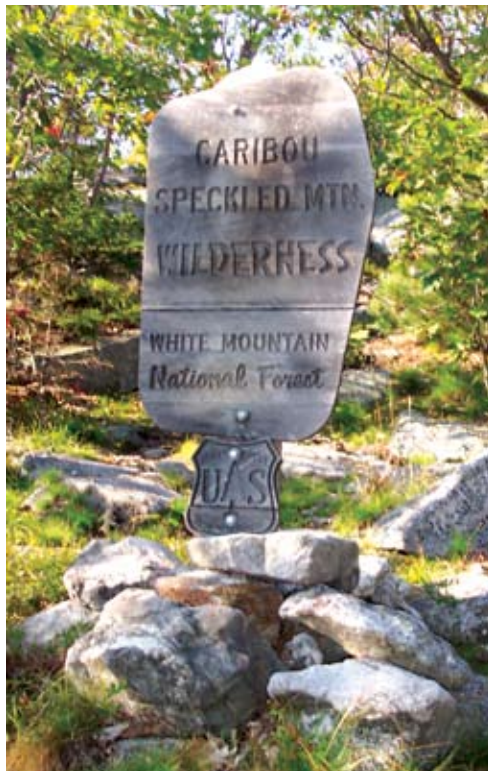
Historically, waste materials at the Ore Hill mine were deposited in a wet area and have been adversely impacting water quality. Work over the summer and fall of 2006 treated the tailings and waste rock with a neutralizing agent and moved them to a relatively dry depository site. The bulk of the restoration work at Ore Hill mine has now been completed, and initial monitoring shows improving water quality. The Forest Service plans to finalize restoration at the removal site in 2007.

At Lily Pond, sediment concerns were noted and water samples showed high conductivity. In 2006, samples were taken to better characterize the existing condition. A partnership was developed with Bates College to determine the source of the high conductivity, which may be caused by road salt. The study will confirm the cause and assist in the development of a restoration plan to improve the water quality.

## Wilderness

In addition to recognizing Wilderness as “an area where the earth and its community of life are untrammelled by man,” the Wilderness Act provides for recreational access as well as consideration of ecological, geological, scientific, educational, scenic, and historic values. The White Mountain National Forest Wilderness Monitoring Plan is aimed at providing a means of tracking management of the Wildernesses in such a way that these different values all receive proper attention. The plan sets forth an agenda and a program of work that aims to assure we maintain a balance among primitive recreation, ecological integrity, and other values of a heavily used urban national forest.

*Over time is there a change in visitor use on trails and at Wilderness destinations?*



Monitoring will provide use trend data that can be used to determine if managers are meeting the Forest wide recreation strategy and more specifically the Wilderness plan. Both of these are aimed at maintaining a balance between high, moderate, and low use areas. The Wilderness plan provides more specific and trigger points for when additional action should be taken. The monitoring will determine if some of those trigger points have been reached.

In 2006 we developed protocol and started collecting data to look at visitor trail use and visitor destination use (tables E-02 & E-03 in the Wilderness Monitoring Plan). For visitor trail use, 3 sample locations (one per each zone) were selected for each Wilderness. Samples were taken on predetermined dates and times. For visitor destination use, 1 destination per zone, per Wilderness was monitored on a predetermined date and time. Sampling occurred throughout the summer in all Wilderness areas.

### Conclusions and Recommendations

At this time, with only one year of monitoring data, it is not practical to establish trend upon which to make any conclusions. We will continue collecting data and evaluate it on three year intervals. As directed by the Wilderness Monitoring plan, if we see three consecutive years of increased use management actions will be triggered.



## Wildlife

Our wildlife monitoring includes a variety of different tasks. We survey rare or uncommon species periodically to assure their populations are stable and suitable habitat is available. These surveys are generally very focused, and designed to identify one or perhaps a few species. Other monitoring tasks are broader, with protocols that allow data to be collected and evaluated for many species. Some monitoring tasks require long-term commitments over many years in order to adequately evaluate trends and determine cause and effect relationships. Others focus on a specific question and may be completed quickly. All are important in providing information to better understand the relationship between species on the White Mountain nation Forest and the management actions occurring here.

### Bald Eagle Monitoring

#### *What is the population trend of breeding bald eagles on the WMNF?*



*Pair-bonded bald eagles. The larger female is on the right. WMNF photo by John Williams.*

Since its listing under the federal Endangered Species Act, bald eagles have steadily increased in number throughout their range. They have now recovered sufficiently that the U.S. Fish and Wildlife Service has proposed removing them from the TES list. New Hampshire and Maine state wildlife agencies, along with partners, survey their respective states annually to determine eagle trends. In 2006, both states reported the highest numbers of territorial pairs, and the most young fledged, in at least six years.

Eagles have never been common on the White Mountain National Forest, primarily due to lack of adequate foraging habitat (large lakes or rivers with abundant fish stocks). However, eagles are occasionally spotted roosting along the Androscoggin River in winter and flying near Lake Tarleton during the summer.

The purpose of Forest Service monitoring is to determine if nesting eagles occur near Lake Tarleton, a relatively recent acquisition to the Forest. If nesting is confirmed, actions can be taken to identify and protect the nest sites and feeding areas.

The staff of the Pemigewasset Ranger District visually inspect the area around Lake Tarleton on an annual basis. If eagles are spotted, follow-up surveys will identify nests and determine if eggs have been laid and hatched.

### Conclusions and Recommendations

In several years of surveys, no evidence of nesting eagles has been documented, and monitoring in 2006 produced the same results. It appears that bald eagles are not breeding in the Lake Tarleton area, but as the species' population continues to increase in New England, Lake Tarleton may become a breeding site. Continued surveys in future years will determine if additional management efforts are needed there.

## Loon Monitoring

### *What is the population trend of loons on the Forest?*

Despite their name, common loons have never been common on the White Mountain National Forest because its mountainous terrain naturally limits the large lakes that loons prefer. Loons may also be affected by high levels of human disturbance (including recreational activities), which can reduce the loons' ability to successfully nest and rear their young. Because of the limited loon habitat on the Forest, and the potential for recreation activities to indirectly impact viability, the common loon has been designated a Regional Forester's sensitive species. This means that there may be some risk to population viability on the Forest. Monitoring helps assure that Forest Plan standards and guidelines are adequate, and that no additional management is needed to protect this species.

While loon monitoring is done on some lakes by Forest Service staff, it is coordinated on a larger scale by the non-profit Loon Preservation Committee. A total of five lakes and ponds are surveyed on the White Mountain National Forest to see if loons are present at the beginning of the breeding season, with follow-up checks later in the season to determine if chicks have survived.

Loon numbers were down a little in 2006 compared to other years. Nesting pairs were present on three of the five waterbodies, but only one chick was produced. In the last ten years of data, the Forest has never produced more than three chicks in a given year, and 2006 was one of only two years in that period when a single chick was produced.

## Conclusions and Recommendations

It appears that the loon population on the Forest has held relatively stable over the last decade. Since the number of nesting loons has not changed substantially over the same time period, no additional management activities are recommended beyond continued monitoring.

## Mature MIS Population Trends

### *Are population trends of the MIS consistent with those projected under the Plan?*

Management Indicator Species (MIS) are plants or animals selected to represent a broad group of other species with similar habitat requirements. The National Forest Management Act, which guides the development of Forest Plans, requires the selection and monitoring of MIS as a way to display and track the effects of Forest Plan implementation. In the 2005 revision to the WMNF Forest Plan, two songbirds were selected to represent mature, low elevation forest habitats: the scarlet tanager (*Piranga olivacea*) in mature hardwoods and the blackburnian warbler (*Dendroica fusca*) for mature softwoods. By monitoring these species' population trends on the Forest, and correlating them with habitat changes, predicted effects can be validated or reassessed.

For these mature forest MIS, bird surveys are completed along fixed, 15-point transects located throughout the Forest. Each point is permanently marked in the field so data can be collected at the same location each year. Transect points are separated by approximately 250 meters. Each transect is visited three times during the breeding season, once during the last week in May and then every other week. During each 10-minute count, all birds heard or seen are noted, with their location recorded as within or beyond 50 meters of the point center. Although the purpose of the survey is to monitor scarlet tanager and blackburnian warbler, counting all bird species requires little additional effort and allows for further data analysis to examine population trends of many species. This particular monitoring has been in place since 1992 to monitor a variety of songbird species. In order to take advantage of the robust dataset produced, the mature MIS monitoring was specifically designed to follow the same protocol.

Surveys were completed annually on the WMNF between 1992 and 2002, and have since been completed every two years due to budget limitations. The 2006 survey was the thirteenth year of data collection, and sixteen transects (240 survey points total) were completed. Two transects (30 points) used in prior years were unavailable because access across private land to one of the survey areas has been denied.

Trends were determined based on the overall total data for each species, as well as separately based on management category. This was to evaluate if there were changes between habitats and consequently population trends in Management Area 2.1, where vegetation management such as timber sales are allowed to occur, and other management areas (generally 6.1 or 6.2), where vegetation management is much more restricted.

Analysis of scarlet tanager data resulted in no statistically significant trend between 1992 and 2006. Visual inspection of the raw data shows a stable pattern, with mean numbers of individuals per transect falling within the 95 percent confidence intervals of almost all other points (Figure 1). This supports the idea that there is no obvious increasing or decreasing trend for this species.

Blackburnian warbler showed a similar pattern as scarlet tanager (Figure 2). No statistically significant trend was apparent for this species over the same time period. Visual inspection of the raw data shows a stable pattern, with perhaps more variability than with scarlet tanager.

## Conclusions and Recommendations

There was no apparent difference between transects on MA 2.1 lands and those in other management areas for either species. This indicates there is probably nothing substantially different between mature forest habitats in areas harvested for timber and those that are not.

Based on these results, it is believed that species using mature hardwoods and softwoods have remained relatively stable since 1992. Additional data should provide more statistical reliability.

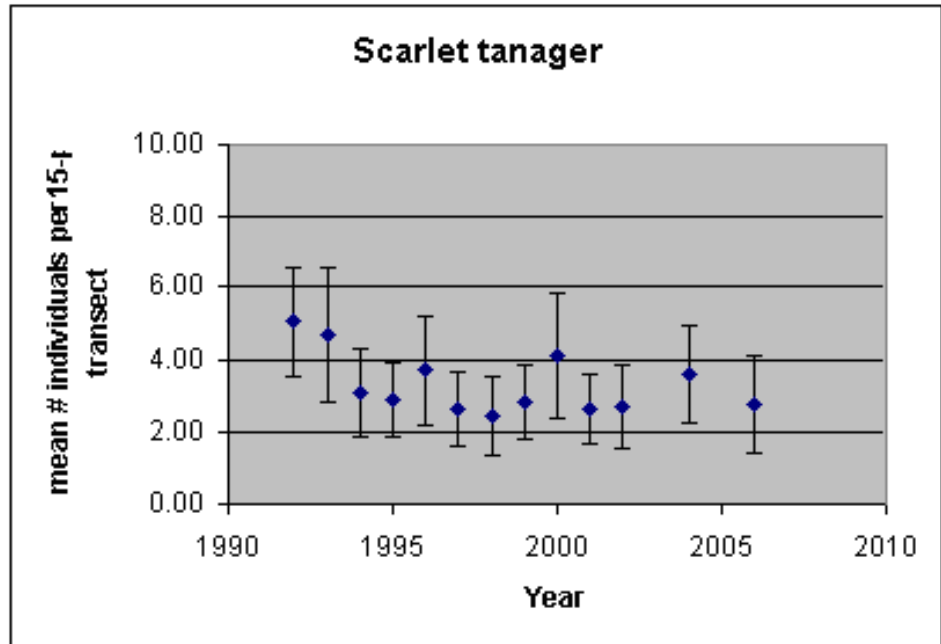


Figure 1. WMNF Permaplot bird survey data for scarlet tanager, all transects, 1992-2006.

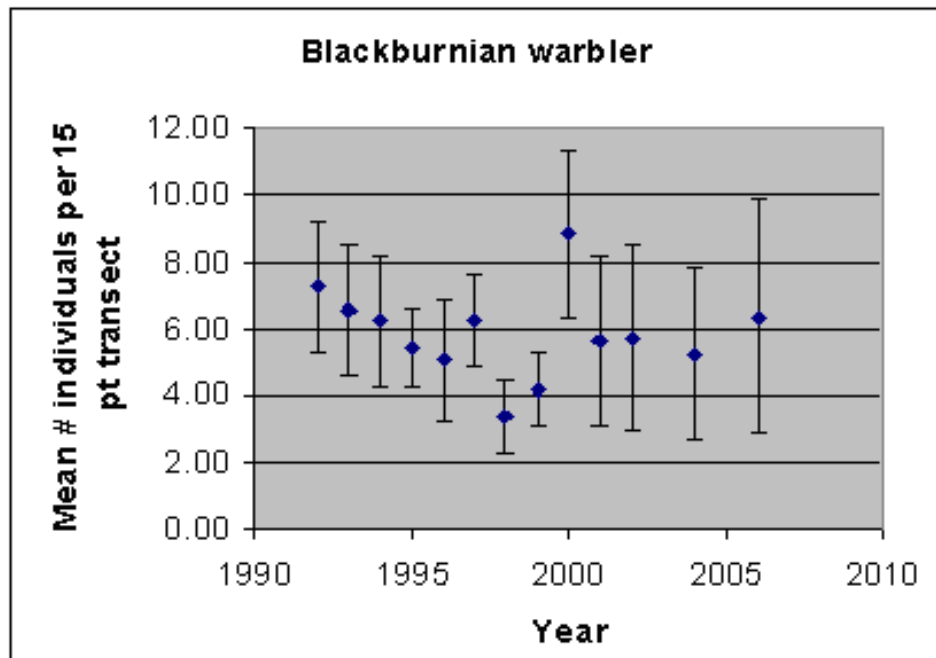


Figure 2. WMNF Permaplot bird survey data for blackburnian warbler, all transects, 1992-2006.

## TES Large Mammals

### *Are Canada lynx and gray wolf present on the WMNF?*

This monitoring is conducted to determine if Canada lynx or gray wolf, two federally listed species with no recent occurrence on the WMNF, are now present on the Forest. These species have recently been sighted in Maine and adjacent areas of Canada, and because both species commonly travel long distances to seek out new territories, the possibility of finding them on the Forest is high. In addition to searching for evidence of lynx and wolf, monitoring also helps identify locations of other uncommon species, such as American marten and bobcat, as well as of snowshoe hare, an important prey species for most large predatory mammals on the Forest.

Although the Forest Service has completed various monitoring exercises to gather information on these species, a new protocol was developed in 2003 and fully implemented starting in 2005. The protocol includes a series of 8 fixed transects located on existing winter trails that are visited twice between January and March each year. Transect location was determined by focusing on areas of abundant softwood habitat in order to improve chances of finding lynx. Transects are run between 24 and 72 hours after a snowfall, with little wind (to avoid snow blowing into tracks). Tracks that intercept the trail are identified and counted, although not all species' tracks are recorded. Refining of the protocol included discounting smaller rodents like mice and voles in order to cover more ground and gather as much information on the target large mammal species as possible.

Implementing this protocol during the 2005-2006 winter proved difficult, due to lack of adequate snowstorms and an early spring. A total of seven transects were completed, five on snowmobile and two on foot. Unfortunately, only three of the transects were completed with two replicates.

A total of 482 tracks were recorded during the 2005-2006 winter. With only two years of data collection completed, there is little to evaluate; although overall, fewer tracks were found in 2006 compared to the previous year. Snowshoe hare and red squirrels were the most often identified tracks, making up almost 60 percent of the total number of tracks. Coyote and fox were by far the most prevalent predators (21 percent of the total). Tracks of one bobcat and two martens were also identified. Snowshoe hare tracks were far more prevalent on the Androscoggin Ranger District than on other units. No lynx or wolf tracks were found in 2006.

Additional tracking sometimes takes place in other areas on non-fixed transects. In 2006, partners and other outside parties were instrumental in furthering knowledge of lynx on the Forest. In January, a tracking project implemented through the Audubon Society of New Hampshire identified a Canada lynx track immediately adjacent to the WMNF. The track was followed, and led into and out of the Forest. A scat sample collected for DNA testing was sent to the Forest Service's Wildlife Genetics Laboratory in Missoula, Montana; they confirmed the scat was from a female lynx. This is significant for several reasons. First, it confirms the presence of a lynx on the Forest, the first in New Hampshire since the early 1990s.



*Above: Canada lynx tracks found near the Forest in January of 2006. Below: Collecting data from the lynx tracks. WMNF photos by Lesley Rowse.*



Second, the DNA testing confirmed that this individual was a pure lynx, not a lynx-bobcat hybrid. There is some concern that a few lynx introduced to an area with an abundant bobcat population might hybridize and lose their genetic uniqueness, but that was not the case with this individual. Finally, although both male and female lynx can travel long distances, it is often males that tend to wander the farthest. The presence of a female could indicate a source population within a reasonable distance that could travel to the Forest and reestablish a breeding population.

Two months after the first lynx track was found, another was discovered approximately ten miles to the north and followed by employees from the WMNF and the New Hampshire Fish and Game Department. A number of compelling photographs were taken along several miles of tracks, although samples collected were not sufficient to extract DNA. Nonetheless, the size, shape, and track pattern provide strong evidence that these tracks were also made by a lynx, even without DNA confirmation.

## Conclusions and Recommendations

Two years of transect data are inadequate to accurately conclude the long-term presence or absence of rare species. However, now that the presence of lynx has been confirmed, monitoring in future years will help determine if this was an isolated event by a transient individual or if lynx are recolonizing the Forest.

## Wood Turtle

### *What is the population trend of wood turtles on the WMNF?*

The wood turtle is a designated Regional Forester's sensitive species on the WMNF. Like the bald eagle and common loon, habitat for this species is somewhat limited by the mountainous conditions of the Forest. Wood turtles prefer large, slow-moving streams with sandy areas nearby for nesting. Wood turtles have never been common on the Forest, and monitoring is important to assure this species persists.

*Right: Example of wood turtle habitat. Below: Male (left) and female (right) wood turtles found during 2005 survey. WMNF photos by Leighlan Prout.*



The Forest began its first comprehensive monitoring strategy for wood turtles by surveying potential habitats. In 2006, six areas in New Hampshire and Maine were surveyed using a protocol developed in 2005. The survey consisted of a targeted search along the banks of these slow-moving, sandy streams, either in early spring or in the fall. If wood turtles were found, measurements and photographs were taken. Wood turtles have distinctive markings and can be monitored as individuals, unlike most other species. Turtle tracks are also noted, since wood turtle tracks can sometimes be differentiated from other turtles.

No wood turtle evidence was found in 2006. The expectation for this monitoring task is that it may take several years for us to perfect the search protocol, since it is a new kind of monitoring for Forest employees.

### Conclusions and Recommendations

One year of data is insufficient to make recommendations for management changes. Additional areas are planned for survey in 2007.

### High Elevation Bird Ecological Indicators

#### *What are the effects of various recreation use levels on high elevation birds?*

During the recent Forest Plan revision process, a concern was expressed over increasing recreation use on the Forest and its possible impact on ecological and social values — the direct effect on wildlife as well as on the public's enjoyment of related activities like wildlife viewing, bird watching, and fishing. A variety of recreation activities have the potential to impact many species, but in order to reasonably address this concern, monitoring has focused on three sensitive areas: cliffs, alpine, and high elevation spruce-fir forest.

In 2006, the Forest designed a high elevation bird monitoring program to address recreation impacts in the high elevation spruce-fir forest. This area supports both a unique wildlife community as well as the highest density of hiking trails on the Forest. In order to focus potential impacts on a reasonable number of species, five birds (Bicknell's thrush, yellow-bellied flycatcher, blackpoll warbler, boreal chickadee, and spruce grouse) were chosen to serve collectively as an ecological indicator for this community. During 2006, collaborators with Forest Service Research, the University of Massachusetts, and the Vermont Institute of Natural Science analyzed the WMNF bird survey data in this habitat and concluded that of the twenty-three species with sufficient data to analyze, populations of Bicknell's thrush and yellow-bellied flycatcher (and magnolia warbler) all had statistically significant declines during the survey period. Since changes in vegetation in this zone are minor (the habitat is too high for timber harvest and most other forms of vegetation manipulation), vegetative changes are unlikely to be the cause of the decline.

A one-time study has been designed to explore possible correlations between hiking use levels and high elevation bird productivity and fitness: a PhD research project initiated through the University of Massachusetts



in 2006. Ninety survey sites were located in suitable habitat across ten high-traffic hiking trails on the Forest. Survey points were situated directly on the trail, and 200 and 400 meters from it (effects from hiking trails or their use are not expected beyond 400 meters). Data collected at each point will be evaluated to determine whether or not birds are avoiding trails. In addition, cameras and direct inspection of nests will help determine if nesting success differs as a function of distance from the trail.

While this study will help determine if recreation use levels are impacting bird productivity, we may find that recreation levels do not explain the population declines, and that other factors may be contributing. Other possible concerns for species in this habitat include mercury deposition and climate change. The toxic effects of mercury on organisms is not a new concept, but the pathways for how mercury becomes available to terrestrial animals in high-elevation ecosystems, and how it specifically influences their numbers or reproductive success, has not been well-studied.

Similarly, the effects of climate change may have serious consequences to species living in isolated habitats such as mountaintops. As temperatures warm, vegetation typically found in warmer, lower elevations may be able to move higher upslope and reduce the amount of high-elevation spruce-fir forest available, leading to reduced numbers in species dependent on this ecosystem.

## Conclusions and Recommendations

The 2006 work was the first year of an anticipated three-year study. Final results and recommendations are expected in 2009, and we hope this same project will be useful in identifying other potential influences.

## Moose Browsing Effects on Regenerating Clearcuts

Moose are attracted to regenerating timber stands for foraging because of the availability of quality food provided by hardwood seedlings and saplings. Even-aged harvest prescriptions, such as clearcutting, are often proposed in order to provide more browse.

Questions have been raised, however, by Forest employees and the public that browsing in some stands might be changing the ultimate species composition of the stand. It sometimes appears as though moose prefer more commercially valuable tree species, such as sugar maple, and pass over the less commercially valuable beech and striped maple. If this is indeed true, then over time it could lead to a forest dominated by a different tree composition.

In October, representatives from the WMNF, Forest Service Research, and the New Hampshire Fish and Game Department visited four sites on the Pemigewasset District. The purpose was to informally review regenerating stands and discuss observations. Based on anecdotal information from District staff, moose activity is consistently observed in Compartment 50 (Walker Brook area) and has been less evident in Compartment 112 (Tripoli Road area). Both compartments have had timber sale activity at about the same time, and have similar forest types.



*Above: This stand in the Walker Brook area was clearcut twenty years ago, and today shows evidence of good growth with no browsing damage. Right: An adjacent stand, clearcut five years ago, is expected to develop in the same manner as its older neighbor. WMNF photos by Leighlan Prout.*



All three of the younger stands showed evidence of browsing and appeared to be dominated by non-commercial species such as beech, striped maple, and pin cherry. However, after a number of vegetation plots were taken and analyzed to determine the actual quantity of trees (stems) in each species, a different picture emerged. There were far more commercial stems than appeared at first glance; in fact, the dominant stems in two-thirds of plots were commercial species. And even in the plots where non-commercial stems dominated, half had commercial species coming up below. Looking at the adjacent older stand, it was apparent that no significant damage as a result of browsing had occurred during earlier growing stages.

### Conclusions and Recommendations

- Evaluating stand condition only along the edge of a cut or along trails may give a distorted picture of the entire stand. Moose and deer like edges, so that's where the most browsing evidence may be seen, but that may not be representative of the rest of the stand.
- Smaller cuts will have more browse evidence than larger cuts.
- If the purpose of some cuts is to create wildlife browse, then evidence of browsing is a good thing.
- Within the first years following harvest, it may appear that the stand is dominated by non-commercial species. Raspberry and blackberry canes will be gone as soon as they start becoming shaded; pin cherry drops out in about 30 years; and striped maple lasts only a little longer than pin cherry.

- It is necessary to be cautious when looking at deformities and evaluating whether or not they truly will affect timber quality in the future. Trees rarely grow perfectly in the woods — temperature, wind, bruising, and other factors contribute to imperfections. For example, in the regenerating group cuts, a number of yellow birch with kinks and forks one to two feet above the ground (the result of earlier browsing) were observed. All were growing well, though, and will ultimately be suitable as a timber product.
- Keeping a landscape perspective is important. Moose and deer are wide-ranging animals. They may spend some time near a particular cut and browse it regularly, but will eventually move on to another location. Even in places where they have returned repeatedly over multiple winters, stands have still successfully regenerated. A look at any individual stand is just a snapshot within a larger picture and a longer time period.
- There will always be more stems in a regeneration age stand than in an older stand. Many of these stems will die (and need to die) as the stand grows, regardless of browse pressure.

The group agreed it would be interesting to have some permanent photo points and corresponding plot data that tracked cuts over time as a demonstration for the public. The researchers on the field review will evaluate if this can be set up as part of the long-term program of work at the Bartlett Experimental Forest.

## Wildlife

### Early-Successional Bird Abundance and Nest Success in Wildlife Openings

Two research projects were completed in 2006 through the Graduate School of the University of Massachusetts. The first was a Master's thesis project completed by Richard Chandler, who evaluated what bird species were found in managed wildlife openings on the WMNF, along with their abundance and how successful they were at nesting over a two-year period. Wildlife openings are areas of the Forest that are permanently managed in an open condition. Clearcuts can provide similar open conditions, but only on a temporary basis until they grow back into a mature stand. Wildlife openings tend to support more grassy, herbaceous vegetation, but may also be shrubby as the result of thick regeneration of tree seedlings. Forest Service biologists have wondered if the bird composition in wildlife openings might be different based on how the openings are maintained (mowed versus prescribed fire), or if their size or spatial arrangement in the landscape might play a role in species composition and nesting success.

Richard selected 57 wildlife openings to study, a sub-sample intended to represent the range of size and vegetation characteristics available on the Forest. All birds seen or heard within a 50-meter plot were counted in each opening, with each opening surveyed three times during the breeding seasons of 2003 and 2004. In 38 of these openings, nests were located and watched to determine rate of successful fledging.



*Example of a wildlife opening on the WMNF. WMNF photo by Richard Chandler.*

Of twenty-nine bird species found, those that commonly use the early stages of regenerating stands (e.g., chestnut-sided warbler and common yellowthroat) had the highest densities. Other early successional species that are more strongly associated with uneven-aged harvest treatments or older stages of regeneration (e.g., American redstart, black-and-white warbler) were absent or less abundant. Nest success for all species combined for both years was 55.1 percent, indicating that most pairs were able to successfully raise and fledge young.

In evaluating bird response to mechanical versus prescribed fire treatments, no obvious patterns were observed. Some species were more abundant in mechanically treated sites, while others appeared to favor burned sites. It seems clear that both treatment regimes provide suitable habitat for early successional bird species, and that there is no clear advantage to one method over the other relative to bird success.

### Habitat Use and Survival of Neotropical Migrant Songbirds During the Post-Fledging Period

The second Master's project completed on the Forest focused on where birds go after they leave the nest, but before they migrate. Abundant scientific literature exists on the types of habitats in which birds nest and where they winter, but little is known on where birds go prior to migration. While nesting and wintering habitat are obviously important to survival, migration usually requires abundant energy reserves, which means food resources must be available and easily accessible in a short period of time.

Carlin Chandler specifically focused on neotropical migratory songbirds that typically nest in mature forested habitats on the WMNF. These are species such as Blackburnian warbler, black-throated green warbler, ovenbird, red-eyed vireo, and Swainson's thrush. Mist nets and standard point counts were used to survey birds in wildlife openings, in recent clearcuts (harvested six to eight years earlier), and in mature forest habitats that hadn't been harvested in at least fifty years. Surveys were completed in July and August after birds had fledged.

Results showed that mature forest nesters are found in higher densities in early successional habitats (wildlife openings and clearcuts) during the post-fledging period. As with Richard Chandler's study described above, some species were more prevalent in clearcuts and others in wildlife openings, so there is no one best forest habitat to provide. Surprisingly, only one species (hermit thrush) was most abundant in mature forest. Findings suggest the thick, tall vegetation that makes up early successional habitats attracts these birds in some way, perhaps by providing better shelter from predators or because food resources are more abundant.

## Project-Level Monitoring

Project reviews give us the opportunity to determine if projects are implemented as planned, and how well standards, guidelines, mitigation measures, and design features are implemented and functioning. Visiting projects at various stages of implementation gives us insight about quality of work, resource protection, and our ability to meet the goals and objectives we've set forth in the Forest Plan. Taken together this information can be used to consider modifications to the Forest Plan, project implementation, or project design.

Project reviews conducted in 2006 varied from somewhat informal field trips to look at specific aspects of the project, such as the North Carter project review described below, to more formal and far-reaching scrutiny as we did in the Chandler Round review.

No matter what the stated objective of a particular project review may be, all field visits to project areas are used as an opportunity to note if the activities on the ground are meeting the standards we set.

### North Carter Timber Sale Activity Review

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A field review of the North Carter Timber Sale, located in Beans Purchase, New Hampshire, was conducted in March 2006 to look at active winter operations and to determine if the project was being implemented as planned. The timber sale was designed to comply with the Forest Plan goal of providing timber products while creating diverse wildlife habitat. One need for the project was to create regeneration-age class for northern hardwood, aspen, and paper birch, to release understory spruce-fir, and to increase the amount of permanent wildlife openings to meet wildlife habitat objectives. Another need was to raise stand quality through thinning and improvement cuts in order to promote a sustainable yield of high quality sawtimber.

Harvest prescriptions assigned to the areas visited were clearcuts, patch cuts, individual tree selection, and group selection. The team discussed the value of removing non-commercial trees in patch cuts and the need to ensure that timber sale marking removes enough trees in group selection prescriptions. It was noted that there are opportunities within stands to regenerate aspen and birch to meet wildlife objectives.

In addition to looking at harvesting results, the review team visited a landing and some roadwork that included a replaced culvert and two temporary bridges. Trees left standing at the landing adjacent to Highway 16 made it less visible to passing traffic. Looking at the roadwork, the group determined that the culvert was larger than necessary for the crossing, and that the temporary bridges on FR 615 were very effective in minimizing disturbance to streambanks.

The review team also was able to compare two types of harvesting equipment being used: a cut-to-length with forwarder and a feller-buncher with grapple skidder. The cut-to-length/forwarder equipment was very effective at minimizing damage to residual trees and the skid trails were

*Review team visits a landing at the North Carter Timber Sale. WMNF photo by Lesley Rowse.*



*Forwarder used to bring cut trees to the landing. North Carter timber sale. WMNF photo by Lesley Rowse.*



somewhat narrower than in the areas harvested with feller buncher/grapple skidder. One note on the topic was that few operators own cut-to-length/forwarder equipment and the forwarders operate best on flat ground.

Site-specific design features for the North Carter Timber sale included smaller clearcuts and patchcuts to address the scenic quality of the area, which were effective in protecting the scenic quality. The screened landing adjacent to Highway 16 was considered effective also.

In addition to this review, the project was monitored by the timber sale administrator and harvest inspector on a regular basis. Operations were halted in October 2005 due to heavy rains, and at other times when temperatures were above freezing. Maintaining erosion controls was emphasized to minimize rutting.

No Forest Plan clarifications, amendments, or corrections are recommended as a result of this project review.

## **Rocky Pond & Higgins Brook Timber Sale Area Review**

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A field review in the Rocky Pond and Higgins Brook Timber Sale areas, located in the Towns of Stark and Milan, New Hampshire, was conducted in May 2006. The timber sales were planned to comply with the Forest Plan goal of providing timber products while creating diverse wildlife habitat. The Rocky Pond project, completed in 2002, was designed to meet the needs for increased acres of paper birch and softwood communities, and for regeneration of northern hardwoods, paper birch, and aspen. The Higgins Brook project, completed in 2004, was intended to promote growth and vigor of residual trees by removing some of the overstory trees, and also to remove timber that had been damaged in the 1998 ice storm.

Harvest prescriptions assigned to the areas visited were patch cuts, individual tree selection, group selection, thinning, overstory removal, and seed tree shelterwood. The review team observed that the desired regeneration was becoming established in some units, with little damage to the residual stand. In other units, at higher elevations where the storm-damaged trees were harvested, regeneration was of beech, stripped maple and hobblebush rather than the perpetuation of the mixedwood type. Also, the paper birch seed tree harvest did not produce paper birch seedlings, but rather cherry, yellow birch, beech, stripped maple, and spruce. The team considered seed tree mortality, a series of bad seed years, or a lack of site preparation as possible reasons for the undesired results. These stands should be rechecked to monitor the types of species. While they are considered stocked, they may not contribute toward meeting the goal of providing high quality sawtimber. Since the species makeup can change considerably over ten years, the Forest should consider conducting additional regeneration surveys after ten years.

The team inspected main skid trails and noticed a segment near the landing that contained a lot of slash to protect the ground during skidding. The trail was also wider than desirable in this area, with no regeneration established. Although these issues are common due to amounts of traffic and volume funneled into the landing, future efforts should focus on a more widespread distribution of slash and narrower skid trails.

The team discussed the possibility of using additional site preparation for improving paper birch composition, using a more structured skidding plan and equipment specification in thinning operations to further minimize impacts, and using shelterwood prescriptions versus group selections in fir stands where windthrow is likely.



Forest Plan standards and guidelines were applied and were effective. They focused primarily on soil and water conservation practices, including stream buffers, stream crossings, and erosion control measures for skid trails, landings, and temporary roads.

No Forest Plan clarifications, amendments, or corrections are recommended as a result of this project review.

## Connor Brook Watershed Restoration



*Connor Brook road.  
WMNF photo by Jay  
Milot.*

The upper portions of the Connor Brook watershed in Shelburne, NH, is the site of an extensive restoration project intended to address the Forest Plan goals of restoring and improving riparian areas to benefit riparian dependant resources and values. The project consists of stabilizing old roads and abandoned skid trails by constructing water bars and adding wood to reroute runoff and dissipate runoff energy. This promotes revegetation on the trails and old roads beds and increases the amount of large woody material on the forest floor. Wood is also being added to stream channels to slow water velocity and dissipate stream flow energy during high flows, allowing for increased sediment storage and channel diversity. This in turn stabilizes stream beds and banks. Stream stability is being promoted throughout the main stem of Connor Brook. As channel reaches become more stable, habitat conditions will be enhanced for trout populations and other aquatic/riparian dependent species in the lower portions of the Connor Brook watershed. Past research has indicated that storing wood in the higher reaches of a watershed can affect the quality of stream habitat downstream by storing sediment .

Work in the upper reaches commenced in June 2006 and finished in September 2006. Work in the lower reaches is planned to start in May 2007 and be completed by the end of the year.

This project was monitored on a regular basis throughout the summer of 2006, with no problems observed. All wood stayed where it was placed in skid roads and streams. The project area was visited again in November to observe any effects of fall rains. Most of the wood placed in streams had not moved, and of note was the build-up of leaf packs which will start to break flows along old skid roads and increase sediment storage. Over time, this will stabilize the watershed and provide nutrients for fish and invertebrates from increased storage of organic matter.

Prior to implementing the project in 2007, photos will be taken at marked points and the amount of wood placed in a treated width of the road or stream will be monitored. We will keep track of the size and how much wood is added to these treated segments during project implementation. After one or two seasons when annual peak flows have occurred



Connor Brook debris jam. WMNF photo by Jay Milot.

in the watershed, we will take post photos and monitor wood loading in the treated segments to determine how successful we have been at building debris jams. This will provide information on wood transport in the watershed and the size of wood needed to create debris jams in road and stream segments of different widths.

Forest Plan standards and guidelines are being applied, and no Forest Plan clarifications, amendments, or corrections are recommended as a result of this project review.

## Chandler Round Project Activity Review

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A field review of the Chandler Round timber sale areas, located in the Towns of Chatham and Jackson, NH, was conducted in December 2006. The project's objectives centered on a need to increase early successional habitat and softwoods, and to promote a desirable stocking of species, size, and quality hardwood trees while providing forest products. The project also addressed safety and resource concerns by removing a defunct bridge located in the project area. Planned activities included timber harvest on about 976 acres, road restoration on about 8.2 miles of existing road, and 0.3 miles of new low standard road construction.

About one-half of the project was completed at the time of the field review.

The group visited the bridge site and several harvest units and found the expected results. Mitigations and design features were employed and appeared effective. Silvicultural prescriptions were implemented properly and desired results were achieved. Road construction work met expected engineering and safety standards. Trails were adequately protected. Scenery concerns were mitigated with buffers, reserve patches and unit design that reduced visibility in accordance with Forest Plan Standards. Erosion control features were working properly. Silvicultural reforestation objectives for ground scarification and removal of existing competition, to foster establishment of desired species, have been met. Thinning and individual tree prescriptions are meeting prescription goals, retaining the desired species and condition of trees, providing them with adequate growing space, to insure development of healthy stands of even and uneven-aged stands to provide the diverse vegetative conditions set forth in the Forest Plan desired future condition.

The applied design features and standards and guides included those protecting soils, water, timber, fisheries, wildlife, scenery, and recreation. The use of the Slippery Brook trail for snowmobiling was prohibited on

weekends and holidays to allow for plowing and timber haul. Because this has been an ongoing situation in the area, the district is currently analyzing the proposal to relocate the snowmobile trail to eliminate such conflicts in the future.

The review found no instances where the project planning and design, including the mitigations listed above failed to protect the Natural Resources or the human environment.

Monitoring for the two timber sales began prior to implementation with a pre-operations meeting with the timber purchaser, field supervisor, and the Forest Service timber sale administrator. Timber sale provisions and resource protection mitigations were reviewed and expectations clarified. Once the sales became active the sale administrator made inspections at least twice a week, with duties such as approving main skid trails, landings, water bar locations, stream crossings and areas that needed brushing in. Engineers followed a similar routine, with a pre-operations meeting regarding the planned road work, followed by regular inspections once work commenced.

No follow up actions needing immediate action were identified. No Forest Plan clarifications, amendments, or corrections are recommended as a result of this project review.

## General Management Review

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*Oak seedling, a sign of new life and a regenerating forest following a prescribed fire at Harriman Brook. WMNF photo by Pat Nasta.*

The Androscoggin Ranger District is based in Gorham, New Hampshire, and stretches north to the Kilkenny area, west to the Dartmouth Range, south to Mount Washington, and east into the Maine foothills. In September 2006, the White Mountain National Forest Leadership Team visited the District to review a variety of management practices being planned, implemented, or recently completed. Joined by resource specialists and District staff, the team looked at activities on the ground and also discussed general management policies and results. The intent was to recognize — and build on — successes, and to agree on strategies for improvement where necessary.

Over the course of four days, the team looked at information management (such as databases and GIS), watershed restoration, timber sales, wildlife habitat analysis, invasive species management, trail restoration, partnership development, coordination with the State of New Hampshire at its new off-road vehicle park, campground management, administrative issues, restoration of newly acquired land, project monitoring effectiveness, pine regeneration, trail and road construction, prescribed burning, the Forest's safety program, and use of Knudsen-Vandenburg funding for resource work following commercial timber harvests.

The underlying theme was implementation of the Forest Plan.

While acknowledging that managing the land for multiple objectives is complex, the team found vegetation management projects such as Mill Brook, Pine Mountain, and Farwell Mountain were successfully meeting



*Forest Leadership Team conducts GMR on Andro Ranger District. WMNF photo by Pat Nasta.*

the goals, objectives, and management area direction specified by the Forest Plan.

In looking at recreation management across the District, it is clear that the Forest Plan is being implemented with great assistance, expertise, and support from our partners.

Looking at fire management efforts to reach Forest Plan objectives for vegetation and habitat types, the team traversed the Harriman Brook underburn site. There they examined early results of using prescribed fire as a site preparation tool to promote white pine regeneration. The site will be burned again and monitoring plots studied before making firm conclusions.

Discussion at a stop in Mason Township, Maine, at the site of a potential land acquisition centered on the resource and safety issues that often come with newly acquired lands. As a result, the Forest Land Adjustment Plan will now include the expectation for a prompt resource assessment upon acquisition.

## Outputs, Services, and Objectives

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. The table below shows the status of each measure for the first year of Plan implementation.

Activity or Product	Unit of Measure	Estimate for the First Decade	FY06 Accomplishment	First Decade Accomplishment, to Date
<b>Aquatics</b>				
Stream habitat restoration	Miles	30	3	3
Restore fish passage	Road crossings	10	1	1
<b>Fire Management</b>				
Wildland Fire Use	Fires	4 – 8	0	0
<b>Forestry</b>				
Volume Sawtimber Harvested	MMBF	137	6.8	6.8
Volume Pulp Harvested	MMBF	106	8.6	8.6
Even-aged regeneration harvest	Acres	9,400	422	422
Even-Aged Intermediate harvest	Acres	5,600	706	706
Total harvest	Acres	34,300	2,313	2,313
<b>Recreation</b>				
Net increase hiking trail construction	Miles	Up to 25	0	0
Net increase snowmobile trail construction	Miles	Up to 20	.1	.1
Net increase developed campground sites	Sites	Up to 32	0	0
Net increase backcountry facility capacity	PAOT	Up to 40	0	0
<b>Soils</b>				
Improved Watershed/Soil Conditions	Acres	At least 250	30	30
<b>Transportation</b>				
Road construction	Miles	10	0.7	0.7
Roads reconstructed	Miles	70	8.3	8.3
Roads decommissioned	Miles	5 - 40	0	0

As shown in the table, 2006 timber harvest volumes are somewhat below normal. This is due to bad weather in the winter of 2005/2006 and the beginning of winter 2006/2007, combined with poor markets for both

sawtimber and pulp throughout summer and fall 2006. Significant declines in the housing market affected the demand for sawtimber. Two major pulp mills in Northern New Hampshire (Groveton and Berlin) recently closed, resulting in a short-term excess of supply for the remaining mills and making it very difficult for most logging contractors to sell their pulpwood.

We are in a transition period for low quality forest products. There is widespread expectation that trees will play a major role in our goal to reduce the use of fossil fuels and to combat climate change. Several proposals for wood energy and bio-chemical plants are being developed throughout New England. These developments are expected to replace or increase the wood demand previously held by pulp and paper mills.

Harvest acres are also down in total for the same reasons as volumes. The exception is regeneration harvests because many of these are cut in the non-winter time so weather conditions didn't affect them.



