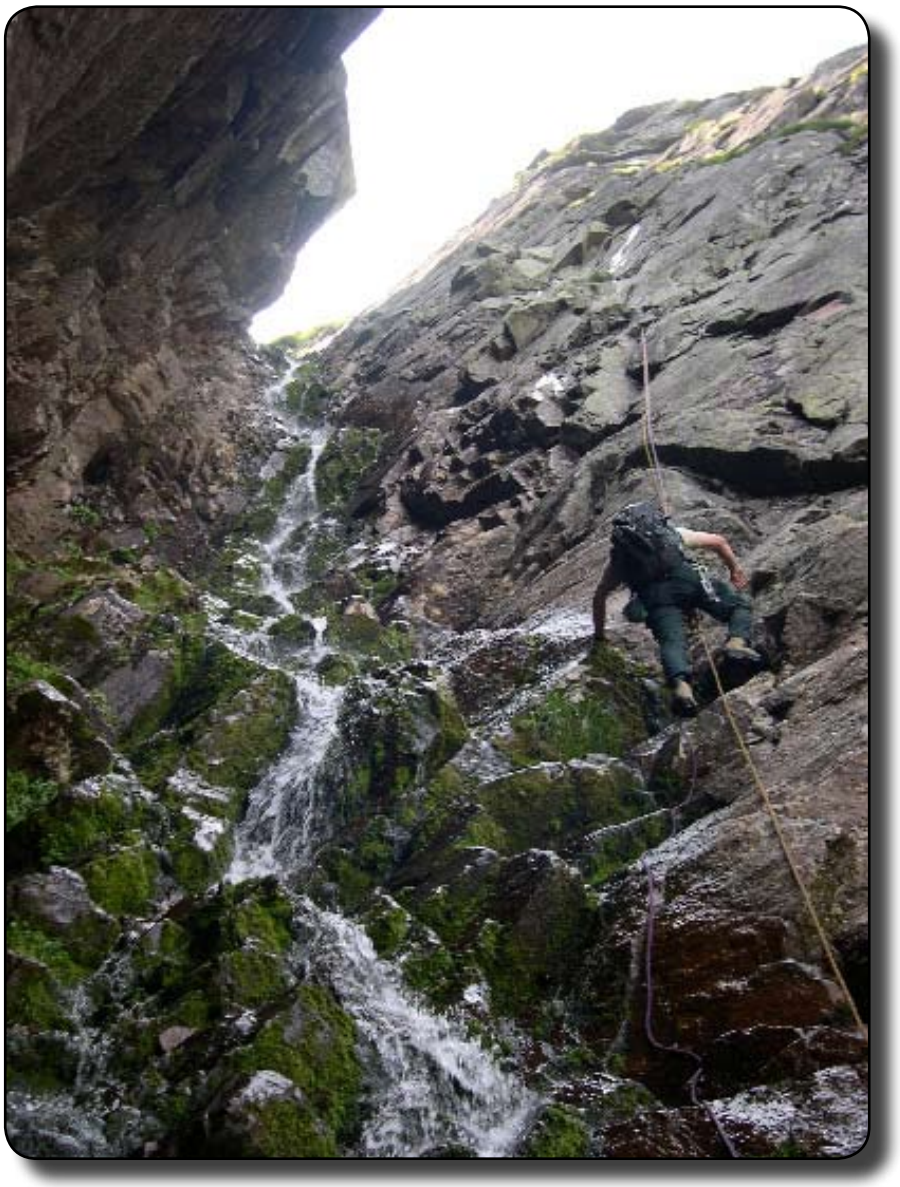
White Mountain National Forest

USDA
United States
Department of
Agriculture

Forest
Service

**Eastern
Region**

Monitoring and Evaluation Report



Cover: Justin Preisendorfer rappels into Pinnacle Gully in search of rare plants. WMNF photo by Chris Mattrick.

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From the Forest Supervisor

I am pleased to share with you the most recent White Mountain National Forest Monitoring Report, addressing work done in Fiscal Year 2007.

Our Land and Resource Management Plan (Forest Plan) is the principal tool for preserving, protecting, and managing the resources that comprise the White Mountain National Forest, revised in 2005. It makes six programmatic decisions that govern landscape-scale management of the Forest. One of those decisions concerns the monitoring and evaluation requirements that help us determine how well management direction is being met, and are the basis for periodic evaluation and amending of the Forest Plan. As this report indicates, standards and guidelines are working effectively and Forest Plan goals and objectives are being met.

Monitoring and evaluating our progress was only part of what we accomplished in 2007. It was a busy, productive year for the Forest and our employees. Our accomplishments include but are not limited to:

- Acquisition of approximately 475 acres of land, including 6,000 feet of frontage along Oliverian Brook.
- Prescribed burning to treat 107 acres for wildlife purposes, plus 247 acres thinned to remove potentially hazardous fuels.
- Off-Forest Incident duties for Forest crews and individuals, providing assistance at wildfire, tornado, and other natural disasters.
- Mechanical, chemical, and biological treatment of 55 acres of invasive plants.
- Completion of 10,000 additional acres of soil survey, that also provided training for students from the University of New Hampshire and Plymouth State University.
- A successful summer YCC program, resulting in completion of on-the-ground projects as well as lessons learned about leadership, collaboration, respect, and accountability.
- With help from partners and volunteers, completion of 275 miles of trail maintenance.
- A botanical survey that updated more than 30 occurrences of rare plants.
- Continued creation of forest wildlife habitat, and sustainable forestry activities conducted on suitable land.
- Eastern Region Honor Awards recognition of six Forest employees who went a step beyond their normal duties.

I am satisfied with the findings and thoroughness of this Monitoring Report, and believe that it meets the intent of both the Forest Plan (Chapter 4) and the planning regulations contained in 36 CFR 219.

I applaud the dedication of the employees who prepared the report, and the commitment of our partners who lend invaluable assistance as we “Care for the Land and Serve People.”

Thomas G. Wagner
Forest Supervisor

Contents

Forest staff, partners, and volunteers deliver conservation education messages at venues like the annual Fryeburg (Maine) Fair. WMNF photo by Clare Long.

Special Events

Conservation Education

Part of the Conservation Education mission is teaching fire prevention. Smokey Bear is always a hit with children — and adults. WMNF photo by Kevin Larkin.

The Conservation Education program supports the education of teachers, students and the general public by providing the tools needed to participate effectively in the critical task of sustaining our nations natural and cultural heritage. Through numerous methods including ranger led programs, displays, materials and informal interactions the WMNF strives to communicate the sustainability of natural and cultural resources and the inter-connectedness of land and people. Public involvement and collaboration with our partners are critical to the future of the success of the conservation education efforts on the Forest. Our goal with partners is to develop mechanisms with out partners to leverage resources, build networks, develop materials and implement delivery systems.

In January 2008, we surveyed our partners, asking them to comment on what was working in the program and how it could be improved. More than twenty-five responded.

At the end of January, we met with our partners at the Forest Supervisor's Office in Laconia. After discussing the goals and objectives of the Conservation Education Plan, the survey results were reviewed. The group identified many things that are working in the program.

- Forest Service commitment to and passion for conservation education and interpretation.
- Successful partnerships.
- Teacher education.
- School visits by Forest Service staff.
- The Forest Discovery Trail.
- Campground and interpretive programs.
- The Tuckerman Ravine website.
- Increased awareness of environmental and conservation issues.

Excellent ideas on how to improve our program also came out of the session.

- Enhance the tie between cultural history and natural history.
- Make better use of the White Mountain National Forest website to communicate conservation education, interpretive information, and opportunities to the public prior to their visiting the Forest.
- Make time to communicate the Forest Service story through various media.

- Increase interpretive programs and involve local communities and young people.
- Adjust the outfitter-guide permit to accommodate small, not-for-profit education providers.
- Provide more information about the Forest, its resources, and its uses to visitors and surrounding communities.

There was tremendous support from our partners for the opportunity to get together at "Partner Meetings" and collaborate on ways to improve relationships. There were positive suggestions particularly directed at the Conservation Education Specialist role, centering on leading versus doing and emphasizing the "multiplier" effect (teaching teachers versus teaching in a classroom).

Internal Survey Results

Forest employees and volunteers make time in their schedules to assist the Conservation Education program by reaching out through school programs, university presentations, campground programs, archeological digs with Girl Scouts, and special events including fishing derbies and participation at local and regional fairs. We take advantage of nationally-accredited programs like Project Learning Tree, Project Wild, and The Globe Project when creating programs and supporting materials.

Currently, we have one full-time Conservation Education staff person and three employees for whom Conservation Education is only part of their job duties. Seasonal interpretive displays and programs are developed in-house, while long-term projects such as the Kancamagus Interpretive Plan, are supported with funding from partners and agencies.

Findings

Based on the feedback from Forest partners and staff, the next steps toward improving our education efforts, meeting Forest Plan goals and objectives, and responding to public needs will be:

- Taking steps towards improving the web page, making it more user-friendly.
- Making better connection between the natural and cultural history education efforts.
- Placing more emphasis on "what is a National Forest," its resources, benefits, and experiences.
- Continuing to work with partners and improving our relationships and educational offerings.
- Developing a more comprehensive approach toward communicating what is happening on the Forest.

Environmental Compliance Audit

Purpose

In August 2006, the Forest Supervisor volunteered to have an environmental compliance audit (ECA) conducted on the White Mountain National Forest to help Forest employees evaluate and enhance their roles as conservation leaders. An ECA is designed to ensure the Forest complies with regulatory and environmental compliance laws including:

- Clean Air Act
- Clean Water Act
- Comprehensive Environmental Response, Compensation and Liability Act
- Emergency Planning and Community Right-to-Know-Act
- Federal Insecticide, Rodenticide and Fungicide Act
- Occupational Safety and Health Act
- Pollution Prevention Act
- Resource Conservation and Recovery Act
- Safe Drinking water Act
- Toxic Substances Control Act

Objectives

One objective of an ECA is to ensure that environmental programs are addressing problems that could negatively impact Forest Service mission effectiveness, jeopardize the health of Forest Service personnel or the general public, significantly degrade the environment, expose the Forest to financial liabilities as a result of noncompliance with environmental and related safety requirements, erode public confidence in the Forest Service, and expose line officers or staff to civil and criminal liability.

Other objectives are to secure information that will permit Forest Service administrators to address existing environmental problems, anticipate and prevent future environmental problems, and provide data, through the auditing process, for use in identifying, validating, prioritizing, programming, and budgeting environmental requirements.

Audit Coverage

During the ECA, the audit team conducted the following tasks:

- Examined files and other documents for compliance with federal and state laws and regulations and conformance with national and regional direction.
- Interviewed employees and exchanged information on various procedures, systems, and problems at specific locations.

- Mutually examined alternatives and identified opportunities to improve the results of the audit.
- Visited several National Forest sites to determine level of compliance and understanding of environmental laws.
- Conducted training with Forest Service personnel on environmental issues as situations allowed.

The audit team reviewed a variety of environmental activities where applicable: drinking water systems management, air quality, hazardous materials management, pollution prevention activities, hazardous waste management, pesticide management, petroleum-oil-lubricant management, solid waste management, special pollutants management (asbestos, PCBs, radon, noise), fuel storage tank management, wastewater management, storm water management, and OSHA issues as they relate to the above activities and operations.

Review Process

The audit was conducted from August 14 to 17, 2006. Entrance briefings at each site prior to the facility review provided employees with an overview of environmental liability, principal compliance issues, and the audit procedures and protocols that would be followed. The audit team used the US TEAM Guide, developed by the US Army Corps of Engineers, as the protocol.

Assessed Facilities

The following sites were visited during the ECA:

Supervisor's Office

Androscoggin Ranger District

Androscoggin Ranger District Office

Gorham Depot

Dolly Copp Campground

Pemigewasset Ranger District

Pemigewasset Ranger District Office

Plymouth Warehouse

Russell Pond Campground

Saco Ranger District

Saco Ranger District Office

Jigger Johnson Campground

Bartlett Work Center

East Central Sewage Lagoon

Final Recommendations

During the exit conference, the audit team made the following recommendations to the Forest Supervisor.

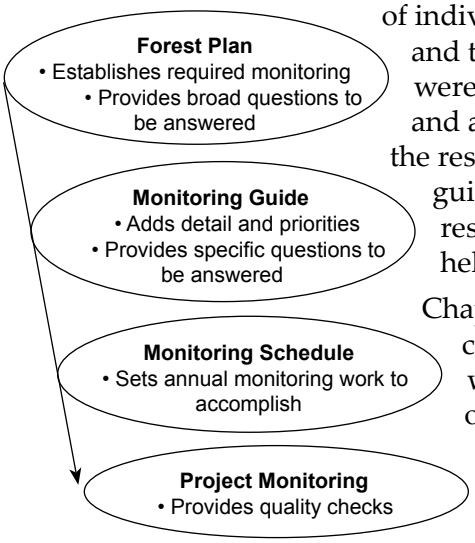
1. Initiate routine testing of overfill alarm systems.
2. Designate an area for the collection of excess hazardous materials at each district office and work center, and provide all required warning signs, equipment, and posted instructions to employees.
3. Develop and implement spill prevention control and countermeasure plans for the Saco District Office, Bartlett Work Station, and the Androscoggin District Office.
4. Designate one location for the official records of drinking water system monitoring and management records.
5. Continue establishing procedures for the accumulation, management, and disposal of excess hazardous materials.
6. Modify the draft Supervisor's Office Hazard Communication Program to address training methods, and develop District-specific written programs that address how the program will be implemented at each District (training, material safety data sheet management, etc.).
7. Evaluate the condition of the liner for the East Central Sewage Lagoon (Bartlett Lagoon), and program for liner replacement if required.

Upon review of the audit team's final recommendations, a Corrective Action Plan was developed by the Forest Facilities Engineer/Hazmat Coordinator, who will assist the Supervisor's Office and District Offices with ongoing corrective actions.

Introduction to Monitoring

Management of the White Mountain National Forest is guided by three broad goals described in our Forest Plan: manage for sustainability, using the best science available to manage for ecosystem viability; provide recreation and other opportunities, experiences, and benefits that may not be readily available elsewhere; and 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.

The Plan also established goals and objectives to guide management of individual resources. In order to meet the broad Forest goals and the more specific resource goals, management areas were established, 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 asks broad questions to guide the monitoring process.

The *Monitoring Guide* is built from the overall guidance in Chapter 4. It links the broad questions 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 items in the database are monitored annually; some are scheduled less frequently and some are dependent on available funding. An annual *Monitoring Schedule* identifies and prioritizes the items to be monitored that year.

In addition to items in the 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 project monitoring is not formally compiled and reported in the Monitoring and Evaluation Report, but is invaluable to ensure 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 of the 2007 monitoring schedule, as well as some of the project reviews conducted during the year. Each resource area includes background, the monitoring question(s) with findings, and conclusions and recommendations.

Monitoring By Resource

Air Resources

Monitoring Air Quality

Air monitoring on the White Mountain National Forest provides information about existing levels of air pollution and related impacts. We measure the level of air emissions how this affects Air Quality Related Values (AQRVs), such as water quality, visibility, aquatic life, and human health. The monitoring data we collect help us detect any new sources of air pollution and determine the potential impact on Class I Wilderness airsheds within the Forest. Working with state air quality agencies, we can suggest ways to improve the design of these new sources and reduce pollution.

Participating in such air monitoring efforts is one of the Forest Plan objectives, and two questions were posed to track our progress

Are the IMPROVE protocols or similar technology being implemented?

The IMPROVE (Interagency Monitoring of Protected Visual Environments) program provides information for federal and state implementation plans that protect visibility in Class I areas as stipulated in the 1977 amendments to the Clean Air Act. The objectives of IMPROVE are to determine current visibility and aerosol conditions in mandatory Class I areas, document long-term trends, and, with the enactment of the Regional Haze Rule, to provide regional haze monitoring data. Additional information about the IMPROVE program and access to the data collected can be found on the web at

<vista.cira.colostate.edu/improve/>.

The WMNF maintains an IMPROVE site at Camp Dodge, where instrumentation includes an aerosol sampler to measure fine aerosols and particulate matter. The particulate monitoring portion of the IMPROVE program measures the concentration of the fine (PM2.5) particles for mass, optical absorption, major and trace elements, organic and elemental carbon, and nitrate; and of PM10 particles for mass. Additionally, the State of New Hampshire maintains an ozone monitor at Camp Dodge through a cooperative agreement.

Less intensive measurements are also made in the alpine zone, at Lakes of the Clouds and the Mount Washington summit, through an agreement with the Appalachian Mountain Club (AMC). Other air-related data are collected at Hubbard Brook Experimental Forest.

Are air emissions affecting Air Quality Related Values?

Once pollution data has been collected, it must be interpreted so we can understand how AQRVs, such as visibility or water quality, are being affected by changes in air quality (water quality is also monitored annually across the National Forest; see the report in this document). In

addition, monitoring in the Great Gulf Wilderness is conducted by the AMC as a cost-share partner with the Forest Service.

Ozone levels are also measured, since ozone can have a direct effect on human health. In 2006, the annual summary reported that peak, mean, and average background hourly ozone concentrations continued to be consistently higher on the summit of Mount Washington than at other sites. Based on the trends reflected in the 20-year data set, hourly ozone concentrations on the summit are often two to five times higher than at the lower elevation sites. Ozone concentrations on the summit of Mount Washington in 2007 continued to be unaffected by strong diurnal patterns at lower elevations, suggesting that ozone levels on the summit are more influenced by regional ozone transportation. Maximum 8-hour ozone concentrations decreased at the Mount Washington Summit and at Camp Dodge.

Monitoring of AQRVs continues at the IMPROVE site, at other sites with cooperators, through working with research, and through forest monitoring of resources such as water quality and macroinvertebrates.

Conclusions and Recommendations

Past monitoring has shown that some AQRVs are being impacted by air emissions. While there has been a decrease in some emissions, such as sulphates, others remain unchanged. Long-term, continued monitoring at the IMPROVE and other sites will contribute to our understanding of how effective our nation-wide actions are in cleaning the air, and the cumulative effect of air pollution combined with other forest activities.

Air quality monitoring site at Lakes of the Clouds, conducted through an agreement with the Appalachian Mountain Club. (WMNF photo by Forrest Seavey)

Fish and Aquatic Habitats

Are stream habitat restoration/improvement projects resulting in increased habitat complexity and wild trout productivity?

The goals of stream habitat projects are to improve habitat complexity of streams and floodplains, and therefore increase the overall biological productivity of the watershed. The Forest has several stream habitat and watershed projects in various stages of implementation. Our first stream restoration project, planned at the watershed scale, occurred in the Great Brook watershed in Stoneham, Maine. Planning began late in 2001 and implementation occurred over four summer seasons from 2003 to 2006. Post-treatment monitoring of the project was initiated in 2007, and a summary of the results is documented below.

Great Brook Stream Restoration

In 2007, Forest staff revisited the Great Brook stream restoration monitoring stations to examine changes in habitat features and fish abundance. Due to drought conditions and related low stream flows, fish monitoring on tributary stations was not conducted in 2007.

In 2003 and 2004, crews had placed cut trees into Great Brook and its tributaries, Shirley Brook and Red Rock Brook. All trees dropped by chain saws occurred upstream of monitoring sites GRT15 and GRT20. Approximately one half mile upstream of the non-treated monitoring site (GRT10), a 1.2 mile reach of Great Brook was treated with large trees using a tracked excavator. The upper portion of this reach was treated in 2005 and includes the GRT20 monitoring site. The lower reach was treated in 2006 and includes the GRT15 monitoring site.

Changes in various habitat and fish abundance indicators were calculated from data collected at these three sites before (2002-2004) and after (2007) habitat manipulations, and are shown in Table 1. The magnitude of treatments can be demonstrated by changes in the amount of wood counted in sampling stations. There was no change in instream wood counts at GRT10, with no wood occurring before and after the project was implemented. Wood additions were greatest in GRT20, where counts went from one to 31 after manipulation. GRT15 had an increase of 10 pieces of wood. The response of these wood additions was a reduction in riffle habitat where wood jams were established, resulting in increased pool or glide habitat.

Changes in habitat types occurred at both control and habitat manipulation sites between 2004 and 2007. At the control site, changes were related to lower stream flows and perhaps some small sampling error in the form of habitat type interpretation. Area of riffle and pool habitat decreased, while glide habitat increased. This could be expected with reduced stream flows. The proportion of flow volume occurring in pool habitat was greater, and also is expected in periods of reduced stream flow. At GRT15, where stream banks and stream slope are lower than the other two sites, we observed an overall increase in pool and glide

habitat surface area, but a decrease in riffle habitat, pool volume, and pool quality. At GRT20, riffle habitat decreased, while glide habitat increased slightly, and pool area, pool volume and pool quality all increased. Observations of the two manipulation sites suggest that high stream flows, experienced in October of 2006, acted differently in the two channel types. In-channel scour was more dramatic in GRT20 as stream power scoured the channel bottom below large logs. At GRT15, a large dense log jam placed at the head of the monitoring station, led to a dramatic re-charge of a side channel in the flat valley bottom in this area. As a result, there was less scour power of pool habitat as flood waters were spread into the floodplain. The result was less pool volume in the station and more glide habitat and marginal pool area habitat.

Changes in fish abundance and biomass at each site were indicative of changes observed in habitat. The largest increases in young brook trout abundance (age-0+) were at GRT15 where glide habitat and low quality pool habitat increases were largest. GRT20 had the largest increase in adult abundance and biomass and this correlated with the large increase in pool area and volume. At GRT10, reductions in young brook trout were large, while changes in adult trout were small.

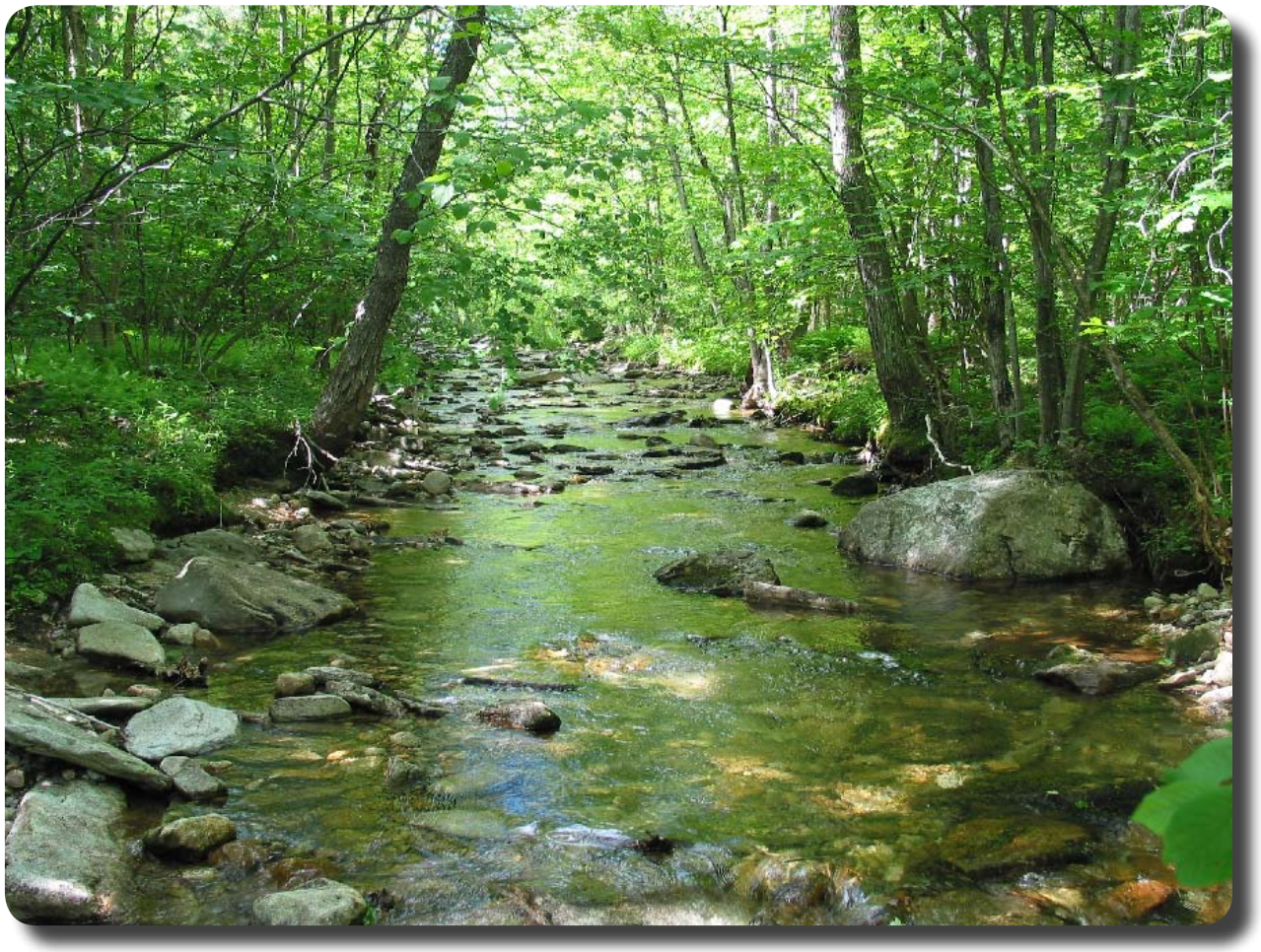
Table 1. Changes in various habitat and fish abundance parameters before and after large wood treatments were made in Great Brook from 2002-2007.

Indicator	Great Brook Control Site (GRT10)	Lower Great Brook Treatment Site (GRT15)	Upper Great Brook Treatment Site (GRT20)
Habitat			
Total LWD pieces	0	+10	+30
% streambed riffle habitat	-6%	-27%	-26%
% streambed glide habitat	+11%	+9%	+3%
% streambed pool habitat	-6%	+18%	+24%
% flow volume in pool habitat	+9%	-7%	+42%
# aquatic habitat units	-2	+2	+15
Pool quality	0	-0.2	+0.4
Fish			
Brook Trout young of year (#/acre)	-136	+198	+158
Adult Brook Trout (pounds/acre)	+1.2	+2.9	+8.8
Adult Brook Trout (#/mile)	+73	+292	+563

Conclusions

One year of post-treatment monitoring of the Great Brook project supports the notion that increases in fish abundance at GRT20 are likely due to habitat manipulations. Trout abundance in the non-manipulated site was similar to estimates found there in past years, suggesting that increases in pool volume and pool quality, as noted at GRT20, can lead to increases in fish productivity even during drought years.

Observations of wood placements at GRT15 suggested that different responses may have been realized if a less dense wood jam had been placed at the head of the station and more individual wood placements had been added below the jam. Some additional manipulations were made to the site after fish monitoring occurred in 2007. Habitat and fish monitoring should be conducted in future years to determine if the changes observed in 2007 are sustained over multiple years.



Great Brook Control Site (GRT10): Pre-treatment 2004

Left. Lower Great Brook Manipulation Site (GRT15): Pre-treatment 2004
Above Right. Lower Great Brook (GRT15): Post-treatment 2007

Upper Great Brook Manipulation Site (GRT20): Pre-treatment 2004

Upper Great Brook (GRT20): Post-treatment 2007

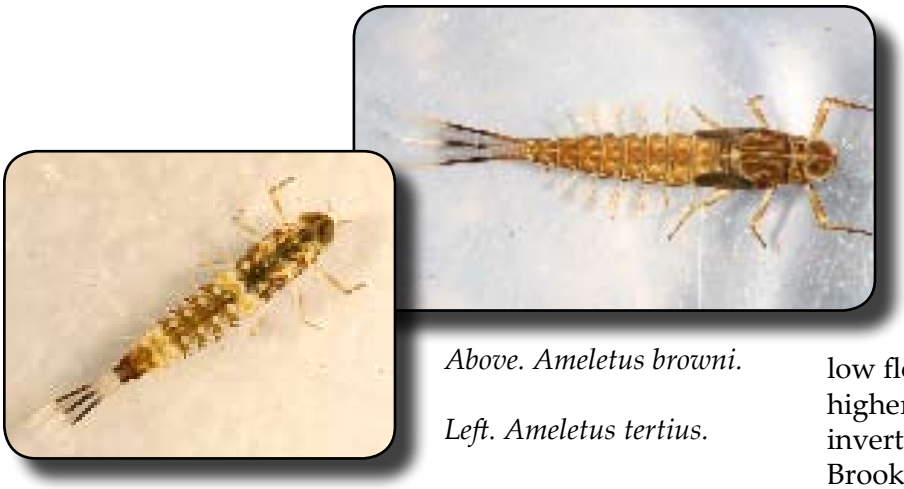
Upper Great Brook (GRT20): Pre-treatment 2004

Upper Great Brook (GRT20): Post-treatment 2007

Stream Invertebrate Communities

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

Sampling continued in 2007 for two Regional Forester's Sensitive Species of the mayfly genus *Ameletus* and other stream invertebrates. The Forest has partnered with the University of New Hampshire to learn more about the aquatic insect communities of the White Mountains. In 2006, sampling was conducted in five different New Hampshire watersheds to establish baseline inventories of aquatic insect diversity, including the distribution of *Ameletus.* In 2007, sampling was repeated within two watersheds and a new watershed was added where management activities are expected to occur in the coming years. Data summaries to date, however, are providing information on the range of variability of stream invertebrate communities in the absence of recent management activities.



Above. Ameletus browni.

Left. Ameletus tertius.

Both species richness and the total number of invertebrates collected declined from 2006 to 2007 at Mill Brook in the town of Stark, and at Mill Brook in the town of Carroll. Most notable about the summer of 2007 was the extended low flow conditions and slightly higher air temperatures. Total invertebrates collected from Mill Brook in Carroll and Mill Brook in Stark declined 37 percent and 36 percent respectively in 2007. The Swift River watershed in the towns of Livermore and Albany New Hampshire, was also sampled in 2007, with most sampling occurring in tributaries to the Swift. The total number of invertebrates collected in the Swift River was nearly 50 percent less than from both Mill Brook watersheds. Stream acidity may be the major variable explaining invertebrate abundance differences between watersheds. Measurements of pH were between 6.8 and 6.9 at all Mill Brook sampling sites, but between 6.1 and 6.6 at the Swift River sites.

Despite the relationships between invertebrate richness and abundance and stream pH noted in 2007, the presence of *Ameletus sp*. did not follow the same pattern. Species experts had suggested that *Ameletus tertius* and *Ameletus browni* preferred coldwater streams with higher pH levels. After two years of sampling, we found *Ameletus tertius* to be widely distributed across the White Mountains although in low numbers at any one site. The species was less common in the coldest streams of Mill Brook in Stark, but more common in the lower pH tributaries of the Swift River. *Ameletus browni* was rare, with only one individual collected in 2006 to date.

Conclusions

Given the large difference in stream invertebrate variables noted in just two years of sampling, all three watersheds will be sampled again in 2008. Additional sampling sites in these watersheds will be added, with emphasis on smaller streams to determine if *Ameletus browni* is present.

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." Stream temperature affects not only species population densities but also fish community composition.

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 fish community composition. The following average July temperature ranges are being used to predict the fish community present in a stream: <18° C for "cold", 18-21° C for "cool", and >21° C for "warm".

For the 2005–2007 monitoring period, seven 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), Wild Ammonoosuc River (Benton, Easton, Landaff), Ammonoosuc River (Bethlehem, Carroll, Crawfords Purchase), and the Swift River (Albany, Livermore). A total of 64 sampling locations were measured on a variety of stream sizes, including 1st through 4th order streams (small tributary streams to large rivers).

The table below lists each sample site by the stream order of the site and which thermal classification the site ranked:

Stream Order	Cold	Cool	Warm	Total
1	18	0	0	18
2	23	2	0	25
3	13	3	0	16
4	3	2	0	5
Totals	**57**	**7**	**0**	**64**

An additional 32 sites were sampled in 2007. Twenty-nine of the thirty sites were rated as coldwater. One 3rd order stream, the lower Swift River, was rated as coolwater. Two other data loggers have not been retrieved due to beaver flooding and bank erosion. Clearly, the coolwater rating of the lower Swift would be expected as the river is too large for riparian canopy to shade the river sufficiently to prevent solar heating of the river. All of the coolwater sites may have always rated as coolwater under the current climate due to the amount of solar radiation that these larger rivers receive.

Conclusions

The Forest will monitor stream temperatures in additional watersheds in 2008 to expand the baseline dataset. Data collected to date will be used to develop a long-term water temperature monitoring strategy to evaluate whether Forest Plan guidelines, state laws, and BMPs are effective at maintaining coldwater aquatic communities while accounting for any effects that could be attributed to climate change. Sampling sites will include a variety of Management Areas where vegetation is and is not actively managed.

Fire Management

The White Mountain National Forest's fire program encompasses varied elements of fire management. In addition to supporting local and national suppression efforts, employees attend firefighter and fire support training, provide outreach to the public to promote fire prevention and education, and work with partners to accomplish landscape-level management. The fire program also enables the use of fire to manage natural resources. The Forest Plan allows both *prescribed fire* and *Wildland Fire Use* (WFU) as management options in certain sections of the Forest.

In 2007, the fire team and supporting employees were active in suppression, outreach, and partnerships. Also, several prescribed fires were implemented and one WFU event was managed.

Prescribed Fire

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

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?

In 2007, the WMNF burned 107 acres under prescription, and 286 acres were mechanically treated (vegetation was cut rather than burned), to meet wildlife and silvicultural objectives and reduce hazardous fuel build-up. For example, one silvicultural project was designed to maintain a unit's oak-pine vegetation by burning to reduce hardwood competition and increase sunlight to the forest floor for new germination. Several wildlife openings were maintained through prescribed burning. In every case, treatments were completed when ground and weather conditions allowed the project's objectives to be met.

Wildland Fire Use (WFU)

The 2007 Fire Management 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). Objectives are accomplished in a manner that protects the safety of people, property, and other resources.

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

Firefighter uses a drip torch to light carefully controlled fires during a prescribed burn. WMNF photo by Chris O'Brien.

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?

In August 2007, the WMNF successfully managed one Wildland Fire Use event, allowing a lightning-ignited fire to run its course. This first WFU event on the Forest was implemented successfully. The fire stayed well within its management area, and the safety of firefighters and the public was not threatened. The fire occurred in a red pine stand with blueberry understory, which is a fire-adapted community. Allowed to burn naturally, without suppression actions, the fire played its ecological role. This site should be re-visited in 10 years to determine if the longer-term objectives were met.

Wildland Fire Suppression

The Forest provides initial attack suppression to fires outside Wildland Fire Use management areas, all human-caused fires, and those that threaten lives, values, or private property. During the summer and fall of 2007, firefighters extinguished three small fires, keeping them under one-half acre in size.

In addition, we support national firefighting efforts by sending crews and single resources to assist during the busiest seasons. In 2007, the WMNF responded to 120 requests, and resources were sent to 19 states.

A total of 115 employees on the Forest attended the annual firefighter refresher. Ninety-five of these, whose duties required physical testing, passed the work capacity test. There were approximately 100 attendees at various other fire training courses that took place during the year. Efforts to keep fire-trained personnel qualified and improving have been successful.

Outreach and Partnerships

The WMNF, along with the Green Mountain and Finger Lakes National Forests, works closely with the Northeast Forest Fire Protection Compact, state governments, other federal fire agencies, and the Department of Defense. Development of a memorandum of understanding with The Nature Conservancy is on-going. Outreach to the public continued. Smokey Bear and other educational materials were handed out at 28 separate events in 2007, some of which focused on the Forest's fire program.

Conclusions and Recommendations

All pertinent Forest Plan standards and guidelines are being applied, and progress is being made in meeting objectives.

WMNF firefighters assist with initial attack on the Lolo National Forest, Montana. WMNF photos by Erin Small.

Forestry

Monitoring regeneration after a harvest is a legal requirement to ensure adequate restocking of tree species following even-aged 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. The results 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 (1/1000th 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). We then calculate the percentage of plots adequately stocked. All 1,059 acres surveyed in 2007 were found to be adequately stocked.

A typical northern hardwood stand on the Androscoggin Ranger District. WMNF photo by Pat Nasta.

Historically, our temperate climate ensures adequate restocking after re-generation harvest. Some portions of stands that are very wet, or areas of summer skid trails, may 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. Additionally, we may consider planting in the future in order to perpetuate these forest communities if necessary.

To what extent have destructive insects and disease organisms increased?

The State and Private Forestry branch of the Forest Service, in Durham, New Hampshire, conducts an aerial detection survey over the WMNF annually. An additional flight took place in early May to assess impacts from a strong "northeaster" that occurred in April of 2007. The storm was most severe on the western side of the Forest, affecting approximately 9,000 acres on the Forest enough to be visible from the air. Very few of those areas were located in our General Forest Management Area (MA 2.1), however, so no significant salvage harvest efforts were pursued. The standard 2007 flight took place in July. Unlike the 2006 survey, there were limited areas of insect and disease damage identified, likely due to drier conditions. In addition to the wind damage already mentioned, there was continued evidence of decline in hardwoods resulting from the severe ice storm of 1998. This has been most evident in paper birch. There was no evidence of significant damage from insect or disease outbreaks.

There is continued concern about the potential risk from invasive pests, including hemlock woolly adelgid, emerald ash borer, Asian longhorned beetle, and balsam woolly adelgid, that could make their way to the Forest. Beech bark disease continues to spread westerly from eastern Maine, where it is quite severe. There is also some concern regionally about a general decline in red oak and some hardwoods. There doesn't appear to be a single factor causing the decline, and scientists believe it may be a combination of weather conditions, age, insects, and pathogens.

Conclusions and Recommendations

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

We will remain engaged with the New Hampshire Forest Pest Advisory Board to monitor insect and disease conditions and coordinate any potential response to an outbreak.

We will also continue to conduct our annual aerial survey provided by the Forest Service State and Private Forestry staff.

Geologic Resources

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 are known to be present. Our monitoring program measures whether sites are being maintained to safety and resource protection standards, and focuses on the Deer Hill Collecting Area. It specifically evaluates whether the Deer Hill fee site is being maintained, and whether the collecting activity itself meets Forest Plan standards and guidelines. Other sites are monitored periodically. 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?

Deer Hill Collecting Area was visited at least once a week through the summer and early fall of 2007. Site maintenance, visitor contacts, and permit checks were the focus of the site visits. In addition, new areas were cleared for collecting activities by cutting brush and small trees within the permitted area. The kiosk at the trail head was renovated and updated to

Young hobby mineral collectors share their finds at Lord's Hill. WMNF photo by Elaine Swett.

provide information on current Forest Plan standards and guidelines for Recreational Mineral and Rock Collecting activities on the Forest. Activities at Deer Hill Collecting Area meet these, with maintenance activities kept current to provide a safe environment for mineral collectors.

Other known mineral collecting sites on the forest were also monitored for activity and compliance with Forest Plan standards and guidelines. These include gold panning sites on the Pemigewasset Ranger District and the Moat Mountain Smokey Quartz collecting area on the Saco Ranger District. These collecting activities outside of the Deer Hill Area largely meet standards and guidelines. Educational programs were conducted at campgrounds, schools, and at after school programs to provide information about rock and mineral collecting on the Forest. A pamphlet on Recreational Rock and Mineral Collecting Standards and Guidelines was developed and made available on the Forest's Internet site.

Conclusions and Recommendations

Monitoring has shown that Deer Hill is 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-wide recreational rock and mineral collecting activities also largely comply with Forest standards and guidelines, with less evidence of unsafe and destructive collecting practices at known mineral collecting sites.

Plants

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 gain insight into condition and trends of water quality, effects of human and natural disturbance, air quality, and even climate change.

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

As stated in the 2006 monitoring report, 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 are collected, compared to previously collected data, and analyzed for trends, management needs, and population stability. In 2007, 62 rare plant populations were monitored.

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, US Fish & 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 and New England Plant Conservation programs. Data collected are 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.

Federally Threatened

Small Whorled Pogonia (Isotria medeoloides)

Similar to 2006 monitoring, results for 2007 reveal that the two small whorled pogonia populations on the White Mountain National Forest are small and scattered, with infrequent and low levels of flowering and fruiting. The populations are stable, but are potentially subject to loss by a random 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 the larger of the two populations in order to create a more open forest condition, which should benefit the plants. The environmental analysis is complete and the District Ranger has signed the decision notice. The White Mountain National Forest is now ready to implement the habitat management actions to ensure the long term viability of this population. The monitoring protocol, which has been in use since 2006, will allow the Forest Service to track the effects of the planned management action on the individual plants, sub-populations, and the population as a whole. The experience gained in managing and monitoring small whorled pogonia at this location will have broader implications for the management of the species on National Forest lands — in New Hampshire and throughout the range of this Threatened species.

Monitoring a population of federally threatened small whorled pogonia at Durrell Brook. WMNF photo by Chris Mattrick.

Delisted

Robbin's cinquefoil (Potentilla robbinsiana)

In 2001, Robbin's cinquefoil became the first plant species to be removed from the federal threatened and endangered species list. The results of the five year, post-delisting monitoring completed by the Appalachian Mountain Club indicate that the natural and introduced populations are stable. Conservation and protection activities relating to this species continue on an annual basis. The closure area on Mount Washington, established to protect the largest population of Robbin's cinquefoil, is monitored and maintained by the WMNF and the AMC. Re-introduction activities continue to take place on a limited basis at several sub-populations, with most efforts directed at the establishment and maintenance of a small viewing garden along Crawford Path. These activities continue through partnerships with NEWFS, AMC, and USFWS.

AMC ecologist records the location of Robbin's cinquefoil planted in a viewing garden near Lakes of the Clouds Hut. WMNF photo by Chris Mattrick.

Other Rare Plants

Other populations of rare species monitored in 2007 appear to be stable or show moderate increases. Extensive monitoring efforts were targeted at Oakes Gulf and Pinnacle Gully on Mount Washington in 2007. In late July, a group of botanists from the Forest Service, New England Wild Flower Society, Appalachian Mountain Club, Society for the Protection of New Hampshire Forests, and several private botanists spent several days

surveying Oakes Gulf on the southeastern side of Mount Washington. Named for Reverend James Oakes, the Gulf was once described as a "seemingly bottomless abyss." This area is known to harbor a number of rare alpine and sub-alpine species.

During the three-day botanical monitoring trip, more than thirty occurrences of rare plants were updated, including populations of alpine bearberry (*Arctostaphylos alpina*), alpine timothy (*Phleum alpinum*), and Oakes eyebright (*Euphrasia oakesii*). The crown jewel of these discoveries was a small population of black sedge (*Carex atraitiformis*), which had not been observed in the State of New Hampshire since 1952!

Another monitoring effort in Pinnacle Gully took a slightly more extreme approach. Nodding saxifrage (*Saxifraga cernua*) was first discovered there in 1939, and it is the only known location in the eastern United States. Located on the eastern flank of Mount Washington, Pinnacle Gully, with its shear overhanging walls made slick by the gush of a perennial alpine stream, is a treacherous place: climbing equipment and skills are a must.

The plants were last positively observed in the early 1970s, and several recent attempts turned up several possible but no positive observations. The population was apparently just far enough up the gully to be out of sight. In August, a team of three rappelled into and through Pinnacle Gully to search for the plants. The team was composed of the Forest botanist, a botanist from the New England Wild Flower Society, and the Backcountry and Wilderness Supervisor from the Androscoggin Ranger District. The rappel, from the summit of The Pinnacle (an imposing buttress jutting out from the south wall of Huntington Ravine), was an adventure in itself. Aptly named "The Pinnacle Plunge," it began with a sheer drop of 40-50 feet from the summit of the Pinnacle to the floor of the gully. The rappel then continued down the steep streambed, often requiring the team to travel in the stream itself, and over several waterfalls.

Many other rare species were observed and their records updated, including Mountain Avens (*Geum peckii*), Pickering's Reed Bent Grass (*Calamagrostis pickeringii*), alpine willow-herb (*Epilobium hornemanii*), and White Mountain saxifrage (*Saxifraga paniculata*). The further the team descended through the gully, the more discouraged they became: no plants could be found. Nearing the bottom, now searching locations that are clearly visible from the base, a small colony of nodding saxifrage was observed growing on a tiny shelf protected from the rushing waters by the morphology of the gully wall. The plants, appearing to be healthy and reproductive, occupy an area less than one square meter.

Cliff Plant Ecological Indicator

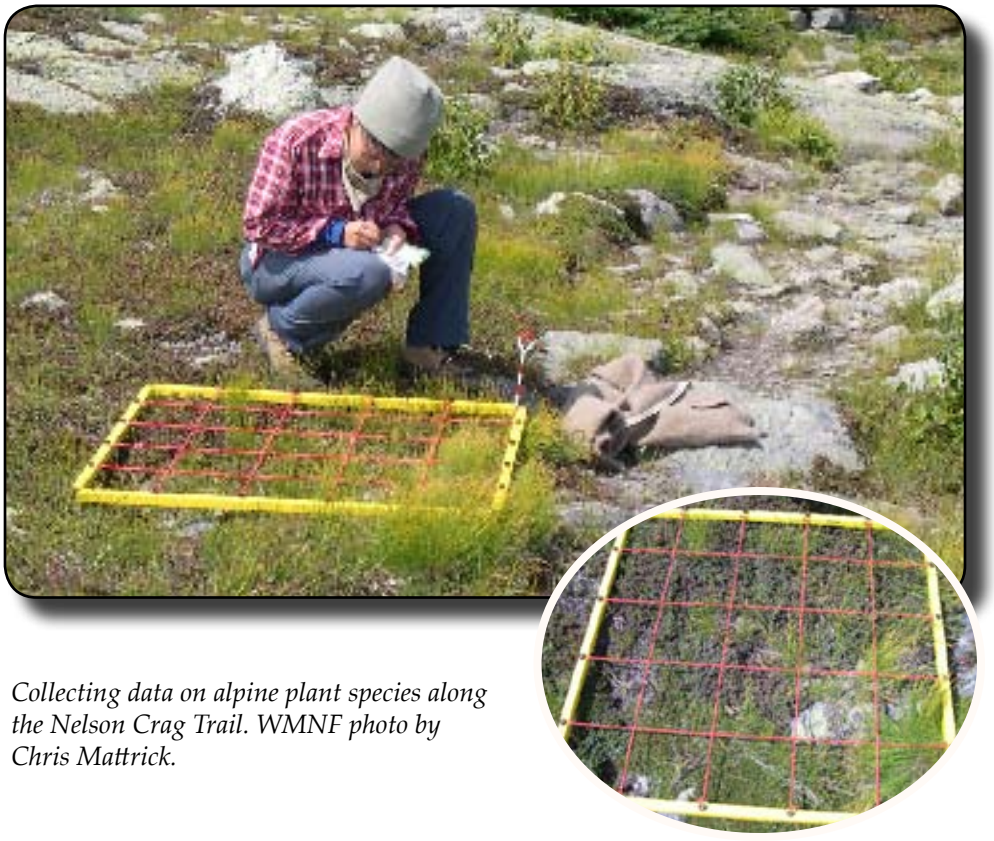
Monitoring for this indicator has been scheduled for FY 2008.

Alpine Ecological Indicators Monitoring

What are the effects of various recreation use levels on alpine plant communities?

Hiking in the alpine and sub-alpine zones in the Franconia and Presidential ranges of the White Mountain National Forest is one of the quintessential activities for a visitor. Since the early 1800s, visitors have flocked to the mountains in ever increasing numbers. In the past this increase in activity has resulted in dramatically increased impacts to the natural resources of alpine zones. Alpine plant species are some of the most uncommon species in the northeastern United States, occupying small islands of suitable habitat in the Adirondacks of New York, Mount Mansfield in Vermont, Katahdin in Maine, and the Franconia and Presidential Ranges of the White Mountain National Forest. Although these species occupy one of the harshest environments in the world, they are actually quite fragile and sensitive to human-induced changes and impacts. One alpine species, Robbin's cinquefoil, was driven to the brink of extinction due to over-collection and trail impacts in the late 1800s and early 1900s. Only through active management, education, and re-introduction has that species been removed from the federal endangered species list, as noted above.

In order to better manage and protect alpine plant species and communities, the WMNF has begun gathering baseline data on alpine vegetation along five segments of trail (two on Mount Washington



Collecting data on alpine plant species along the Nelson Crag Trail. WMNF photo by Chris Mattrick.

and one each in the northern Presidential, southern Presidential, and Franconia ranges). Data on species diversity, abundance, and coverage are collected along 50 meter trail segments. Within these segments, 14 meter square plots are arranged in vertical bands extending from the trail center laterally for three meters on either side of the trail. Following initial data collection in 2007 and 2008, data collection will be repeated at five year intervals using the same protocols. These data will be analyzed and compared to those collected in 2007 and 2008. Comparing data over time will allow the Forest Service to detect changes in species diversity, abundance, and coverage at these locations. The data will reveal both short and long term impacts of hiking, trail movement, inadvertent trampling, and perhaps climate change on native plant communities in the alpine zone. The results of the monitoring, in association with recreation data on trail use, will allow for more effective management of hiking and protection of alpine plant communities on the White Mountain National Forest.

In 2007, plots were established and data gathered on one trail segment on Mount Washington. The remaining monitoring plots will be established in June of 2008. The first set of comparative data will be collected in 2012.

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 constant point of discussion among land managers, town governments, state agencies, and non-profit organizations such as the New England Wild Flower Society, The Nature Conservancy, NH Department of Agriculture, and the Society for the Protection of New Hampshire Forests. 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 function, impact wildlife, reduce 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 WMNF, including such species as glossy buckthorn, Morrow's honeysuckle, and Japanese knotweed. The species impacting the Forest are terrestrial or wetland species. No true invasive aquatic plants or animals have been documented as yet, and the Forest is currently free of any infestations of NNIS insect species such as hemlock woolly adelgid or emerald ash borer.

However, these species are currently impacting other national forests to the south and west of New England, so in 2007 the WMNF developed a pest action plan to deal with a potential future threat. This plan sets forth a series of actions that would allow for rapid response to any discovered infestation of invasive insect pests.

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 was 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 New England Wild Flower Society 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, Appalachian Trail Conservancy, and local citizens about previously known and newly-discovered NNIS infestations. In April 2007, the WMNF, in partnership with the AMC, Silvio O. Conte National Fish and Wildlife Refuge, and the Invasive Plant Atlas of New England convened the White Mountain Early Detection Network (WMEDN) during a one-day early detection training on invasive plants and insects threatening the White Mountain region. The WMEDN will function as the Cooperative Weed Management Area for the greater White Mountain region.

Data regarding NNIS are maintained in the Forest Service's Natural Resource Information Service (NRIS) database, which currently stores information on 175 infestations (a decrease from 2006 resulting largely from a database clean-up) on lands managed by the White Mountain National Forest, and 1,762 additional infestations located outside the Forest boundary. Data on 42 new infestations occurring on lands managed by the Forest Service (including a portion of the Appalachian Trail corridor) were processed in 2007. Similar to those reported in 2006, these are likely newly-discovered areas of established infestations rather than new infestations resulting from recent introduction.

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 their spread, both on and off the National Forest. Control of NNIS is a relatively new activity on the WMNF, only beginning in earnest in 2005. The effectiveness of these treatments will be monitored closely to determine which methods are most effective.

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.

The NRIS 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 and 2006, a total of eight infestations were treated with herbicides, one site with the release of Galarucella beetles (which feed on purple loosestrife and can be an effective biological control for that species), and 21 infestations were treated with a variety of mechanical techniques (for example, mowing or hand-pulling). In 2007, all sites receiving chemical or biological treatments in 2005-2006 were monitored for treatment effectiveness; one-third of the mechanically treated sites were also monitored. All were evaluated by comparing current condition (infestation size, area, percent cover of invasive plants) to those conditions documented prior to implementation of control actions. An estimate of the percent cover of invasive plants is used as a general measure of the effectiveness of chemical and mechanical treatments. Biological treatments require a more balanced evaluation between a measure of percent cover and percent reproduction. Pre-treatment photos are compared to images taken of the site during the 2007 site evaluations. These become part of a series of photographs of each site, allowing for long term evaluation of treatment efficacy and recovery of native plant species.

Chemical treatments: Four out of seven infestations treated in 2005 showed only slight (20 percent) declines in percent cover. The remaining three infestations showed a significant reduction, with two of the sites being 100 percent eradicated and the third 90 percent controlled.

Ammonoosuc Ranger Station before and after control of invasive non-native honeysuckle. WMNF photos by Chris Mattrick.

One additional site was treated with herbicide in 2006. This infestation had a 90 percent decline in percent cover of the target species in the canopy and sub-canopy; however, a significant amount of seedling recruitment was observed in the ground cover layer. This is likely due to the increased level of light reaching the soil surface due to the removal of the canopy and sub-canopy of NNIS.

Biological Treatments: In July 2007, Galarucella beetles were released for the third consecutive year at a purple loosestrife (*Lythrum salicaria*) infestation near Pinkham Notch. Feeding beetles and damage to purple loosestrife plants were observed at that time from previous years' releases. This infestation was monitored periodically throughout the 2007 season, and no reproductive (blooming or seed producing) plants were observed. This is a dramatic and positive development. The lack of reproduction equates to cessation of seed introduction into the infested and surrounding areas.

Mechanical treatments: Mechanical treatments were utilized in 2005 and 2006 as stopgap measures. Only a small percentage (33 percent) of these were monitored in 2007, and the effectiveness of these treatments was extremely low.

Conclusions and Recommendations

At this time, with only two full 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 chemical treatments, when applied in a timely and appropriate manner, are highly effective in the short term. To date there is not enough long-term data from WMNF treatments to make any inferences on the longer-term efficacy of these treatments. In the third year of biological control for purple loosestrife, the effectiveness of the beetle feeding prevented flower production on all plants within the infestation. This is a positive result, but further monitoring is needed to determine whether it will be a long-term trend, with a resulting decrease in the coverage of purple loosestrife at this location.

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 2007 that would alter our management approach, and none of our results indicate a need for alteration in the current program.

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 (RMAs) to guide the Forest in providing a quality experience for the many visitors. Monitoring efforts on the Forest are designed to track progress in meeting these approaches.

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

In 2007, use data was collected at developed campgrounds as number of sites sold and at ski areas as number of tickets sold.

Campgrounds	47,791
Alpine Ski Areas	842,592
Nordic Ski Areas	53,413

The number of sites sold at the campgrounds in 2007 was up about 2,600 sites over 2006. Although this is an increase, the 5-year trend still shows an overall decline. Tickets sold at ski areas showed a decrease at the alpine areas but an increase at the Nordic areas in 2007. The decrease is largely due to the weather and low snow accumulations in the first part of the season.*

While the Forest does 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, annual or weekly passes). In 2007 we saw an almost 15% increase in the sale of daily fee passes. The weather seemed to play a role in this increase as sales were highest during the later half of the summer and into the fall when the weather was warm and dry.

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 2007:

AMC hut system	36,259 overnight guests
AMC Joe Dodge Lodge	17,171 overnight guests
AMC backcountry shelters	9,822 overnight guests
Hermit Lake Shelters	5,306 overnight guests
RMC backcountry facilities	2,975 overnight guests

These figures show a decrease in use with the exception of the Hermit Lake shelters which show a slight increase over 2006. There has been an

*Sales reporting requirements for ski areas were reviewed late in 2006, which resulted in higher 2006 figures (912,049 at alpine areas and 53,376 at Nordic areas) than shown in the last monitoring report.

overall trend of decreasing use at backcountry facilities over the last few years.

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

Number of Outfitter/Guide permits issued:

FY 2007	154
FY 2006	151
FY 2005	158
FY 2004	163
FY 2003	60

The number of permits issued over the last 5 years has not changed significantly. 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 (RMA) have given the Forest the basis to take a closer look at use to better manage the quality of recreation opportunities. The RMAs provide guidelines in order to prevent 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 amongst Forest Service staff, indications are that the RMAs are being implemented and are guiding recreation management on the Forest. In FY 2007 we started work on a process to store recreation use data consistently in one place and have engaged partners to help with collecting monitoring data. Monitoring use is labor intensive and with limited Forest personnel it will be difficult to accomplish this task on our own.

Adirondack shelter at Wild River Campground. WMNF photo by Ken Allen.

Soils

Monitoring for soil compaction should determine if soil compaction is happening, and if so, how detrimental it is and does it disappear when the research data suggests it should. We care about soil compaction because it can stunt future regeneration of tree stands and create more water runoff and less water retention, which ultimately effects soil productivity.

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

The decision to monitor certain areas of a proposed management project rather than others is based on discussions with Interdisciplinary Team members and listening to their concerns. In addition, ecological land type (ELT) layers of the soils mapped, the slope layer, and area photos are reviewed. Ultimately, prior experience and professional judgment determine representative sites for analysis. These resources provide the most accurate information to pinpoint areas that might have slope,

A properly rehabilitated skid trail. Use of waterbars and placement of slash has prevented soil erosion. WMNF photo by Andy Colter.

wetness, and regeneration issues. The tests chosen, the shovel test and occular method, have been proven to be effective on the White Mountain National Forest, and are sanctioned under the regional soil quality standards. Shovel testing involves digging a hole with a tile spade, determining how hard it was to dig, and visually examining the soils for evidence of platy structure.

In FY07, potential effects to soil productivity were monitored in several management project areas to determine if regional soil quality standards — soil erosion, compaction, puddling, displacement, impaired nutrient cycling — are met. Shovel tests and ocular measurements were used to monitor soil productivity on the Kanc7, Oliverian Stewardship, Albany HMU, Crawford, and Peabody timber projects, as well as for the Gail River hiking trail, Loon Mountain South Mountain Ski area expansion, Manway snowmachine trail, Brown Brook trail, and Bog Brook trail.

Monitoring revealed that the hiking trails were detrimentally compacted in the trail width, which is to be expected and allowed, but that there was no compaction outside the trail width, which is the desired condition. The pre-harvest timber project areas showed no detrimental compaction

The Forest-wide soils survey continued in 2007. WMNF photo by Chris Mattrick.

from prior timber activities on those lands, giving those areas a good pre-harvest soil condition on which to base post-harvest monitoring.

There is quite a bit of related research on this subject from the late 1980s and early 1990s. *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 forest. Monitoring ensures that this information is still relevant.

Conclusions and Recommendations

It will be necessary to revisit the timber project areas listed above for post-harvest monitoring to determine if the results are as expected. Given the history of prior harvest in those areas, there should continue to be no detrimental effects on soil productivity.

Are Forest Plan Objectives Being Achieved?

Standards and guidelines are being followed and BMPs are being implemented Whole-tree harvest is being monitored carefully, and no whole-tree harvest is occurring on outwash sands or soils shallow to ledge. Management activities are not occurring on soils when they are too wet.

BMPs appear to be providing the expected results; there is no evidence of excessive erosion from the skid trails and hiking trails monitored that could effect soil productivity. Tree health appears to be productive because all clearcuts continue to revegetate and we have not seen in unusual degree of mortality in the forest that could be an indictor of nutrient deficiency.

We continue to develop partnerships for soil nutrient monitoring, and to implement measures to minimize soil disturbance on Forest projects.

Continued monitoring will reveal if the effects of our management practices are what we expected.

Water

Water Quality Monitoring

Monitoring for water quality continued in 2007 to characterize and assess water quality of streams and lakes within the White Mountain National Forest. Water quality is tested in several ways. Longer term sites have been established on the Swift River, Wildcat River, and Upper Ammonoosuc River. Monitoring of the Wildcat Wild and Scenic River helps to indicate whether management actions are sufficiently protecting the quality of that river.

Other sampling sites are located in order to monitor the effects of specific forest management activities. For example, monitoring is used to characterize the water quality of streams in areas proposed for vegetation treatments. Sampling is done before and after selected management activities to provide information on the existing condition of surface waters and their watershed characteristics. This allows an understanding of how these watersheds will response to the proposed actions to assist in developing alternatives and to check whether or the proposed actions had an effect if implemented. This monitoring is accomplished by the Forest and through partnerships with researchers and other groups to study specific effects of management practices.

We also monitor for the effectiveness of Best Management Practices (BMPs): practices used to reduce the effects of Forest activities through project design features as well as standards and guidelines. This monitoring assesses if mitigation was incorporated into project plans and if it was implemented and effective. More specifically for water quality, it includes evaluation of implementation and effectiveness of protection measures such as riparian zones, limits on harvest acreages in watersheds, and erosion control measures. This monitoring has been informal and conducted through project reviews, but a formal process is being tested for use in 2008 to strengthen this important process.

Forest hydrologist taking water samples. WMNF photo.

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

As previously mentioned, water quality is being monitored in several ways. Long term sites continued to be sampled in 2007 on the Swift River and main tributaries, Upper Ammonoosuc River, and the Wildcat River. Data from these sites will be used to assist in understanding water quality characteristics in these larger watersheds. Field samples gathered in 2007 on the Wild and Scenic Wildcat River continue to be used to characterize the river and will help in determining river conditions. An initial assessment of data available in 2007 showed that in the spring, total aluminum concentrations in the Wildcat River are greater than the NH chronic criteria for the protection of aquatic life (87 μg/l). This is coincident with lower pH values. The Swift River has a similar pattern. Other watersheds on the White Mountain National Forest also have this relationship. Spring runoff is more acidic with more aluminum due to the influence of snowmelt whose chemistry is influence by atmospheric pollution and watershed characteristics such as topography and soil. The Upper Ammonoosuc River shows a different pattern with overall aluminum levels also above the chronic criteria, but with lower aluminum values in the spring compared to the summer low flows. This could be related to the influence of organic acids as evident by the darker color of the water.

Steven's Brook watershed was selected for focused water quality monitoring to assess how vegetation management activities combined with mitigations effect water quality. Pre-harvest samples were collected in 2006, 2007, and will continue in 2008. Field data, such pH, temperature, turbidity, conductivity and other parameters, are collected when water samples are taken. At the lab, major cations and anions and select metals are measured. Elevational sampling occurred in 2006 along the main stem and two tributaries of Stevens Brook. Total concentrations of aluminum of water throughout Stevens Brook are below the chronic criteria most of the time but from the limited amount of spring data available, it appears that Stevens Brook also demonstrates the pattern of more acidic spring runoff with higher aluminum concentrations. Additional analysis of this data will continue in 2008 as more data is available. There is also the potential for agreements and cooperative research or academia to assist with this study.

In addition, some of the sites where samples were collected in 2007 include Mill Brook and its tributaries and New England Brook on the Androscoggin Ranger District, Batchelder Brook, Clifford Brook, Oliverian Brook on the Pemigewasset Ranger District, and in Bog Brook, Ellis River, and upper Swift River tributaries on the Saco Ranger District. These samples will help understand water quality in other watersheds where projects are planned, and may help apply the Steven's Brook results across a wider range of stream conditions.

Monitoring Implementation and Effectiveness of BMPs

Are best management practices prescribed and implemented for activities?

Activity reviews occur throughout the year by District personnel as well as specialists and the Forest Leadership Team. For example, see the Project-Level Monitoring section in this report.

Project environmental analysis in 2007 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.

The Washington Office is working to develop a formal process for evaluating the effectiveness of BMPs. The Effectiveness Studies in Maine are examples of the type of study that will occur on the White Mountain National Forest within the next few years.

Conclusions and Recommendations

At this time, neither the monitoring results nor the research indicates a need to change the Forest Plan regarding water quality. Information is being collected to assess the utility of using percent basal area removed as an indicator for water quality changes within 1st order perennial watersheds. The Forest Plan and project monitoring and cooperative agreements are providing information for this purpose.

Best Management Practices are being applied and appear to be effective in mitigating impacts. A formal monitoring process of the effectiveness of BMPs is being developed by the Washington Office and will be tested for use in 2008.

Other Forest Plan monitoring includes how well the Plan's objectives are being met. One such objective is to maintain the "outstanding resource waters" within the Forest. Each year, watershed improvement projects are implemented across the forest to address identified areas requiring treatment. These projects are implemented across a wide range of programs. In 2007, these projects included work to improve stream function and habitat, restoration of impacted stream channels, and the relocation and/or redesign of several stream crossings.

Historically, waste materials at the Ore Hill mine deposited in a wet area adversely impacted 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 (CERCLA) work at Ore Hill mine has now been completed, and initial monitoring shows improving water quality.

The CERCLA work at the Ore Hill site now consists of continued assessment and monitoring and erosion control measures. Additional studies are being done at Ore Hill to understand the chemistry and effectiveness of the treatment. Erosion control measures were installed on the repository at the site to prevent rills and gullies while revegetation occurs. This type of work will continue in 2008.

Wilderness

In addition to recognizing Wilderness as "an area where the earth and its community of life are untrammeled 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 Management Plan (Appendix E of the Forest Plan) provides specific monitoring protocols consistent with the Limits of Acceptable Change (LAC) process as a means of ensuring that these different values are managed consistent with the Wilderness Act. The plan is designed to assure the Forest maintains a balance among primitive recreation, ecological integrity, and other wilderness values, even in the context of a heavily used urban national forest.

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

The LAC process is designed to emphasize monitoring of physical conditions within wilderness that may affect the use and enjoyment of the area as wilderness. Though less significant in terms of management action, it will also provide use trend data along trails and at destinations. This information will be used to determine if managers are meeting the desired condition of Wilderness as described in the Forest Plan, consistent with the Wilderness Act. The LAC method used in the Wilderness Management Plan was designed in recognition that managing for one value or characteristic of wilderness (such as providing "outstanding opportunities for primitive … recreation") may sometimes compromise another value (such as providing "outstanding opportunities for solitude"). The system defines standards which are the degree to which one value may compromise another before management action is necessary to maintain or restore an appropriate balance. This balance is often not the "desired condition" of the wilderness, but rather — as the name says — the limit of acceptable change. Over time, monitoring will determine if any of these standards have been reached or exceeded. If this occurs, specific management actions are described to ensure that an appropriate balance between use and enjoyment and primitive condition of the wilderness is restored.

Conditions

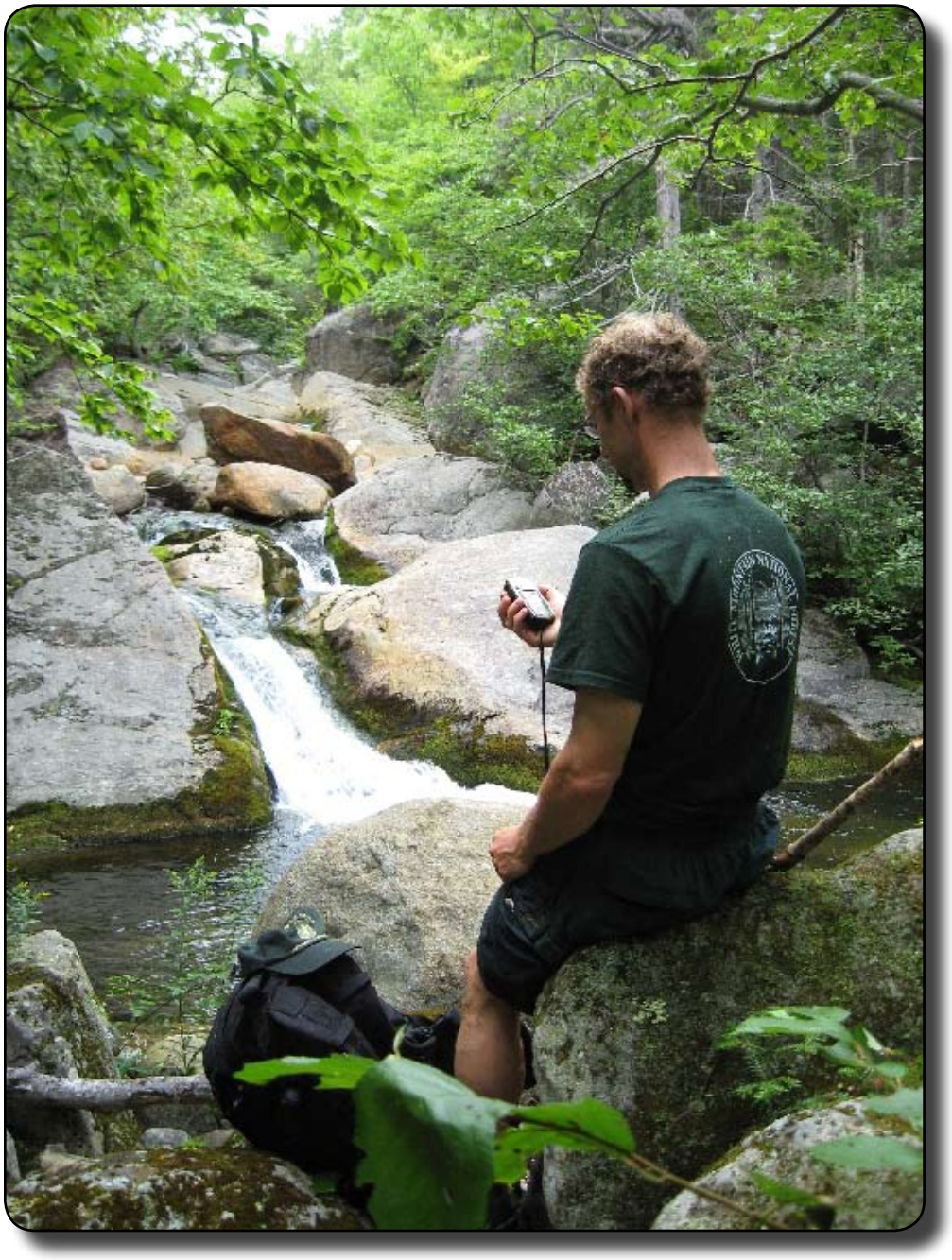
In 2007, the Forest developed protocol and started collecting data to look at campsite density and campsite size (tables E-05 & E-06 in the Wilderness Monitoring Plan). We also continued to collect data on visitor trail use and visitor destination use (tables E-02 & E-03 in the Wilderness Management Plan). Using Forest Service staff and volunteers, sampling was conducted throughout the summer in all Wilderness areas.

Conclusions and Recommendations

The Wilderness Management Plan sets timeframes for monitoring each of the indicators described in the LAC process. At this time, collected data

have not indicated a need to take management action for any indicator. As additional data are gathered, they are likely to confirm that actions will be required to address campsite size and density in certain locations based on the current condition.

Use data is measured over three-year trends. At this time it is not expected that a consistent increase in use will be observed over this period. As such, specific management actions are not expected to be required to address increase or change in visitor use patterns.



Matt Schomberg takes a GPS reading while monitoring recreation use in the newly-designated Wild River Wilderness. WMNF photo by Justin Preisendorfer.

Wildlife

Bicknell's Thrush

What is the population trend of Bicknell's thrush on the Forest?

Bicknell's thrush is a migratory songbird that breeds in montane fir-dominated forests of the northeast, wintering in the Greater Antilles. It is the only bird endemic to the northeastern U.S. and adjacent Canada. Unfortunately, Bicknell's thrush is also considered one of the songbirds most at risk in eastern North America. Partners In Flight (an international coalition of government agencies, conservation organizations, academic institutions, and private industry dedicated to "keeping common birds common") considers Bicknell's thrush among the highest priority species for conservation planning in the northeast. Bicknell's thrush is currently listed as Sensitive by the Forest Service and Special Concern in New Hampshire.

Bicknell's thrush breeds in high elevation forests dominated by balsam fir, with lesser amounts of spruce, white birch, mountain ash, and other hardwood species (Rimmer et al. 2001). The Vermont Institute of Natural Science (Lambert et al. 2005) created an elevation-based model to identify the amount of potentially suitable habitat in the U.S. They found New Hampshire holds 45 percent of the habitat (123,000 acres), followed by Maine (23 percent), the Adirondack Mountains (23 percent), the Green and Taconic Mountains of Vermont (8 percent), and the Catskill Mountains (1 percent). The White Mountain National Forest manages the majority of habitat in New Hampshire. Within that area, highest densities

Suitable Bicknell's thrush habitat. WMNF photo by Leighlan Prout.

are often found in chronically disturbed stands of dense, stunted fir (e.g., in "fir waves").

This species' habitat is already naturally restricted by elevational constraints, but this fact is compounded by the problem of apparently declining population numbers. An initial analysis showed an annual decline of -8.3 percent on the WMNF from 1993 to 2000 (Rimmer et al. 2001). A more rigorous statistical analysis in 2005 confirmed a similar negative trend (Lambert et al. in press).

Bicknell's thrush is monitored along with a number of other high elevation bird species, using fixed-point transect protocol. Approximately 550 points are spread in suitable habitat along 37 transects. The number of points per transect varies as a function of topography and elevation, which dictate the amount of suitable habitat in a given area. Each transect is visited once during June. During each 5-minute point 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 Bicknell's thrush numbers, 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 1993 as a way to monitor a variety of songbird species.

Surveys have been completed annually on the WMNF between 1993 and 2000, and have since been completed every other year beginning in 2003 as a result of budget limitations. The 2007 survey was the 11th year of data collection.

In 2007, almost 3,100 individuals were counted, totaling 61 different species. Sixty-eight Bicknell's thrush were identified on 24 separate transects, a decline from the 83 individuals identified in 2005. It would appear that such a drastic change indicates a continuing population decline; however, bird monitoring data often shows dramatic year-to-year variations as a result of early or late spring weather affecting breeding behavior or poor survey conditions hampering the ability of surveyors to hear birds in a given year. Anecdotally, surveyors felt this year's survey suffered from especially cold temperatures on some mornings.

Long-term datasets are crucial for obtaining an accurate picture of population trends. Since the last major analysis was just completed, we would expect that another evaluation would not occur until at least 2010.

In the meantime, U.S. and Canadian agencies and organizations in the Northeast have joined forces to develop a region-wide monitoring protocol for Bicknell's thrush. The new protocol will allow for a more accurate assessment of Bicknell's thrush population trends throughout its breeding range. The protocol is expected to be field tested during the summer of 2008, with full implementation beginning in 2009. If the Forest's existing protocol can be slightly modified to follow this new regional protocol, the Forest will likely adopt it. If, on the other hand, the protocols are widely different, a decision will be needed on whether to implement both protocols or continue with just one of the protocols.

Conclusions and Recommendations

No new conclusions or recommendations are available. Continued monitoring and data analysis over the next several years should result in more refined population trend information. If a new protocol is not adopted, we would anticipate another detailed analysis of the data in 2010.

Literature Cited

Lambert, J.D., McFarland, K.P., Rimmer, C.C., Faccio, S.D., and J.L. Atwood. 2005. A practical model of Bicknell's thrush distribution in the northeastern United States. Wilson Bulletin 117(1):11.

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TES Large Mammals

Are Canada lynx and gray wolf present on the WMNF?

This monitoring task is designed to help search out evidence of Canada lynx and gray wolf, two rare species with little or no recent occurrence on the WMNF. In 2006, a single female Canada lynx was verified on the Forest, with evidence of additional animals possibly occurring nearby. A single animal recently shot and killed in Massachusetts after depredating livestock was identified as a wolf. Both species commonly travel long distances to seek out new territories, so the possibility of finding them on the WMNF 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 snowshoe hare, an important prey species for most large, predatory mammals on the Forest.

Although the Forest 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.

All 8 transects were run in 2007, including two replicates for each transect. In addition, a directed search specifically for lynx tracks was performed along the Kilkenny Loop Road in the northern part of the Forest.

A total of 1,673 tracks of various species was recorded during the 2006-2007 winter. Even considering the greater number of replicates run

this year, these numbers are significantly higher than in 2006. However, there appears to be substantial year-to-year variation in numbers of individuals counted for many species. With only three years of data collection completed, there is little to evaluate. As in previous years, snowshoe hare and red squirrels were the most often identified tracks, making up almost 80 percent of the total number of tracks. Red fox were significantly higher than in the two previous years, while snowshoe hare declined again in 2007 after higher numbers were counted in 2005. No lynx or wolf tracks were found in 2007.

On the Kilkenny directed search, no lynx tracks were found, although abundant snowshoe hare tracks were noted in two locations.

Conclusions and Recommendations

Three years of data are inadequate on which to base conclusions about long-term presence or absence of rare species. Lynx and wolves are so rare in the area around the WMNF that it is not surprising that no tracks were found this year. Similarly, long-term trends of various populations cannot be adequately described with such limited data, especially given the wide variation in year-to-year numbers for some species. However, we hope to be able to provide a more qualitative evaluation in the 2009 report, which would be based on 5 years of data.

Wood Turtle Monitoring

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

The wood turtle is a designated Sensitive species on the WMNF. Like some other sensitive species, habitat is somewhat limited by

Typical wood turtle habitat. WMNF photo by Leighlan Prout.

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 here.

In 2007, 4 areas were surveyed on the Forest for wood turtles: (Bog Brook (Gilead, ME), a tributary to the Mad River (Campton, NH), Basin Pond area (Chatham, NH), and Cold River (Stow, ME) using a protocol developed in 2005. The protocol consists of a targeted search along banks of slow-moving, sandy streams. Streams are surveyed either in early spring or in the fall. If wood turtles are found, measurements and photographs are taken. Wood turtles have distinctive markings and can easily be monitored as individuals, unlike most other species. Turtle tracks are also noted, since wood turtle tracks can sometimes be differentiated from other turtles.

Wood turtle found on Mad River tributary. WMNF photo by Michael Jones. Below: UMASS graduate student Mike Jones with a Mad River wood turtle. WMNF photo by Leighlan Prout.

In 2007, one adult wood turtle was found on the Mad River tributary using this method.

Related Research

In 2007, a research project was initiated to evaluate wood turtles and their habitats in and around the White Mountain National Forest. Michael Jones, a PhD candidate at the University of Massachusetts at Amherst, surveyed 6 rivers and their suitable tributaries, focusing more intensive marking and radiotelemetry work on two sites near Plymouth, NH. A total of 78 wood turtles were marked (by notching their shells) and catalogued by taking photos of their shells. The markings on the underside (plastron) of wood turtle shells are unique and individuals can be identified based on these markings. In addition, an estimation of age was obtained by counting the rings (annuli) around each segment (scute) of the shell. Finally, radio transmitters were attached to 15 adult turtles, which were then followed for 5 months during the summer.

The wood turtle population around Plymouth appears heavily biased towards males, with twice as many adult males found as adult females. This is different than other wood turtle populations studied in Massachusetts and Maine, where sex ratios are more even.

The set of wood turtles from the WMNF had a higher number of older individuals and a higher proportion of injuries (which

Unique plastron markings and annuli of a female wood turtle. WMNF photo by Michael Jones.

might be associated with an older population). The level of injury and skewed population structure might indicate the effects of mammalian predators such as fox and raccoon. These mammals would readily feed on turtle eggs, which could limit the number of individual wood turtles that could hatch and add to the population. Because wood turtles don't breed until they are quite mature (around 20 years old), loss of older individuals could result in a serious population crash until young turtles grow old enough to reproduce.

Telemetry data provided valuable information on local wood turtle home range size. On average, wood turtles used approximately 1,000 meters of stream habitat and utilized terrestrial habitats approximately 100 meters away from the water. However, activity patterns varied widely between males and females, with males occupying a longer stream distance, but females ranging further from the water. These patterns are similar to those from a related study in Massachusetts.

Conclusions and Recommendations

Because wood turtles have a long lifespan and relatively low recruitment level, we expect monitoring will be needed for many years. In the meantime, efforts by researchers such as Michael Jones provide much appreciated details and insight into local wood turtle habitat requirements. We expect additional data collection during summer, 2008, will add to the information available from this important study.

High Elevation Bird Ecological Indicators

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

An issue identified in the recent revision of the Forest Plan was concern over levels of recreation use and the potential impacts they may have on ecological values. There are a variety of recreation activities that potentially could cause impacts to many wildlife species, but in order to reasonably address this issue, monitoring is focused on three sensitive areas: cliffs, alpine, and high elevation spruce-fir forest.

A study was initiated in 2006 to evaluate the effects of hiking use on occupancy and breeding success of birds in high elevation spruce-fir on the WMNF. Bill DeLuca, a graduate student at the University of Massachusetts and Dave King, a Forest Service Research Wildlife Biologist, are heading up the project, which focuses on high use hiking trails in the Presidential Range.

A series of 120 survey sites (90 sites in 2006) was located in suitable habitat across ten high use hiking trails on the Forest. Survey points were located directly on the trail, as well as 200 and 400 meters from the trail (effects from hiking trails or use on trails are not expected beyond 400 meters). Point counts were completed three times for each point between June 1 and mid-July.

In addition, a number of blackpoll warbler nests were located and followed over the course of the nesting season to determine nest success. Blackpoll warblers are an indicator species in this habitat type and serve as a good research subject because they are generally more abundant (therefore territories are easier to find). Video cameras were also set up at 13 nests in an effort to better determine effects of hiking use on breeding behavior. Cameras recorded bird behavior while researchers walked the trail broadcasting human voices to simulate disturbance from hikers. Cameras recorded 30 minutes without disturbance, then 30 minutes with broadcasting, then an additional 30 minutes without disturbance to compare behavior.

Over the last two years, 630 point counts were completed, with researchers identifying a total of 42 bird species. Identifying a bird on a point count depends on two factors: whether or not a species is present and whether or not it is detected if present. Neither occupancy rates nor detection rates were statistically different when comparing survey points at varying distances from the trail for any species. This essentially means that hiking use is not likely causing birds to avoid trails or somehow changing their behavior to make them less detectable closer to trails. Interestingly, this is the opposite of what other similar studies have found. However, those studies were in different habitats in western environments and may not be applicable to the dense forested condition here on the WMNF.

UMASS PhD candidate Bill DeLuca measuring a blackpoll warbler.

Mapped blackpoll warbler nests ranged from 3 to 200 meters from the trail with an average of 55 meters. Nest success rate was 83 percent in 2006 and 50 percent in 2007. Both years fledged an average of 3.5 young per successful nest. The lower nest success in 2007 may be due to the biennial red squirrel cycle. (Red squirrel populations follow the balsam fir cone crop, which is usually high in one year and low the next. Because red squirrels are a common nest predator on many songbirds, it is common for nest success to be higher in low squirrel years and lower in high squirrel years).

Video cameras collected a total of approximately 82 hours of footage, which is still being analyzed. We hope to see final results of this data in 2 years.

This PhD study will help answer the monitoring question identified above. However, we may find that recreation levels do not explain population declines and that other contributing factors may be to blame. Other possible concerns for species in this habitat include mercury deposition and/or climate change. While the toxic effects of mercury on organisms is not a new concept, the pathways for how mercury becomes available to terrestrial animals in high-elevation ecosystems or how it specifically influences their numbers or reproductive success has not been well-studied. Mercury can impact behavior and reproduction, and also affects processes requiring calcium, such as egg-laying. Comparisons can be evaluated using soil calcium models, mercury levels, and sites with increasing or decreasing bird trends (identified using the 15-year WMNF bird monitoring dataset).

Similarly, the effects of climate change may have serious consequences to species living in isolated habitats such as mountaintops. As temperatures warm, the range of vegetation typically found in warmer, lower elevations may move higher upslope and reduce the amount of high-elevation spruce-fir forest available. Consequently, species dependent on this ecosystem would find less suitable habitat, which could lead to reduced numbers.

Bird monitoring data from the past 15 years on the WMNF will be evaluated to determine if bird occurrence has changed in elevation over that time (as climate warms, we would expect that high elevation spruce-fir habitats will shrink and be replaced by deciduous habitats).

Conclusions and Recommendations

The 2006 work was the first year of an anticipated 3-year study. Final Results from this multi-year project area expected in 2010.

Other Monitoring

Preliminary Biological Surveys At Four High Elevation Ponds

Each year, a number of individuals request approval to perform a wide variety of research activities on the Forest. In many cases, these projects provide valuable information which WMNF staff would otherwise be unable to obtain because of limited funding and staffing. One example of such a project is a baseline amphibian survey of high elevation and alpine ponds, performed by Scott Smyers of Oxbow Associates and Michael Jones of the University of Massachusetts – Amherst. By the very nature of the White Mountains, high elevation ponds are relatively uncommon. The late snowpack and harsher climate that prevails in higher elevations results in a different set of challenges for species more commonly found in valleys and lower mountain slopes. Despite this common knowledge, almost no information exists on species occupying high elevation ponds.

Between May and July of 2007, Smyers and Jones completed a 1-day survey at each of four pond complexes (Eagle Lakes, Hermit Lakes, Lakes of the Clouds, and Star Lake). All of these ponds are at least 900 meters in elevation, with two above treeline and two just below. Baseline data collected included presence and identification of amphibians, reptiles, and invertebrates present in or around the water. Habitat characteristics such as water temperature, air temperature, and pH were also collected, as well as identification of vascular plants located in and around the ponds.

Wood frog eggs from Eagle Lakes. WMNF photo by Scott Smyers.

Table 2. Summary of amphibians/reptiles found at WMNF high elevation ponds

Pond name	Air temp (°C)	Water temp (°C)	pH	Wood frog	Green frog	Spring peeper	Spotted salamander	American toad	Garter snake
Eagle Lakes	22	16	5.0	22 adults; 365 egg masses			1 egg mass	1 (along trail)	1 (along trail)
Hermit Lakes (Hermit Lake)	16	18	4.8	2 adults	3 adults	1 adult	6 egg masses	1 (along trail); eggs present	1 (along trail)
Hermit Lakes (Cutler Brook Pond)	16	10	5.4	1 juvenile				2-3	
Lakes of the Clouds	19	17-19.5	5.1					2	
Star Lake	15	16	4.2	1 adult (along trail); 70+ tadpoles				14 (along trail)	

A variety of aquatic invertebrates were found at all ponds, with the exception of Lakes of the Clouds, at which only a small number of caddisflies were found. The other ponds supported different kinds of caddisflies, water boatmen, mayflies, darners, midges, and others.

Even though this initial survey was completed over a very few number of days, the results offer interesting insights. Wood frogs are, not surprisingly, the most prevalent amphibian found. Their unique ability to freeze and thaw allows them to survive severe winter weather without burrowing into mud, the way other frogs do. This adaptation would lend itself well to the cold temperatures and deep snowpack on mountaintops. It would also appear that at least some species of amphibians and invertebrates have been able to persist despite fairly acidic conditions.

In the future, this kind of information could be supplemented by additional surveys at other high elevation ponds, as well as form the basis to evaluate how some species respond to variations in temperature, moisture, and other environmental conditions. This in turn could provide useful information in determining how species respond to subtle or abrupt changes resulting from changes in climate or chemical deposition.

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.

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.

Loon Mountain Ski Area Expansion

Deputy Forest Supervisor Barnie Gyant, Saco District Ranger Terry Miller, and Ecosystems Team Leader Chuck Prausa. WMNF photo by Joe Gill.

On July 12, the Forest Leadership Team, Eastern Region Winter Sports Team, and ski area managers toured the Loon Mountain Ski Area South Mountain expansion project.

The pump house originally situated on the edge of Loon Pond has been removed. The site had been restored, seeded, mulched with straw, and a silt fence had been installed between the site and the edge of the pond. Despite subsequent heavy rains, there was no evidence of soil movement.

Two lift lines were visited: the G-1 that connects the existing ski area with the South Mountain Expansion area and doubles as a work road, and the G lift that carries skiers from the South Mountain parking area. The team observed no sedimentation in Loon Pond brook where it crosses the G-1 road/lift line, despite the heavy construction activities on both sides of the brook.

Next, the team hiked down trail 40, the eastern-most trail in the expansion area and the one that best represented all phases of trail construction occurring on the mountain. Mitigation measures along the trail will create Lynx denning habitat.

Conclusions

Mitigations identified in the ROD were carried out. Recent heavy rains had not adversely affected the conditions. It is important to continue monitoring the effects of the mitigations.









Loon Mountain's South Mountain expansion work in progress. WMNF photos by Joe Gill.

Monitoring Project Revegetation

A singular characteristic of the White Mountain National Forest is its capability for renewal through natural reforestation and regeneration. The Saco District has been monitoring the effects of common temporary harvest features such as skid trails, stream crossings, as well as the recovery from various types of harvest prescriptions.

The Steam Mill Project, situated along the Kancamagus National Scenic Byway near Steam Mill Brook, was harvested during 2001 and through March, 2002.

2003, 2004, 2007

2004, 2007

The three upper photos show the effects of time on, and the natural recovery of, a main skid trail within the Steam Mill sale. This unit was harvested with a processor and forwarder during the winter of 2002. The ground surface shows no slope and no likelihood of runoff; thus the sale administrator chose not to have this area seeded or mulched. Although the natural recovery was slower than similar locations where seeding and mulching was used, the end results are determined acceptable, with no overland runoff.

The two lower photos show the same skid trail where it passed through a softwood stand. The soil types were similar and the same skid loads and equipment came over this portion of the trail. Again no seeding was done.

The three photos below show a short (<100 feet) section of steep skid trail that exceeded a 20 percent slope. This was within Forest Plan guidelines, which allow for "short" sections that exceed 20 percent. This location had no water directly running into the skid trail above the top of the slope and, thus, no demonstrated need for a cross waterbar. A small puddle at the base of the slope can be seen, yet, no evidence of soil erosion is present and the area is naturally re-vegetated within three years.



The three photos below show an experimental thinning, hand felled and harvested with a cable skidder in Winter 2003. Photos shows the lack of soil compaction, natural reseeding of the skid trail, and a residual stand in a typical thinning.



March 2003, May 2005, June 2007

All WMNF photos by Ken Jaeger.

Recovery of a Temporary Bridge Crossing, Tremont Sale

2006, 2007

The two photos at left show the results of seeding at a temporary bridge crossing site for Tremont sale that was closed out and seeded in 2006. The 2007 photo shows one years growth and no evidence of erosion. Monitoring will continue in 2008.

Revegetation of a Log Landing, Allard Brook and Experimental 2 Sales

Allard Brook 2005, 2006, 2007

Experimental Thinning 2 2005, 2006, 2007

Log landings (where trees are stacked until they can be hauled to the mill) at Allard Brook were closed out and naturally seeded. These two landings were used during non-frozen conditions and, therefore, have typical soil compaction and re-vegetation. Closure for both sites included grading and waterbarring. Allard Brook was allowed to reseed naturally. The Experimental 2 sale received partial seed and mulch, primarily to test a winter rye seed mix and evaluate its ability to prevent erosion and establish a vegetative layer rather than because it was needed here. This location was chosen for seeding in part because of its close proximity to an open Forest System road near the town of Bartlett.

North Kilkenny Vegetation Management Project Field Review

In March 2007, while this proposed sale's Environmental Assessment was out for public comment, a review team that included several members of the project's interdisciplinary team visited the site to review and confirm harvest prescriptions for aspen and softwood regeneration and to discuss protection of three ponds in the project area.

The project area is located in the Towns of Stark and Milan, Coos County, New Hampshire; the project proposes to harvest timber on 1,031 acres in the South Pond Habitat Management Unit (HMU) and to expand and maintain four permanent wildlife openings.

Stand Prescriptions

The team visited three stands:

Stand 17, compartment 6: Group selection was prescribed to regenerate spruce-fir in four two-acre patches across the stand. The team agreed that the prescription would meet the Forest Plan goal of regenerating spruce-fir to maintain this habitat type. By not taking every tree in a designated patch, there would be less damage to the existing advanced spruce regeneration.

Stand 34, compartment 6: A clearcut was proposed to regenerate 18 acres of aspen. A total of about 135 acres of aspen regeneration is the desired condition for the South Pond HMU. While the stand could be managed for the high value sugar maple and ash that occur throughout it, this stand is the only area in the northern portion of the HMU that has an opportunity for aspen regeneration. Conversely, there are many other opportunities for northern hardwood management with a sugar maple component throughout this portion of the HMU. As a result, the team confirmed that managing for aspen was the priority, and that the prescription and completed timber marking and layout met the goal of the EA's preferred alternative for regenerating aspen.

Stand 4, compartment 7: The review team discussed whether to re-enter this stand and if so, what prescription and cutting guide would best meet habitat needs. The stand provides good deer wintering cover in its current condition, and if harvest is proposed, the treatment should retain 70 percent of crown closure to preserve wintering habitat. It was generally agreed that it is desirable to harvest some of the fir that might die before the next entry. Shelterwood was discussed as an acceptable prescription for regenerating spruce-fir as long as a portion of the stand is left with adequate cover. Group selection is another possibility, as it maintains cover in the stand and still allows deer to move easily through it.

Pond Protection

During the interdisciplinary analysis process, the Forest Botanist recommended a 300-foot buffer around Rocky Pond and two other nearby softwater ponds to protect this pond complex, which is considered an exemplary community by the New Hampshire Natural Heritage Bureau. The Forest Plan recommends a 25-foot no-cut buffer and a 75-foot riparian management zone around all ponds.

> *G-1, page 2-24 – Tree cutting and harvest should not occur within 25' of … the high water mark of a pond.*
>
> *G-2, page 2-24,25 – Uneven-silvicultural practices should be used within the Riparian Management Zone (RMZ) along... ponds…. Cuts should be designed to maintain a relatively continuous forest canopy for the protection and maintenance of water quality, dead wood recruitment, hydrologic function, wildlife habitat, and scenic values. (Note: per Table 2-01, p. 2-25, ponds have an RMZ of 75'.)*

On the field review, some of the team questioned whether the RMZ called for in the Forest Plan would be adequate to protect the exemplary pond complex without increasing the no-cut buffer to 300 feet. A lighter treatment could be used within 300 feet of the pond and still meet protection standards in the Plan. A large berm near the pond is a natural feature that could be incorporated into the design of a riparian buffer zone. The review team discussed what needs to be protected around the pond (maintaining light levels, preventing sedimentation resulting from harvesting, limiting soil compaction, etc.) and what mitigation would meet those needs.

The review team also considered whether the Land Suitability Class (LSC) for the area surrounding the ponds should be changed to identify the area as unsuitable for timber harvest. They concluded that if the 300-foot buffer is needed to protect the pond complex, it would be desirable to change the LSC in this area to 810 (unsuitable for harvest). However, input from the Botanist is still needed as to what attributes of the exemplary community need protecting and how forest management activities would affect them. The team will consult with the Forest Botanist to find appropriate solutions.

Design Feature Validation

While reviewing prescriptions in stand 34 of compartment 6, the team noted that two clumps of hemlock had been marked for harvest, one near a stream. However, a design feature in the EA recommends preserving hemlock where possible.

> *Design Feature: Where present, reserve most hemlock trees, hemlock inclusions, and some large white pines as wildlife trees. In particular, reserve supercanopy white pine trees within 0.25 miles of South Pond to maintain potential bald eagle and osprey nest trees (USDA-Forest*

Forest Service specialists lead a public inspection of the proposed North Kilkenny project area. WMNF photo by Jeff Williams.

Service, 2005a, Wildlife, G-3, p 2-33 and Rare and Unique Features, Bald Eagle, G-1, p. 2-13, USDA Forest Service 2003 and USDA Forest Service 2005d).

The rationale for the design feature is that hemlock trees provide excellent cover for wildlife, are not usually a valuable product, are long-lived, and once cut, are unlikely to regenerate in the area. As a result, the review team recommended that the hemlock clump near the stream be retained to accommodate the design feature.

Additional Conclusions and Recommendations

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

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.

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 wide-spread 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 biochemical 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.

Activity or Product	Unit of Measure	Estimate for the First Decade	FY07 Accomplishment	First Decade Accomplishment, to Date
Aquatics				
Stream habitat restoration	Miles	30	3	3
Restore fish passage	Road crossings	10	1	1
Fire Management				
Wildland Fire Use	Fires	4 – 8	1	1
Forestry				
Volume Sawtimber Harvested	MMBF	137	4.4	11.2
Volume Pulp Harvested	MMBF	106	5.3	13.9
Even-aged regeneration harvest	Acres	9,400	321	1,243
Even-Aged Intermediate harvest	Acres	5,600	298	1,004
Total harvest	Acres	34,300	1,511	3,824
Recreation				
Net increase hiking trail construction	Miles	Up to 25	0	0
Net increase snowmobile trail construction	Miles	Up to 20	.1	.1
Net increase developed campground sites	Sites	Up to 32	0	0
Net increase backcountry facility capacity	PAOT	Up to 40	0	0
Soils				
Improved Watershed/Soil Conditions	Acres	At least 250	25	55
Transportation				
Road construction	Miles	10	0.9	1.6
Roads reconstructed	Miles	70	6.4	14.7
Roads decommissioned	Miles	5 - 40	0.13	0.13