United States
Department of
Agriculture

Forest Service

White Mountain National Forest
Monitoring Report
1998

Forest Supervisor's Message

Hello,

I'm pleased to issue the 1998 White Mountain National Forest Monitoring Report. In this year's report, we are featuring an array of activities, studies, and research accomplished by cooperators, scientists, and college and university programs involved with the White Mountain National Forest. The efforts of many dedicated people who work to understand how a forest functions and how activities impact the land are truly outstanding. This cooperation enables us to stretch our monitoring budget to cover a wide area of topics. This information along with the information gathered by our own employees provides us with the essential building blocks to continually adapt our management of the forest to meet Forest Plan objectives. In each section, we highlight our thoughts about how the information affects Forest management and the Forest Plan.

You may note that some data appears old. Analysis of collected data can often take more than 2 years. Unfortunately that is the case with the air monitoring data. Though we have continued to collect data on air quality in both 1997 and 1998, the data interpretation is not completed. We will report those results to you as they are available.

This year's monitoring report illustrates the diversity of management opportunities on the White Mountains. In this report, you will find discussions on timber harvesting, recovery efforts for threatened plants, investigations of trout genetics, and investigations into soil productivity. Another item that comes across is the concern and care that the public has for the White Mountains. This concern is reflected in the forest values paper discussed in the Monitoring Report.

I have some good news to pass on. We have received funding to begin the Forest Plan Revision in 1999. We will formally begin the process by publishing a Notice of Intent in the Federal Register in September. This will enable us to begin addressing those items that we and the public agree need to be considered for change in the current Forest Plan.

As we undertake the Forest Plan Revision over the next 3 years, I am encouraged by the connection I see between the public concerns and the Forest Service's Natural Resource Agenda for the 21st century. The Agenda focuses on the four areas: 1) watershed health and restoration, 2) sustainable forest ecosystem management, 3) forest roads, and 4) recreation. These seem to voice the same themes that our monitoring data and many of the public are voicing.

We look forward to working with you on the Forest Plan Revision as we address the complicated and controversial decisions that are required to improve our Forest Plan.

Donna L. Hepp

Forest Supervisor

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The White Mountain National Forest

The White Mountain Forest is a special place. Concern for the White Mountain inspired the 1911 Weeks Act and creation of National Forests in the east. Many interests from across New England came together and worked for 10 years to pass this legislation. The States of New Hampshire and Maine ratified the creation of the White Mountain National Forest. The initial purposes emphasized in creating the National Forests were to protect water flows, furnish a continuing supply of wood products, and to improve and protect the forest.

Today, the White Mountain National Forest is 777,496 acres within the states of New Hampshire and Maine. Fifty-eight towns lie within the National Forest boundary. The National Forest is vital to the life-style and economic health of the area. The landscape ravaged by uncontrolled logging and fires has been restored to a productive sustainable forest through over 80 years of Forest Service stewardship. Almost 7 million visitors are drawn to the White Mountain National Forest each year for its outdoor recreation opportunities and scenic beauty.

National Forests were established to provide resources for the nation while also protecting and managing the land for future generations. National Forests were set aside for conservation, the wise use of resources through a balance of activities and uses. These uses include water, recreation, fish and wildlife habitat, wood products, and wilderness. The Natural Resource Agenda for the 21st Century for the Forest Service is to protect and maintain the health of the land. The Agenda focuses special attention on four key emphasis areas:

- Watershed Health and Restoration
- Sustainable Forest Management
- Recreation
- National Forest Roads

There are 20 watersheds in the White Mountains, including the headwaters for many of the streams that flow into the state's rivers. There is an incredible range of recreation opportunities on the Forest every season of the year. Scenic driving, camping, hiking, fishing, hunting, bicycling, mountaineering, canoeing and kayaking, swimming, rock and ice climbing, downhill and cross country skiing, and snowmobiling are some of the activities people enjoy on the Forest. The Forest provides habitat to a wide variety of plants and animals including over 184 species of birds. This includes habitat for federally designated threatened and endangered plant and animal species including the peregrine falcon, bald eagle, Indiana bat, pogonia, and Robbin's cinquefoil. More the 50 percent of the Forest is designated for activities that do no allow commercial timber harvest. The current timber harvest level of 20 million board feet is about 1/3 of the annual forest growth on the timber base. Vegetation management projects are tied to habitat management goals established in the Forest Plan.

The Forest Service is committed to maintaining and restoring watersheds and ecosystems, while also using the land at sustainable levels for water, recreation, wood products, Wilderness and a wide range of special uses from ski touring to maple tapping, based on sound science and collaborative stewardship.

Fish

Our Thoughts: *This section describes data gathering efforts which are designed to assess fish populations and in some cases provide information on habitat quality and use. Researchers will combine this information with future monitoring information to determine the effectiveness of restoration efforts on increasing fish populations. We will examine any guidance on restoration or habitat objectives that researchers discover for possible incorporation into the Forest Plan.*

Researcher's work on trout genetics is a much broader effort to provide baseline information. Until they develop such baseline information, it is too early for us to predict what the potential effects may be, if any, on Forest management.

Heritage Brook Trout Genetics Project

In 1998, the White Mountain National Forest in partnership with the Ammonoosuc Chapter of Trout Unlimited, The Coldwater Fisheries Coalition and New Hampshire Fish and Game began a genetic analysis project to gather information about the historical and genetic relatedness of brook trout populations occupying four main watersheds on the Forest. These watersheds included the Ammonoosuc, Androscoggin, Pemigewasset, and the Saco. The initial objective of the project is to establish a present day baseline of the composition (how much) and architecture (what is the distribution or structure) of genetic diversity in our brook trout populations. Information from this effort could lead to strategies for improved resource protection and management on the Forest and throughout New Hampshire. Also, these data would contribute to the database of other North American Heritage brook trout studies.

During the summer and early fall Forest staff and volunteers from the Coldwater Fisheries Coalition and local Trout Unlimited chapters collected fish from headwater streams in each watershed. A total of 158 brook trout were collected from 10 streams. These streams included the North Branch of the Gale River, Mt. Tom Brook, Mt. Hoxie Brook, and Black Brook from the Ammonoosuc watershed; the West Branch of Bob Brook and Bull Brook from the Androscoggin watershed; the East Branch of the Pemigewassett and Franconia Brook from the Pemigewassett watershed; and Dry River and Wonalancet Brook from the Saco watershed. In addition, fish collection occurred above natural migration barriers in order to minimize the potential effects of past gene flow from stocking of distant gene pools.

In December 1998, the wild brook trout sample was sent to Guelph University in Ontario, Canada for analysis. The results are expected in Spring 1999. We will discuss the results with our partners and decide how to proceed with this project at that time. We all agree, that this project is just the start of learning about the genetics of brook trout in New Hampshire streams.

Merrimack River Anadromous Fish Returns

Fiscal year 1998 marked the first year for implementation of the revised Strategic Plan for Anadromous Fish Restoration in the Merrimack River Basin. The White Mountain National Forest is a member of the multi-state/federal, interagency committee which revised the plan and is now implementing it. There is a direct linkage between salmon restoration goals identified in the Strategic Plan and fisheries program direction described in the Forest Plan. This allows us to implement projects at the District level which meet Forest goals and objectives and also contribute to anadromous fish restoration goals at Merrimack River watershed level. A similar process is underway in the Connecticut and Saco River watersheds in which the Forest Service is an active participant.

Anadromous fish returns to the Merrimack River in 1998 represented mixed results in relation to historical returns. All fish numbers presented below were from fish counted at the Essex dam fish-lift in Lawrence, MA. Atlantic salmon returns were significantly up from last year. A total of 123 adult salmon returned compared to 71 adults in 1997. Sixty-six (56 percent) of the returning salmon originated from fry stocked in basin streams including WMNF streams, while 57 adults were from hatchery smolt stocking. American shad, on the other hand returned in record numbers (27,891), the largest number yet recorded in the program. It is likely that the American shad number would have been even higher if 3 weeks of flood conditions in May/June had not rendered the fish lift inoperable during the middle of the shad migration. Adult river herring returns were also up from 1997 returns but the 1,362 returning adults is still low compared to the long term average.

Atlantic Salmon Fry Stocking and Population Monitoring

In 1998, we continued to monitor Atlantic salmon restoration activities on the Forest in cooperation with the New Hampshire Fish and Game Department, U.S. Fish and Wildlife Service and numerous partners such as Trout Unlimited and other conservation organizations. Under this partnership, Forest fisheries personnel released approximately 2 million young salmon fry into 30 streams on or adjacent to National Forest lands. Last fall, our fisheries staffs returned to some of these streams to monitor the growth and survival of the young salmon. Salmon population monitoring was conducted on 15 streams in five watersheds; Mad River, Baker River, Pemigewasset River, Ammonoosuc River and Upper Ammonoosuc River. Juvenile salmon survival was quite variable, ranging from 10-30 percent for first year salmon fry and parr to 5-10 percent for one year old and older parr[1]. Many of these larger parr will migrate as smolts from Forest streams to the Atlantic ocean next spring. Most will remain at sea for 2 years before returning to our rivers as adults to spawn.

Broodstock Spawning and Natural Reproduction Monitoring

In 1998, the WMNF entered into a cooperative agreement with the US Fish and Wildlife Service (Laconia Fisheries Office) to monitor and evaluate domestic Atlantic salmon broodstock spawning in the wild. Sixty-one adult salmon from the Nashua National Fish Hatchery were released at five sites in the Baker River, a headwater tributary in the

[1]parr - a young salmon actively feeding in fresh water.

Merrimack River watershed. Shore and watercraft surveys were conducted to visually observe and locate fish and redds (fish nest). In addition, 10 of the 61 salmon had radio transmitters surgically implanted in the abdominal cavity for tracking and evaluating the movement and behavior of fish. All fish had an external tag for visual identification as well.

Salmon were released on September 23, 1998, into river sites where the habitat consisted of large, deep pools and long riffle/run complexes. Substrate in riffle/runs was composed of cobble and gravel, characteristics of preferred salmon spawning habitat. Survey and radio telemetry reconnaissance conducted throughout the fall indicated broodstock were often found in pools during the daylight hours. They were also observed in run habitat but often sought shelter and cover in pools when disturbed.

Active spawning activity and redd construction occurred when water temperatures approached 4 degrees Centigrade and river discharge at approximately 80 cfs (cubic feet per second), or about 38 percent of the mean annual flow for the month of November. Salmon redds were initially observed on November 9, 1998. A total of 21 redds were documented throughout a 5.82 mile reach of river. Redd construction occurred near release points but fish ranged as far as 2.59 miles downstream from release sites to build redds. On December 16, 1999, two redds were partially excavated, and samples indicated that 36 percent of the eggs from the first redd were fertilized, whereas 100 percent of the eggs from the second redd were fertilized.

Six of the 10 tagged fish remained in the river near spawning sites until ice-up when monitoring ceased. One tagged fish was found dead 43 days after release; one was lost, and its whereabouts remained unknown; and two were located downstream at Ayers Island Dam, a distance of 36 plus miles from their release sites. The untagged salmon were observed throughout the river and no mortalities were documented.

Future monitoring and evaluations will focus on similar release sites for broodstock. If spawning success continues, then monitoring and evaluation of parr survival and abundance will likely be initiated. In addition, future projects involving the release of sea-run salmon into our restoration rivers may be developed.

Wildlife

Threatened, Endangered, and Sensitive Wildlife and Plants

Our Thoughts: *Below are some notes on four of the species that we are monitoring. As many of you probably know, the Fish and Wildlife Service is considering the peregrine falcon for delisting, as a result of population recovery. The population in New Hampshire is one of the largest concentrations of peregrine falcons living in natural habitat in the eastern United States. Forest Plan guidance on protecting habitat for this species has been successful.*

Researchers are monitoring the cinquefoil and pogonia plant species to identify baseline information for assessing population trends. The monitoring history is not yet long enough to identify long term population trends. Current Forest Plan direction restricts activities in order to protect those populations. We will continue that direction.

Researchers will use the information for the three-birds orchid to assess the effects of timber harvesting on the orchid. We will use the results from that study to determine what activity mitigation and/or restrictions are necessary to protect populations of the orchid. We will examine any new guidance when it is available for possible incorporation into the Forest Plan.

Monitoring in 1998 for wildlife and plants, including federally listed threatened and endangered species as well as Regionally sensitive species, was accomplished through several funding sources. These included a mix of appropriated Forest Service funds, other agencies, and private contributions (both in money and in-kind services) from partners.

Peregrine Falcon

Peregrine falcon (*Falco peregrinus,* federally endangered) monitoring was accomplished by the Forest in partnership with Audubon Society of New Hampshire, New Hampshire Department of Fish and Game, and the U.S. Fish and Wildlife Service (FWS). Accomplishments by the Forest included surveillance of two nest sites on Androscoggin Ranger District (one in New Hampshire and one in Maine), two sites on Saco Ranger District, and one on the Ammonoosuc/Pemigewasset Ranger District to confirm nesting activity/success. Follow-up was provided to assist with banding of young birds and monitoring of fledging success.

Robbins' Cinquefoil

Robbins' cinquefoil (*Potentilla robbinsiana*, federally endangered) accomplishment included a continuing effort to revegetate historical and new sites. With oversight and assistance from U.S. Fish and Wildlife Service, the Appalachian Mountain Club (AMC) collected seeds and the New England Wildflower Society (NEWS) propagated transplants for planting. In

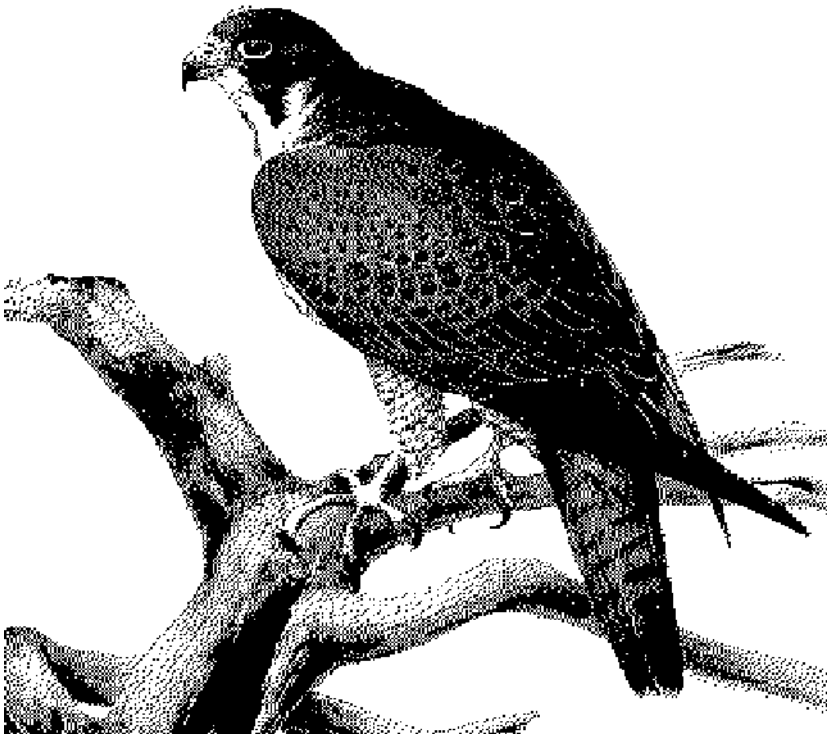
1998, two plantings were done. One in June (regularly scheduled planting) in which 45 plants were set and a follow up planting in July with an additional 19 plants covering a one acre (more or less) area in the Mt. Washington vicinity. As part of the recovery efforts, most of the known populations are monitored annually to determine mortality and natural recruitment. Forest service employees and these partners hike into apline areas to transplant these plants and monitor the existing populations. Monitoring indicates that two past transplant sites appear to have viable reproducing populations. Two other transplant sites in marginal habitat have been abandoned, because of poor success. Transplanting will continue in an effort to expand existing populations. Monitoring will continue at all sites.

Small Whorled Pogonia

Small whorled pogonia (*Isotria medeoloides*, federally threatened) populations on the Forest are monitored every year to determine mortality and/or recruitment. In 1998 Forest Service and U.S. Fish and Wildlife Service personnel relocated known populations and did a complete census. Overall status of the species appears to be steady but due to relatively short monitoring history no population trend is determinable.

Three-birds Orchid

Three-birds orchid (*Triphora trianthophora*, state listed threatened in New Hampshire and Maine) populations on the Forest were inventoried for baseline data in preparation for an administrative study to determine the effects of commercial harvest of timber. Several sub-populations of the orchid were identified as control sets as well as treatment sets in a proposed timber sale. A complete census of each sub-population was for use in future correlation of population trends.



Bird Monitoring

Our Thoughts: *The following is the summary of this past year's bird monitoring. The Forest, the Audubon Society of New Hampshire, New Hampshire Fish and Game have conducted bird monitoring since 1992. Though researchers do not have enough historical monitoring data to identify long term population trends, there is enough data available to begin making evaluations of bird habitat preferences. The two papers we have summarized after the bird monitoring discussion, are examples of such an evaluation.*

As part of Forest Plan Revision, we and others will use the monitoring data to answer a number of questions. We will use the data to select species or groups of species to monitor the adequacy of specific habitats on the Forest. We will also use the data to assess the effectiveness of vegetation treatment activities in providing specific habitat conditions. The information may also provide new guidance on what habitat conditions particular species desire. The data will also help us to identify species of concern, that we may want to monitor closely.

As one step in the Forest Plan Revision, we will gather all of the existing evaluation data together in one place so that we and others can address the specific findings in the context of the whole.

A comprehensive bird monitoring program has been in place on the Forest since 1992. Data has been collected on permanent point count (permaplot) transects located in managed and unmanaged areas, as well as in high elevation spruce fir forests and in wetland habitats located throughout the forest. Wetland habitats were monitored from 1992 to 1996.

A total of 360 permaplots located along 12 transects are distributed throughout three management regimes. Five transects with 30 points each are located in actively managed forests (Managed), five transects with 30 points each are in unmanaged areas adjacent to managed forest (Unmanaged), and 2 transects of 30 points each are in unmanaged, remote areas of the Forest (Remote). Permaplots are surveyed three times during June and July for a total of 1080 point counts. For each point count, observers document all birds seen or heard during a 10-minute period.

In 1998, a total of 82 species were detected on permaplots, of which 40 were found in all three management regimes, and 42 were detected in only one or two of the three management regimes. Eleven species were found only in managed forests, and four species were found only in remote areas (although these species were not restricted to remote forest in past years). Although there are not enough years of data to allow detection of statistically significant trends in bird populations, we have noticed changes in populations of individual species that may be significant, and warrant further investigation.

Surveys of high elevation bird communities consist of five-minute counts at points located 250 meters apart along trails through spruce-fir habitat. High elevation point counts are done once each season during the month of June. In 1998 there were a total of 623 individual birds, representing 49 species, detected on high elevation survey routes. These numbers are within the range of totals from past years, with a high of 693 individuals recorded in 1995 and a low of 466 individuals recorded in 1994. The number of species

detected in a given season ranges from a high of 53 in 1996 to a low of 40 species in 1994 (fewer high elevation survey routes were done in 1994 dues to a smaller field crew). Of the 82 species detected in 1998, the winter wren was the most abundant, and the Bicknell's thrush was the 9th most abundant.

This project was funded through a Challenge Cost Share Agreement with the Audubon Society of New Hampshire and the New Hampshire Fish & Game Department Nongame and Endangered Species Program. Much of the monitoring work is done by a dedicated crew coordinated by the Audubon Society of New Hampshire.

Songbird Response to Group Selection Harvests and Clearcuts on the White Mountain National Forest

Thesis Presented by Christine A. Costello, University of New Hampshire

Our Thoughts: *The goal of this research was to determine if bird species perceived a difference between the opening habitat produced by different harvest treatments. Group selection harvest produces small openings, while clearcutting produces larger openings. The data indicated that for species that use opening habitat, some occurred in both the smaller openings produced by group selection harvest and the larger clearcut openings. Other species only occurred in the larger openings produced by clearcuts. The data suggests that the smaller openings of group selection harvest may not provide the type of opening habitat that some bird species prefer. Two species, brown creeper and northern parula, only occurred in mature stands. We will use this information in Forest Plan Revision for assessing what habitat conditions are produced by different activities.*

Past research has indicated that clearcutting creates habitat for many species of early successional songbirds. However, little information is available on bird communities that use small forest openings created by other silvicultural practices, such as group selection. Information is also lacking on the bird communities that occupy the forested areas between group openings. With the discussion of potential elimination of clearcutting on public lands and a greater use of group selection, this information gap becomes important.

To determine if species richness and composition differed between areas managed by these methods, a total of 6 study blocks were chosen within northern hardwood stands in the White Mountain National Forest. Each block consisted of a clearcut stand, a group selection stand, and a mature stand without openings. Group selection openings and clearcuts ranged in size from approximately 0.13 - 0.65 hectares (.32 - 1.6 acres) and 8 - 12 hectares (20 to 30 acres), respectively. Surveys were conducted in these blocks using the point count method during the 1992 and 1993 breeding seasons.

A total of 50 bird species were recorded, with 46 species recorded in clearcut stands, 33 in group selection stands, and 30 in mature stands. The most abundant species detected in clearcut stands were early successional breeding birds, whereas forest breeders were the most abundant species detected in group selection stands. Pairwise comparisons of least squares mean differences determined species richness per stand to be significantly higher in clearcut stands than in groups selection stands. Forested areas surrounding

group selection openings were similar in species composition and richness (P = 0.85) to mature stands.

An analysis was used to identify natural groupings of survey sites based on avian community structure. This analysis demonstrated that clearcut interior points formed the most distinct group, indicating a unique bird species assemblage. No distinct groups were formed from the group selection openings points, group selection forest points, and mature points, indicating that bird species structures was similar in those areas. An analysis of these data suggest that the group selection system does not provide habitat similar to that created by clearcutting in extensive northern hardwood stands. This system appears to retain much of the mature forest bird community while providing for a small number of early successional species.

Avian Habitat Relationships at Multiple Scales in the White Mountain National Forest

Summary of a Thesis Presented by Sean W. MacFaden, University of Vermont

Our Thoughts: *This research provides some interesting results that could potentially change our understanding on what signifies suitable habitat for some bird species. Experts agree that many birds select habitat according to the habitat conditions found in the immediate vicinity of their location. What this report explores is the potential that some birds select habitat based upon the mix of conditions that exist over a much broader area. The analysis suggests that, at least for some species, this broader context is important in selecting preferred habitat.*

This information has the potential to change the scale at which we address and manage for some species habitat. Additional study is needed on this topic, to produce more definitive results.

In 1998, Sean McFadden presented a Master's Thesis that used bird monitoring data from the White Mountain National Forest to determine at what scale birds select a preferred habitat. The data used were from 1992 - 1995. There is ample evidence that indicates many birds select habitat according to specific combinations of microhabitat characteristics, such as tree and plant species, size, and arrangement. This thesis attempts to determine if bird species select habitat according to characteristics at scales other than the localized microhabitat level. The study looked at three landscape scales, ecological landtypes, land type associations, and landscape configuration. These scales along with the microhabitat scale were used to identify relationships between habitat or landscape characteristics and whether a bird species was likely to be found in a particular area. Microhabitat was defined as those vegetative characteristics that occurred in the immediate vicinity of the point where the bird monitoring data were gathered. Ecological landtypes (ELT) are defined as continuous areas with similar potential vegetation associations, topographical relief, and soil characteristics. They commonly range from 100 to 1000 acres in size. Landtype associations (LTA) represent groups of ELTs. The four landtype associations used in the study were valleys, mountain slopes below 2500 feet elevation, mountain slopes above 2500 feet elevation, and mountain tops. The landscape configuration analysis looked at the patchiness, configuration, and complexity

of forest versus non-forest conditions in a 740 acre area around the survey points. This scale looked at landscape configuration patterns to determine if they are important in some species selection of a home range.

The analysis techniques used in the study indicated that the microhabitat scale was the level with the greatest influence on the presence or absence of a species. Variables from this scale were significant for the largest number and variety of species. Analysis models that contained variables from multiple scales were usually dominated by microhabitat characteristics. These results support the preponderance of evidence in the wildlife literature citing site-specific vegetation characteristics as primary determinants of bird habitat selection. The microhabitat variables used in this thesis demonstrate the strongest apparent relationship to bird presence or absence, with less influential contribution from landscape level variables. The species for which the microhabitat scale was significant spanned a wide diversity of habitat preferences, body sizes, and feeding habitats, including warblers, thrushes, sparrows, flycatchers, woodpeckers, and upland game birds.

However, a link between the other scale levels and presence or absence patterns was also evident, particularly with landscape level variables. The ELT and LTA were also linked to bird presence or absence patterns, but limitation of the analysis methods prevented thorough examination of these data layers. Nonetheless, the results indicate that each scale level explained at least a part of the variation in species data and also supports the premise that some birds respond to coarser-scale environmental characteristics.

These results could have important implications for forest management. Specifically, it could serve as a guide for diversity-based management schemes that explicitly recognize the need to consider bird habitat analysis at multiple scales.

Wildlife and Plant Program Accomplishment Highlights

Our Thoughts: *This list provides an idea of the diversity of items we are monitoring in the wildlife program. We will incorporate this information into the assessments done for the Forest Plan Revision.*

The following list highlights the wildlife and plant inventory and monitoring accomplishments for the White Mountain National Forest in 1998:

1. Peregrine falcon surveys -- 25 acres of nesting territories were inventoried by the Forest and monitored for occupation and nesting success, 25 acres inventoried by Forest with partners (New Hampshire Fish and Game, Maine Dept. of Inland Fish and Wildlife, Audubon Society of New Hampshire, and US Fish and Wildlife), and 75 acres inventoried by Partners.
2. Robbins' Cinquefoil --1 acre of occupied habitat was enhanced through supplemental planting and inventory was conducted of known populations, per the 1991 Updated Recovery Plan. Completed in Partnership through a Cooperative Agreement between Appalachian Mountain Club (AMC), New England Wildflower Society (NEWS), U.S. Fish and Wildlife Service (FWS) and the Forest.
3. Small Whorled Pogonia -- 3 acres of occupied habitat inventoried by the Forest in Partnership with FWS. New England Wildflower Society and New Hampshire Natural Heritage Inventory (NHNHI) are participating in monitoring efforts of this species on and off Forest.
4. Three-birds Orchid -- 6 acres of occupied habitat were inventoried by the Forest in preparation for an administrative study in Partnership with NEWS and NHNHI.
5. Plant Surveys were conducted on all currently proposed vegetation management projects (14). Surveys were accomplished by New Hampshire Natural Heritage Inventory. Surveys were primarily for Federally listed species and Regional sensitive species as well as unique or rare plant communities. Survey results from work completed in Fiscal Year 1998 are not yet available.
6. Waterfowl/wetland areas --17 acres inventoried by Forest, 37 acres inventoried by Forest in Partnership, and 43 acres inventoried by Partners
7. Deer winter areas -- 100 acres of known and suspected deer yards inventoried by Forest.

Watershed

Large Woody Debris in Streams

Our Thoughts: *One question we ask when designing stream improvement projects on the Forest, is what was the historic condition of White Mountain streams before extensive logging occurred in the White Mountains. The long history of logging and land clearing that has occurred in the White Mountains has affected most of the streams on the Forest. Streams that have received minimal or no disturbance, such as Wonalancet Brook, provide important information on historic stream conditions and ecological structure, function, and process. The effectiveness of improvement projects in achieving desired stream conditions is important in designing future improvement projects.*

We will use the final assessment of this information along with other stream information from New England streams, as a basis for discussing what objectives, standards, and guidelines should be established in the Forest Plan Revision.

Large woody debris is an important component of the stream ecosystem. Large woody debris consists of fallen trees or large branches generally greater than 4 inches in diameter and 6 feet long located in the stream channel or on the stream bank. Large wood is associated with many of the physical, chemical, and biological processes that occur in streams. Woody material dissipates water energy and stores both organic and inorganic sediments; serves as an energy and nutrient source; and influences the complexity, diversity and distribution of habitats for aquatic plants and animals. Large woody debris loading and retention is affected by a number of factors including condition of riparian zone vegetation, stream size and channel gradient. Research from across the country has shown one major difference between streams flowing through stands of old-growth and stands of second-growth timber is the high abundance of instream large woody debris in old-growth forests.

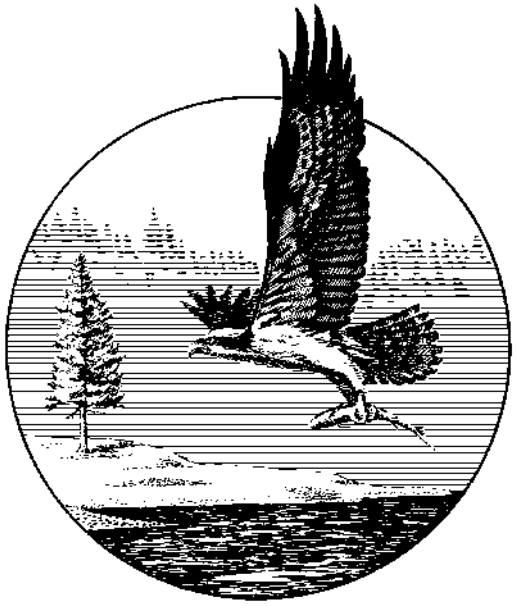
As in most of the continental United States, the long history of logging and land clearing in the White Mountains has left very few forest stands and streams that have not been disturbed by humans at least once. One exception is a virgin stand of spruce-fir and northern hardwoods on the Forest, known as the Bowl. In 1997, we conducted a fish habitat survey of Wonalancet Brook, a small headwater stream which flows through the Bowl. In that survey, we found large woody debris loading in Wonalancet Brook to be 281 pieces per mile of stream (about 5 pieces per 100 feet). Approximately 16.5 percent of the pieces were in the largest size class. The larger pieces of wood tend to be the most stable, the most capable of forming instream habitat and provide the best cover for fishes. The large woody debris loading observed in Wonalancet Brook was more similar to that observed in old-growth forests than in second-growth forests of the southern Appalachian Mountains.

In our stream survey work on streams across the Forest, we have found a wide range in large woody debris loading, but it is generally less than that found in Wonalancet Brook.

For example, large woody debris loading in stream reaches on the Ammonoosuc - Pemigewasset Ranger District surveyed in 1995 ranged from 22.3 to 352.4 pieces per mile and averaged 136 pieces per mile (0.4, 6.7 and 2.6 pieces per 100 feet, respectively). On average, less than 10 percent of the pieces were in the largest size class.

Over the last 8 years, our stream habitat improvement work has included adding large woody debris to selected streams. For instance, in Evans Brook on the Androscoggin Ranger District, we have installed a number of log and boulder structures intended to collect and store substrate, enlarge existing pools, and provide cover for fish. While our fish population monitoring is still on-going, we have observed effects including noticeable changes in channel geometry. Substrate is beginning to build behind collection structures, the thalweg[2] has narrowed and deepened and the pools have become wider and deeper.

In coming years, we plan to continue our stream habitat improvement projects and include additional channel monitoring in order to better evaluate effects. We have selected three streams as demonstration areas for stream habitat improvement work: Evans Brook on the Androscoggin District, Zealand River on the Ammonoosuc - Pemigewasset District and Steam Mill Brook on the Saco District. In 1998 we established baseline monitoring stations on these streams where we measured channel cross-section geometry and substrate. We are currently completing the planning process for these demonstration areas and plan to implement the projects in 1999 - 2004.



[2]thalweg - the line connecting the lowest or deepest points along a stream bed, valley or reservoir, whether under water or not.

Soils/Ecology

Soil and Ecology Monitoring Information

Our Thoughts: *The first five items in the list are mostly concerned with the factors that determine soil productivity, specifically those items that affect soil nutrients. Much of the work deals with assessing such factors as past use and acid rain. Researchers will combine this information with the effects that timber harvesting and other management activities have on soil productivity to determine an overall picture of the factors affecting soil productivity. This work will enable us to more effectively focus our environmental effects discussion on those items we can actually influence. This work may lead to standards and guidelines in the Forest Plan Revision.*

Deadwood in a forest stand provides habitat for wildlife species and affects soil nutrients. We will use the estimates of standing and down deadwood provided by the deadwood recruitment tables to assess effects and establish objectives, standards, and guidelines in the Forest Plan Revision.

One of the purposes of Research Natural Areas is to provide baseline information to compare natural ecosystems to altered ecosystems. Part of this process is to gather the information so the baseline information is available. One decision that may be made in the Forest Plan Revision is whether there is a need to allocate lands for additional Research Natural Areas. Information on existing areas will be important in determining if additional examples of natural systems are needed.

The pollen study work, which looks at the amounts and kinds of vegetation pollen that are found in the layers of mud at the bottom of ponds, will increase our understanding of historical vegetation patterns and may help us examine historical fire patterns. It is too early for us to speculate on whether the results of this research will provide any new information that may lead to changes in the Forest Plan.

The soils and ecology program has focused in recent years on our responsibilities to conserve the long term productivity of the land, and to do so partially by increasing our scientific understanding. The ultimate goal is to better integrate relevant factors into cumulative estimates about changes in soil nutrients, and to understand changes in forest productivity and composition. The factors known to be important include acid deposition, timber harvest, fire, agriculture, soil mineralogy and slope position. The following is a summary of past, present and planned work.

1. Working cooperatively with the Northeast Research Station (Durham, NH), tables were devised which estimate the impacts of acid rain and different intensities of timber management on forest soil nutrients. These tables rely on research studies in New Hampshire and Maine.

2. We cooperated with Complex Systems at UNH this past year to devise a first approximation land use history map of the White Mountain National Forest. This map will display the different mixes of land use impacts, such as timber harvesting, agriculture, and fire, that were occurring on the land in the early 1900's. This map may also point to areas which have had limited impacts or may have old growth conditions.

3. The impacts of agriculture and fire on soil nutrients are not well documented. Because of this, an effort is being organized this year with the Northeast Research Station (Durham, NH), relying partially on the land use history maps, to study these land uses, and characterize their possible impacts on soil nutrients.

4. There has also been an on-going effort to systematically estimate soil mineralogy, which can buffer the impacts of acid deposition, and soil nutrient changes. This spring, we are supporting work at the Hubbard Brook Experimental Forest to make a forestwide map of soil mineralogy. We hope this information will help rank forested areas with respect to susceptibility to acid deposition, and changes in soil nutrients.

5. We are cooperating with the Northeast Research Station (Durham, NH), the Nature Conservancy, and the Spatial Analysis Laboratory at UVM to build a landscape model which may help highlight slope positions where soil acidification may be more possible.

6. A set of deadwood recruitment tables were devised a few years ago in cooperation with the Northeast Research Station to display the impacts of different timber harvest systems on standing and down dead timber found in a forest stand. These were done for the northern hardwood and spruce-fir forests. This winter we are revising these tables to include some different breaks in size classes, to incorporate the northern hardwood-spruce forest, and to display the result by weight, basal area, and number of trees. It is hoped this will be helpful in future analysis related to wildlife, riparian areas, and soil nutrient changes to determine the effects of different harvest treatments on deadwood levels.

7. Work is being planned with the Northeast Research Station (Burlington, VT) to better establish the reference area value of Research Natural Areas on the White Mountain National Forest. Research Natural Areas are established to provide unmanaged baselines for ecosystems. These areas are then available to assess differences between managed and unmanaged ecosystems. The planned work will focus on the Bowl Research Natural Area and the vicinity of Shingle Pond (NH) which appears to have good old growth qualities.

8. And finally, the result of pollen studies in ponds at 3000 foot elevations conducted by SUNY are in the publication process. Eleven ponds have been surveyed in the past 3 summers. These, in addition to other previously studied ponds contribute to a better understanding of vegetation history after the glaciers receded. The information may also contribute to the understanding of fire history during the same time period.

Recreation

Our Thoughts: *The following discussion outlines some of our efforts to develop better monitoring techniques for assessing recreation use on the Forest, particularly dispersed recreation use. It is too early for us to tell if we need additional adjustments to more accurately identifying the use on the Forest. Additional years of monitoring are necessary to determine overall effectiveness. It is apparent that the trend of use on the Forest for many activities is still increasing. This information will provide the basis for discussion in the Forest Plan Revision on whether change is needed to meet recreation demand and/or if actions are necessary to respond to the effects that increased recreation use is having on Forest resources.*

Recreation Use on The White Mountain National Forest

Historically recreation use on the Forest has been measured using simple observations, scattered trail counters, trail registers, developed site receipts and other use data gathered from a variety of cooperators that have an interest in or relationship to the Forest. Some of these cooperators are the major ski areas, Appalachian Mountain Club, Randolph Mountain Club, Mt. Washington Auto Road and White Mountain Attractions. The NH Department of Transportation also contributes traffic data for key travel routes that service the Forest such as Route 16 and Route 302 and Route 112, the Kancamagus Scenic Byway.

There has been an increased effort in the past 2 years from the Regional and National levels to provide Congress and their associated budget committees with more reliable data that is representative of the actual use occurring on the National Forests. Accurate recreation use numbers are important at every level of the organization. They are used in planning, budgeting, and making important management decisions about resource allocations. Congress compares our recreation use numbers to those of other agencies, and also to the outputs of timber, range, and other resources on the National Forests.

Estimates of developed site use are more accurate than dispersed use, because they are based on fees paid and/or estimates of site supervisors. As discussed below we are making efforts to better our estimates of dispersed use.

The White Mountain National Forest participated in a Recreation Use Sampling study in 1997-98 that involved 32 Ranger Districts nationwide. Data from this study is being analyzed to help formulate a predictive model that may be used to determine use on a nationwide basis throughout the National Forests.

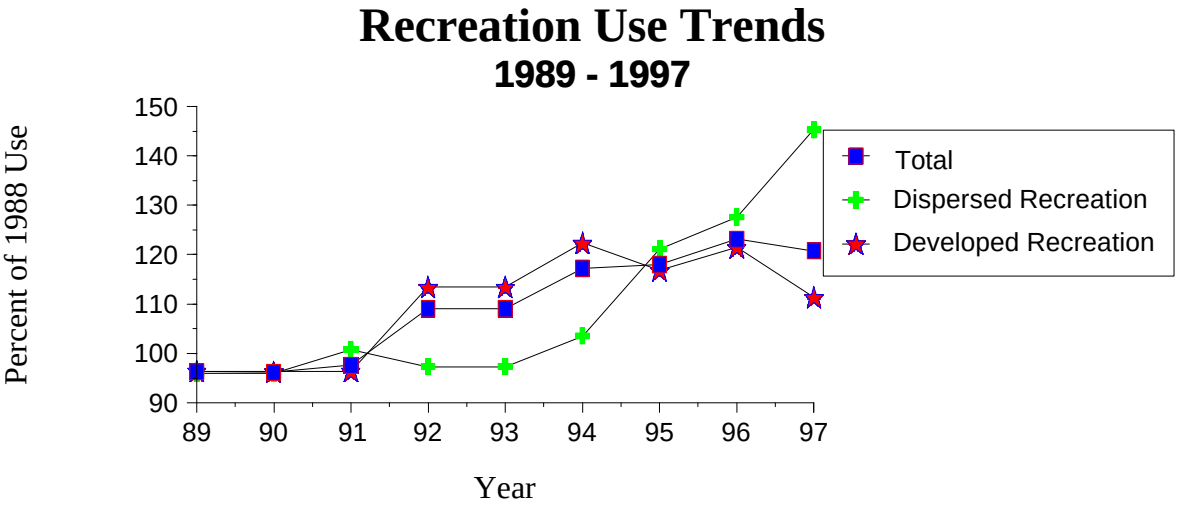
The old Evans Notch District of the White Mountain National Forest was selected as part of the sample to represent part of the national pool of sites. Recreation use from various activities associated with developed and dispersed sites was monitored from April 1997 through April 1998. Data were collected using random sampling, personal interviews and traffic counters.

Additionally, our required reporting of Forestwide recreation use for 1997 was obtained using trailhead/parking lot counts from the fee demonstration program, trail registers, data from the Evans Notch recreation use pilot project and other data supplied by our concessionaires and cooperators.

The 1997 recreation use reported for the White Mountain National Forest is 6.35 million visitors (This equates to 3,430,500 Recreation Visitor Days [3]). These figures included over 500,000 hikers and 250,0000 developed site users. The remaining numbers came from our dispersed type activities such as driving for pleasure, viewing scenery, hunting and fishing, and snowmobile use.

In a continuing effort to obtain more accurate, reliable use figures, the Forest implemented a statistical methodology for sampling in 1998. This statistical methodology for sampling backcountry hiking and camping use randomly selected 40 trails, stratified by high, medium, and low use categories. Trail registers were installed and monitored from May 15 through October 15. Compliance checks were made on each register during the season.

The 1998 data are currently being processed and preliminary indications are that this system of monitoring our use has increased the numbers over the 97 data by 17 percent. This more reliable data will then be coupled with our developed site figures and those from our other sources such as cooperators to give us our final count of 1998 recreation use.



We intend to continue gathering recreation use data using the 1998 methodology and improve upon it by more accurately capturing winter use such as snowmobiling.

Recreation use data collected and reported for the White Mountain National Forest since 1988 shows a steady increase in use (see chart). Indications from other research and economic models indicate that outdoor recreation will continue its steady growth into the next century as people turn more to their natural environment and open spaces as a refuge from their work, jobs, and the everyday stress that accompany a highly technical society.

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[3] Recreation Visitor Day (RVD) - represents a 12 hour visit by one person.

Wilderness

Wilderness Use in Fiscal Year 1998

Our Thoughts: *The following discussion addresses recreation use in our 5 Congressionally designated Wilderness Areas. Dispersed use in Wilderness shows an upward trend. This use is a subset of the greater recreation use discussed previously and many of the same thoughts apply. In the Forest Plan Revision, increasing demand for Wilderness recreation will be one component of the discussion for determining the need for additional Wilderness and what actions are needed to protect the Wilderness resource.*

Wilderness use on the White Mountain National Forest in 1998 was calculated to be 119,472 Recreation Visitor Days (RVDs). These data are especially significant since they rely on a statistical sampling methodology that the Forest implemented in 1998 to sample our backcountry and trail use.

Methodology: A statistical sample of 40 trails was selected that involved representative sampling of the categories of high, medium and low use trails on the Forest. The sampling period was from May 15 through October 15.

Trail registers were installed and monitored at the selected trails throughout the use season. A minimum of two compliance checks on the registers were completed; one for weekdays and one for weekends. The trails were monitored to count total use that day and then a check of the register to see what percent of the people signed in. Compliance rates varied. The lower compliance rates had over half of the users registering. The highest compliance rates were around 90 percent.

Based on the trail registers, an average number of visitors and RVDs were calculated for each category of trail, and then this average was applied to all the trails on the Forest to come up with total use.

Wilderness RVDs, for WMNF 1998

Trail Categories	Forest average (RVD)	Number of Wilderness Trails	Total Wilderness RVDs
High	3707	17	63019
Very High	4930[1]	3	14790
Medium	1078	26	28028
Low	505	27	13635
Total	10220	73	119472

[1]Since none of our very high use trails in the wilderness were sampled , we added a 30 percent increase over the average RVDs for high use trails on the Forest. This is a conservative estimate knowing what our field observations and historic use is on these trails, the use is easily double that on the normal high use trails but at this time we have no hard data to confirm this. We are currently assessing the need to restructure our sampling to obtain estimates of the use on very high use trails.

Our use trends on the Forest have been gradually increasing about 2-4 percent annually.

Socioeconomic

Forest Values, Environmental Ethics, and Attitudes Toward National Forest Management.

by Manning, Treadwell, Minteer, and Valliere, University of Vermont

Our Thoughts: *The paper provides some valuable insights into why people value the White Mountain National Forest. The report does a good job of documenting the strong environmental ethics of people in the Northeast. It says: 1) People deeply care about the environment and 2) People want to conserve and protect the Forest for current and future use, especially preserving options for future generations.*

Researchers have cautioned us not to read too much into the results. The report points to general values and ethics, but cannot be used to identify specific concerns. As with any public opinion poll, subtle changes in questions can give substantially different results. For example: one question on water withdrawal for snow making indicates people are opposed to the action if it has ecological impact. However, we cannot conclude that people would be opposed if the question stated the impacts were minor or if they were mitigated.

Some results such as people's concern over clearcutting are not a surprise to us. We use clearcutting primarily to achieve the wildlife objectives stated in the current Forest Plan. However, we have scaled back the use of clearcutting to 20 percent of Forest Plan levels, partially in response to people's concerns. We will closely examine this issue during Forest Plan revision.

We will work with people to expand this type of information as we continue with the Forest Plan Revision. The paper indicates that the people surveyed are willing to limit current uses in order to protect and conserve the Forest. One of our tasks in the Forest Plan Revision will be to identify the specific measures that may or may not be necessary to achieve objectives. With these measures identified we can discuss trade-offs with the public.

This study explores public attitudes, environmental ethics and social values concerning the White Mountain National Forest.

Data was gathered through a questionnaire format which had a number of objectives. An importance scale ("not at all important" to "extremely important") measured the value respondents placed on several forest value statements. An agreement scale ("strongly agree" to "strongly disagree") was used to assess potential environmental ethics. A series of questions using an agreement scale was used to measure attitudes toward National Forest management ranging from vehicle use on the Forest to protection of wildlife species. These questions were submitted to two survey groups. The first survey group

consisted of a proportional sample from each of the six New England states. The second survey group consisted of 1500 Massachusetts residents. Follow up phone calls were made to non-responders in both survey groups.

The questions on forest value statements targeted two areas. One addressed what respondents felt were the most important uses of the Forest. The second area addressed what was most important over time. Of the 11 use values, 10 received average ratings of moderately to extremely important (Table 1). Specifically aesthetic and ecological values ranked highest among the use values, with over 90 percent rating those values moderately to extremely important. The next four highest rated use values were educational, historical/cultural, moral/ethical, and recreation. At the other end of the spectrum, economic use was only rated at moderately to extremely important by 32 percent of the respondents. The author points out that the findings demonstrate that the respondents value the White Mountain National Forest for many reasons.

Table 1. Forest Use Value Rankings

Value	Value Description	Mean Ranking[1]	Percent of Respondents Rating Value at Moderately Important or Above
Aesthetic	opportunity for enjoying the beauty of nature	5.2	93
Ecological	opportunity for protection of nature in order to ensure human well-being and survival	5.1	91
Educational	opportunity for learning about nature and natural processes	4.9	89
Historical/ cultural	opportunity for seeing and experiencing nature as part of a shared national heritage	4.8	86
Moral/ethical	opportunity for exercising moral and ethical obligations to respect and protect nature and other living things	4.8	83
Recreation	opportunity for outdoor activity	4.7	87
Therapeutic	opportunity for promoting physical and mental health and well-being	4.7	84
Scientific	opportunity for scientific study of nature and ecology	4.7	83
Intellectual	opportunity for creative and inspirational thought	4.4	74
Spiritual	opportunity for getting closer to God or for obtaining other spiritual meaning through contact with nature	4.2	70
Economic	opportunity for economic well-being	2.8	32

[1] Where the importance scale is:

1 = Not at All
2 = Slightly
3 = Somewhat
4 = Moderately
5 = Very Much
6 = Extremely

The second area targeted under the forest value statements addressed the temporal aspect of forest values. Under this section "bequest," the opportunity to pass along the Forest to future generations, was ranked as moderately to extremely important by 95 percent of the respondents. Other items are displayed in Table 2. The lowest rated temporal value was "use," the opportunity to use the Forest now. Sixty-seven percent of the respondents indicated moderate to extreme importance for this value. These findings demonstrate people value both future and present oriented values, but see maintaining the Forest for the future as most important.

The final section of the study focused on the attitudes toward National Forest Management. As indicated in Table 3, respondents demonstrated a diversity of attitudes to the management questions. However, in general statements that emphasized commodity values and economic priorities in National Forest management met with more disagreement than agreement. Statements that emphasized a number of commodity oriented forest management practices, elicited general disagreement from respondents. Practices that fell in this area included clearcutting, four-wheel drive vehicle use, and economic well-being ahead of preservation interests. Statements which emphasized nonmaterial forest management practices met with general agreement.

Table 2. Forest Temporal Value Rankings

Value	Value Description	Mean Ranking[1]	Percent of Respondents Rating Value at Moderately Important or Above
Bequest	opportunity to pass along the forest to future generations	5.4	95
Option	opportunity to use the forest in the future	4.7	82
Existence	opportunity to enjoy simply knowing the forest exists	4.6	78
Altruistic	opportunity to allow others to use the forest now	4.2	72
Use	Opportunity to use the forest now	4.0	67

[1] Where the importance scale is:

1 = Not at All
2 = Slightly
3 = Somewhat
4 = Moderately
5 = Very Much
6 = Extremely

Another aspect of the study was an analysis to determine how environmental values/ethics influence attitudes toward management. This was accomplished by comparing the results from the different sets of questions. The study found a relatively strong relationship among forest values, environmental ethics, and attitudes toward National Forest management. Further conclusions can be found in the report.

The study also made an assessment of whether the results differed based upon race or residence. The findings indicate that most potential values of the White Mountain National Forest were rated highly by all subgroups examined urban, rural, minority, and white. The only differences were: 1) Rural residents value the temporal "Use" value higher than the other three subgroups; 2) Whites tended to rate recreation as more important than did minority respondents; 3) Urban residents tended to rate historical/cultural value, intellectual value and scientific value as more important than did rural residents. The

author goes on to state that the majority of environmental values and ethics were not affected by racial or residential factors.

Table 3. Forest Management Attitude Rankings.

Attitude Statement	Mean Ranking[1]	Percent or Respondents Agreeing with Attitude Statement
Management of the WMNF should emphasize production of timber and lumber products	3.6	22
Clearcutting (cutting all trees in a large area) should be banned on the WMNF	1.7	86
Four wheel drive vehicles should be allowed to travel off roads in the WMNF	3.5	26
Protecting fish and wildlife on the WMNF should be the highest management priority	1.7	89
Remaining undisturbed forest on the WMNF should be protected	1.5	94
Recreational use on the WMNF should be limited so that each visitor (hiker, camper, etc.) can enjoy the forest in peace and quiet	1.8	84
More wilderness areas should be established on the WMNF	2.2	64
The economic well-being of timber workers and their families is more important than preservation of undisturbed forest on the WMNF	3.9	8
The economic vitality of local communities should be given highest priority when making decisions about the WMNF	3.2	32
Ski areas should be allowed to withdraw water from streams on the WMNF in order to make snow even if there are ecological impacts	3.8	13
The WMNF should be managed to protect ecological processes, and not to favor individual plant or animal species	2.3	71
Management of the WMNF should restrict recreational use in order to minimize ecological impacts caused by humans	2.4	62
Logging should not be allowed on the WMNF in areas where it would disrupt the habitat of animals such as bear and moose	2.0	75
The WMNF should be managed to ensure that future generation will have the opportunity to use and enjoy it, even if this means limiting current use.	1.7	91
The opinions of professional foresters are more important than public opinion when deciding how the WMNF should be managed	3.0	41

[1] Where the importance scale is:

1 = Strongly agree
2 = Agree
3 = Uncertain/No Opinion
4 = Disagree
5 = Strongly Disagree

Visual Resources

Esthetics of Clearcutting -- Alternatives in the White Mountain National Forest

Paper prepared by Palmer, Shannon, Harrilchack, Gobster, and Kokx

Our Thoughts: The results of this report were referenced in past monitoring reports, though the report itself was not presented. We felt that it was important to present the results of this study for consideration in this monitoring report.

Through the implementation of timber sales, and other public comments, it is obvious that many people did not like the effects of clearcutting on the scenic values in the White Mountain National Forest. While the majority of timber harvest on the Forest is selective cutting or thinning and less than 0.25 percent is affected annually by clearcutting, the public concern remains. This study addresses the questions of what effect different intensities, arrangements, and sizes of clearcuts have on scenic values.

We expected some of the results which indicate that areas without clearcutting have a higher scenic value than areas with clearcutting and that areas with less clearcutting have higher scenic value than areas with more clearcutting. Other results provide us new information. It appears that clearcuts in 10 to 14 acre units are visually more appealing than twice as many 4 to 5 acre clearcuts or half as many 20 to 30 acre clearcuts. The results did not indicate significant differences between people's ratings of the scenic values when a given number of clearcut acres where scattered across a viewshed (the area within the observer's view) versus concentrated in a portion of the viewshed.

An additional question that we would like to answer is how is the scenic value of a viewshed that contain other openings, such golf courses, pastures, and/or home sites, affected by clearcuts. In areas like this, are the clearcuts an additive impact or do they become part of the pattern of openings. This question and the following study will be important in the Forest Plan Revision for assessing the effects that clearcutting will have on the scenic values of the Forest. In alternatives where clearcutting is proposed, these results along with other factors, such as habitat objectives, will provide guidance on how clearcutting will be used.

Since the 1960s and the 1970s, the use of clearcutting has changed significantly. The current practice in the White Mountain Nation Forest is to limit individual clearcut units to 30 acres. However, there is still active public concern about clearcutting, and much of it can be attributed to appearance. One approach to mitigate this is to reduce the size of clearcut units. However, forest landscape architects and other managers on the White Mountain National Forest became concerned that reductions below the current average of 10 to 15 acres might create a checkerboard appearance across the landscape.

Consequently, a series of visual simulations was developed to realistically portray potential forest management scenarios. The scenic value of these simulations was evaluated in the field by hikers contacted at the original viewpoints. These data were analyzed to determine the effect of clearcut size, intensity, and pattern on scenic value.

Photos of actual viewsheds and clearcuts were used to generate computer simulated photographs that represented different clearcutting patterns in the landscape. Simulations included ranges that removed from 0 to 5 percent of the viewshed, patterns that scattered or concentrated the clearcuts, and clearcuts sizes of between 4 to 5 acres, 10 to 14 acres, or 20 to 30 acres. Once the photos were prepared hikers at the actual viewpoint where the original photos were taken were asked to evaluate the scenic value of each photo on a scale of 1 to 10, where 10 is the highest scenic value. A total of 53 hikers at two different viewpoints were interviewed.

In general, the hikers knew that they were visiting a working forest. Eighty-nine percent were aware that timber harvesting occurred in the White Mountains, and virtually all of these individuals understood that clearcut areas were visible from the viewpoint where the interview was conducted. Forty-eight percent accurately thought that a typical clearcut in the White Mountains would be between 10 and 24 acres, while less than 20 percent thought clearcuts were typically over 75 acres. All those interviewed could identify negative effects from harvesting, and 90 percent were also able to name benefits.

Table 1. Mean Scenic Values for Management Scenario Variables

Scenario Variables		Mean Scenic Value
Viewpoint	Sugarloaf	4.93
	Welch Ledge	5.00
Pattern of Cutting Units	Scattered	5.04
	Concentrated	4.90
Size of Cutting Units	4 to 5 acres	4.80
	10 to 14 acres	5.13
	20 to 30 acres	4.97
Percent of viewshed removed	0	8.00
	1	5.80
	2	4.75
	3	4.20
	4	3.66
	5	3.40

The mean scenic values in Table 1 are for the attributes that determined the management scenarios and their visual simulations, viewpoint, pattern of cutting units, percent of viewshed cut each decade, and size of cutting units. The results of the analysis indicate that there are significant differences attributable to the size of openings and the

percentage of the viewshed removed, while variation between viewpoints and the pattern of openings is not significant.

The public has lobbied for smaller and smaller cutting units, anticipating a smaller scenic effect. However, these results indicate that the current practice of making cutting units between 10 and 14 acres has less of an effect than would either smaller (4 to 5 acres or larger (20 to 30 acres) cutting units. The analysis indicates that the larger and smaller areas are not rated significantly different from one another, but both are significantly less scenic than the current standard. However, the mean differences among the mean ratings are rather small- about .2 units on a 10-point scenic value scale.

There is a consistent decrease in scenic values as the percentage of the viewshed cut increases. The most severe change is from no cutting to 1 percent removal per decade, while the least severe is the difference between 4 and 5 percent removal. The analysis indicates that the decreasing scenic value is significant between all levels except for the change from 4 to 5 percent removal.

Considerable care was taken to make the design of these scenarios as realistic as possible. Forest landscape architects used the same procedures to specify and locate simulated cutting areas that they normally use for actual forestland. The research landscape architects, creating the simulations, made several site visits to photographically document the scenes and to validate the colors and textures being used to simulate the clearcut and revegetated areas.

The authors indicated that the study had two primary implications for the visual management of forest areas:

1. Increased cutting intensity is associated with increased negative scenic effects. Vistas of the middle ground without any cutting areas are more scenic than those with cutting areas.

2. The optimal unit size for clearcut areas seen in the middle ground is 10 to 14 acres. Both larger and smaller units had lower scenic values when seen at this distance.

Timber

Our Thoughts: *The following discussion provides a historical perspective on one aspect of the changes that have occurred in harvest activities in the last 30 years. It provides us some context for the Forest Plan Revision, in that the current existing habitat conditions and scenic values are a function of the harvest activities. These past activities allow us to make assessments of the effects that such activities have on the Forest resources, such as scenic values and wildlife habitat. The assessment of these past activities will guide us in determining what effects and conditions are produced by harvest activity and what effects and conditions are foregone without harvest activity. This will lead us into a discussion of trade-offs in the Forest Plan Revision.*

Changes in Harvest Treatments

The White Mountain National Forest uses both even- and unevenage timber harvest practices to achieve Forest Plan objectives. This combination of harvest methods was integrated to meet timber, wildlife, visual, and watershed needs in keeping with the requirements of the National Forest Management Act. Since the Plan was signed, there has been a gradual decline in the acres of clearcutting, as reported in the 1994 and 1996 Forest Monitoring Reports, and as illustrated in Table 1. This table reports on the history of clearcutting since 1970, and illustrates that a general decline in clearcutting has also occurred during this longer time frame. There has also been a growth in the use of unevenaged harvesting during this time. As we look ahead to Forest Plan Revision, we know that this combination of harvest practices will be reexamined, and that there is significant public interest in clearcutting.

The reasons for the decline in clearcutting include: 1) all timber harvest has declined as costs to prepare sales have increased, while budgets have not increased to compensate for the increased costs; 2) site specific application of Forest Plan standards and guidelines has led to more limits on where and how much clearcut harvest could occur; 3) release of a new silvicultural guideline for northern hardwoods has lead to fewer stands needing regeneration harvest in the short term; and 4) changing public values that don't support clearcutting. Also, our ability to use clearcutting to favor certain forest types to meet wildlife goals has been more limited by ecological capability than anticipated.

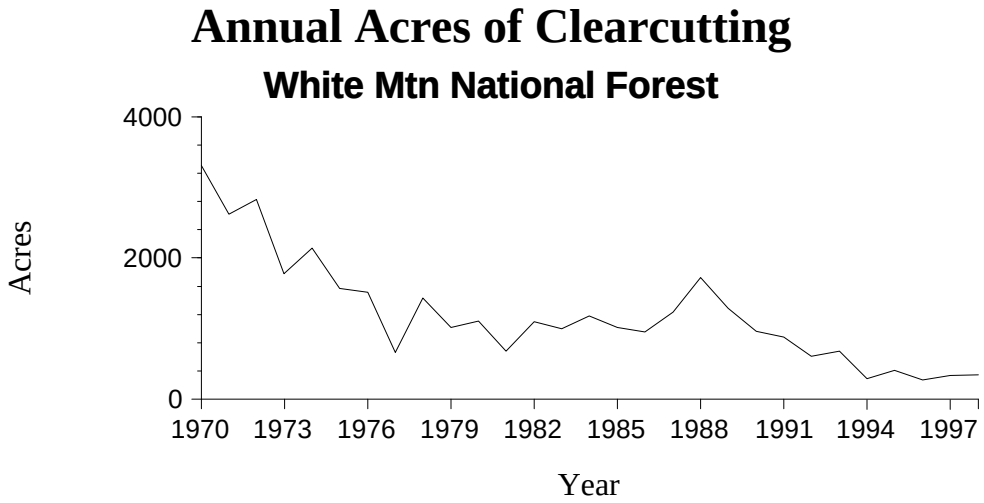
The reasons for more unevenaged harvest include: 1) more opportunities exist to use unevenaged harvest to manage variable stand conditions to meet Forest Plan objectives and meet visual concerns than anticipated and; 2) a greater awareness of public values favoring unevenaged treatment.

The Forest Plan Revision will examine the mix of harvest practices needed to meet Forest Plan objectives. In determining the mix of practices, the Revision effort will be able to take advantage of new scientific knowledge in wildlife ecology, the effects of harvest methods and intensities on deadwood recruitment, effects on soil nutrient cycling, effects on cumulative visual impacts, and the interaction of harvesting with other forest uses. The different harvest practices have positive and negative effects on these various elements.

The Revision effort will analyze the trade-offs of these effects in determining the mix of harvest practices needed to meet Forest Plan objectives.

Table 1. Annual Acres of Clearcutting on White Mountain National Forest
(1987 Forest Plan prescribed annual clearcutting of 1900 acres per year)

Year	Acres	Year	Acres
1970	3308	1985	1015
1971	2622	1986	955
1972	2829	1987	1234
1973	1780	1988	1720
1974	2138	1989	1287
1975	1570	1990	963
1976	1519	1991	880
1977	663	1992	605
1978	1436	1993	678
1979	1013	1994	290
1980	1105	1995	408
1981	678	1996	271
1982	1094	1997	339
1983	996	1998	345
1984	1179		



Ice Storm

Our Thoughts: *The January ice storm caused significant damage across portions of the Forest. Some timber value has been lost as a result of that damage. On the flip side, the storm has provided some wildlife habitat benefits in the form of increased dead and down timber habitat and small forest openings. There is also the long term opportunity to monitor the affects of natural disturbance events on the Forest.*

In January 1998, a devastating ice storm hit northern New England and New York, damaging over 17 million acres of rural and urban forests. On the White Mountain National Forest damage occurred on 200,000 acres. The following write-up describes the status of the work that has been done on Forest Service lands since the storm. The majority of these activities were accomplished with the $1.5 million emergency funding the Forest received after the ice storm.

The ice storm caused extensive damage to the Forest's hiking and snowmobile trail system, along with isolated pockets of damage to some of our developed recreation sites. The Forest worked closely with trail and snowmobile clubs to ensure that all 1,770 miles of trails were cleared. The Forest hired extra seasonal employees to patrol and clear trails, and supported the clubs with challenge cost share agreements. The Forest Service was joined by several other organizations and the Office of the Governor to organize two volunteer weekends, with over 200 participants. Hundreds more volunteers worked throughout the spring and summer.

Roughly 110 miles of forest roads were also affected. Initially, clearing was focused on roads open to the public to restore access to cabins, campgrounds, picnic areas, and trailheads. The second priority was to clear roads that are closed to the public, but that provide access for forest management activities. Accumulations of debris and dangerous leaning, broken, and overhanging trees had to be removed. The larger debris was cut into short lengths and piled on the roadside for the public to take as firewood. The small debris was chipped to reduce the fire hazard and the impact to scenic values. Along some roads remaining debris piles need to be removed and/or chipped.

Overall, about 20 percent of the damage occurred on acres where timber management was appropriate to consider. Of this, a little less than 10,000 acres were severely damaged. Crews finished on the ground assessments of these areas by fall. These areas are primarily in the northeastern part of the Androscoggin District and along the eastern half of the Saco District. Where severely damaged stands were found in active timber sales, resource specialists assessed the situation prior to recommending a course of action. Where appropriate, the contracts were modified to remove the most heavily damaged trees.

In other areas, management plans are evaluating the need to salvage damaged trees. The Forest does not plan on increasing the volume of timber that will be offered for sale. Rather, the focus will be on treating those storm damaged stands at greatest risk to disease, decay, or dying, and shifting the Forest's sale program to those areas.

The Forest is also mapping hazardous fuel areas in cooperation with State and Federal agencies across the four-state region.

Lands

Lake Tarlton Land Exchange

> ***Our Thoughts:*** *The following covers the activities that occurred in the Lake Tarlton land exchange this past year. The Forest Plan Revision will address the management area allocation for these new lands.*

The White Mountain National Forest added 2,154 acres to its administration through the acquisition of forested land west of Lake Tarlton in Grafton County. The second phase of the Lake Tarleton land purchase was completed September 30, 1998. This brings land acquisition efforts to a total of 3,434 acres around Lake Tarleton during the past year. This second land acquisition included Lake Katherine, Lake Constance and a small portion of forest land on the northeast corner Lake Armington. A third phase of acquisition of approximately 100 acres is currently underway.

The Forest acknowledges the work of the Trust for Public Land and the Upper Valley Land Trust in acquiring the Lake Tarleton acreage. U.S. Senator Judd Gregg and U.S. Congressman Charles Bass were instrumental in obtaining Congressional funding for the land purchase.

No specific management allocations have been set in place for the acquisitions at Lake Tarleton. That will occur during the Forest Plan Revision process and will provide an opportunity for the general public, local communities, and residents to join in determining the best future management for Lake Tarleton. In the interim only custodial activities such as fire prevention are being conducted on the lands.

Minerals

Ore Hill Mine Restoration

Our Thoughts: *This section provides an example of a different level of monitoring than we normally display in our annual monitoring report. This project level report addresses water quality concerns from a past mining operation. Though the effects do not represent a broad Forest concern, they are significant effects within the local vicinity of the mine. These types of unique problems are usually underfunded and typically take many years to fully address.*

Background

Ore Hill Mine operated as a silver, zinc, and mica surface mine in the early 1900s. The Forest Service acquired a portion of the mine in 1937. The National Park Service acquired the remaining portion in 1979 as part of the Appalachian Trail corridor.

The mining operation left tailing[4] piles throughout the 5 acre area near the headwaters of Ore Hill Brook. The tailing piles contain high concentrations of aluminum, zinc, copper, lead and fine sediments. Runoff and leachate from the tailing piles have polluted and damaged the aquatic ecosystem of the headwaters of the South Branch of Ore Hill Brook with heavy metals. In the summer and fall of 1984, the White Mountain National Forest and the National Park Service conducted a restoration project at the old Ore Hill Mine in Warren, NH.

The reclamation effort included rerouting a short section of the stream channel away from the tailing piles, leveling and recontouring the tailing piles, applying heavy layers of lime, topsoil, seed, fertilizer and covering the area with a layer of mulch hay. It was hoped that this restoration effort would stop the acid mine drainage and allow the brook to return to normal over a few years.

Before and after the restoration effort the White Mountain National Forest conducted water quality testing of the Ore Hill Brook Watershed. An analysis of the water quality data collected at three sites in the Ore Hill Brook Watershed follow. Ore Brook Site #5 is located in the tributary the Forest calls the South Branch of Ore Hill Brook. This site is just downstream from the old mine site. Ore Brook Site #6 is also located in the South Branch of Ore Hill Brook approximately 0.75 mile downstream from Site #5 and upstream of the confluence of Ore Hill Brook and South Branch of Ore Hill Brook. Ore Brook Site #7 is located in Ore Hill Brook downstream of the confluence of Ore Hill Brook and South Branch of Ore Hill Brook.

Table 1 lists standards for levels at which heavy metal concentrations are harmful to humans and aquatic life. Micrograms are one millionth of a gram. In the table, acute

[4] tailings - the residue that is separated in the preparation of the ore

exposure refers to higher concentrations of limited duration. Chronic exposure refers to lower concentrations for long durations.

Table 1: Water Quality Standards for Protection of Aquatic and Human Life (ug/l = microgram per liter).

	Levels Harmful to Aquatic Life		Levels Harmful to Human Life
Substance	**Acute Exposure**	**Chronic Exposure**	**Exposure from ingestion of water or fish**
Aluminum	750 ug/l	87 ug/l	--
Copper	4.6 ug/l	3.5 ug/l	1,000 ug/l[1]
Manganese	--	--	50 ug/l
Zinc	35.4 ug/l	32.3 ug/l	5,000 ug/l[1]

[1]These recommended contaminant levels were found in Viessman, W. and Hammer, M. J. Water Supply and Pollution Control. 4th ed. New York: Harper and Row, Inc., 1985. The rest of the water quality standards were found in the State of New Hampshire Surface Water Quality Regulations Env-WS-430. New Hampshire Dept. of Environmental Services. September 30, 1996.

Manganese Levels:

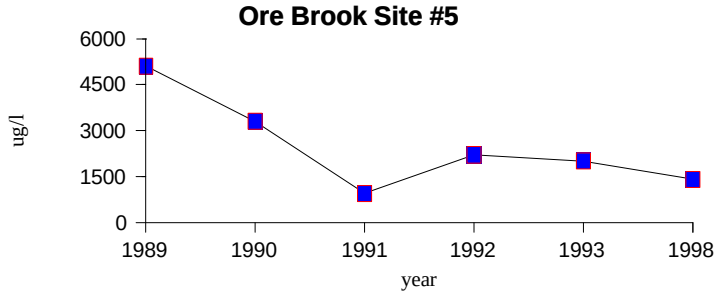
Table 2 shows the levels of manganese at the sampled sites. Figures 1 and 2 display these levels graphically from 1989 forward. In 1989, five years after reclamation, the levels of manganese were all greater than the level listed in Table 1.

Table 2. Manganese Levels at Sampled Sites (ug/l)

	1973	**1989**	**1990**	**1991**	**1992**	**1993**	**1998**
Site #5	380	5100	3300	940	2200	2000	1400
Site #6		150	58	42	5	5	5
Site #7		58	17	19	5	5	5

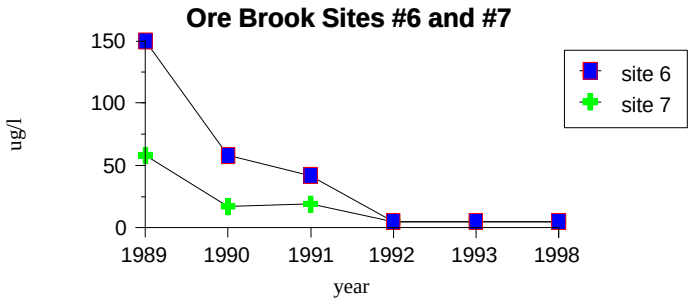
For Site #5 there have been some fluctuations in the manganese levels but other than a low concentrations in 1973 and 1991, manganese concentrations have been on a downward trend. Despite this, trend levels are still too high.

Figure 1. Sampled Manganese Levels



The samples at Sites #6 and #7 indicate that the manganese levels are also in a decreasing trend further downstream. Since 1992 samples at both sites are well below the 50 ug/l level established for the protection of human life. The rehabilitation and increase of flow downstream seems to have lowered the manganese levels to acceptable levels in Ore Hill Brook.

Figure 2. Sampled Manganese Levels



Aluminum Levels:

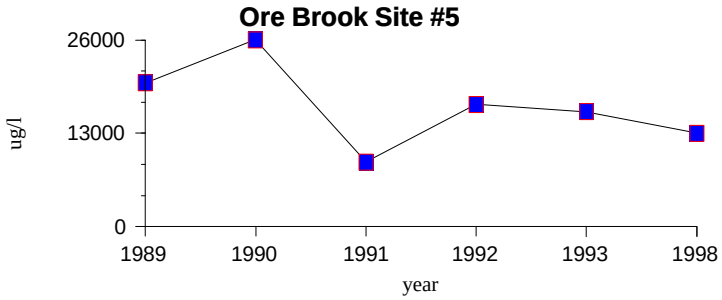
Table 3 shows the levels of aluminum at the sampled sites. Figures 3 and 4 display these levels graphically from 1989 forward. No aluminum standards have been set for the protection of human life, but there are standards for the protection of aquatic life.

Table 3. Aluminum Levels at Sampled Sites (ug/l)

	1972	1989	1990	1991	1992	1993	1998
Site #5	23000	20000	26000	9000	17000	16000	13000
Site #6		460	140	270	90	70	50
Site #7		290	50	200	70	50	50

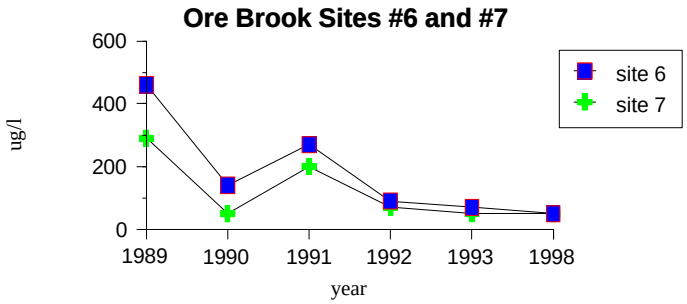
Since rehabilitation work was completed, the general trend of aluminum concentrations have been downward at Site #5. However aluminum levels are still extremely high. In 1998, the aluminum concentration was 13,000 ug/l which is far greater than the acute level at which aquatic life is harmed.

Figure 3. Sampled Aluminum Levels



The aluminum concentrations at Sites #6 and #7 are all below the acute level shown in Table 1. Since 1993, the levels at both sites have been below the chronic level shown in Table 1. The data indicate that rehabilitation work was successful in decreasing aluminum concentrations further downstream from the Ore Hill Mine. This may be attributable to an increase in water flow and increase in the dilution of aluminum.

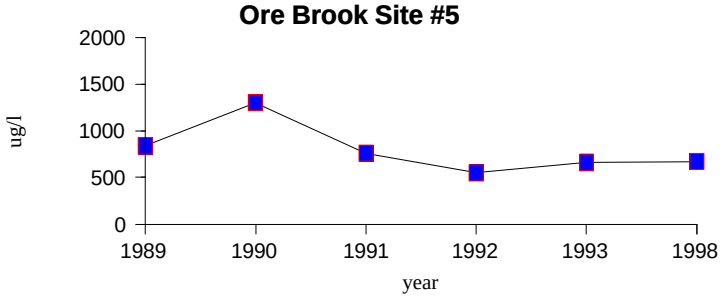
Figure 4. Sampled Aluminum Levels



Copper Levels:

Ore Hill Site #5 copper levels are extremely high at this site. There is a lot a fluctuation in the copper levels over the years. There is no clear trend that copper levels have decreased over time since the rehabilitation work was completed. As shown in Table 1 the acute and chronic copper level standards for protection of aquatic life is 4.6 ug/l and 3.5 ug/l, respectively. The lowest copper level measured at this site was 139 ug/l. The recommended contaminant level for copper in drinking water is 1,000 ug/l and the daily dietary copper level is 5,000 ug/l (Viessman and Hammer, 1985). The copper levels at this site only exceeded the recommended drinking water criteria once. This occurred in

Figure 5. Sampled Copper Levels



1990 when copper levels were 1,300 ug/l. The copper levels never exceeded the daily dietary copper levels. Copper is not of high concern in terms of human health. This data indicates that the rehabilitation work that was conducted in 1984 has not been effective in controlling copper levels in the South Branch of Ore Hill Brook immediately below the mine. The data indicate that some additional rehabilitation work needs to be done in the future in order to improve conditions in the South Branch of Ore Hill Brook to allow aquatic life to return.

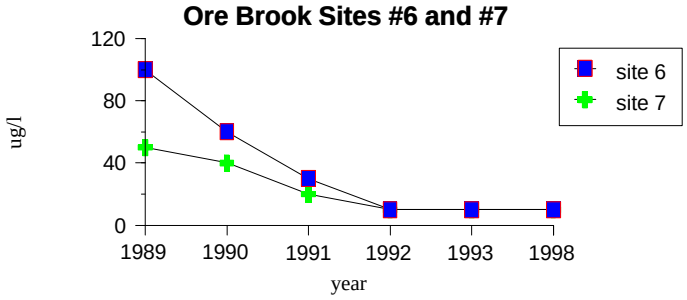
Table 4. Copper Levels at Sampled Sites (ug/l)

	1974	1977	1978	1979	1989	1990	1991	1992	1993	1998
Site #5	800	139			840	1300	760	550	660	670
Site #6	50	142	65	110	100	60	30	10	10	10
Site #7					50	40	20	10	10	10

Ore Hill Sites #6 and #7 copper levels are dramatically lower than the copper levels at Ore Hill Site #5. There has been a decreasing trend at both sites since the rehabilitation work was done. The last three samples in 1992, 1993, and 1998 all had measurements of less than 10 ug/l. This is still greater than the acute criteria for aquatic life shown in Table 1. None of the samples exceeded the water quality criteria for protection of human life. Again dilution and distance from the old mine may be a big factor for the lower levels of copper at Sites #6 and #7.

Because all of these sites have copper at levels that surpass the state standards in order to protect aquatic life, a plan for further rehabilitation must be undertaken to improve the water quality and lead to the reestablishment of fish, aquatic insect and microbe populations that are native to the Ore Hill Brook watershed. The risk to human health based on copper levels in the brooks does not seem to be very high.

Figure 6. Sampled Copper Levels



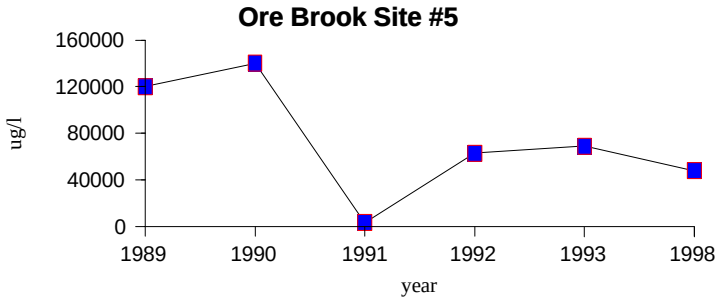
Zinc Levels:

Ore Hill Site #5 has a wide variation of zinc levels since testing began in 1972. Zinc levels range from 3,700 ug/l to as high as 140,000 ug/l. As listed in Table 1, the acute criteria is 35.4 ug/l and the chronic criteria is 32.2 ug/l. The water quality criteria for zinc in drinking water is 5,000 ug/l as shown in Table 1. Only 1 sample between 1972 through 1998 was below the drinking water criteria of 5,000 ug/l. The zinc levels at this site are extremely high.

Table 5. Zinc Levels at Sampled Sites (ug/l)

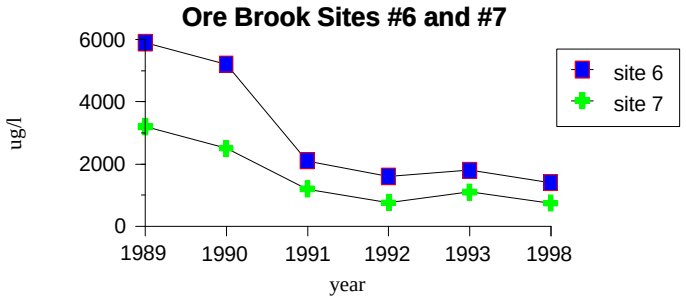
	1972	1973	1974	1977	1978	1979	1989	1990	1991	1992	1993	1998
Site #5	77900	26900	25500	44000			120000	140000	3700	63000	69000	48000
Site #6			1800	2400	6300	5400	5900	5200	2100	1600	1800	1400
Site #7							3200	2500	1200	760	1100	740

Figure 7. Sampled Zinc Levels



Ore Hill Sites #6 and #7 have a dramatically lower concentration of zinc levels than Site #5. The maximum zinc level for these two sites since the rehabilitation was 5900 ug/l in 1989 at Site #6. The trend at both of these sites seems to be downward except for some higher concentrations in 1993. Since 1991, the zinc levels have decreased to the point where human health concerns are low. All levels are still well above the level that is harmful to aquatic life.

Figure 8. Sampled Zinc Levels



Conclusions

The analysis of manganese, aluminum, copper and zinc levels in the South Branch of Ore Hill Brook and Ore Hill Brook indicate that the rehabilitation work completed in 1984 was minimally successful in controlling the acid mine drainage from Ore Hill Mine. Of course, the section of the South Branch of Ore Hill Brook which is closest to the old mine site, had the greatest amount of toxic substances.

Manganese levels exceeded the criteria listed in Table 1 at Ore Hill Site #5, but since 1992 the levels at Ore Hill Sites #6 and 7 were well below the manganese criteria. This indicates that distance from the mine and increased flow dilutes the concentration of manganese.

Aluminum levels were greatest at Ore Hill Site #5. There is a decrease in aluminum as the water flows downstream. At Ore Hill Sites #6 and 7 the aluminum levels have been below the chronic criteria since 1993 and 1992, respectively.

Copper was the only substance analyzed in this report in which the levels did not exceed the drinking water criteria for the protection of human life listed in Table 1 more than once. Copper is not a concern from the aspect of protecting humans. However, the copper levels are dramatically greater than what causes an acute and chronic effect on aquatic life.

Zinc levels are extremely high at all three sites for the aquatic life. The zinc levels have gone below the drinking water criteria at both Ore Hill Sites #6 and 7. The acid mine drainage seems to be most evident by the high amounts of zinc. Human health is of low concern from Ore Hill Site #6 and downstream from there.

Overall, there have been some improvements in heavy metal concentrations in the Ore Hill Brook watershed. There still needs to be further reclamation of the area in order to improve the water quality so aquatic life can return to the area in healthier populations. The Minerals and Watershed staff on the Forest will determine what actions are necessary to address this continuing concern in 1999 and will implement the actions in 2000, funding permitting.