Habitats

What's in a Natural Community?

by Ellen Snyder, Coordinator
New Hampshire Ecological Reserve System Project

Beneath a canopy of sugar maple, white ash, and basswood, ephemeral spring wildflowers burst forth on the forest floor, absorbing nutrients and soaking up sunlight before the canopy closes in. Along with their overstory associates, squirrel corn, Dutchman's breeches, bloodroot, and blue cohosh are some of the early bloomers found in a **rich mesic forest**. This forest is one of more than 170 natural community types described by the New Hampshire Natural Heritage Inventory Program.

Natural communities are groupings of plants that occur together in recurring patterns based on soils, water, nutrients, and climate. A rich mesic forest community occurs in areas with mineral-rich bedrock, at the base of cliffs and steep slopes, or in ravines—places that accumulate nutrient rich organic matter similar to your backyard compost pile. A study in Vermont described 48 species of herbaceous plants including many rare plants, in rich mesic forests, a reflection of the "rich" nutrient content in the soil.

The names of natural community types reflect the dominant plant species and physical conditions in which they are found. New Hampshire hosts a diversity of rare types (e.g., Atlantic white cedar basin swamp, pitch pine/scrub oak barrens, cold-air talus forest, coastal dune) and many common types (e.g., red maple alluvial swamp, hemlock forest, sugar maple-beech-yellow birch forest). One of the goals of the New Hampshire Ecological Reserve System Project (ERSP) is to ensure the long-term protection of all natural community types, both rare and common.

Ecologists use a combination of new technology and traditional field study to predict, locate, and map natural communities and plant populations. Data layers available through Geographical Information Systems (GIS) are analyzed for predictors of rare plants or unique landscape features. These predictors typically involve physical characteristics such as the weathering potential of bedrock, poor or excessive soil drainage, or presence of cliffs, slopes or summits. Aerial photos are also interpreted to find wetland and upland communities.

As summer approaches, botanists head into the field with topographic maps that identify potential "hot spots" and a knapsack of field guides, data forms, magnifying glass, insect repellent, binoculars—for those who can't resist a look at the birds and butterflies, water bottle, sun hat, and lunch. A new addition to field gear is a GPS unit. Global positioning systems (GPS) are used in the field to record the location of plant populations or natural communities. The data are then downloaded to a computer and plotted onto a topographic map, aerial photo or other GIS "base map." Without the aid of a GPS unit, data are transcribed by hand from hard copy field maps to the computer.
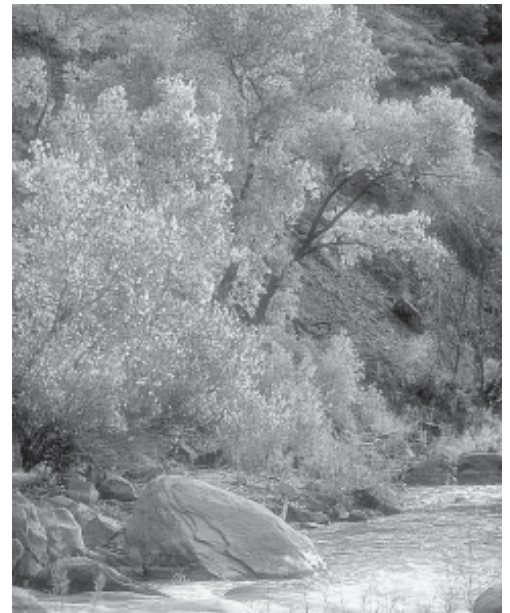
CARING FOR OUR FORESTS, WATERSHEDS, AND WILDLIFE HABITATS

Global Climate Change
## *Global Impacts Translate to New Hampshire Impacts*

Adapted with permission from the website http://www.des.state.nh.us/factsheets/ard/ard-23.htm of the Air Resources Division of the NH Department of Environmental Services. For more information on climate change and what is being done at the international and national level, or what you can do to reduce greenhouse gas emissions, please contact them at 271-1370.

The Evidence is Compelling...

The 1980's and the 1990's were the warmest decades on record. Global average surface temperatures are approximately a degree higher than in the 19th century. Climate records from Hanover, NH show a 3 degree increase in yearly temperatures and a 4 degree increase in summer temperatures over the past 150 years. Once just climate anomalies, intense rain and snow events and fewer extremely low minimum temperature events are now becoming more the norm.

Potential Environmental Impacts

Higher temperatures may increase extreme events- periods of winter thaw followed by intense cold, spring and summer drought, and summer heat stress. Serious impacts may include: loss of 10 to 20% of ski season days; sea level rise of 12 to 20 inches causing large scale alteration of Great Bay, reduction of coastal estuaries and flooding of rivers; dulling and browning during foliage season due to tree die-offs, species substitution, and "climate stressed" unhealthy trees; loss of cold water fishing with 50 to 100 percent eradication of rainbow, brook and brown trout.
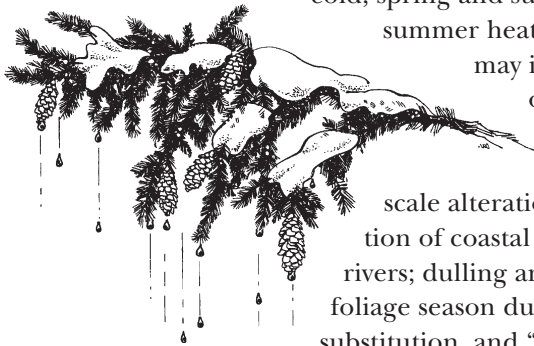
Forest and Timber Impacts

Most likely on balance global climate change will bring adverse impacts to New Hampshire's forests. In general, ecological models predict that warmer temperatures and extreme weather events would move optimal conditions for the growth of northern hardwood forest species northwards by at least 100 to 300 miles by the end of the next century. Disturbances such as pest and pathogen outbreaks, flooding, and wind damage will increase and may kill trees and forests. Extremes of weather have been associated with die-backs and declines in several northern hardwood species in New England in the last 100 years. Sugar maple, ash, and yellow birch, all northern hardwoods, are sensitive to extreme weather and may decline or even collapse.

Human and Economic Impacts

The following was adapted from Jan Pendlebury, NH Global Warming Campaign. She welcomes inquiries at 224-1955. Email: janpend@totalnetnh.net

Environmental changes associated with global warming have serious implications on public health. Higher summer temperatures will adversely affect children, seniors and people suffering from cardiopulmonary disease. Higher temperatures could also increase the spread of infectious disease. Changes in rainfall may disrupt our public water supply.

Ozone, formed near the 'ground level,' can be damaging to humans, vegetation and animals. Ground-level ozone causes irritation and damage to membranes of the respiratory system and eyes. Elevated ozone concentrations, especially common during the summer months, have become a serious problem- not only in urban areas, but also in remote, high-elevation forests like the White Mountains.

Global warming will have a dramatic effect on our state's economy, which relies heavily on natural resources and tourism. The White Mountains bring visitors from around the world to enjoy hiking, skiing, leaf-peeping, fishing, swimming and relaxing. Global warming can have a great impact on the environment that we cherish in our national forest.

The debate around global warming is no longer *if* it will happen but *how dramatic* the impacts will be and what action needs to be taken to reverse this trend. Over 2,000 economists worldwide have declared that the cost of inaction is higher than the cost of reducing greenhouse gas emissions.

What's in a Natural Community?

A map provides an excellent visual depiction of plant or community locations. However, it is the size and quality of the population or occurrence and the quality of the surrounding landscape that determines its health and viability over the long term. Ecologists record in the field their assessment of size, quality, and landscape context. Taken together these attributes are used by Natural Heritage to rank natural community occurrences as "A" (excellent), "B" (good), "C" (fair), or "D" (poor).

High quality ("A" or "B" rank) examples of common communities and all examples of rare types are called **exemplary natural communities**. These best examples are most likely to have a diverse complement of native plant species, structural features such as dead wood and varied age classes, and natural processes such as treefall gaps. As Natural Heritage ecologists and their partners identify and map exemplary natural communities and rare plant populations, it is incumbent on private and public landowners to aid in the stewardship of these important ecological features of our landscape.

The ERSP has identified a suite of criteria that Project partners can use to locate and protect ecologically significant areas in New Hampshire. In addition to exemplary natural communities, the criteria include critical wildlife habitats, rare plants and animals, uncommon geologic features, and ecological linkages. The goal is to utilize the best available scientific knowledge to protect plants and animals, the communities and habitats in which they are found, as well as the ecological processes and functions that they (and we) depend on.

Natural areas, and more recently ecological reserves, are places designated on public lands that harbor plant, animal or geologic features of state, regional or global significance. The ERSP is bringing together botanists, biologists, geologists and others to discuss the scientific basis for determining boundaries of these areas to ensure that the ecological functions are maintained. Drawing a boundary around a rare plant population or a natural community and calling it a natural area doesn't necessarily ensure its long-term survival. The surrounding land use will contribute to or detract from its survival. Ecologists employ the concept of core and buffer areas to address differences in land use in their efforts to conserve our biological heritage.

Across New Hampshire people are protecting land and water. Together we're acknowledging and maintaining an interconnected and comprehensive system of rivers, ridges, wetlands, watersheds, communities, and habitats. To ensure that this "green infrastructure" contains all the necessary parts and processes, we must support and utilize the efforts of volunteers and professionals in their search for and documentation of natural communities and other ecologically significant places. Only then can we be sure we're conserving the full spectrum of our natural heritage for today and the future. Anything less will decide that some things survive and others disappear from our landscape.

For more information on natural communities consult the following references:

Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont. 2000. E. H. Thompson and E.R. Sorenson. Distributed by University Press of New England.

New Hampshire Natural Heritage Program Web Site: http://www.dred.state.nh.us/forlands/formgt/nhiweb/

NH Ecological Reserve System Project Web Site: http://ceinfo.unh.edu/forestry/documents/nhecosrv.htm

---

Evaluating the New Hampshire Professional Logger Program

by Sarah Smith, Extension Forest Industry Specialist

University of New Hampshire graduate student, MHC McLeod of the Adult and Occupational Education Department conducted a phone survey of participants in New Hampshire's Professional Loggers Program. Working with the NH Timber Harvesting Council, the NH Timberland Owner's Association, UNH Cooperative Extension, and UNH Thompson School of Applied Sciences, MHC developed a list of 27 questions designed to evaluate the four core-courses and the certification process. Two hundred surveys were completed.

Eighty-three percent of respondents identified themselves as loggers; 8.5% truck drivers; 3% skidder, crane, or feller-buncher operators; 1.5% foresters; and another 4% as other. 74.5% of the loggers were owner/operators, 13.5% employees, and 12% identified themselves as contractors. Other general information revealed that 80% of the loggers have been in the business for over ten years and 40% over twenty years; most found out about the programs from mills, direct mail, and word-of-mouth; 80% work in central or northern NH; and 14% have attended classes in other states.

When asked which of the courses was the most and least valuable- first aid was the most popular (45.5%) followed by safe and productive felling (33%), timber harvesting law (17.5%), and fundamentals of forestry (3.5%). When asked if they enjoyed meeting and networking with other loggers, 81% agreed that they did; 91% agreed that they were better informed as a result of taking these classes; and 73% indicated that they planned to get recertified.

Overall, loggers felt that the courses were relevant; that they remember information presented; that they used the information; and that it was presented in an understandable way. The majority disagreed with the statement that the information presented in the workshop was something they already knew. Participants felt respected and that the instructors generally kept their attention and engaged them in discussion.

The loggers questioned for this study offered dozens of suggestions for additional classes and workshops. The most frequent topics concerned safety and included suggestions such as advanced first aid and felling. Other topics listed were log bucking, scaling, grading, job layout, mechanized logging, skidder and equipment operation and maintenance. Many loggers would also like to learn more about sawmilling.

Many wanted to learn to communicate better with foresters, landowners and environmentalists. Quite a few of the loggers were concerned with their public image and wanted to learn what they could do to improve the public's opinion of logging and loggers. Additionally, respondents listed business management, marketing, forest ecosystems, wildlife habitat, and wetlands.

Many felt that logger certification should be mandatory, others wanted to see logger licensing, others did not. There were numerous opinions expressed about the American Forest and Paper Association, Sustainable Forestry Initiative (SFI). The initiative requires the member mills to purchase wood only from certified loggers. Many loggers felt that the training requirement generated a fair amount of resentment.

New Hampshire loggers also suggested that an advanced certification or "Master Logger" certification be established to provide a higher level of knowledge (This is being pursued by the NH Timber Harvesting Council). In addition, many would like a testing, or demonstration of skills, as well as a decertification mechanism. Other respondents felt that certification was too intrusive and should be abandoned.

Based on the findings of this study, MHC McCloud reports, "The majority of the certified loggers have had a positive experience overall. Although a small minority expressed dissatisfaction with the certification process, the overwhelming majority concluded their interviews with such comments as "This is a very good program. Keep up the good work". Many stated that they were skeptical at first, but have come to see its value in their professional development."

MHC goes on to say "Participants have increased their awareness of safety and first aid, honed their felling techniques, and increased their knowledge of timber-related laws and principles of forest management. But more importantly, they are increasing the status of logging as a profession and are finally being taken seriously as professionals, making their voices heard beyond New Hampshire's forests."

An executive summary of this study is available from the Forestry Information Center at 1-800-444-8978.
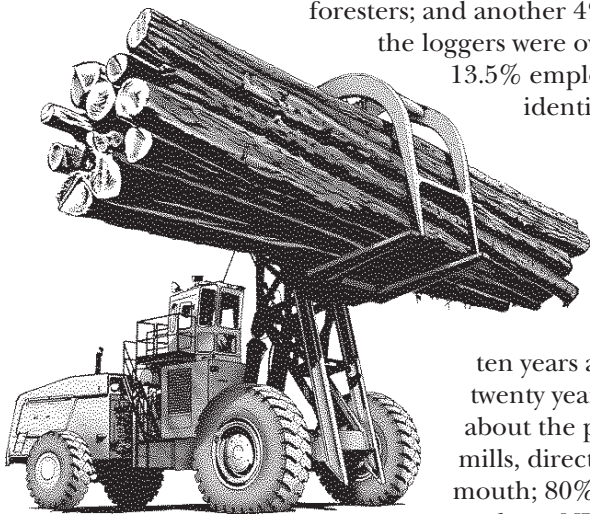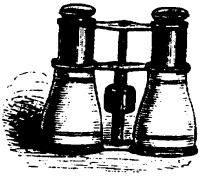
Field Findings

Results of current research on New England forests, watersheds, and wildlife habitats

Watching Our Watersheds

by Jeff Schloss, Extension Water Resources Specialist

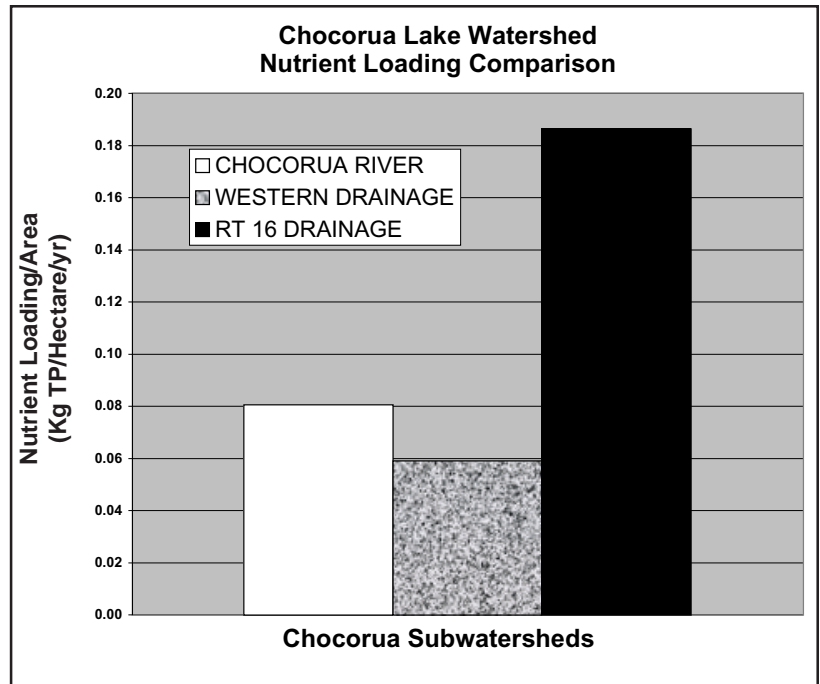Our pristine surface waters are important assets to residents and the many visitors they attract. Local citizens, associations and decision-makers are in dire need of research based information required for the wise management of our waters . Increasing development pressures and recreational use requires more accurate assessment of the water quality of our lakes, ponds, rivers, streams and estuaries. The New Hampshire Lakes Lay Monitoring Program (LLMP), a joint effort of UNH Cooperative Extension and the UNH Center for Freshwater Biology, began in 1978 as a class project on Lake Chocorua. The Great Bay/Coast Watch (GBCW) was established 11 years later using the LLMP and early estuarine programs as models.

Both are grassroots water quality monitoring programs and their keys to success are the many active volunteers across the state. These volunteers sample water, do basic tests, and perform visual surveys. They provide the timely and extensive monitoring data to assess water quality and detect if any significant long-term changes are occurring. In addition, these programs provide screening alerts to state agencies responsible for environmental protection.

Decision-makers have made informed management decisions affecting the water resources in their communities as a result of the program, based on sound data, which would otherwise be unavailable or too expensive to collect without the programs.

An example of a successful LLMP impact concerned a multi-agency effort on Lake Chocorua. Volunteers from the lake association provided monitoring data and the LLMP produced the report needed to get the NH Department of Transportation and the Town of Tamworth (with design help from the USDA Natural Resources Conservation Service, coordination through the Carroll County Conservation District and North Country Resource Recreation and Development Agency, and funds from the NH Department of Environmental Services) to fix run-off problems into the lake from Route 16 and surrounding roads. In addition, the results provided the Chocorua Lake Foundation with data to allow them

Chocorua Lake Watershed Nutrient Loading Comparison

Legend: □ CHOCORUA RIVER, ▨ WESTERN DRAINAGE, ■ RT 16 DRAINAGE

Y-axis: Nutrient Loading/Area (Kg TP/Hectare/yr)

X-axis: Chocorua Subwatersheds

to plan land acquisitions and initiate local protective ordinances for lake protection. Similar protective efforts from LLMP monitoring have occurred for Dublin Lake, Baboosic Lake, Newfound Lake, Squam Lakes, and Lake Winnipesaukee to name a few.

GBCW data and surveys conducted by volunteers assisted Dept. of Health & Human Services to reopen a clam flat that had been closed for 10 years and to open additional Great Bay shellfish beds.

This "neighbor-to-neighbor" effort has been successful in watershed protection. It serves to educate, build confidence and empower volunteer participants. Program volunteers also educate other members of their associations, commissions and/or towns. In 2000, the LLMP had over 500 active volunteers monitoring 300 lake and pond sites, and 290 stream sites in 129 lake watersheds with a total of 98 lake associations participating (with greater than 5000 members potentially

Conservation Notes

Implementing Biodiversity Conservation

by Mark Zankel, Conservation Programs Director, The Nature Conservancy

I. Ecoregional Planning for Biodiversity

In 1996, The Nature Conservancy initiated biodiversity conservation planning in 64 large ecoregions throughout the United States, including the Northern Appalachians-Boreal Forest Ecoregion (NAP). The purpose of our ecoregional planning is to design a portfolio of sites that, if adequately conserved and allowed to regain their natural condition, would effectively conserve representative viable examples of all native species, natural communities, and ecosystems in the ecoregion.

The NAP ecoregion spans 31 million acres of the great Northern Forest, from New York's Tug Hill and Adirondack mountains to Down East Maine, and contains the largest expanse of unbroken forest remaining in the eastern United States. New Hampshire's portion of the ecoregion includes the White Mountains and the Northern Forest, and supports a spectacular array of biological diversity.

One of the new and exciting approaches developed during the NAP planning process was the idea of using large "matrix forest blocks" as a landscape feature for conservation analysis and site selection. We define matrix forest blocks as *large contiguous areas whose size and natural condition allow for the maintenance of ecological processes, viable occurrences of matrix forest communities, embedded large and small patch communities, and embedded species populations.*

Matrix blocks are really a mosaic of common forest types and embedded small and large-patch natural communities (e.g., wetlands, ponds, cliffs), bounded by roads or other major fragmenting features. Imagine a matrix block as a giant chocolate chip cookie. The chips represent the constellation of species and small-scale natural community occurrences in a landscape. The chips are embedded in, and kept intact by, the cookie dough, which is the matrix of dominant natural land cover. There are four dominant, matrix-forming forest community types in the NAP ecoregion: Montane (or high elevation) Spruce-Fir, Red Spruce-Northern Hardwood, Maple-Beech-Birch Northern Hardwood, and Lowland Spruce-Fir.

II. Why Matrix Forests?

It is well accepted that biodiversity exists at many levels of biological organization, and occurs at a variety of spatial or geographic scales. In assessing the biodiversity of ecoregions, The Nature Conservancy looks at the suite of plant and animal species, natural communities, and ecosystems that are most representative of a given ecoregion.

In the NAP ecoregion, we were challenged by the incomplete nature of on-the-ground biological inventory data. Very little ecological inventory has occurred in common matrix forest communities, or at the scale of watersheds or large ecological systems, which are the landscape units that need to be protected if we are to conserve the full range of New Hampshire's biodiversity. Early on in the NAP planning effort, it became apparent that if we designed our network of ecoregional conservation sites based solely on a group of currently known, small-scale rare species and natural community occurrences, we would fail in our mission to conserve the full array of native biodiversity. Nature Conservancy scientists decided to use matrix forest blocks as a coarse filter for representing and conserving ecoregional biodiversity within a complementary portfolio of diverse and viable forest landscapes.

III. Getting the Scale Right

To be considered for the ecoregional plan, matrix forest blocks were required to meet a minimum size criteria based on two viability factors: 1) the area needed to ensure that a system can absorb, buffer, and recover from severe, stand-replacing natural disturbances (e.g., hurricane, downburst, fire, ice-storm), and 2) the breeding territory requirements of selected forest interior wildlife species found in the ecoregion (e.g., pine marten, fisher, broad-winged hawk, barred owls, and forest interior neotropical migratory birds). Based on the scientific literature, our working theory is that in order for a matrix forest conservation area and its constituent biodiversity to be viable over time, it needs to have a relatively contiguous area that is:

1) at least four times the size of the largest stand-replacing natural disturbance, and

2) able to accommodate at least 25 female breeding territories for a select set of forest interior wildlife species.

Using these criteria, Nature Conservancy scientists decided upon a minimum size of 25,000 acres for a viable matrix block in the NAP ecoregion.

IV. Identifying, Analyzing, and Prioritizing Matrix Forest Blocks

We used the following process for delineating, analyzing, and prioritizing matrix forest blocks:

1. Identify potential blocks through GIS analysis. Potential matrix block boundaries were delineated by significant fragmenting features including Class IV or higher roads, as defined by the U.S. Geological Survey, major utility corridors, railroad lines, and shorelines of very large lakes. We retained all of the contiguous blocks greater than 25,000 acres for further analysis.

2. Refine block boundaries through maps, photos, site visits, and expert opinion. We used topographic and road maps, aerial photos, satellite imagery, and local expert opinion to check the validity of the GIS-created block boundaries. Certain blocks were enlarged because some roads in the GIS data layer had actually been retired or were so narrow and little-used that they did not fragment the forest. Other blocks were reduced in size or withdrawn from consideration because of new roads or settlements that significantly fragmented the forest.

3. Collect and analyze matrix block data. To evaluate and prioritize matrix blocks, Nature Conservancy staff compiled a large volume of GIS-generated data for each block, including: road miles and density, land cover, topographic classes, geology, landforms, lakes and ponds, streams and rivers, dams, rare species and natural community occurrences, and conservation lands. We also examined published reports and interviewed people with local expertise to better understand the overall condition of the forest, management history, and presence of old growth or other unusual natural features.

4. Select matrix forest blocks for the ecoregional portfolio. Matrix forest blocks were selected for inclusion in the ecoregional conservation plan based on their embedded biodiversity, regional significance, viability, and conservation feasibility. Embedded biodiversity includes features such as old growth remnants, ponds and brooks, and high physical landscape diversity. Regional significance incorporates factors such as irreplaceable biodiversity features and connectivity with other important landscapes. Viability is measured through a combination of block size, current forest condition, and landscape context. And feasibility is a measure of threat and opportunity for success.

V. Results and Next Steps

A total of 38 matrix blocks were selected in the first iteration of the NAP ecoregional plan. These blocks contain:

- 302 viable occurrences of rare species and exemplary natural communities

- Over 50% of the viable documented occurrences of globally rare species (G1-G3) in the ecoregion

- Over 45% of the viable documented occurrences of target natural communities in the ecoregion

- An estimated 40,000 acres or more of old growth forest

Matrix blocks are proving to be a valuable tool for identifying large, intact, forested areas on the landscape that merit conservation attention. The next step for The Nature Conservancy is to work on a voluntary basis with partners, communities, and willing landowners to conduct site conservation planning, whereby the specific set of natural features that are of conservation interest within or adjacent to a matrix block can be analyzed and suitable conservation plans developed.

Through the second iteration of the NAP ecoregional plan, we are now stratifying and re-prioritizing matrix blocks to ensure representativeness and complementarity across the entire ecoregion. The Nature Conservancy is classifying landscapes into Ecological Land Units (ELUs)

Implementing Biodiversity Conservation

using a GIS-based analysis of bedrock and surficial geology, landform, and elevation, and we are grouping matrix blocks with similar ELU features. Through this analysis, we hope to ensure that each matrix block we choose is ecologically complementary to the other blocks (and thereby avoids too much redundancy), and that the full set of blocks selected for the portfolio is representative of the range of ecological variation in the ecoregion.
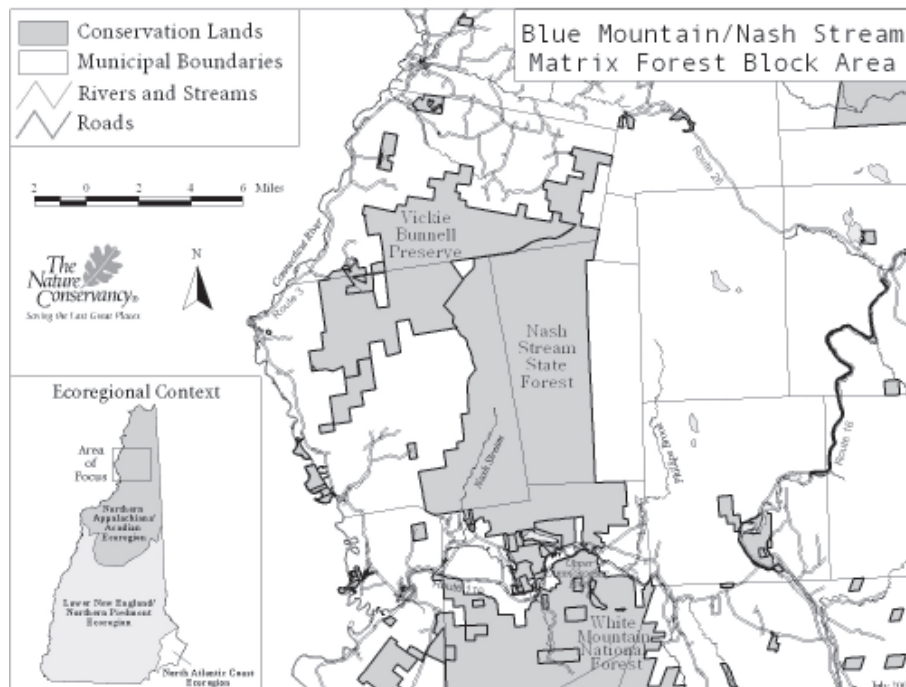
VI. The Blue Mountain/Nash Stream Matrix Block: An example in New Hampshire's Northern Forest (See map)

Located in central Coos County and centered around the Nash Stream State Forest, the Blue Mountain/Nash Stream matrix forest block was selected as an important area for conservation in the NAP ecoregion plan. This block possesses high biodiversity values, including the best high elevation spruce-fir forest and largest concentration of peaks over 3000' found north of the White Mountains in New Hampshire; 140 miles of coldwater streams; 22 lakes and ponds; diverse wetland complexes; outstanding deer yards; exemplary cliff, summit, fen, and forest natural communities; and high physical landscape diversity.

The regional significance of the block is very high because the Blue Mountain/Nash Stream matrix block serves a critical landscape connectivity function in the NAP ecoregion. This landscape forms the central hub of a wheel connecting the White Mountain National Forest to the south, Vermont's Nulhegan Basin to the west, the vast International Paper lands and Canada to the north, and the Lake Umbagog National Wildlife Refuge to the east. The viability of the matrix block is considered to be medium-to-high. It more than meets the 25,000-acre minimum size criteria. Current condition is fair, as much of the land has been subject to large-scale industrial timber harvesting and there are numerous haul roads interspersed through the block.

The landscape context is good, in that the block is largely surrounded by forest land to the east, north, and south, and by the Connecticut River to the west. Some fragmentation is occurring along the perimeter, but the near-term potential for significant additional fragmentation is low. And, finally, the conservation feasibility is considered very high. With The Nature Conservancy's recent acquisition of the 18,500-acre Bunnell Tract, the block contains in excess of 60,000 contiguous acres of protected land, more than 250,000 acres of which are being managed primarily for biodiversity conservation). A closer analysis shows, however, that lower elevation areas are significantly under-represented in reserve areas. This finding is characteristic of the Northern Forest region, and provides insight for future land conservation activities in the Blue Mountain/Nash Stream matrix block.

Blue Mountain/Nash Stream Matrix Forest Block Area

New Hampshire Natural Heritage Inventory

by Sara Cairns, NH Natural Heritage Inventory Data Manager/Biologist

Suppose that a subdivision is being planned on a beautiful patch of forest near your house. Personally, you value the forest and would like to save it. But how good a case can you make for why a land trust should spend its limited funds to conserve it? Can you say whether it is exceptional compared to other patches of forest?

Conservation decisions, such as the one given above, can benefit greatly from solid data on the ecological value of a piece of land, including how unique it is. The NH Natural Heritage Inventory is a small state program that, in cooperation with The Nature Conservancy and other organizations, is gathering and distributing the information needed to make sound conservation decisions. Along with other Heritage programs throughout the US, we keep track of "exemplary" natural communities. These include most examples of rare types, such as a riverside seep on calcareous bedrock (which typically has many rare plants), as well as undisturbed examples of common types, such as an old-growth spruce-fir forest. We maintain a database that describes the location and condition of each known example of exemplary natural communities. We also study issues such as how to define natural communities and how we can judge the quality of the communities at any given location.

Riverside seep
Caren Caljou

As an example, we recently finished a two-year survey of floodplain forests in New Hampshire. We collected detailed ecological observations at sites all over the state and analyzed the data to accurately define the different types of floodplain forests that occur in New Hampshire, and to determine how rare each type is. We also developed a set of standards for giving any one forest a rank ranging from A (excellent size and condition in an undisturbed setting) to D (poor quality). The result is that we now have well-defined criteria for assessing the quality of a given forest in relation to other examples in the state.

We have conducted a similar statewide study of peatlands, as well as producing more focused reports on rare natural community types such as Atlantic White Cedar Swamps. We also document locations where rare plant and animal species have been observed, and assess the viability of these populations. We use the information we gather to help the state manage its lands in ways that will preserve New Hampshire's natural heritage, and to encourage voluntary protection by private landowners.

At our web site (www.dred.state.nh.us/forlands/formgt/nhiweb/) you can find more information, including details on how we rank natural communities, lists of rare plant and animal species in the state (or in your town), and a form for reporting sightings of rare species. You can also call us at 271-3623. We are not funded to conduct individual site visits, but we can tell you if a particular natural community (or species) is rare or not, and what things to look for to help determine its ecological value.
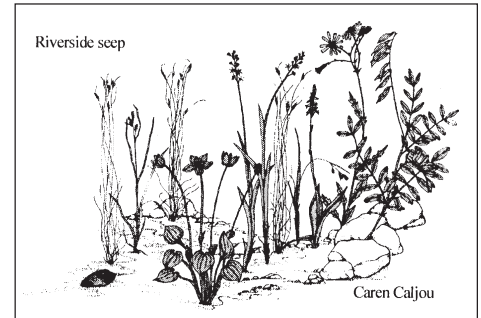
Watching Our Watersheds

benefitting). The GBCW has 75 volunteers on 26 sites in 7 coastal watersheds.

The monitoring efforts and data not only serve for local stewardship efforts but also have been utilized in statewide and regional studies. Great Bay/Coast Watch data on salinity in Great Bay has been incorporated into graduate research on lobster migrations and population dynamics. The Lakes Lay Monitoring Program has initiated many "participatory research efforts" aimed at the concerns of its participants. Fish condition studies, recreational impact assessments, evaluation of monitoring methods and long-term trend analysis focusing on climate change are just some of the many research projects undertaken through the program. The GBCW also recently initiated "red tide" plankton monitoring at in- and off-shore locations and the LLMP piloted a freshwater "mussel watch" program to keep tabs on blue green algae toxin levels in participating lakes.

For more information on the GBCW contact Ann Reid at 603-749-1565. For information on the LLMP contact Jeff Schloss at 603-862-3848 or Bob Craycraft at 862-3696.

Ecological Profiles

Why Did the Beavers Kill the Black Gum Trees?
Natural Communities Responding to Change

by Frank Mitchell, Extension Water Resources Specialist

Not long ago, deep in the woods of Deerfield, New Hampshire, beavers moved into a swamp, began building a dam and chomping into the bases of some of the trees in the swamp. This activity is common, but in this case, the situation was special. This is no ordinary swamp. It is (or was) both an "old growth" forest stand and a rare community characterized by black gum, or tupelo, trees.

Many of the black gums were killed by the beavers' bark chewing or flooding. Using tree ring analysis, forest ecologists discovered a number of the black gums were among the oldest trees known in the state— nearly 500 years old! Any black gum swamps are considered unusual this far north, but the old growth status of the Deerfield swamp made it especially rare.

When the beavers moved into the Deerfield Black Gum Swamp they raised an intriguing question. Why now? Why did the Black Gum Swamp remain undamaged by beaver for hundreds of years, only to be nearly wiped out in the 1990's?

There are several possible explanations for this mystery. One is that nature is full of random events and long-term cycles, and that randomness caught up with the Deerfield Black Gum Swamp. Its time had simply come to fall to beaver.

Another explanation is that something about the natural communities is different now than in the past and that this difference led to the flooding of the Black Gum Swamp. One difference could be food availability. Beavers don't have a known preference for black gum as a food source, particularly in the Northeast. They favor poplar, willow, birch, maple, ash, alder and some aquatic plants. If these were regularly available during the history of the Black Gum Swamp, it would seem reasonable that beaver would have avoided the black gums in favor of their preferred species. Without an abundance of these species, might beavers have moved into an area and eaten trees they normally would have left alone?

Let's consider what the forest around the Black Gum Swamp might have been before European settlement and what it's like now. A basic character-istic of undisturbed forests in the Northeast is that they are mixtures of trees of different sizes, ages and species, including some very old trees as well as earlier successional species. At the time of the flooding by beavers, the Black Gum Swamp itself was in an old growth condition, but the surrounding forest was certainly not. Today , the upland forest around the Deerfield Black Gum Swamp is one of mostly even-aged trees, with a lot of hemlock and pine along the swamp edges, species which are not favored by beaver. Could it be that in today's landscape, dominated by relatively young, even-aged evergreen growth, that beavers migrate to new wetland sites more often than they would have in a more mature forest?

There's a fairly obvious answer to why beavers didn't kill the black gums during the past *two* hundred years—there were hardly any around to do so. Beaver populations declined as human populations increased following European occupation. Today with increased protection, they are perhaps at an all time high, living in almost every available habitat. Their currently high population pressure may be a reason why they recently moved into the Deerfield Black Gum Swamp. It doesn't explain, though, how the black gums survived the 200 years before European Colonization.

Predator populations are the focus of another explanation for this puzzle. Since European settlement, a number of species have been eliminated from the region and thereby removed from the historic food web in which beaver evolved. Among these are two predators—wolves and mountain lions. Another species, bobcat, is still here but much reduced in numbers. By reducing beaver populations regularly, these predators may have kept their migration frequency lower than today. Today, food supply, rather than predation, may be more of a limiting factor.

There are other possible explanations for the plight of the Black Gum Swamp. Climate change, acid rain, increased ultraviolet light due to atmospheric ozone depletion or water pollution could have environmental effects we have not discovered, and may not suspect. It may also be that this event is but a result of two or more of the possible causes.

From the Resources Library

**UNH Cooperative Extension
Forestry Information Center**

The following publications are available from the Forestry Information Center. Unless noted, all publications are free. For charge publications, make checks payable to UNH Cooperative Extension and remit to UNHCE Forestry Information Center, Room 211 Nesmith Hall, 131 Main St, Durham, NH 03824-3597. To request copies, call 1-800-444-8978 or email kathy.barrett@unh.edu.

New Hampshire Best Log Scaling Practices Guide is a 13-page, color-illustrated booklet, summarizing the most common scaling practices used in New England. Using the International 1/4-inch rule, the guide illustrates scaling procedures, the most common defects causing deductions, and a sample mill scale slip.

Once again, **The Guide to New Hampshire Timber Harvesting Laws** has been revised. Feedback from last spring's edition helped us clarify confusing sections. We also added a complete listing of the fourth order and higher streams. Individual fact sheets are also available on the following laws: **Timber Trespass**, **Basal Area**, **Slash**, and **Deceptive Forestry Business Practices**.

From "the oldies, but goodies" file: **Threatened and Endangered Plants and Animals in New Hampshire's Forested Habitats: A Guide for Foresters and Other Land Managers** uses brief and clear language to describe seven wildlife and sixteen plant species. Published in 1998, this guide includes information about identification, habitat, management, and status for each species.

In last month's *Habitats* we announced the publication of **Natural Resources Inventories: A Guide for New Hampshire Communities and Conservation Groups**. It provides step-by-step guidance for starting a new inventory or updating an existing one. It is available now for a cost of $18.00 per copy. It will be distributed as part of our Community Conservation Assistance Program and in workshops about natural resource inventories. Watch for workshop announcements beginning in the fall of 2001 (See Upcoming Events).

Other Library Resources

The **Forest Landowners' Guide to the Federal Income Tax** (Agriculture Handbook 718) is now available online or for purchase through US government bookstores. This replaces Ag Handbook 708 and contains information on financial and tax planning, property exchanges, casualty losses, conservation easements, self-employment taxes, alternative minimum tax for individuals, Christmas tree production, and record keeping.

Contact information for the nearest US government bookstore is: Thomas P. O'Neill Building, Rm 169, 10 Causeway St, Boston, MA 02222, phone (617) 720-4180, fax (617) 720-5753, http://bookstore.gpo.gov/locations/index.html. The 160-page internet version of the handbook can be seen at www.fs.fed.us/spf/coop/.

Readers may also be interested in visiting the National Timber Tax Website at www.timbertax.org.

And, speaking of web sites, check out the new and improved sections of our UNH Cooperative Extension Forestry and Wildlife Program Area, starting at http://ceinfo.unh.edu/forest.htm. From there, click to the following:
- The NH Coverts Project <http://ceinfo.unh.edu/Forestry/Documents/nhcovrts.htm>
- NH Ecological Reserve System Project <http://ceinfo.unh.edu/forestry/documents/nhecosrv.htm>

Why Did the Beavers Kill the Black Gum Trees?
continued from page 9

Whatever the cause(s), the "why now?" question of the Deerfield Black Gum Swamp story is not only intriguing, but serious. It is a serious question because it illustrates a possible example of basic environmental change resulting from human activity.

We still have much to learn about natural communities and how they respond to change. The Deerfield Black Gum Swamp is one of the many places where we can find questions to ask—questions that may help us direct that learning.

Habitats

UNH Cooperative Extension
214 Nesmith Hall
131 Main Street
Durham, New Hampshire 03824-3597

525081

Upcoming Events

Check the event calendar on the UNH Cooperative Extension Forestry and Wildlife Program web site at <http://ceinfo.unh.edu/forest.htm>

Planning for Wildlife and Other Natural Resources in New Hampshire Fall 2001 Community Workshop Schedule

These workshops will help communities assess and protect their natural resources, using two new guides: *Natural Resources: An Inventory Guide for New Hampshire Communities and Conservation Groups*, and *Identifying and Protecting New Hampshire's Significant Wildlife Habitat: A Guide for Towns and Conservation Groups*.

   Each program will be from 9 a.m. to Noon. Fee: $25, includes instruction, the 2 guides and refreshments. Sponsored by UNH Cooperative Extension, NH Association of Conservation Commissions and NH Fish & Game Department. For more information or to register, contact Debra Anderson at 862-1028 or email at debra.anderson@unh.edu

DATE	REGION	LOCATION
September 22, 2001	North Country	The Rocks, Bethlehem
October 6, 2001	Upper Valley	New London Public Library, New London
October 13, 2001	Lakes Region	Lakes Region Planning Commission, Meredith
October 13, 2001	Central NH	Conservation Center, Concord
October 20, 2001	Southern NH	UNH Cooperative Extension Office, Milford