

New Hampshire Forest Resources Plan

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Forest Resources Plan Steering Committee

and

New Hampshire Department of Resources and Economic Development
Division of Forests and Lands



Table of Contents

Introduction	iii
Executive Summary	v
I. What is the Forest Resources Plan?	1
II. Vision and Challenges	7
III. View of the Forest	11
IV. Assessment Results and Actions Needed	17
1. Creating a favorable business climate	19
2. Keeping contiguous blocks of forest intact	25
3. Developing mechanisms for sustaining managed forests	29
4. Addressing the impact of local land use decisions	35
5. Conserving New Hampshire's biological diversity	39
6. Continuing the tradition of keeping land open to the public	45
7. Providing timely collection of data about forests	49
8. Instilling appreciation, knowledge and skills of forest conservation	55
9. Acquiring and managing public lands and easements	63
10. Conserving community forests	67
11. Developing forest policy collaboratively	69
Appendices	
A. Update on "Action Program for the 1980s"	A-1
B. Assessment Report Group Members	A-17
C. List of Abbreviations	A-19
D. Glossary	A-21

Introduction

It was 1952 when Governor Sherman Adams suggested, "examining New Hampshire's forest problems and determining what should be done about them." The Division of Forests and Lands and Forest Resources Plan Steering Committee worked for two years to fulfill this same task. In accordance with RSA 227-I:8, this Forest Resources Plan summarizes the condition of New Hampshire's forests, sets forth a vision for the future, and proposes a variety of policy options to achieve the vision.¹

Many individuals assisted the Steering Committee in developing this plan. The committee sought input from a broader group of citizens with an interest in New Hampshire's forests to review and comment on interim products. In this plan you will find the Steering Committee's vision of the future, its understanding of current problems, and their suggestions for solutions. It is organized as follows:

Executive Summary -- In this section we describe the planning process, summarize key findings, and highlight twelve actions identified as critical first steps.

Chapter I -- What is the Forest Resources Plan? This section provides background on Forest Resources Planning in New Hampshire, establishing a context for evaluating this draft. Chapter I includes: the legislative authority for Forest Resources Planning; objectives for this plan; a brief history of forest planning in New Hampshire; and a description of the plan development process and those involved in it.

Chapter II -- Vision and Challenges. Here, the Steering Committee outlines its shared expectations for the future of New Hampshire's forests. A view of New Hampshire's forests is captured in the "Vision of New Hampshire's Forest Resource: The Desired Landscape Condition," and a companion statement, "Challenges to Achieving the Vision."

Chapter III -- View of the Forest. This section provides a snapshot view of New Hampshire's forests based on existing inventory information. Trends over time are included in this overview of today's forests.

Chapter IV -- Assessment Results and Actions Needed. In this section we summarize the findings of a six month assessment of the status of our forests and, using this information, suggest a total of 62 actions to address issues identified in "Challenges to Achieving the Vision." Guided by the hopeful view of the future set forth in Chapter II, we develop clear objectives and realistic actions to work toward that end.

Appendices -- Three appendices include an update on progress implementing the 1982 Forest Resources Plan, Assessment Group membership, and abbreviations used.

¹RSA-220 was recodified to Chapter 227-I in January 1996.

Executive Summary

Continuing the tradition begun in 1952, this Forest Resources Plan describes the condition of New Hampshire's forests and articulates a vision for the future. It presents a variety of actions to address the question of *what* we must do to sustain New Hampshire's forests and the economy that depends on them, and *how* we might use various means to achieve the vision. It is the fourth such plan to be written in New Hampshire in 45 years.

Like all of the earlier plans, this plan responds to new issues and ideas that are important to our times. Forest sustainability and a more ecological approach to forestry are central themes. This emphasis reinforces the role of the forest-based economy by defining the relationship between forests, people and forest industries in contemporary terms. Another prominent theme is the complex task of balancing society's interests in preserving public values in forest land with the fundamental precepts of free enterprise and individual property rights and responsibilities. This builds on our state's long and proud tradition of protecting personal and property rights while working collaboratively to resolve public issues and problems.

The Forest Resources Plan is based on the participation and involvement of many different forest interests and perspectives in New Hampshire. The effort began in April 1994 when State Forester John E. Sargent convened a Steering Committee of 28 people to guide the process. The committee began their work by writing a vision for New Hampshire's forests in 50 to 100 years and identifying "challenges" that might impact progress toward the vision. Over the next two years the committee conducted an assessment of the condition of New Hampshire's forests, developed findings of fact and specific policy options for each of the challenges, and prepared the Forest Resources Plan. Through the entire process the committee encouraged open communication between diverse and often opposing interests. On several occasions they sought public input by inviting people to review and comment on interim products including a draft "Vision and Challenges," "Findings and Draft Options," and "Draft Forest Resources Plan."

Before charting a course toward the vision, the committee needed more information about where we stand today. An Assessment Report was prepared to summarize the current conditions of our forests. It looked at three perspectives: how New Hampshire's forests are used and valued by people; the forest's role in our economy; and their ecological condition. The assessment was a collaborative project with over forty people contributing their technical expertise. It took the committee several months to review the Assessment Report, add supplemental information, and synthesize its contents into several major findings about the current status of New Hampshire's forests.

Summary of Key Findings

- C **For over 300 years, New Hampshire's forest-based businesses have been a stable force and major contributor to the state's economy.** The wood products industry, from timber harvesting to the manufacturing of finished goods, ranks third in the state for value-added, cost of materials and value of shipments, and ranks fourth in employment and wages. But wood manufacturing in New Hampshire has not reached its full potential. We export an estimated 122 million board feet of unprocessed timber annually to neighboring states and Quebec, with lost value-added opportunities for our forest economy.

- C **Maintaining blocks of contiguous forest is extremely important, both ecologically and economically.** In northern New Hampshire, nine blocks of contiguous forest have been identified, each over 25,000 acres. In southern New Hampshire, blocks of forest over 25,000 acres are rare and blocks of uninterrupted forest are likely to be in multiple ownerships. With private land comprising 83 percent of the state's forested land, factors such as tax policies, land use and forest policy have a large impact on the ability to maintain large tracts. New Hampshire's Current Use Law (RSA 79-A) is the best tool currently available for conserving forest land. But current use assessment does not address the full range of pressures facing land owners.

- C **For decades sustained-yield forest management has been the accepted model of forest management.** In the 1990s the concept of forest sustainability has been expanded to include larger landscapes and non-commodity values of forested ecosystems. Information to assess current forest conditions is needed to adapt forest management to an evolving notion of sustainability.

- C **Local decision-making authority is the foundation of New Hampshire civic discourse.** The potential of local decisions to impact the ability to practice forestry and sustain healthy forests is not widely recognized. Local decisions affect the availability of land for timber harvest, the value of property owned for forest management purposes, and the fragmentation of contiguous tracts of forest. Land use policies are a potentially powerful tool for conserving forest land and forests adjacent to communities, but their success depends on adequate natural resource information that is readily accessible to local decision-makers.

- C **The human influence on biological diversity is very complex, but it is clear that some forest habitats are scarce because of past or present human activity.** The state list of threatened and endangered species now includes 17 percent of known species of vascular plants and 14 percent of known vertebrate species. These habitat and species declines are not all related to forest management activities. Many are the result of land clearing, farm abandonment and development. Species declines that are linked to the availability of forested, and in some cases agricultural, habitat are important concerns in forest resource planning.

- C **New Hampshire's population has nearly doubled in the last 30 years which has stimulated changes in land use.** For example, an average of 13,000 acres of forest land was converted to development each year between 1982 and 1992. Demand for outdoor recreation opportunities by residents and millions of tourists who visit each year are evident in two trends. On public lands, the numbers of people using state and federal lands is increasing and some popular locations bear visible signs of overuse. On private lands there is a perception that more owners are restricting public access to their property. Since completion of the Land Conservation Investment Program, New Hampshire no longer has a coordinated process to prioritize state acquisition of land and conservation easements.
- C **Access to reliable information about the forested resource is critical to sustain both the industry and the forest.** While several sources of information are currently available there is insufficient information on some issues vital to sustaining our forests. In some cases, the information is not being collected. In others, the system for collecting data is not thorough or timely. New Hampshire depends on the U.S. Forest Service decennial Forest Inventory and Analysis (FIA) for data on the status of timber and other forest resources. However, FIA inventories are conducted at unpredictable intervals and do not collect comprehensive information about all biological elements of the forest. Limited funding for the Natural Heritage Inventory Program, established to serve as an ongoing inventory of the state's biological diversity, has allowed only limited inventory coverage of the state. Increased efforts to coordinate research are needed to provide landowners and resource managers with the information they need to make informed decisions.
- C **As New Hampshire's population increases, fewer residents are connected to the land or have a real understanding of our forest resources.** The Steering Committee believes that forest policy will not achieve the desired goals of a sustainable ecosystem and forest economy without public understanding of the natural systems that allow forests to function. Education for landowners and resource professionals to respond to new technology and research is expected, but the recurring call for basic science education for children demands stronger action.
- C **New Hampshire has a long and proud tradition of protecting personal and property rights while working collaboratively to resolve public issues and problems.** Open communication between diverse and often opposing interests is needed to foster respect for different views and to develop creative solutions based on trust and consensus. The emphasis on forest sustainability and a more ecological approach to forestry will further test our ability to balance personal and property rights with public values and societal objectives. A variety of mechanisms to facilitate cooperation and collaboration are in place. They provide a foundation, that with some modification, will assist people in developing and revising our forest policies.

First Steps

Working toward the ideal presented in the Vision and Challenges, the Steering Committee developed 62 actions to address the issues identified during the assessment process. They are grouped under broad objectives for clarity and to capture the complex interconnections between the actions. Every action in this plan is important. Taken together they will help us make progress toward the vision of New Hampshire's forests in 50 to 100 years. Nevertheless, all 62 actions cannot be implemented at once. The Steering Committee identified the following 12 actions as necessary first steps.

Action 1-1. Integrate forest products development with other state economic development activities by establishing a full-time forest products development specialist position at the Department of Resources and Economic Development in Concord. The specialist would direct existing programs and agency resources toward forest-based businesses and value-added manufacturing of unprocessed wood.

Action 2-2. Encourage the maintenance of large contiguous parcels of forest lands in private ownership. Promote long term forest management by supporting current use assessment, capital gains treatment of timber, an equitable regulatory climate, and property and income tax policies that influence the attractiveness of investment in forest land.

Action 3-2. Integrate scientific information and management through establishment of statewide forest structure and composition goals. The Forest Sustainability Standards Work Team should consider this as part of the development of voluntary site-specific forest management practices and landscape-level strategies. Practices and standards should assist landowners and foresters in linking new scientific information to feasible management applications.

Action 4-2. Encourage careful siting of development to maintain ecologically significant land and large contiguous blocks of managed forest by providing communities with information and tools to assist them in making long range land use decisions.

Action 5-2. Support the Ecological Reserve System Steering Committee process to design a science-based system of ecological reserves as one approach to maintain and enhance New Hampshire's biological diversity. The committee should involve citizens in planning and developing a process to create reserves through the participation of public landowners and the voluntary cooperation of private landowners.

Action 6-1. Continue building coalitions between forest landowners and people who recreate on private lands. Increase awareness of New Hampshire's

landowner liability law among landowners, recreation users and others. Build understanding of responsible use of private land by recreationists.

Action 7-1. Provide accurate and timely forest inventory data to landowners, resource managers, and forest-based industries to make informed decisions and to guide forest-based economic development. Data should be developed through state partnerships that build on the USDA Forest Service, Forest Inventory and Analysis, but give New Hampshire the flexibility to creatively meet our own information needs.

Action 7-2/3. Conduct comprehensive biological inventories on all public lands, and encourage landowners to conduct ongoing biological inventories of their land. On public lands emphasize state and municipal lands where the least information has been collected. On private lands develop a protocol for data collection, provide incentives and respect the concerns of property owners.

Action 8-1. Form a coalition to work with the State Board of Education/Department of Education to assure that future generations of New Hampshire citizens have an adequate background in science and natural resources. The coalition should address the availability of science and conservation education curricula and materials, and propose revisions to teacher certification and continuing education distribution requirements.

Action 9-1. Initiate a goal-oriented, public planning process to develop a state acquisition program for land and easements that builds upon the successful model of Land Conservation Investment Program and Trust for New Hampshire Lands.

Action 10-1. Continue to expand community forestry programs with an emphasis on urban ecosystem benefits and public awareness. Focus on city and community tree programs, citizen involvement, maintaining private forest land in suburban settings, and open space planning in communities.

Action 11-1. Create a task-oriented "umbrella" group based on the Northern Forest Lands Council concept of a State Forest Roundtable. Their role should be to advocate implementation of actions in this plan, coordinate forest policy development, facilitate dialogue between diverse interests, and assure opportunities for public participation in policy development.

Success will depend on the commitment and cooperation of all who have a stake in the forests of the future--agencies, landowners, organizations, businesses and citizens. The task ahead is to implement actions to realize the vision of New Hampshire's forests set forth in this plan.

New Hampshire Forest Resources Plan

Chapter I. What is the Forest Resources Plan?

In April 1994 work began on a fourth New Hampshire Forest Resources Plan, continuing a 50 year history of periodically evaluating the condition and needs of our state's forests. In 1981, RSA 220 codified this tradition in the "Forest Resources Planning Act," requiring a comprehensive statewide plan be prepared every ten years.² This Forest Resources Plan carries on the tradition and fulfills the legislative obligations.

The purpose of the Forest Resources Plan is to gather existing information to assess the state's forest resources, and to prepare a plan to address problems and opportunities for all forest land owners. The Plan discusses the use, ownership and management of forest resources, outlines policies for the future management of forests, and establishes legislative priorities to promote both public and private resource management programs in New Hampshire.

State Forester John E. Sargent initiated development of this plan by inviting 28 individuals to serve on the Forest Resources Plan Steering Committee. Committee members are:

Mitchell Berkowitz, *Berlin City Manager*
Robert Berti, *FORECO Inc.*
Charles Bridges, *Fish and Game Department*
Philip Bryce, *Crown Vantage*
Paul Bofinger, *Society for Protection of NH Forests*
Rick Cables, *White Mountain National Forest*
Chris Eagar, *Northeast Forest Experiment Station*
Robert Edmonds, *UNH Cooperative Extension*
David Funk, *Durham Conservation Commission*
Richard Hamilton, *White Mountain Attractions*
Cheryl Johnson, *New Hampshire Landowners Alliance*
Gigi Laberge, *HHP, Inc.*
Roger Leighton, *UNH Cooperative Ext., Retired*
Charles Levesque, *Innovative Natural Resource Solutions*

Bill Mautz, *UNH Life Sciences & Agriculture*
Jim McLaughlin, *Office of State Planning*
Ted Natti, *State Forester, Retired*
Charles Niebling, *NH Timberland Owners Association*
Sid Pilgrim, *State Soil Scientist, Retired*
Steven Taylor, *Commissioner, Department of Agriculture*
John Twitchell, *DRED Division of Parks*
John E. Sargent, *DRED, Division of Forests and Lands*
Jamie Sayen, *Northern Forest Forum*
Mary Shriver, *New Hampshire Wildlife Federation*
Patrick McCarthy, *The Nature Conservancy*
Kirk Stone, *Audubon Society of New Hampshire*
Hank Swan, *Wagner Woodlands*
Chris Simmers, *NH Dept. of Environmental Services*

Early in the process the Steering Committee wrote a mission statement, saying it would provide input and direction to the Division of Forests and Lands in developing a Forest Resources Plan by:

- C examining the forested landscape of the state, looking at environmental, economic and social values of forest lands and assessing the benefits of healthy and productive forests;*
- C developing strategies to ensure New Hampshire's forests remain healthy and viable, to provide economic and social benefits for present and future generations and to contribute to the diversity of natural habitats, human communities and landscapes in the state.*

²RSA-220 was recodified to Chapter 227-I in January 1996.

Building on Past Forest Resource Plans

It was not until 1981 that New Hampshire law required the development of Forest Resource Plans, but long before the law there was a tradition of assessing our state's forest resources and planning for their future. Over the last 50 years, a number of forest plans were developed, each with a unique process that resulted in plans with a different structure and content. However, each past plan assessed forest conditions, identified problems, and set out future objectives. Today, the success of these plans is measured by the condition of the forest and by their recommended programs that remain in effect.

The first statement of policy focused on the condition of New Hampshire forests and was written by a committee appointed by Governor Sherman Adams in 1952. The committee found that only 13 percent of New Hampshire's forest land was considered well-stocked with trees of sufficient size to be sawn into lumber. Nearly 40 percent was stocked with smaller diameter, pole-sized trees. The committee concluded that in more than 75 percent of harvesting operations, practices used to cut and remove the timber were so poor that future productivity would likely decline.

To improve forest productivity, the 1952 committee examined four policy areas: education, improved forest practices, public lands, and research. Many of the committee's recommendations were subsequently implemented. Education recommendations resulted in approval of a two-year forestry program and accreditation of the existing four-year program at the University of New Hampshire. Today's full-time County Cooperative Extension Forestry Staff, providing an array of services to landowners, are a direct result of the 1952 policy for improved forest practices. The 1952 policy also led to the establishment of Hubbard Brook Watershed Experimental Area in the White Mountain National Forest, site of pioneering research in ecosystem ecology.

In 1964, New Hampshire's forest policy was revisited by a committee appointed by Governor John W. King. This committee reviewed the recommendations and accomplishments of the 1952 plan before identifying new problems, defining objectives for the next decade, and recommending an action program to accomplish those objectives. The primary concern in 1964 was an overall decline in forest condition, resulting from strong demand for scarce, high-quality wood coupled with soft markets for more abundant, poor-quality timber. Recommended policies focused on improving forest resources by creating markets for low-grade wood. In addition, implementation of the 1964 plan resulted in increased private landowner participation in technical assistance programs, and transfer of the white pine blister rust control program to the state. Almost a decade later, still acting upon the 1964 plan recommendation to address fair assessment of forest land, New Hampshire passed the Current Use Tax Law (RSA 79-A).

The 1964 plan acknowledged for the first time the importance of assessing recreation, wildlife habitat and watershed management in addition to forest products. The plan also documented early concerns that human population pressure would result in forest land being converted to other uses.

Chapter I -- What is a Forest Resources Plan?

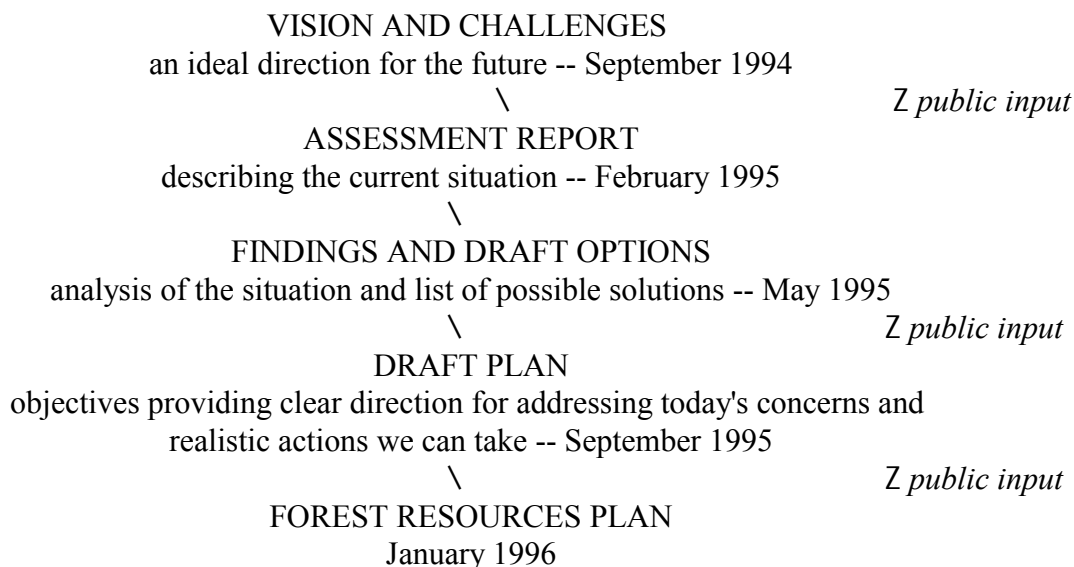
New Hampshire's third statement of forest policy was developed in 1982. This plan was a continuation of the tradition started by the previous efforts and a response to the federal Renewable Resources Policy Act of 1974. The committee appointed by Governor Hugh J. Gallen developed an issues-driven process incorporating broad public involvement to address citizen concerns.

Eleven "citizens committees" focused on specific issues and developed a total of 104 recommendations. The University of New Hampshire's Cooperative Extension Program implemented 1982 plan recommendations by hiring a wildlife specialist, establishing a computerized marketing information system, and publishing a Bimonthly Forest Marketing Bulletin. The Division of Forests and Lands inventoried state forest lands, and then mapped and zoned them for different uses. In 1981, the state legislature passed RSA 220, requiring a Forest Resources Plan be developed in New Hampshire every ten years.

Planning for the Twenty-first Century

The Division of Forests and Lands and Steering Committee began work on this Plan in April 1994. The group began by agreeing on a future vision and then identified a course of action to get there. The committee recognized ecosystem management as an emerging concept, and agreed to use new information about ecological approaches to forestry in the plan. Throughout the process, the committee sought input from people with expertise and an interest in the future of New Hampshire forests.

The following diagram shows the steps involved in developing this Plan:



At their first meeting the Steering Committee brainstormed what New Hampshire's forests might be like in 50 to 100 years. Then the committee drafted a "Vision of New Hampshire's Forest Resource: The Desired Future Landscape Condition." They also identified 13 "Challenges" which might impact progress toward the Vision.

Copies of the draft Vision and Challenges were distributed widely through the Division of Forests and Lands September 1994 newsletter, and publications of other organizations. People were invited to respond with their comments. The final Vision and Challenges incorporated suggestions received.

Next, the committee conducted an assessment of the condition of New Hampshire's forests as a basis for developing informed policy. They set up three assessment groups that looked at the role of forests in our economy, their ecological condition, and how they are used and valued by humans. The assessment groups completed their work in six months. Each developed its own process to address issues relevant to the Vision and Challenges. The results of these three investigations are compiled in the Assessment Report.³

The Steering Committee synthesized information from the Assessment Report into Findings and Draft Options, published in May, 1995. The committee supplemented the Assessment Report with the Northern Forest Lands Council's *Finding Common Ground: Conserving the Northern Forest*. The Findings and Draft Options include findings of fact and specific policy options for each challenge.

Again seeking public input, the Steering Committee invited 150 people to discuss the Findings and Draft Options at a one-day work session. Over 60 people participated, representing a variety of interests including: foresters; forest landowners; educators; researchers; non-profit conservation organizations; forest industry; local, state and federal government; agricultural interests; wildlife and water resource advocates; and community groups. Input provided by participants enabled the committee to consolidate the nearly 100 draft options into the 57 recommended actions included in the Draft Plan.

About one thousand copies of the Draft Plan were mailed and distributed in September and October 1995. Five public comment sessions were held around the state. People were invited to comments on the Draft Plan at the public sessions, in writing, over the telephone, or in meetings. A total of 57 comments were received. The Steering Committee considered all of the comments and used people's input to further revise the Forest Resources Plan.

Implementation and Follow Up

The Division of Forests and Lands will be responsible for providing leadership and support for implementation of recommendations, but the success of this plan will depend on the

³ Copies of the Assessment Report are available by calling or writing the Forest Resources Planning Staff at New Hampshire Division of Forests and Lands, PO Box 1856, Concord, NH 03302-1856, (603) 271-2214.

Chapter I -- What is a Forest Resources Plan?

commitment of all who are affected--agencies, landowners, organizations, businesses and citizens--working together in coordination.

Beyond carrying out the actions in this plan, the Division of Forests and Lands will develop a means to monitor and evaluate the results of the actions. Measuring success should go further than counting the number of actions implemented. Evaluation is needed to learn whether the actions achieved their desired effect. Where assumptions supplemented incomplete information, monitoring will verify if assumptions were correct.

Progress on plan implementation will be reported to the public every five years as required by the "Forest Resources Planning Act." Reliable data on why each action succeeded or failed will be useful to people continuing New Hampshire's tradition of Forest Resources Planning, and will provide an essential link between this plan and those to follow.

Chapter II. Vision and Challenges

A Vision of New Hampshire's Forest Resource: The Desired Future Landscape Condition

The human history of New Hampshire is dominated by our relationship to the forests. The very character of our state is proudly derived from generations of people who extracted a living and purpose from land which grows trees in abundance. Today, due largely to population growth and technological change, the majority of New Hampshire people are removed from an immediate relationship with forested land. Livelihoods and purpose are no longer perceived to be dependent upon the forest resource. A future in which New Hampshire's forests play a defining role cannot be taken for granted; rather, it must be planned for and vigorously pursued.

The planning and thinking process represented by this, and previous Forest Resource Planning documents, took both the heritage and prospects of New Hampshire's landscape seriously and arrived at the following vision statement to guide New Hampshire's forest policy:

New Hampshire's landscape will be dominated by diverse forest cover in a complex mosaic of forests and farms, rivers, lakes, and mountains, interspersed with thriving urban and rural communities, enhanced and connected by undeveloped open spaces.

The landscape will reflect a balance that is vital to the character of New Hampshire --sustainable, strong economies of forest industry, tourism and outdoor recreation, dependent upon healthy, properly functioning ecosystems.

New Hampshire citizens, now and in the future, will live, work and play in this diverse forested landscape, and will increasingly understand themselves as sustaining the landscape, and being sustained by it.

Challenges to Achieving the Vision

Many recent changes to New Hampshire's forested landscape are related to population growth. Urbanizing towns along the southern border, suburban sprawl in communities state-wide, land posted against public access, wildlife habitat broken up by roads and development, and increasing numbers of people visiting our public forests and parks, will ultimately change the quality of life that characterizes our state.

This Forest Resources Plan cannot directly address the impacts of population growth. But it can guide the use of land and resources to assure the land provides for our needs, and that forest health and productivity are sustained for future generations.

We face many challenges ahead. They are listed here to serve as a guide to our development of a forest policy that will shape the forest landscape we pass on to our children.

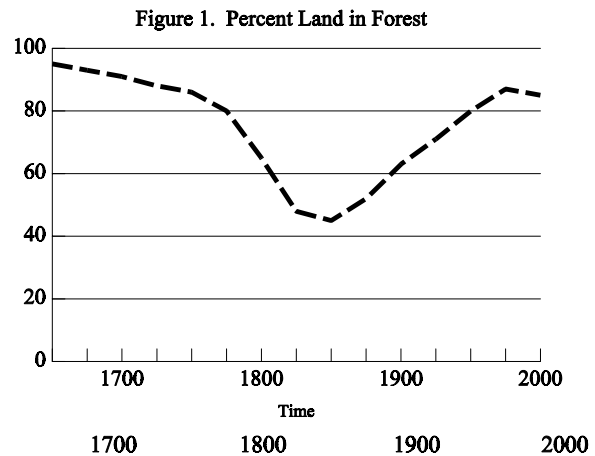
We are challenged to create a future where:

- 1. People understand and appreciate the value of New Hampshire's forests. They are aware of products they use and benefits they receive from the forest; understand the compatibility of ecologically-sound forest uses and natural processes; and know that economic and human health depend on respect for ecological limits.*
- 2. Forest communities sustain biologically diverse populations of native plants, animals and other organisms that depend on the processes of the forest environment for survival and continuation of evolutionary processes.*
- 3. Scientific information about natural communities, ecological systems and physical site conditions is the foundation for land management and protection decisions.*
- 4. Natural resources are used by New Hampshire industries to provide a diverse economic base that optimizes value-added products and provides stability for communities and residents.*
- 5. Forest-based businesses, which have contributed to the stability of New Hampshire's economy for 300 years, are recognized and encouraged by public and private organizations, and the public at large.*
- 6. Privately owned forest lands contribute significantly to New Hampshire's forest-based economy, tourism and outdoor recreation, biological diversity, and character of the landscape.*
- 7. The role of public lands is continually evaluated so they complement private forest lands by protecting land and amenities not provided elsewhere. They contribute some of the same benefits as private lands but also contribute, for example, by showcasing ecologically sound forest management, developing knowledge about ecosystems and forestry, and providing unique habitats and natural communities.*

8. *Landowners responsibly exercise property rights and the public respects owners rights.*
9. *Policies are developed cooperatively by government, industry, non-government organizations and individuals. They are developed using science and a science-based definition of sustainability. Policies recognize cultural differences and demographic patterns, and emphasize education and incentives.*
10. *The New Hampshire tradition of cooperation and community-spirit continues with well-informed citizens who actively participate in local, regional and state decisions about forest resources.*
11. *Local land use plans reflect and incorporate the state forest resources plan.*
12. *Diverse domestic and global markets provide optimum, sustainable return to the state's economy.*
13. *Key parameters of forest health are identified, changes and trends are monitored, and appropriate actions to maintain a healthy forest ecosystem are implemented.*

Chapter III. View of the Forest

Climb any New Hampshire hill, and the view will likely be dominated by forests. Three centuries ago Europeans who settled New Hampshire encountered vast forests. But by 1850, land clearing for farm and pasture reduced forest cover to only 45 percent statewide, mostly in the north and White Mountains (figure 1). By 1983, forest cover had rebounded to an estimated 87 percent. Recent data suggest forest cover may have declined in the last decade. An update of the 1983 estimate will be available upon completion of the next U.S. Forest Service, Forest Inventory and Analysis (FIA) of New Hampshire.



A Historical View

The composition and range of New Hampshire's forests have seen major changes during the 10-12,000 years since Pleistocene era glaciers receded. After the ice melted, plant species moved into the region at different times and from several directions. The current species combinations have been present for about 2,000 years, and are similar to those encountered by European settlers 300 years ago. The exceptions are American chestnut and elm, whose appearance as forest trees was virtually eliminated by diseases introduced to North America. But despite the similarities in tree species composition, the forests of today are thought to contain trees in different proportions and distributions from three centuries ago.

Before New Hampshire forests were cleared by settlers, small-gap disturbances created a multi-aged forest of Northern hardwoods. In spruce-fir forests, the historical balance of age classes and proportion mixed with hardwood is not known, but the proportion of older trees is thought to be higher than is present today. Both hardwood and spruce-fir forests had large amounts of dead wood in various stages of decay, thick layers of organic matter on the forest floor, and localized pit and mound topography from stumps, logs and pulled-up roots. Historical accounts of oak-pine forests indicate they had an open and park like appearance with some extensive clearings and a persistent overstory of large white pine and red oak.

Forest Ownership Today

New Hampshire's forests are on land that is mostly in private ownership (figure 2). Of the total area of forest in New Hampshire, over 80 percent is privately owned, with about 14 percent in industrial forest land. Nearly 20 percent of New Hampshire forest is in public ownership--federal, state, or municipal. The public ownership includes conservation easements and designated Wilderness in the White Mountain National Forest.

Structure of the Forests

The proportion of trees in three size classes (seedlings and saplings, pole-sized trees, and trees large enough to saw into timber) has been tracked since 1948 through the FIA (figure 3). Data from 1948-1983 indicated a trend toward larger trees, as forests that grew back on abandoned farm land matured. At the same time, the acreage of seedling- and sapling-sized forest was declining.

About 3,000 acres of forest considered to be old growth (never logged or cleared) are estimated to occur in a dozen well recognized areas, with additional acreage of subalpine forest that was never logged.

Forest Composition

Foresters have defined forest types by the dominant tree species. The most common is northern hardwood, which includes American beech, yellow birch and sugar maple (figure 4). Several species of pine, mostly Eastern white pine, occur in a pine forest type with some Eastern hemlock and oak mixed in. Red and white oak dominate the oak forest type. The spruce/fir forest type includes balsam fir, and red and white spruce. The aspen/birch type includes fast-growing pioneer species that establish in old fields and after a disturbance like fire or clearcutting. Black ash, American elm, and red maple on wet sites, are grouped together.

In the 35 years between 1948 and 1983 the acreage of aspen/birch forest type declined while the acreage of oak forest type increased. This trend reflects a transition to a maturing forest, in which pioneer species that established on abandoned farms at the turn of the century are replaced by longer-lived species.

Figure 2. Forest Land Ownership

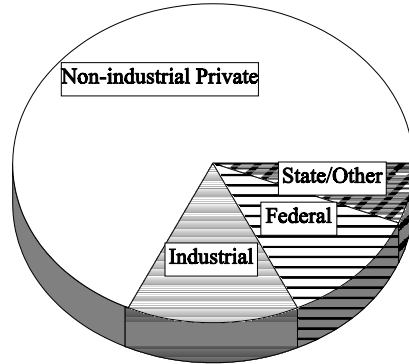
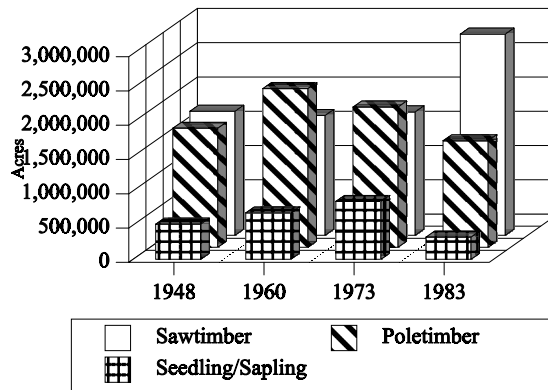
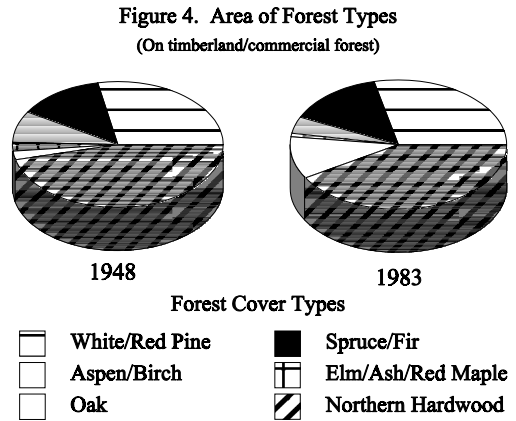
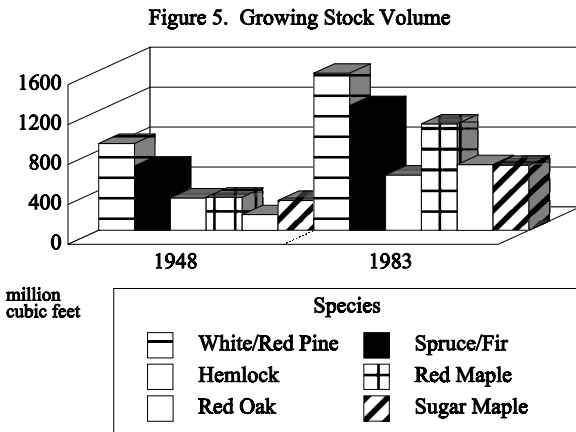


Figure 3. Size Class Distribution



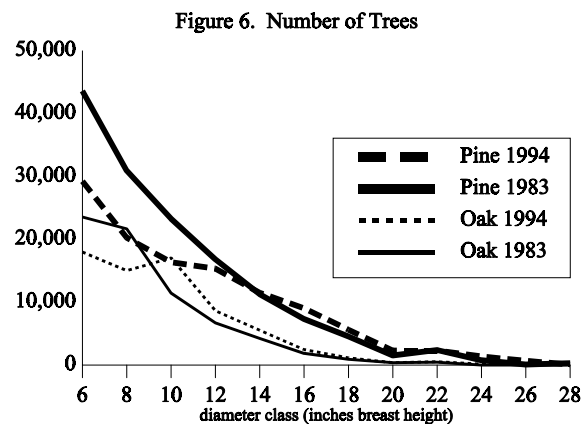
The trend in growing stock volume of individual tree species reveals more about the dynamics of New Hampshire's forests. Growing stock volume is an estimate of the amount of wood that could be provided by trees currently growing on the land. Between 1948 and 1983 the growing stock volume of all species increased 111 percent (figure 5). The volume of hardwood growing stock increased 130 percent and the volume of softwoods increased 89 percent. The volume of red oak growing stock nearly quadrupled, and the volume of red maple more than tripled.



The 1995 New Hampshire Forest Inventory Project provided new information on growing stock volume. Data collected on white pine and red oak show that between 1983 and 1994 growing stock volume of white pine increased 5 percent and growing stock volume of red oak increased 23 percent. These increases are expected in a maturing forest, and indicate that large trees are not being over cut. However, in both pine and oak the number of small diameter trees declined between 1983 and 1994 (figure 6).

As shown previously (figure 3), the acreage of seedling- and sapling-sized forest declined between 1973 and 1983. Moreover, an apparent decline in small diameter white pine and red oak (figure 6) suggests that these commercially valuable species may not be as prevalent in the future.

Since at least 1960, the rate of timber harvest has remained lower than the rate of forest growth. The FIA estimates the growth rate between 1960 and 1983 at about 3 percent per year. Removal of timber (as a percent of annual growth) during this time period fluctuated between 27 and 56 percent. The recent inventory of pine and oak estimated the growth rate of both species at

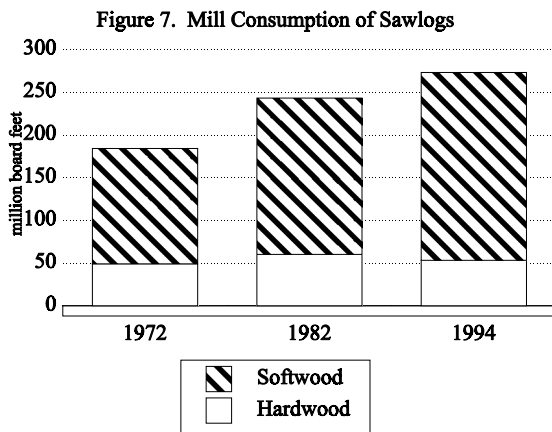


2.5 percent, reflecting continued good growing conditions. The inventory estimated current removals (from harvest or land clearing) of white pine as 82 percent of growth. Removals of red oak are 37 percent of growth.

The New Hampshire Forest Inventory Project estimated the annual sawtimber harvest volume between 1983 and 1993 as an average of 231 million board feet (MMBF). Fifty percent of the volume of sawtimber cut during this time was white pine. A variety of cutting methods were used in harvesting this wood. A recent study to determine the prevalence of clearcutting revealed that 1.1 percent (49,800 acres) of New Hampshire's forest land was clearcut in the last 15 years. Individual clearcuts ranged in size from 3 to 261 acres, with an average size of 29 acres.

Forest Industry

In 1995 there were 208 registered sawmills in New Hampshire. The total mill consumption of sawtimber (in 1993) was reported as 273 million board feet. This is a 9 percent increase from 1982 (figure 7). The increase in mill consumption was primarily by white pine sawmills. Almost 40 MMBF of sawtimber are imported annually from surrounding states. The net outflow of sawtimber leaving New Hampshire--exported to Vermont, Maine and Quebec-- is estimated at 122 MMBF. The amount of sawtimber leaving New Hampshire as unprocessed logs is equivalent to 45 percent of the existing manufacturing capacity within the state.



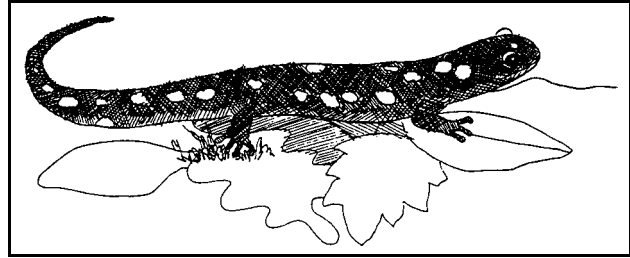
The economic value of New Hampshire's forests is considerable. The wood products industry ranks third in the state for value-added, cost of materials and value of shipments, and ranks fourth in employment and wages. Annually, wood-based manufacturing value of shipments exceeds \$1.7 billion. About 10 percent of people who work in manufacturing in New Hampshire are employed by forest industries. The wood products sector generate \$340 million a year in income.

For each one dollar of value in a standing tree, the forest products sector adds an average of \$27. Sawmilling, kiln drying, and planing adds over \$400 per thousand board feet to the value of logs. The total benefit of the biomass industry is \$260 million. The pulp and paper industry adds value to a cord of pulpwood by a factor of 50.

Trees and More

But the overall value of New Hampshire's forests is even further reaching. Forests supply clean water and air to New Hampshire communities and offer protection to municipal

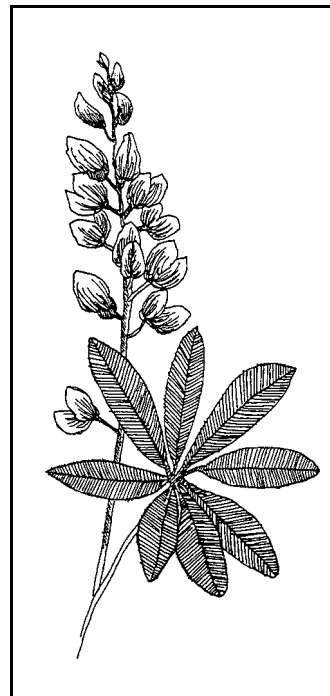
drinking water supplies in many towns. Many people use forests for recreation. Eighty-eight percent of the population participates in wildlife-related activities from birdwatching to hunting. Forests are a scenic backdrop to New Hampshire's \$2 billion dollar tourist industry. Visitors from around the world travel to see our fall foliage. In 1990, total tourist expenditures were \$2.1 billion, with 57 percent attributed to forest-based travel expenditures.



Spotted salamanders breed and spend their larval stages in vernal pools before moving to forest areas as adults.

Biologically, there is more to New Hampshire's forests than the trees. Approximately 1,900 species of vascular plants--trees and shrubs as well as herbs ranging from ferns to grasses to wildflowers--occur in the state, though not all are in forests. Many of these plants have biological affinities with flora in other parts of North America. For example, many alpine plants in the White Mountains are also found in the arctic, while some plants in New Hampshire's hardwood forests are found along the chain of Appalachian Mountains to the south. New Hampshire contains around 350 species of mosses, 150 species of liverworts and 5 species of hornworts. Lichens in the state are not well known, but a total of 199 species growing on bark and wood have been recorded to date.

Natural communities are characteristic groups of species (plants, animals, fungi, microorganisms) that are found together in a particular physical environment. Variation among natural communities in large part reflects differences in environmental conditions: climate, bedrock, soil, nutrients, water levels, and disturbances. Examples of natural communities and their physical environments include Atlantic white cedar swamps in low-lying areas with limited drainage, enriched hardwood forests in regions where the bedrock is calcium-rich, and pitch-pine/scrub oak barrens on sandy outwash from glacial meltwater and ancient river deltas. So far, 130 different communities have been classified in New Hampshire. Roughly half of the 130 communities are forest or woodlands. Many of the rest occur adjacent to and are dependent upon biological and physical interactions with forests.



Lupine leaves are food for larvae of the endangered Karner Blue butterfly found in pitch-pine/scrub oak barrens.

New Hampshire habitats support a great variety of animals. Each species has different requirements for resources (such as food, nest sites and mineral nutrients) and responds differently to physical conditions, disturbances, predators and disease. The variety of animal species reflects the diversity of living conditions between the seacoast and the alpine zone. Of the more than 400 vertebrate species that

inhabit the state, there are 55 species of mammals, over 300 bird species, 18 species of reptiles, 19 amphibian species, 35 species of freshwater fish and 7 species of anadromous fish. Invertebrate diversity is not known as well, but includes representatives of 15 phyla, and six classes of arthropods. Insects are the largest arthropod class, with an estimated 16,000 species occurring in New Hampshire.

Past and Future

As the twentieth century draws to a close, it is clearly a period with significant social and economic changes, driven primarily by population growth and technological advances. Public policies were instituted to protect human health and property by controlling wildfire and seasonal flooding. Motor vehicles and roads brought about changes in land use and development. In forestry, advances in logging equipment--from chainsaws to mechanized harvesters--provide stark contrast to the timber harvesting of one hundred years ago.

The maturing forests we benefit from today are a testament to the resilience of forests and the proactive implementation of policies to improve forest regeneration and quality nearly half a century ago. Today, we have a vision of the desired future landscape condition in 50 to 100 years. Many challenges lie ahead, and they present an opportunity to develop policies that will help people in our time meet their needs and shape the forests we pass on to future generations.

Chapter IV. Assessment Results and Actions Needed

Working toward the ideal presented in the Vision and Challenges in Chapter II requires clear objectives and realistic actions. The Forest Resources Plan Steering Committee, in its Findings and Draft Options, identified nearly 100 potential actions to address issues cited in the Assessment Report. In response to public input from the May 1995 work session, the range of actions was narrowed. They were organized into categories such as education, recreation, and sustainable forest management, based on the uses and values of New Hampshire's forest lands.

However, many of these uses and values overlap. Given the enormous variety of human activities in forests--from municipal watershed use, to timber harvesting, to recreation use, to home-building--any such categorization of potential actions listed here would not capture their complex interconnections. Instead, we chose to group actions together under broad objectives.

Many of the objectives outlined in this chapter refer to the term "sustainability," either in regard to forest management, or to the use of forest resources. In this plan we adhere to the definition of sustainability suggested in the Vision and Challenges to mean balancing the broad human and ecological needs of today without compromising the ability of future generations to meet their own needs.

The objectives listed below are inter-related and address the question of *what* we must do to achieve our goals. Not meeting these critical objectives would undermine the viability of New Hampshire's forests and forest-based economy. The objectives also address the question of *how* we might use various tools, such as education, to sustain our state's forest resources. The 11 objectives outlined in this chapter are:

1. *Creating a favorable business climate for the forest products industry.*
2. *Keeping contiguous blocks of forest intact and under consistent management.*
3. *Developing mechanisms for sustaining managed forests.*
4. *Addressing the impact of local land use decisions on the ability to practice forestry and sustain healthy forests.*
5. *Conserving New Hampshire's biological diversity.*
6. *Continuing the tradition of keeping lands open to the public and providing appropriate levels of outdoor recreation to support the state's tourism industry.*
7. *Providing timely collection of data about forests and assessment of information necessary to meet the goal of sustaining forest ecosystems.*
8. *Instilling or enhancing appreciation, knowledge and skills of forest resource conservation among youth, adults and forest resource professionals.*
9. *Acquiring and managing lands and easements for which there is a public interest and that complement the benefits provided on private forest lands.*
10. *Enhancing awareness of the importance of conserving community forests for their ecological and social values.*
11. *Developing forest policy collaboratively, and organizing agencies to facilitate sustainable forest management.*

The 62 actions in this Chapter are each followed by a list of groups, organizations, agencies and individuals who might get involved in implementation. The lists are included as suggestions and a starting point. Setting these actions in motion will depend on the joint efforts of a variety of people and organizations representing different interests in New Hampshire's forests. Our hope is that this section will encourage people to reflect on the roles they would like to play in fulfilling the actions in this plan.

1. Creating a favorable business climate for the forest products industry.

For over three centuries, the manufacturing of wood products has been a constant in many New Hampshire communities. Forest-based businesses, including primary processing and value-added manufacturing, provide necessary diversity to the state's economy.

The wood products industry, from timber harvesting to the manufacturing of finished goods, ranks third in the state for value-added, cost of materials and value of shipments, and ranks fourth in employment and wages. Annually, wood-based manufacturing value of shipments exceeds \$1.7 billion. The 10.3 percent of manufacturing employees working in the wood products sector generate \$340 million in income.

For each one dollar in a standing tree, the forest products sector adds an average of \$27. Sawmilling, kiln drying, and planing adds over \$400 per thousand board feet to the value of logs. The total benefit of the biomass industry is \$260 million. The pulp and paper industry adds value to a cord of pulpwood by a factor of fifty.

Forests, and the industries relying on them, are capital assets that grow in value in proportion to the amount invested in them. A business climate that fosters long-term investment in forests and forest industry will sustain forests far better than an environment promoting short-term benefits.

“A business climate which fosters long-term investment in forests and forest industry will sustain forests far better than an environment promoting short-term benefits.”

Compared to neighboring states, New Hampshire's regulations and taxes are viewed as less burdensome to business. This perception is based on New Hampshire's cooperative, education-oriented approach to regulation, which includes state assistance with compliance. To assure a favorable climate in the future, we must continue to monitor regulatory barriers and insurance costs to businesses. We must continue to clearly identify costs and benefits when new regulations are proposed, as is currently done by the General Court. We must also assess the impact of existing regulations on forest-based businesses and landowners. Ultimately, a favorable business environment enables forest landowners to invest more in managing for ecological values, such as consulting regularly with a wildlife biologist, protecting areas with exemplary natural communities, or retaining riparian corridors wider than the law requires.

New Hampshire's forests have rebounded from a century ago when they were farmed and cleared for lumber. The U.S. Forest Service decennial Forest Inventory and Analysis (FIA) documents that New Hampshire forests are maturing. Data from 1948, 1960, 1973 and 1983 show trends towards larger trees and increased growing stock volume. Species composition is also changing, with a rise in the percentage of red maple seedlings. The 1983 inventory assessed the quality of live trees of commercial species from a wood-products perspective.

Between 1973 and 1983 they detected an overall decline in log grade quality. This points to the need to support existing markets for low quality wood and to develop additional ones. Markets for low grade wood provide opportunities to improve the quality of forest stands, and utilize an existing abundant resource. With the recent loss of some wood-chip markets, there is concern about maintaining markets for low quality wood.

Even with the perception of a favorable business climate, the wood manufacturing industry in New Hampshire has not reached its full potential. For example, a 1995 study of interstate and international flow of unprocessed timber revealed an estimated outflow of 122 million board feet (MMBF) annually to Maine, Vermont and the Province of Quebec--a volume equal to about 45 percent of existing in-state solid wood manufacturing capacity. The majority of this unprocessed timber export is to Quebec, with whom we share an historically strong regional market for timber and wood products, but whose wood manufacturing companies are regarded as having some competitive advantages over New Hampshire.

Clearly this movement of unprocessed timber into Quebec represents lost value-added opportunity for New Hampshire's forest economy. Recent international trade agreements, liberalizing trade relations between the United States and Canada, decrease the likelihood that the federal government will intervene, as some have proposed, to impose trade barriers or tariffs to discourage unprocessed timber exports. Rather, a concerted effort should be made by industry leaders working in cooperation with officials of the State of New Hampshire and the Province, to strengthen cross-border wood product trade relations. A focus should be to carefully examine current trade incentives and industrial development programs to see if there are mutually agreeable policies that may stem the flow of log exports, and increase cross-border investment in higher value-added manufacturing.

With limited funds, current state efforts to market New Hampshire's forest resources center on tourism rather than on the state's forest or agricultural products. The Department of Resources and Economic Development's (DRED) industrial marketing program reaches across the country to other parts of the world, but forest products have not fully benefited from their expertise. Taking better advantage of New Hampshire's favorable business climate and apparent opportunities for value-added manufacturing would provide necessary diversity to the state's economy and rural communities.

The following actions are recommended to strengthen the business climate in order to perpetuate a viable forest industry.

Actions:

- 1-1. Integrate forest products development with other state economic development activities by establishing a full-time forest products development specialist position at the Department of Resources and Economic Development in Concord. Locate the position in Concord to accomplish the following:
- a. Integrate the business development and recruitment strategy with activities of the DRED, NHDA, OSP, Small Business Development Center (SBDC), and UNH Cooperative Extension.
 - b. Identify and address barriers to value-added manufacturing. Conduct a study focused on understanding barriers that limit utilization of unprocessed wood; wood flow and export of raw logs; retention and expansion of existing and forest-based industry; and actions needed.
 - c. Highlight traditional forest-based industries and recreation, and explore opportunities to develop markets for special forest products and low quality wood. Consider resource availability and market opportunities when citing new manufacturing facilities.
 - d. Direct existing programs and agency resources toward forest-based businesses. Give attention to programs that have not traditionally considered natural resource businesses, such as Community Development Block Grants, Community Assistance Program (CAP), and "work-fare."

Implementation: DRED, NHDA, OSP, SBDC, UNH Cooperative Extension, RC&D's, North Country Council, Forest Users Coalition, UNH-CSRC.

- 1-2. Reduce barriers arising from the financing process. Assist forest-based businesses in obtaining financing and investment capital through a partnership effort by DRED, UNH Cooperative Extension, and U.S. Forest Service to educate financial institutions about the forest products industry.

Implementation: DRED, UNH Cooperative Extension, USFS, Business and Industry Associations, SBDC and NH Bankers Association.

- 1-3. Form a roundtable of business interests to identify common concerns with state and federal regulatory processes and provide input to the Department of Resources and Economic Development. Conduct periodic surveys of forest-based industries to identify concerns and problems, with questions developed by the roundtable in partnership with the state and local interests. Provide the information to businesses and the state legislature.

Implementation: Forest-based businesses and industries, NHTOA, NE Forest Users Coalition, NH Business and Industries Association.

- 1-4. Improve and strengthen cross-border relationships between wood products manufacturers in New Hampshire and the Province of Quebec to increase cross-border investments and value-added manufacturing.
- a. Establish the New Hampshire/Quebec Wood Products Trade Forum as a function of the existing New Hampshire/Quebec Trade Council. Its purpose would be to improve relations and understanding among wood product manufacturers in Quebec and New Hampshire, and to facilitate joint marketing and new or expanded manufacturing opportunities. The Forum would be staffed by the forest products development specialist envisioned in action 1-1 and some funding could be provided by industry.
 - b. Conduct a study of the nature of competitive advantages that Quebec manufacturers benefit from, and explore the establishment of economic incentives using tax policy or other domestic processing initiatives to mitigate these advantages and assist in the restoration of greater local processing capacity.
 - c. Continue to openly discuss the issue of log exporting to strive toward consensus among landowners, loggers and industry. Facilitate discussion through the “State Forest Roundtable” in action 11-1, and collaboration of industry and other organizations.

Implementation: State of New Hampshire, Province of Quebec, New Hampshire/Quebec Trade Council, DRED, NE Forest Users Coalition, forest industry, and other organizations.

- 1-5. Work with communities to develop strategies for appropriate forest-based business development using the following principles:⁴
- a. Plug the leaks (keep money circulating in the local economy).
 - b. Support existing business (encourage small business, the heart of any local economy, to run more efficiently and to expand).
 - c. Encourage new local enterprise (support new start-up businesses that build on local strengths).
 - d. Recruit compatible new business (focus on the net benefit to the community, not just any development).
 - e. Promote value-added manufacturing.

Implementation: DRED, NH Rural Development Council, USFS, UNH Cooperative Extension, local governments, community organizations.

⁴Adopted from the Rocky Mountain Institute's Economic Renewal Program.

- 1-6. Work cooperatively with industry associations to promote markets that recognize the potential for diverse products from New Hampshire's forests. Focus on long-term stability and careful use of resources to supply markets today and in the future.
- a. Create an "identity" for made in New Hampshire products based on a consistent message about the relationship between our economy and environment. Develop a motto, such as "craftsmanship and quality," to promote a consistent message. Include marketing of New Hampshire products with the state's tourism promotions.
 - b. Work with other states to create a regional identity for New England products. Explore marketing efforts that promote sustainable forestry such as green certification and recycled wood products.
 - c. Encourage forestry and agricultural interests to join the New Hampshire Travel Council to revitalize the partnership of timber-tourism-agriculture and jointly promote tourism, cultural resources and forest products.

Implementation: DRED, NHDA, NH Travel Council, NEFA, NHTOA.

2. Keeping contiguous blocks of forest intact and under consistent management.

Private land comprises 83 percent of the more than 4.9 million acres of forest land in New Hampshire. The wood products industry, dependent upon the private land base, ranks third in the state for value added, providing \$27 for each dollar in standing tree processed. Annually, timber sales from private forests return in excess of \$33 million to private landowners. The interdependence of private lands and the forest products industry is vital to the economic and social fabric of the state.

An inventory in northern New Hampshire (Coos, Carroll and Grafton counties) of large tracts of uninterrupted forest identified nine blocks of contiguous forest, each over 25,000 acres. The total area of these blocks is 718,000 acres. Although most is public land, some of these large tracts are privately held by industrial or non-industrial owners.

Although an inventory using this method has not been conducted in central or southern New Hampshire, a study of southern New Hampshire reveals that few large blocks remain along the Massachusetts border, the Seacoast and the Merrimack River Valley. This study finds a positive correlation between rates of population growth and fragmentation of forested tracts. Since blocks of forest over 25,000 acres are rare in this part of the state, it is appropriate to use a different definition of “large” based on the current pattern of roads and development. Additionally, it is more likely that blocks of uninterrupted forest in southern and central New Hampshire are owned by multiple parties.

Maintaining blocks of contiguous forest is extremely important, both ecologically and economically. When there is one owner, large contiguous forests offer a variety of forest management options not readily present in smaller tracts. Due to the economies of scale, forest planning and timber harvesting can be accomplished more efficiently and economically. With multiple owners contiguous forest still may provide operational benefits but depend entirely on the various objectives of landowners at a given point in time. Large tracts offer unique ecological values that are independent of ownership patterns, such as habitat for interior-forest species and animals with large home ranges. Keeping contiguous forest intact provides greater opportunity to manage forests for diverse wildlife habitats and to support ecological processes that foster biological diversity.

Forest lands in private ownership, large tracts and small, face mounting pressures from increasing human population and demand for wood products. A growing population often leads to turnover of forest ownership and changes in land use. Forest management plans take decades to implement. An initial harvest may be conducted, with plans for an interim cut in one or several decades. But with turnover in ownership, the new owners may have different

“As human population grows, it is becoming increasingly important to promote actions to retain large forested tracts and properly manage our remaining forest lands.”

objectives and may abandon on-going forest management plans. Or they may divide the land into smaller parcels and convert the land to other uses. Without consistent management habitat may be fragmented and timber resources to support New Hampshire's 1.7 billion dollar forest products industry may become unavailable.

The cause of many forest land sales or conversions, as determined by the Northern Forest Lands Council, is a variety of costs that lower returns to landowners. The costs include property taxes, estate taxes, potential expenses due to regulation, and the fear of uncertainty due to changing laws. Timber is exempted from annual taxes with a single payment due at the time of harvest. This "Timber Tax" is the result of RSA 79, passed in 1949 when heavy cutting associated with the *ad valorem* tax was viewed as an undesirable incentive to liquidate forests.

New Hampshire's Current Use Law (RSA 79-A) is the best available tool for conserving forest land. It relieves some of the financial pressure on land owners by assessing property taxes according to the ability of the land to produce timber. Forest management and timber harvesting are not required, but land owners with a management plan have use values reduced by about 50 percent. Voluntarily allowing public recreational access reduces use values by another 20 percent. With over 2.7 million acres of forest land in current use, the program is presently the strongest incentive for maintaining contiguous blocks of forest and encouraging consistent long term management.

But current use assessment is not by itself sufficient to address all the pressures facing land owners. A recent U.S. Forest Service survey of private forest land owners found that the percentage of New Hampshire landowners who are retired jumped from 15 to 40 percent between 1983 and 1994. Retired owners now hold nearly 1.5 million acres of New Hampshire forest land. This means that more than one fourth of the forest land in the state will change owners in the next 25 years. If current owners are able to pass the land to their heirs, it may remain as forested land. However, if those inheriting the land cannot afford to hold it or to pay federal estate taxes, it is likely that some or much of this forest land will be liquidated or converted to other uses.

Foresters play an important role in maintaining the investment value of forested lands, providing consistent management over time, and sustaining forest productivity. In the late 1940s a handful of foresters managed public land, and one or two consulting foresters worked on private lands. By 1985 there were an estimated 85 private consulting foresters, with a public forester in each of the state's 10 counties. In 1995 over two hundred licensed foresters were in practice. Forester registration was enacted in 1969, but in 1981 the law was sunsetted. Ten years later forester licensing was established. The current law does not require that a licensed forester be involved in all timber harvests. It does require any forester providing services to private landowners for compensation to be licensed. The law was designed to promote sustainable forest management, create an incentive for continuing education of foresters, and provide professional recognition.

Keeping contiguous blocks of forest intact

As pressures on the owners of forest land increase, it is evermore important to promote actions to retain large forested tracts and properly manage our remaining forest lands. The following actions use incentives and voluntary agreements--not regulation--as motivation to keep contiguous blocks of forest intact and to promote long term forest management that is consistent and sustainable.

Actions:

- 2-1. Promote long-term management on private lands and institute policies that allow heirs to retain family-owned land.
 - a. Identify opportunities to strengthen incentives to maintain contiguous blocks of forest and promote consistent long term management, including current use assessment.
 - b. Develop model language for conservation easements requiring long term forest management and the use of sustainable management principles on individual properties for a specified time period even if ownership changes.
 - c. Seek modification of federal estate taxes to encourage long term management by allowing land to be handed down through generations; including conservation easements or enrollment in a state's current use assessment program as a condition of eligibility for estate tax reductions; and allowing heirs to make post mortem decisions about conservation easements.
 - d. Safeguard incentive and tax advantage programs with a penalty for selling the land soon after benefiting from the program.

Implementation:

- a. Current Use Board, SPACE, legislature, NH F&L, NHTOA, SPNHF, UNH Cooperative Extension, and others.
- b. Private Land Trusts, state agencies, Forest Legacy Committee, SPNHF.
- c. Organizations and individuals.
- d. Organizations and individuals.

- 2-2. Encourage the maintenance of large contiguous parcels of forest lands in private ownership by addressing factors that improve their attractiveness as an investment.
 - a. Continue current use assessment of forest land.
 - b. Support federal legislation to reinstate Capital Gains treatment of timber.
 - c. Promote education and incentives over regulation.
 - d. Encourage development of value added markets.
 - e. Conduct a study of large contiguous blocks of forest in central and southern New Hampshire.

Implementation:

- a. Current Use Board, legislature, SPACE.
- b. Organizations and individuals.
- c. State agencies and legislature.
- d. See action 1-1.
- e. UNH CSRC, UNH Cooperative Extension, NHTOA, SPNHF, NH F&L.

- 2-3. Conduct a complete and thorough review of the effectiveness of the Timber Tax in achieving its original conservation goals. Examine the implications of exempting growing timber from annual property taxation and deferring payment of taxes to the time of harvest. Explore opportunities to use the Timber Tax as a basis for new incentive programs to encourage sustainable forest management.

Implementation: NH F&L, DRA, SPNHF, NHTOA, local government.

- 2-4. Renew authorization of forester licensing to assure the professional standards and skills needed to reach the goal of sustaining forested ecosystems and the forest-based economy.
- a. Ensure opportunities for integrated, cross-disciplinary training in forest ecology, methods of biological inventory, wildlife management, and sustainable forest management in fulfillment of continuing education requirements.
 - b. Encourage an active role for foresters in implementing this Forest Resources Plan.

Implementation: Foresters, landowners, forest industry, Forester Licensing Board, GSD/SAF.

3. Developing mechanisms for sustaining managed forests.

The Vision and Challenges in Chapter II make multiple references to sustainability. In the ideal portrayed in the Vision, citizens will understand that they sustain, and are sustained by, the landscape. But what does it really mean to sustain the forested landscape, and how, specifically, shall we do it?

For decades sustained-yield forest management has been the accepted model. It was defined by the Society of American Foresters in 1958 as “the management of a forest property for continuous production with...an approximate balance between net growth and harvest.” But we do not know the extent to which sustained-yield management is practiced, and suspect that application by New Hampshire landowners as a deliberate policy may be limited. In 1993, the Society of American Foresters issued a report stating that traditional sustained-yield management does not fully sustain forested ecosystems, providing too much focus on forest stands with little attention to the larger landscape and non-commodity values of forests.

"True sustainable forestry results from landowners, foresters, and woods operators making thoughtful and knowledgeable decisions that are also economically viable."

The assessment group focusing on ecology considered the Vision and Challenges an invitation to look for other answers to the sustainability question. The group interpreted the challenge to mean, "respecting the ecological and physical limits of New Hampshire's forests as we use them to sustain our communities and the economies of our forest-based industries." They invoked the seven ecologically-oriented "Principles of Sustainability" in the Northern Forest Lands Council's *Finding Common Ground: Conserving the Northern Forest* to rate New Hampshire's forests. With regard to each principle of sustainability (e.g. maintaining soil productivity or conserving water, wetlands or riparian zones) the group made four lists: (1) things we are doing well; (2) things that need our attention; (3) things we don't know about; and (4) outside influences we should factor in.

In the area of "things we are doing well," the group cited several examples where education, incentives, best management practices, and voluntary conservation efforts are having the desired effect on forest resources. Winter harvesting is protecting forest soils; water quality is maintained when best management practices are followed; and for all tree species, with the possible exception of white pine, spruce and fir, removals are less than annual growth.

The group's sustainability summary cited several areas that require attention to assure sustainability of forest land and resources. Among the concerns they cited were: late successional spruce-forests are especially lacking at low elevations; floodplain forests have vanished from over 50 percent of their historical range; and a decline in red oak and Eastern white pine regeneration, indicating that much of the mature pine and oak growing on abandoned farm land will be replaced by mixed hardwoods.

The summary also pointed out a number of areas where evidence is inconclusive. For example, we don't know if whole-tree harvesting depletes soil nutrients when practiced on repeated rotations in places with sandy soils. Nor can we assess from current data if employing the Basal Area Law provides biologically adequate buffer zones for forests in riparian areas. The summary also indicated that little is known about the status of many species of invertebrates, non-game vertebrates, and species inhabiting aquatic ecosystems.

Although the assessment group's effort to address the sustainability of New Hampshire's forests is valuable, it is based only on a six month review of available scientific information. Additional study will be required to fully understand this issue.

Early drafts of the Northern Forest Land Council's *Finding Common Ground* did not attempt to address the issue of sustainability, as the Council considered forest practices to be outside the scope of their mission. But public response to their drafts revealed that people wanted forest practices addressed. After some controversy, the Council, in its final report, acknowledged public concerns about forest practices that high-grade and liquidate timber. They also recognized the legitimacy of silvicultural clearcutting and other intensive forest management methods.

In New Hampshire media reports and sporadic proposals for legislation indicates growing concern about large scale timber liquidation, where hundreds of acres are harvested without regard to regeneration or effects on environmental quality. Some are suggesting that large scale timber liquidation has reached the point where it needs to be regulated. In the last five years, three pieces of legislation proposing forest practice regulation were introduced in the State Legislature. But lack of information made consensus on legislation elusive. Instead, the legislature directed the formation of a forest law recodification "Roundtable" and funded an inventory to determine the actual level of clearcutting.

The Roundtable reviewed all existing forestry laws and recodified them into one organized forestry title with consistent and clear language. They discussed forest practice regulation, but could not reach consensus in time to include a recommendation in their June 1995 report.

The clearcutting inventory was completed in July 1995.⁵ The study revealed that 1.1 percent (49,800 acres) of New Hampshire's forest land were clearcut in the last 15 years. Individual clearcuts ranged in size from 3 to 621 acres, with an average size of 29 acres. After the study was conducted, a highly visible clearcut exceeding 1,000 acres reinvigorated public concern. People are also voicing concern about the consistency, timeliness and equity of the enforcement of forest laws, and are questioning the ability of the state to adequately enforce new laws without additional resources.

⁵The following definition was used in conducting the statewide clearcutting inventory: Forestland harvested to meet silvicultural objectives (including wildlife management purposes), or timber liquidation purposes, and meeting the following criteria: a) minimum size of 3 acres, b) residual basal area per acre of less than 20 square feet; and c) harvested within the last 10-15 years.

The Northern Forest Lands Council recommended that states review their present forest practices and programs to see whether they achieve the "Principles of Sustainability." Their approach is based on a belief, shared by the Steering Committee, that "true sustainable forestry results from landowners, foresters, and woods operators making thoughtful and knowledgeable decisions that are also economically viable." The key to developing mechanisms for sustaining managed forests is to learn from scientific research, continually assessing current forest conditions and adapting management to new information.

The following actions are presented in five parts: (1) developing practical applications for forest management; (2) using scientific information; (3) encouraging voluntary application of practices; (4) monitoring implementation to see if practices result in forest sustainability; and (5) regulating practices to assure minimum standards. A Forest Sustainability Standards Work Team (FSSWT) has already been established to begin the work of developing practical applications for forest management.

Actions:

Practical applications for forest management.

- 3-1. Support the Forest Sustainability Standards Work Team (FSSWT), established in June 1995 upon completion of the Forestry Title Recodification and in response to the Northern Forest Lands Council recommendation #12. Their purpose is to identify practical, site-specific forest management practices and landscape-level strategies derived from the best available scientific information. Encourage participation in their public review process, publicize their work, and promote implementation.

Implementation: Individuals and organizations.

Use of scientific information.

- 3-2. Integrate scientific information and management through establishment of statewide structure and composition goals. The Forest Sustainability Standards Work Team should consider this as part of the development of voluntary site-specific forest management practices and landscape-level strategies. It presumes concurrent implementation of action 7-5, a statewide land classification system, explained in the discussion on page 50.
- a. Establish statewide forest structure and composition goals within Subsections. Determine the ability of the land to support different forest types and communities, estimated by Landtype Associations, for example by identifying lands with capability for natural white pine regeneration.
 - b. Consider current and expected future needs of forest industry and other users in choosing between alternative structure and composition goals. Conduct this goal setting process in an open environment with public involvement.
 - c. Compare actual forest structure and composition to the stated goals, and provide the information to foresters, landowners, and others for voluntary use in forest management planning.
 - d. Develop voluntary site-specific forest management practices and landscape-level strategies to implement statewide forest structure and composition goals.
 - e. Monitor statewide progress at meeting goals using remotely sensed data.

Implementation: Forest Sustainability Standards Work Team, UNH-CSRC, NH F&G, NH F&L, USFS.

Voluntary application of practices.

- 3-3. Motivate private landowners to use more informed decision-making in managing their land, and to implement voluntary site-specific forest management practices and landscape-level strategies.
- a. Develop monetary incentives sufficient to motivate actions. For example, cost-share programs for forestry and wildlife management plans and wider distinctions between stewardship and non-stewardship categories of current use assessment (see action 5-3).
 - b. Develop non-monetary incentives, such as public recognition for using sustainable forest management practices. In addition to American Tree Farm and Backyard Tree Farm Programs, efforts to reach people in the community and region are needed.
 - c. Improve landowner understanding of the range of management choices--from regeneration harvests to liquidating timber or deciding not to harvest--and the economic and ecological implications of their decisions.

Implementation:

- a. Individuals and organizations, UNH, NRCS.
- b. Tree Farm Program, consulting foresters, UNH Cooperative Extension.
- c. UNH Cooperative Extension, consulting foresters, Northeast Forest Experiment Station, UNH.

- 3-4. Promote free enterprise, market solutions to achieve sustainable forest management.
- a. Encourage wood-using industries to assert greater positive influence over the forest practices used to harvest wood they purchase.
 - b. Design a pilot program that generates market premiums for landowners practicing sustainable forest management and improves consumer awareness of sustainable forestry. Green certification is one possible model.
 - c. Promote awareness of the skills and services provided by licensed foresters and certified professional loggers.

Implementation:

- a. Forest industry, sawmills.
- b. NHTOA, SPNHF, forest landowners, GSD/SAF, NH Association of Consulting Foresters, forest industry.
- c. NH Timber Harvesting Council, GSD/SAF, NH Association of Consulting Foresters.

Monitor implementation to see if practices result in forest sustainability.

- 3-5. Develop a system to measure and monitor the extent to which voluntary practices are applied and achieving their objectives. Use the results of monitoring to test the hypothesis that sustainable management practices maintain ecological processes and viable populations of native species, and to facilitate changes in on-the-ground management. Compare monitoring results to information about baseline conditions (see action 5-4).
- a. Determine the extent to which voluntary practices are being applied.
 - b. Develop a process for voluntary audits of on-the-ground practices on a variety of public and private ownership types.
 - c. Publish regular reports with the results of monitoring, and establish a long term commitment to monitoring over time.

Implementation: NH F&L, Forest Sustainability Standards Work Team, USFS, UNH, Conservation Districts, NRCS.

Regulate forest practices to assure minimum standards.

- 3-6. Provide consistent, swift and equitable enforcement of forest laws.
- a. Reinforce and restructure current Forest Protection staff of ten field-oriented Rangers. Create new job descriptions with separate responsibility for law enforcement and fire protection. Secure funding for five additional Ranger positions. Allocate ten Rangers to law enforcement and five to fire protection.
 - b. Utilize licensed professional foresters to streamline the regulatory process.

Implementation: NH F&L, organizations, individuals, state legislature.

- 3-7. Recognize regulation as a legitimate solution that may be appropriate in certain situations and creates a level playing field by setting and enforcing the same minimum standards for all operators. Develop and implement forest practices regulations under the following guidelines: scientific information shows a clear need; voluntary measures are in place; education and incentives have not changed behavior; and monitoring shows that current practices are not sustainable.

Implementation: NH F&L, State Forest Roundtable (action 11-1).

4. Addressing the impact of local land use decisions on the ability to practice forestry and sustain healthy forests.

The fact that 83 percent of New Hampshire lands are now forested is less a legacy of land use planning than a by product of changing market forces and the decline of agriculture. Recent development trends, however, are now limiting land available for forest management and timber harvest. The Natural Resource Inventory conducted by the Natural Resources Conservation Service indicated that between 1982 and 1992, an average of 13,000 acres of forest land was lost each year to development. A recent inventory of white pine and red oak suggested that a loss of these forest types to development or other land use may reduce timber availability as much as 13 percent.

"Communities, and society in general, will continue to struggle with the imperative of preserving individual property rights and freedoms while also conserving public values in forest land."

The Assessment Report also identified trends in the status of New Hampshire forests resulting from land use changes. Among the most disturbing trends are:

- C a decline in the availability of land for timber harvest in heavily-populated areas; rising property values of forest land owned for management purposes; and increased local restrictions on wood harvesting and manufacturing operations;
- C fragmentation of forested habitats by roads and development;
- C declining occurrence of 18 of the state's forested natural communities, with three community types reduced to less than 50 percent of their former range; and extirpation or significant threat to 289 species of vascular plants and 34 vertebrate animals.

These trends cannot be reversed without addressing local-level decisions that determine how land is used and developed.

Local land use planning is a potentially powerful tool to conserve forest land. Unfortunately, few municipal master plans address land conservation or forestry in more than a perfunctory manner. While most include a chapter on natural resources, they generally focus on water resources and agricultural lands, making little, if any, mention of wildlife or forests. A 1994 review of 12 North Country communities' master plans showed that only three addressed forest resources comprehensively. And only one of the 12 communities had conducted a natural resource inventory.

A current tool to assist communities in natural resource planning is the Forestland Evaluation and Site Assessment (FLESA) model. An outgrowth of the Land Evaluation and Site

Assessment model, FLESA is used to inventory and assess a community's forest resources for a variety of related uses and values. FLESA enables citizens to make thoughtful decisions about their town's resources, and to guide its future development to avoid conflict over competing uses of resources. A pilot FLESA project was conducted in Bath, New Hampshire in 1994. Results from the project have proven valuable in community planning. The New Hampshire FLESA committee has since endorsed statewide implementation of this process.

Many traditional land use decisions designed to retain the rural character of New Hampshire communities have had a negative impact on forest resources. The Governor's Commission on New Hampshire in the 21st Century found that conventional two- to five-acre lot zoning does more to fragment land than to protect it. Some communities have considered alternatives, such as cluster zoning, to conserve open space. Three New Hampshire communities have created forestry districts, with minimum lot sizes ranging from 10 to 50 acres, to conserve open space and encourage timber harvesting. This concept is relatively new and it is yet unclear whether such large-lot zoning will have the desired effect.

Often local regulations and policies, such as weight restrictions or damage bonding to limit heavy truck traffic on rural roads, discourage forest harvesting and forest product manufacturing. While it is within the right of communities to protect their roads, these restrictions may preclude loggers and truckers from harvesting local timber. Despite potential economic benefits, local ordinances or permitting bodies may also discourage new wood manufacturing operations from locating in their towns or may limit the ability of existing facilities to expand.

Planning for open space at the local level is often barred by the misconception that open space is more expensive for a community to maintain than residential or industrial land. It is true that open space generates limited tax revenue; however, unlike land zoned for other uses, open space costs the town little in services. The UNH Cooperative Extension and Rockingham County Conservation District recently completed an economic study of two Rockingham County communities, Fremont and Deerfield. Using the Cost of Community Service (COCS) index developed by the American Farmland Trust they compared residential, commercial/industrial and open space lands in each community for the year 1994. Results showed that residential land use expenditure exceeded revenues in each of the communities, whereas the cost of open space land was less than 40 cents for each dollar generated by that land. Clearly, for these communities open space land provides an economic asset as well as aesthetic and ecological benefits.

The Steering Committee believes the most effective land use planning occurs at the local level. However, implementation of local land use controls to promote forest conservation will continue to prove difficult. Communities, and society in general, will continue to struggle with the imperative of preserving individual property rights and freedoms--so strongly held in New Hampshire--while also conserving public values in forest land. The following actions suggest education, assessment, planning assistance, monitoring and protection be employed to help communities find this elusive balance, and maximize the effectiveness of local land use planning.

Actions:

- 4-1. Educate communities about the value of forests and forestry.
- a. Develop education programs targeted specifically at town conservation commissions, planning boards and zoning boards of adjustment.
 - b. Coordinate with Office of State Planning to develop training programs and provide information about GIS to local officials.
 - c. Promote awareness of RSA 672:1-III-c, the "Right to Practice Forestry Law," which states that towns shall not unreasonably limit forestry activities by use of municipal planning and zoning powers, among local officials and regional planning organizations.
 - d. Sustain the cultural and economic role of forests in communities by researching and designing land use planning mechanisms to promote active forestry and forest-based businesses.

Implementation:

- a. NH F&L, UNH Cooperative Extension, SPNHF, NHACC, NHTOA, OSP, NH Municipal Association.
- b. NH F&L, OSP, UNH-CSRC.
- c. NH F&L, NHTOA, SPNHF, UNH Cooperative Extension, consulting foresters, NH Municipal Association.
- d. NH F&L, UNH Cooperative Extension, SPNHF, NHACC, NHTOA, OSP, and land trusts.

- 4-2. Encourage careful siting of development to maintain ecologically significant land and large contiguous blocks of managed forest.
- a. Provide community decision makers with information about areas that are ecologically-suited to forestry or for inclusion in an ecological reserve system so that tradeoffs in developing these lands are acknowledged up front.
 - b. Use ecological land classification (LTA and ELT) to provide towns with spatial information and guidelines for evaluating land capability and current forest conditions (see action 7-5).
 - c. Encourage the use of FLESA to assess the productivity of land for economically sound forest uses.
 - d. Review current zoning regulations to determine their impact on forest land conservation.
 - e. Work with municipalities that own forest land to determine which lands meet the criteria for long-term forest management or inclusion in an ecological reserve system.

Implementation:

- a. NH F&L, NHHI, TNC, UNH Cooperative Extension, consulting foresters.
- b. NH F&L, USFS, OSP.
- c. NH F&L, UNH Cooperative Extension, communities.
- d. Town Planning Boards, Conservation Commissions, Boards of Selectmen.
- e. UNH Cooperative Extension, consulting foresters, SPNHF, NH F&L, OSP, Town Planning Boards, Conservation Commissions, Boards of Selectmen.

- 4-3. Encourage communities to incorporate forest components as a part of the natural resources chapter of municipal master plans and to consider appropriate revisions to zoning to promote the protection of forests and related resources. Office of State Planning and Division of Forests and Lands should provide guidance for natural resources chapter development and implementation.

Implementation: NH F&L, OSP, Regional Planning Commissions, NH Municipal Association

- 4-4. Encourage communities to designate appropriate municipal forest land as Town Forests with compatible recreation use allowed or as part of a statewide Ecological Reserve System.

Implementation: Town Planning Boards, Conservation Commissions and Boards of Selectmen, NHACC.

- 4-5. Develop and fund a clear and visible project to monitor trends in land use and development through the Office of State Planning biennial state development plan. Create a developed land index to be published regularly.

Implementation: OSP.

5. Conserving New Hampshire's biological diversity.

Scientists from the University of New Hampshire joined the Fish and Game Department and Division of Forests and Lands in September 1994 to form New Hampshire's Scientific Committee on Biodiversity. The group is assessing the status of biodiversity in the state and will publish its findings in "The Biodiversity of New Hampshire" in 1996. The description of biological diversity that follows here was excerpted from their manuscript.

“Complex beyond understanding and valuable beyond measure, biodiversity is the total variety of life on earth.”

John Ryen

What is Biological Diversity?

Biological diversity, or **biodiversity**, is the variety and variability of all living organisms. This variety includes the diversity of plants, animals, fungi, algae, bacteria, and other microorganisms, their genetic variability, the natural communities in which they live, and the processes and interactions that weave the biological and physical elements of the planet into a complex web. By separating the concept into several layers--genetic, species, community, ecosystem, and taxonomic diversity--we gain a better understanding of biodiversity.

Species diversity is the most easily understood and commonly used measure of biodiversity, although the terms are not synonymous. A **species** is a group of individuals capable of breeding with each other, but unable to breed successfully with any other group. In New Hampshire, more than 15,000 different species of organisms have been identified.

The number of species in a particular area, or **species richness**, is one measure of species diversity. This measure does not take into account the fact that not all species are equally abundant: many are uncommon, some are common. Species richness at the local level contributes to biodiversity at the state or regional level. Loss of a species reduces biodiversity. This is why rare species, which are more susceptible to extinction, often receive special attention.

Although addition of new species will increase an area's biodiversity in the short term, the spread of non-native species can ultimately cause a decline in native species diversity. A **native** species is one that occurs naturally in a particular area without human activity to assist its introduction. Since non-native species are often introduced without natural predators or other controls, they can outcompete native species for space, moisture, sunlight, and nutrients.

At a smaller scale **genetic diversity** refers to variation in genetic makeup among individuals of the same species. At a larger scale, groups of species (plants, animals, fungi, microorganisms) that occur together in a particular area make up a community. Alpine bogs, spruce-fir forests, Atlantic white cedar swamps, and coastal sand dunes are all examples of

the 130 types of natural communities identified in New Hampshire. An **ecosystem** is a community or group of communities plus their physical environment (soils, geology, climate, etc.). A **landscape** is a larger area that supports a variety of different ecosystems. Community or ecosystem diversity is the variety of communities or ecosystems within a larger landscape.

Change within these levels of biodiversity is constantly occurring at different scales of time and space. Understanding the dynamic nature of biodiversity requires a focus on ecosystems and larger landscapes, rather than just individual species. This focus considers the full complexity of natural systems--the ecological, evolutionary, physical, and human processes that affect and sustain life.

Why is Biodiversity Important?

Biological diversity benefits people in many ways. The reasons for maintaining biodiversity are varied and often difficult to quantify, yet all contribute to a greater quality of life.

Biodiversity is an economic resource, a reservoir of materials for use in agriculture, medicine and industry. Worldwide, tens of thousands of plants and animals are used by humans. Plants are sources of vegetables, fruits, grains, spices, herbs, oils, beverages, drugs, fuel, fibers, timber, and more. New Hampshire's agricultural crops alone bring in nearly \$100 million yearly. Despite the obvious economic value of biodiversity, fewer than 1 percent of all plants and animals have been examined for possible human benefit.

The link between biodiversity and our own health is clear. Most medicines used today originate from studies of wild species. Aspirin comes from a willow tree, penicillin from a common fruit mold. The pacific yew, a tree growing in the northwest U.S., contains taxol used to treat ovarian cancer. Plant-derived drugs have yielded the U.S. pharmaceutical industry billions of dollars. Hundreds of other plants are used as herbal medicines.

In addition to agricultural and medicinal values, biodiversity influences a region's appeal to tourists. Each year millions of Americans take trips primarily to view, photograph, hunt, or study nature and spend billions of dollars on trip-related expenses. In New Hampshire, 88 percent of the population participates in wildlife-related activities. Retail sales for birdwatching and birdfeeding in New Hampshire total \$57 million. Hunting and fishing bring in millions more to local communities.

A diversity of living things performs a variety of services for us, including pollination of fruit and vegetable crops and control of pests, at no cost to human society. The growing field of Integrated Pest Management relies on natural biodiversity as a source of new pest control agents that are less damaging to the environment and human health, and cost less than traditional control measures.

As part of the biological community, humanity depends on natural systems for survival. Living organisms enrich the soil that grows our food and generate the oxygen we breathe.

Many organisms thrive by processing natural and human wastes. Organic materials like leaf litter on the forest floor, agricultural wastes and human sewage are broken down by microbial organisms. Polluted waters are purified through the actions of natural microbial communities. As little is known about how many microbial species are involved in these processes or what their specific roles are, protection of biodiversity of these organisms is important.

The structure of natural systems is often strongly influenced by species that are not particularly abundant or conspicuous. Such species typically control their prey populations or modify their physical habitat and thus affect the ecosystem's physical appearance or species composition. Other organisms play key roles in the recovery of natural systems from disturbance. For example, clearcutting of northern hardwood forest liberates nutrients that might be lost from the ecosystem were it not for pin cherry, a short-lived tree with little direct economic importance. Pin cherry seeds germinate when soil is disturbed and the seedlings grow rapidly, sopping up nutrients that would otherwise be leached or eroded.

The diversity of life forms and interactions between them are the reason earth's systems function so efficiently and effectively. The integrity of these systems is a function of biodiversity.

Loss of Biodiversity

In the last two hundred years, at least five animal species that once occurred in New Hampshire have disappeared forever. As human activity continues to reduce biodiversity, we don't know how or if the loss of these species will affect the function of the ecological systems they inhabit. In the words of Aldo Leopold, "To keep every cog and wheel is the first precaution of intelligent tinkering." In addition, we may be losing a cure to deadly diseases or a new food source for future generations.

Factors Affecting Biodiversity In New Hampshire

The relative importance of the *factors* that determine the overall biodiversity of New Hampshire are not precisely ranked, but scientific evidence strongly suggests that the diversity of environmental conditions is most important. Different species have different requirements for resources such as mineral nutrients, food, and nest sites. Each species responds differently to physical conditions, disturbances, predators and disease. Consequently, the greater the variety of conditions in a region, the greater the diversity of biological communities, species, and genetic variants within species. It is a "mix of things" that maximizes biodiversity.

In New Hampshire, spatial variation in climate, bedrock, landforms, soil characteristics, and disturbance agents is responsible for much of the state's biodiversity. Ecological processes such as disturbance, population growth, predation, and dispersal interact with the physical environment to affect biological diversity.

The most fundamental *process* affecting biodiversity is evolution. We can often observe differences between individuals in a species. But the variation we see represents only a fraction of the differences that occur at the molecular level. Genetic differences are a critical level of biodiversity--needed to maintain the assortment of differences that allow a species to adapt to changing environments through time. Evolutionary processes generate new genetic diversity and organize it into species. Ecological and evolutionary forces often influence biological diversity in combination by affecting the distributional patterns of species and communities.

The human influence on biological diversity is very complex. However, it is clear that humans have a disproportionately greater effect on biodiversity than other species. Both ecological processes and human activities cause significant environmental disturbances that create conditions favoring some species and communities over others. But the frequency and severity of some human activities may exceed that of disturbances caused by ecological processes. Unlike other species, humans are much more likely to intentionally or accidentally introduce species to new, often distant locations. Native American people hunted and practiced agriculture on a small-scale. European settlers undertook widespread land clearing, farming, forestry, hunting and trapping. More recently, human activities affecting biodiversity have broadened to include dam and road construction, and permanent conversion of land to residential and commercial uses. Currently, the state's list of threatened and endangered species includes 17 percent of vascular plants and 14 percent of vertebrate species known to occur in New Hampshire.

The assessment group focusing on ecology examined biodiversity by looking at trends in plant and animal populations. For species whose population experienced a notable increase or decrease in size, they looked for a related change in habitat availability. They found that some habitats within forest communities had become scarce, due to past or present human activity. A few examples of habitats in decline are: late successional spruce-fir forests where three-toed and black-backed woodpeckers are found; silver maple floodplain forests that are home to three insects found only in those forests; and pitch pine/scrub oak barrens that support dwindling populations of the state butterfly, the Karner blue, and other rare species. The causes of these declines are not necessarily related to forestry. For example, agricultural lands displaced floodplain forests, and fire suppression and development are responsible for declines in pitch pine/scrub oak barrens. But declines in these forest habitats are an important forest planning issue.

Understanding the significance of these changes in habitat availability and population sizes requires information about trends over time. Reference points to determine how human activities affect biological diversity are needed. Some existing protected lands in New Hampshire (public and private) could serve this function, and a few already do. However, a comprehensive inventory of the species and natural communities found on these lands has never been conducted, and many natural communities and habitats are not likely to be represented on land that is currently protected.

The ecological section of the Assessment Report outlined a conceptual framework for conserving biological diversity. It combines two approaches: active forest management to create and maintain different habitats, and establishing a system of ecological reserves to maintain species and natural communities and provide reference sites. The Northern Forest Lands Council combined these approaches in recommendation #21 of their final report. They call on states to create ecological reserves as a component of state public land acquisition and management programs, and recommend providing landowners with information about how to conserve biodiversity on their land. These strategies have already been implemented to a limited extent in New Hampshire by the activities of individual landowners. The actions which follow provide for coordinated implementation of both approaches to conserving biological diversity.

Actions:

- 5-1. Develop a statewide, interagency strategy to maintain and enhance biological diversity using the best available information.
 - a. Implement action 7-5, developing statewide forest structure and composition goals, which includes assessing the degree to which public and private lands contribute to meeting the goals, and identifying where actual forest structure and composition exceeds or falls below the stated goal.
 - b. Develop a strategy outlining how different classes of ownership may contribute to these statewide goals.
 - c. Monitor the effects of wildlife on forest vegetation and biodiversity, and manage wildlife populations at densities consistent with statewide goals.
 - d. Implement the interagency strategy when making site-specific management decisions, or developing or revising management plans for state forests, parks and other state lands.
 - e. Continue to improve coordination of state management activities affecting biological diversity through the State Land Management Team, Cooperative Land Management Program, and other formal and informal channels. Include agencies not presently involved, such as Departments of Transportation and Agriculture (see action 11-3).

Implementation: NH F&G, NH F&L, NHHI, DES Water Resources, DOT, UNH-CSRC, NHDA, CLMP, USFS, US F&W, and NH SCOB.

- 5-2. Support the Ecological Reserve System Steering Committee process to design a science-based system of ecological reserves as one approach to maintain and enhance New Hampshire's biological diversity. The committee was established in October 1995 in response to Northern Forest Lands Council recommendation #21. Their purpose is to define "ecological reserves" and design a scientifically credible reserve system to be established through the participation of public landowners and the voluntary cooperation of private landowners. They will also coordinate citizen involvement in reserve system planning and establishment.

Implementation: NH F&G, NH F&L, NHNHI, OSP, UNH-CSRC, US F&W, USFS, NH SCOB, TNC, SPNHF, ASNH, NHTOA, forest industries and businesses, consulting foresters, local governments, and other organizations and individuals.

- 5-3. Provide financial and other incentives to landowners to encourage the conservation of biological diversity and other ecological values on private lands. Build on existing programs such as New Hampshire's current use assessment (see action 3-3), US F&WS Private Lands and Safe Harbors Programs, and USDA cost-share programs. Inform landowners of the importance of efforts to understand and conserve New Hampshire's biodiversity.

Implementation: Forest Stewardship Committee, Current Use Board, SPACE, UNH Cooperative Extension, consulting foresters, NHTOA, SPNHF, USDA, US F&WS, NH F&G.

- 5-4. Establish a system to monitor and track forest health that builds on existing programs. Establish baseline data across ecological conditions. Baseline data collection should not be limited to ecological reserves.
- a. Define forest health to reflect the values for which New Hampshire's forests are managed including wood products, biological diversity, ecological processes and maintenance of all communities and habitats.
 - b. Integrate and build on methods and results from existing monitoring at permanent locations such as Hubbard Brook Experiment Forest, Research Natural Areas, Fox Forest, and other locations.
 - c. Promote Natural Heritage Inventory and WINGS ongoing efforts to collect and assess data on the highly dynamic species, ecosystems and populations that comprise New Hampshire's biodiversity (see actions 7-2, 7-3).
 - d. Build on existing networks to track trends in non-native insects, diseases and plants.
 - e. Incorporate methods developed by UNH Complex Systems Research Center to assess forest health by detecting changes in vegetation.

Implementation: NH F&L, NH F&G, DES, USFS Forest Health Monitoring Program, UNH, UNH CSRC, NH Pest Advisory Council and other organizations interested in monitoring.

6. Continuing the tradition of keeping lands open to the public and providing appropriate levels of outdoor recreation to support the state's tourism industry.

New Hampshire enjoys a strong tradition of public use of private land for recreation. With most of New Hampshire's forest lands in private ownership, tourists and residents both rely heavily on access to private forest land for recreation and enjoyment. However, recent changes in land use have begun to restrict opportunities for recreational use of private lands.

The leading reasons New Hampshire owners post their land are not clearly understood. A 1992 survey of landowners enrolled in current use found that 1-out-of-5 landowners post their land, and estimated that 15 percent of land in current use is restricted from some public use. Property tax assessments are lowered by 20 percent for current use enrollees who do not post, yet this incentive has not proved sufficient to keep some lands open. Among those who now post their land, nearly 70 percent said they would continue to post even if they had to pay higher taxes.

The Northern Forest Lands Council identified a correlation between smaller parcel sizes and increased restrictions on public access to private lands for recreation. They found the leading reasons for landowners to post include liability concerns, abuse of property, and damage to property. Although each state in the Northern Forest has a liability law, the Council found little awareness of existing liability protection among landowners, recreation users and others. They also learned that recreation users have little understanding of the costs incurred by landowners to allow safe public use of their land, and for clean up after incidents of vandalism.

"Communication and cooperation is essential if the tradition of public recreational access to private land is to continue."

Communication and cooperation between landowners and those seeking to use their land for recreation is essential if the tradition of public access is to continue. Widespread understanding of the following questions would improve the outlook:

- C what is responsible use of private land by recreationists?
- C what protection does the state's liability law offer landowners?
- C what expenses do landowners incur as a result of irresponsible recreationist behavior, such as vandalism, trash dumping and gate breaching?
- C could local clubs and organizations accept responsibility for some cost-incurring activities, such as trail maintenance or trash pickup, in return for continued public access?

New Hampshire's network of snowmobile trails provide a model partnership. Currently there are over 5,800 miles of New Hampshire snowmobile trails jointly managed by the New Hampshire Bureau of Trails and local snowmobile clubs. About 86 percent of these trails are located on private land. Snowmobilers have proactively promoted responsible use of private land and boosted landowner awareness of liability protection. Club members maintain trails, bridges and parking areas, and assist owners when irresponsible behavior occurs.

The correlation between smaller parcel sizes and increased restrictions on public access to private lands suggests that publicly owned forest land will be subject to greater use. Many recreation sites on public lands are already overused. Intense use of forest land may produce adverse environmental impacts such as loss of vegetative cover, soil compaction, wildlife displacement and water pollution. As a result, visitors may have a less enjoyable experience and learn less about the forest around them. They may have to contend with over-crowding and multiple, often incompatible, uses of the land. If we continue to promote tourism, we will need to determine the statewide carrying capacity for a variety of recreation uses. At some point the quality of the experience and ecological integrity of the land will decline significantly, in turn affecting the tourism industry.

The actions which follow are intended to promote continued recreational use of private land by addressing landowner concerns and statewide recreation opportunities.

Actions:

- 6-1. Continue building coalitions between forest landowners and people who recreate on private lands.
 - a. Increase awareness of New Hampshire's landowner liability law among landowners, recreation users and others.
 - b. Develop additional forums to build understanding of responsible use of private land by recreationists and expand awareness of expenses incurred by landowners as a result of irresponsible behavior.
 - c. Provide models to demonstrate how local clubs and organizations have accepted responsibility for some cost-incurring activities, such as trail maintenance or trash pickup, to help keep private lands open.
 - d. Build a political coalition to promote policies that maintain private land open for recreational purposes.

Implementation: NH P&R, NH Travel Council, RC&D, NHTOA, NH F&G, NHWF, NH Snowmobile Association, local government, community organizations, consulting foresters, forest industry, landowners, recreation users and organizations.

Continuing the tradition of keeping lands open to the public

- 6-2. Include information about the rights and responsibilities of forest landowners in landowner education programs.

Implementation: NHTOA, SPNHF, UNH Cooperative Extension, SPACE.

- 6-3. Develop programs to make sure responsible use of private lands is explained to recreation users in all forums. Examples include state agency publications for hunter education and off highway vehicle regulations, and tourist brochures distributed through visitor centers and outdoor shops.

Implementation: NH F&L, NH F&G, RC&D, UNH Cooperative Extension, Office of Travel & Tourism Development.

- 6-4. Continue existing or develop new policies and programs to assist landowners in recovering or reducing the costs of keeping land open for public use. Consider the effects of these policies and programs on citizens with limited financial resources.
- a. Encourage New Hampshire's congressional delegation to support Northern Forest Lands Council recommendation #14, to institute a National Recreation Excise Tax as a funding source for programs to assist landowners in recovering costs.
 - b. Explore opportunities for user-fee programs, such as a national recreation license with a local user fee.

Implementation:

- a. Organizations, RC&D, individuals, legislators, governor, state agencies.
- b. Organizations, recreationists, landowners and others.

- 6-5. Develop a comprehensive strategy for understanding the statewide carrying capacity for recreation. Form a partnership of federal and state land managers, private landowners, tourism officials, and private-sector tourism interests to recommend appropriate action to maintain a balance between resources and users.

Implementation: USFS, DRED, NH F&G, NH Travel Council, NHTOA, DES Lakes Program, LMAC, OSP, UNH CSRC, RC&D, AMC, UNH Cooperative Extension, NH Snowmobile Association., NHWF.

7. Providing timely collection of data about forests and assessment of information to meet the goal of sustaining forest ecosystems.

Decisions affecting forests are made every day--in the woods, at the mills, in bank offices, around kitchen tables, and in legislative offices. Access to reliable information is critical, whether deciding where to locate a skid road, whether to invest in new sawmill equipment, or how to handle family estate taxes. In compiling the Assessment Report it became clear there is insufficient information on some issues vital to sustaining New Hampshire's forests. In some cases, the information is not being collected. In others, the system for collecting data is either not thorough, or is not timely.

Like other states, New Hampshire depends on the U.S. Forest Service decennial Forest Inventory and Analysis (FIA) for data on the status of timber and other forest resources. Inventories have been conducted in New Hampshire at a variety of intervals: in 1948, 1963, 1973 and 1983. Data from the scheduled 1996 inventory may become available as late as 1998. FIA inventories, in addition to being conducted at unpredictable intervals, do not collect comprehensive information about all biological elements of the forest besides timber. Various efforts in recent years to increase federal funding for and address the inadequacies of the FIA have been largely unsuccessful.

“In compiling the Assessment Report it became clear there is insufficient information on some issues vital to sustaining New Hampshire's forests.”

For the last ten years, the Natural Heritage Inventory Program (NHNHI) has collected and evaluated data on the location and condition of plants, animals, and natural communities in New Hampshire. The Heritage Program was established within state government to serve as an ongoing inventory of New Hampshire's biological diversity. Focusing on rare and sensitive species and exemplary occurrences of all natural communities, the Heritage Program collects and maintains data using a standardized methodology and database that enables the Heritage Program to evaluate the range and statewide significance of the elements of New Hampshire's biodiversity. Sources of information for Heritage data include: fieldwork conducted by the Heritage Program and other agencies/individuals, and museums and herbaria. Funding has allowed only limited coverage of the state, and data collection and fieldwork have been directed toward threatened or endangered species and natural communities. As a result, very little is known about some of New Hampshire's biological resources, such as the invertebrates, fungi and lichens found in forests. From the limited data available on many of these groups, we can make no assessment of their current status. Where surveys have been conducted, statewide sampling may be so widely dispersed that species appear to be more rare than they actually are.

In 1994, the state legislature responded to claims from New Hampshire's forestry community that information was lacking about the condition of timber resources. After efforts to hasten

the scheduling of the FIA failed, the legislature passed a bill funding an interim inventory called the New Hampshire Forest Inventory Project. This four-part study examined: growth and removal of white pine and red oak since the 1983 FIA; harvest levels between 1983 and 1992; the flow of unprocessed timber within the state; and restrictions on commercial availability of timber due to physical, regulatory and other constraints, including those of landowner attitudes toward timber harvesting. Although the results of this inventory were not available when the Steering Committee developed its Assessment Report, they have been incorporated into this Plan.

For several key questions posed in the Assessment Report, a lack of information signaled the need to increase efforts to coordinate research. Better communication between scientists, academics, land managers, and resource users could help match project design and funding with the often more urgent need to develop policy and make management decisions.

In addition to being timely, complex data must be organized and presented in a clear, comprehensible manner to be useful. The Assessment Report recognized that a consistent statewide land classification system is needed to provide everyone with a common frame of reference, and to integrate various systems now in use to classify forest cover types, soils and natural communities. The ECOMAP hierarchical classification system is the most promising such system available to date. A preliminary map and classification of Landtype Associations (LTAs) was developed for New Hampshire as part of the assessment process.

The continued development of NH GRANIT, the statewide Geographical Information System (GIS) is key to improving the quality of information about our natural resources. GIS allows users to collect, manage, analyze and display geographic information and integrate different spatial data. A centralized GIS data base provides a means of allowing users to access the most recent and correct version of any of the data layers. Since 1985, the University of New Hampshire's Complex Systems Research Center (CSRC), working under annual funding agreements with the Office of State Planning, has been instrumental in the development, archiving and application of the GRANIT database. Their continued existence is critical to achieving many of this plan's objectives. State funding for CSRC through the Office of State Planning's budget or through forestry related projects is necessary for CSRC to fulfill the roles called for in this document.

The Assessment Report also recognized that organizing ecological information is merely the first step in setting management goals. The LTAs, for example, can show which forests and habitats New Hampshire's landscape *could* support, but they cannot tell us what the land *should* support to meet landowners' and society's needs. The second step in establishing goals for forest structure and composition, therefore, is to solicit input from landowners and citizens. With this open process, people are not only offered an opportunity to participate in policy decisions, but they may also learn about the ecological capabilities of the land, and how to develop forest management plans to meet New Hampshire's economic needs within real physical and biological constraints.

The experience of the 1995 New Hampshire Forest Inventory Project demonstrated that New Hampshire does not, and can not, continue to be dependent on the USDA Forest Service, Forest Inventory and Analysis as the sole source of statewide data about the condition of our forest resources and trends in their use and renewal. While the FIA should continue to serve as the baseline, New Hampshire must commit to the development and funding of other state-based inventory processes.

The following actions address a wide range of information needs that are essential to move ahead with many of the actions in other parts of the plan.

Actions:

- 7-1. Provide accurate and timely forest inventory data to landowners, resource managers, and forest-based industries to make informed management decisions and to guide forest-based economic development in the state.
 - a. Aggressively lobby NH's congressional delegation in cooperation with other northeast region states to fund the Forest Inventory and Analysis at levels which allow the inventory to be conducted at least every ten years.
 - b. Supplement the periodic data provided by the FIA through state funding appropriated every second or third biennial budget. Such funding should be contingent on a percentage match by private industry, or from other private sources. These funds should be focused where the information needs are greatest, as determined by the State Forest Roundtable envisioned in action 11-1. These efforts should be focused on using updated remote sensing technology and GIS to estimate growth and harvest between FIA cycles.
 - c. Formalize and improve the accuracy of a regional wood flow survey with other states and the Province of Quebec to determine the flow of unprocessed timber and milling by-products within the state.
 - d. Annually compile harvest volume data from information provided on the report-of-cut form to the NH Department of Revenue Administration, and explore ways to improve the accuracy of reporting.
 - e. Update remotely sensed data and aerial photography regularly to aid interim inventories, and assess forest health and forest practices.

Implementation: USFS, NH F&L, NHTOA, SPNHF, NE Forest Users Coalition, UNH Cooperative Extension, UNH-CSRC, forest industry.

- 7-2. Conduct comprehensive biological (aquatic and terrestrial) inventories on all public lands, with an emphasis on state and town lands where the least information has been collected. Follow Natural Heritage Network protocol for plants, animals and natural communities, and NH Fish and Game protocol for the Wildlife in the Granite State (WINGS) database of wildlife and species/habitat relationships. Provide the information to the Heritage and WINGS programs.

Implementation: NH F&G, NH F&L, NHNHI, NH P&R, DES Water Resources, Conservation Commissions, USF&W and USFS, NRCS, Conservation Districts, DES Lakes Program.

- 7-3. Encourage landowners to have biological inventories conducted on their land, and respect the concerns of property owners associated with these inventories.
- a. Develop a protocol for landowners to conduct biological inventories that considers the different needs and resources of large and small landowners, and follows Natural Heritage Network protocol for plants, animals and natural communities and WINGS protocol for wildlife and species/habitat relationships.
 - b. Provide incentives by allowing costs to be included in landowner cost-share programs or allowing tax deductions for the cost of inventory.
 - c. Encourage landowners to forward the results of inventories to the New Hampshire Natural Heritage Inventory and the Nongame and Endangered Species Program.
 - d. Develop a process to resolve concerns among landowners and natural resource agencies including; landowner notification, disclosure of field location and use of data when surveys are conducted.
 - e. Inform landowners of their rights under the Native Plant Protection Act, RSA 217-A.

Implementation:

- a. NH F&G, NHNHI, TNC, NHTOA, UNH Cooperative Extension, landowners, consulting foresters, NRCS.
- b. Forest Stewardship Committee, USFS, UNH Cooperative Extension.
- c. NH F&G, NHNHI, TNC, NHTOA, UNH Cooperative Extension, landowners, consulting foresters, NRCS.
- d. NH F&L, NH F&G, NHNHI, US F&W, NH Audubon, TNC, industrial & non-industrial private landowners.
- e. SPNHF, NHTOA, NH F&L, NHNHI, UNH Cooperative Extension, Forest Stewardship Committee.

- 7-4. Continue efforts to develop and revise New Hampshire's natural community classification system and correlate it with other classification systems, including LTA/ELT units, Natural Resource Conservation Service (NRCS) soil map units, and Society of American Foresters cover types.

Implementation: NHNHI, TNC, NRCS, USFS, UNH-CSRS.

- 7-5. Develop ecological information to help forest managers maintain the structural and compositional diversity of New Hampshire forests. The following steps would need to be implemented sequentially, with each developing information that is needed in the next step. This action relies on the use of the ECOMAP classification system.
- a. Refine preliminary Landtype Associations (LTA) by completing the unit descriptions, field verifying the unit delineations, mapping LTA units at a finer scale and updating the statewide LTA map (see Assessment Report page III-129).
 - b. Establish statewide forest structure and composition goals based on the ability of the land to support different forest types and communities, estimated by LTAs. Consider current and expected future needs of forest industry and other users in choosing between alternative structure and composition goals. This goal setting process would be conducted in an open setting, as described in action 3-2.
 - c. Use FIA, GRANIT/GIS, Natural Heritage Inventory data, and other sources along with the Landtype Associations to assess the degree to which forest structure and composition goals are being met at a broad scale, including the contribution of public and private lands. Identify where actual forest structure and composition exceeds or falls below the stated goal.
 - d. Develop the next, more site-specific level of the classification hierarchy, Ecological Landtypes (ELT). Identify lands with the capability or potential to contribute to the statewide forest structure and composition goals.

Implementation: NH F&L, NH F&G, FSSWT, USFS, OSP, UNH-CSRC, NRCS, consulting foresters, landowners, forest industry and others.

- 7-6. Conduct a landscape level assessment of biological resources every ten years using indicators identified by the Forest Sustainability Standards Work Team to provide a framework for information collection. LTA's should be the spatial frame of reference for the assessment.

Implementation: NH F&L, NH F&G, USFS, OSP, UNH-CSRC, consulting foresters, landowners, forest industry and others.

- 7-7. Fund natural resource inventory programs within the Department of Resources and Economic Development, Division of Forests and Lands (including the New Hampshire Natural Heritage Program) and Fish and Game Department to accomplish the actions listed on objective 7.

- 7-8. Encourage research by university, state and federal scientists that addresses current needs. Disseminate research results to forest land managers, policy-makers and the public by expanding existing networks to provide increased and more timely access to the information. Current needs include the following eight areas:
- a. Landscape-level ecological processes.
 - b. Trends in native biological diversity.
 - c. Ecology of rare forest communities.
 - d. Rates of land conversion and parcelization.
 - e. Forest fragmentation.
 - f. Forest inventory, harvest levels, log flow, timber availability, species availability and wood quality.
 - g. Soil productivity and soil ecology.
 - h. Ecological effects of biosolid (clean municipal sludge) applications.

Implementation: UNH faculty, UNH Cooperative Extension, USFS, NH F&L, GSD/SAF, NRCS, Conservation Districts, and other organizations involved in research and dissemination of results.

- 7-9. Compile information on the rate of harvest to monitor resource availability and the sustainability of forest harvesting. Develop a system for collecting harvest information separately from the Timber Tax, with all parties sharing responsibility for accurate reporting.

Implementation: DRA, NH F&L, NHTOA, NE Forest Users Coalition, SPNHF, UNH CSRC, local governments.

- 7-10. Understand public and landowner attitudes through:
- a. Public opinion surveys (conducted by UNH) at five year intervals with the goals of understanding people and their perceived relationship with forested resources; discovering what citizens believe impacts their quality of life; and tracking the level of public awareness.
 - b. Surveys at appropriate intervals to assess forest landowner attitudes, objectives of landownership, and availability of timber from private lands.
 - c. Development of a mechanism for evaluating the effectiveness education and incentive programs.

Implementation: UNH, NHTOA, UNH Cooperative Extension, NH F&L.

8. Instilling or enhancing appreciation, knowledge and skills of forest resource conservation among youth, adults and natural resource professionals.

In each of the last three decades, New Hampshire's population has increased at least 20 percent. While the landscape itself has remained predominately forested, fewer residents are connected to the land or have a real understanding of our forest resources. The Steering Committee believes that forest policy will not achieve the desired goals of a sustainable ecosystem and forest economy without three things: 1) public understanding of the natural systems that allow forests to function; 2) professionals--including loggers, foresters, scientists, and others--sharing knowledge across disciplines about how to manage forested landscapes; and 3) an awareness by those who own forest land of its increasing importance to both the forest resource base and the maintenance of ecological values.

"Each New Hampshire Forest Resource Plan since 1952 has cited the importance of public understanding of natural resources and the need to expand natural resource education at all levels."

Each New Hampshire Forest Resource Plan since 1952 has had an education component. Each cited the importance of public understanding of natural resources and the need to expand education at all levels, including programs for youth, adults, landowners and natural resource professionals. With constant advancements in technology and research, we expect to continue to enhance education efforts aimed at landowners and professionals. But, we will also need to address the recurring emphasis on basic natural resource education for New Hampshire's youth.

The assessment group investigating how humans use and value New Hampshire forests examined the current role of natural resources in the state's public education system. Minimum standards for school accreditation acknowledge the importance of natural resource education at the primary and secondary levels. However, New Hampshire has no mandated curricula for K-12 students in the sciences, nor specifically for natural resources or ecology. Many schools are discussing social aspects of natural resources and land use, but it is not clear that students are provided the basic scientific background to understand these issues. This may be particularly true at the elementary school level where teachers, whose certification requires only three credits of science, tend to be less oriented toward teaching scientific principles. Although there are several organized programs to make natural resource and ecology materials more available to teachers, the programs presume a core knowledge which may not be realistic.

This plan suggests two elements to improve the success of youth education programs. The first is to offer teachers better tools for teaching natural resource-related subjects; the second is to enhance teachers' scientific background to help them use those tools. Action by the State Board of Education will be required to accomplish the latter. And it will not happen

unless a strong coalition of natural resource-related interests are willing to learn the Board's process and articulate the case for changing existing mandated curricula and certification requirements.

Past Forest Resources Plans have highlighted the need to educate professionals. Programs resulting from plan recommendations have been very successful. An example of this is New Hampshire's Cooperative Extension program, which is among the best in the nation. Current challenges for professional education include bringing together the variety of professionals who work in the woods--loggers, foresters, biologists, scientists, and others--to share different perspectives on how to manage forests.

Plan actions aimed at educating resource professionals build on the strengths of existing programs. Recommendations focus on providing professionals with access to data on biological resources and training them to use new technology to integrate complex information to make informed land management decisions. The plan also supports education associated with logger certification.

Past plans have targeted education for New Hampshire's forest landowners, leading to programs which, like professional education programs, have demonstrated positive results. With a growing population and declining forest land base, it is increasingly important for owners to recognize and properly manage remaining forest lands. To work with forest landowners, we must first understand their needs. A 1994 survey indicated about 7,000 landowners, or nine percent of all New Hampshire landowners, own more than 60 percent of the forest land. The Steering Committee believes many of these owners have an interest in managing their land for timber, wildlife and other reasons. Several of the following actions, therefore, are intended to meet their needs. The 76,000 landowners who own the remaining 39 percent of forest lands control an equally important part of the resource base. However, providing meaningful education opportunities for this group will require a better understanding of their specific needs (as suggested in action 7-10).

The following actions are grouped together in four sections: education for youth; education for resource professionals; and education for landowners; and education for the public at large.

Actions:

Education for youth.

- 8-1. Form a coalition of natural resource-based industries, landowners, natural resource professionals, conservation organizations and others, to work with the State Board of Education and the New Hampshire Department of Education to increase availability of environmental and conservation education curricula and materials.
- a. Support implementation of the NH Department of Education's recently developed K-12 Science Curriculum Framework by providing local school boards and teachers with the resources needed to add course work in natural history and natural resource management.
 - b. Become familiar with State Board of Education administrative procedures for changing standards for primary and secondary education course requirements, revising requirements to enter teacher certification programs to include a college course in natural resources, and adding natural resources to continuing education distribution requirements.

Implementation: UNH Cooperative Extension, NHTOA, GSD/SAF, SPNHF, Harris Center, Conservation Districts, NH Environmental Education Assn., forest industry and other natural resource-based industries, consulting foresters, landowners, and other organizations and individuals.

- 8-2. Expand access to and availability of programs, such as Project Learning Tree, Project Wild and Wonders of Wildlife, to schools and school districts by supporting increasing staff development time for natural resource education and increased funding for resource materials. Include a segment on forest industry in “Ag in the Classroom” curriculum.

Implementation: Local school districts, NH Board of Education, PLT steering committee, NHDA, NHTOA, SPNHF, Business Roundtable (action 1-3), Conservation Districts.

Education for resource professionals.

- 8-3. Support and enhance continuing education programs for natural resource professionals in areas of sustainable forest resource use, such as those offered by Society of American Foresters, Society for the Protection of New Hampshire Forests, New Hampshire Timberland Owners Association, NH Association of Consulting Foresters and UNH Cooperative Extension.
- a. Broaden reach to include a greater diversity of natural resource professionals.
 - b. Include new information about biological diversity and maintenance of other forest values.
 - c. Provide information about forest structure and composition goals to foresters, landowners, and others for voluntary use in planning forest management (see action 7-5).

Implementation: SAF, SPNHF, NHTOA, NH Association of Consulting Foresters, UNH Cooperative Extension, Conservation Districts, other organizations, individuals.

- 8-4. Provide forest land managers with training in the use of new tools that facilitate the use of scientific information in forest land management decisions. Training is needed in the following three areas:
- a. Interpretation and use of Landtype Associations for land capability assessment (see action 7-5).
 - b. Interpretation and use of Natural Community Classification System for identification of elements of biological diversity (see action 8-5).
 - c. Use of GIS/GRANIT for landscape-level analysis (see action 4-1).

Implementation: NH F&L, NH F&G, NHNHI, OSP, USFS, TNC, Conservation Districts, UNH-CSRC, Environmental Consultants.

- 8-5. Provide foresters with information about New Hampshire's rare forested natural communities, and state and federally listed species of plants and animals.
- a. Develop a handbook and conduct training in the identification of communities and species.
 - b. Develop acceptable management practices for rare forested natural communities and habitat of state and federally listed species.
 - c. Distribute information about conservation of biodiversity on private lands through forest management practices and establishment of ecological reserves.

Implementation: NHNHI, TNC, UNH Cooperative Extension, consulting foresters, NH F&L, NH F&G, FSSWT, Conservation Districts, US F&W.

- 8-6. Support New Hampshire's Certified Professional Logger Program. Strengthen the emphasis on sustainable forest management, including best management practices, and forest ecology in the curriculum.

Implementation: NH Timber Harvesting Council, NHTOA, UNH Cooperative Extension, Conservation Districts, College of Lifelong Learning, forest industry, other organizations, individuals.

- 8-7. Form a working group of researchers, federal and state agencies, UNH Cooperative Extension, forest industry, forest landowners, and natural resource professional organizations to facilitate:
- a. Flow of information from researcher to forest land manager (users).
 - b. Flow of information from forest land managers back to researchers about utility, timeliness and future needs.
 - c. Efficient coordination of research activities.

Implementation: Researchers, federal and state agencies, UNH Cooperative Extension, Conservation Districts, US F&W, forest industry, forest landowners, consulting foresters, natural resource professional organizations.

- 8-8. Assist workers in developing skills needed for jobs in primary, secondary, and tertiary forest products businesses.
- a. Support existing courses at high schools, technical colleges and other institutions, in the following areas: fine craftsmanship and cabinetry; logging training; small business management; marketing for forest-based businesses; and natural history education (balancing the ecology as well as balancing the books).
 - b. Institute new courses in locations where the above training is not provided.

Implementation: UNH Cooperative Extension, New Hampshire Technical College System, University of New Hampshire, NH Dept of Education-Vocational Education, Conservation Districts.

Landowner education.

- 8-9. Promote natural resource education designed to reach landowners who have the greatest impact on the forested landscape.
- a. Support existing and develop additional volunteer programs for forest landowners to improve their knowledge and understanding of natural resources, increase their ability to share information with other landowners and decision-makers, and facilitate cross-boundary communication. Examples of existing programs are the Master Tree Farm Program and the Coverts Program.
 - b. Support comprehensive programs for landowner resource education offered by natural resource agencies and private conservation organizations.
 - c. Continue to periodically evaluate the focus of existing landowner education programs offered by UNH Cooperative Extension.
 - d. Distribute information to landowners regarding New Hampshire Forester Licensing and the New Hampshire Certified Professional Logger program.

Implementation:

- a. NH Tree Farm Committee, UNH Cooperative Extension, SPNHF, NHTOA, ASNH, consulting foresters, Conservation Districts.
- b. SPNHF, NHTOA, UNH Cooperative Extension, NH F&L, Conservation Districts.
- c. UNH Cooperative Extension.
- d. Forester Licensing Board, UNH Cooperative Extension, NH F&L, NHTOA, Conservation Districts, consulting foresters.

- 8-10. Provide landowners with information about New Hampshire's rare forested natural communities, and state and federally listed species of plants and animals.
- a. Develop a handbook and conduct training in the identification of communities and species.
 - b. Develop acceptable management practices for rare forested natural communities and habitat of state and federally listed species.
 - c. Distribute information about conservation of biodiversity on private lands through forest management practices and establishment of ecological reserves.

Implementation: NHNHI, TNC, UNH Cooperative Extension, consulting foresters, NH F&L, NH F&G, FSSWT, US F&W, USFS, NRCS, Conservation Districts.

- 8-11. Use the results of action 7-9 (understand public and landowner attitudes) to develop education programs that meet the needs of landowners.

Implementation: UNH Cooperative Extension, NH F&L, NH F&G, SPNHF, NHTOA, Harris Center, ASNH.

Education for the Public at Large

- 8-12. Increase public awareness of the importance of New Hampshire's forested resources and the relationship of people to the forest.
- a. Use the results of public attitude surveys (action 7-9) to develop education programs that meet the needs of the general public. Support and enhance existing outreach programs such as those offered by UNH Cooperative Extension, Society for the Protection of NH Forests, The Harris Center, and others.
 - b. Increase use of the media to develop and promote awareness of the role of forests, forest products, and forest policy in our state.
 - c. Evaluate the success of educational programs in meeting the needs of the general public. Conduct public surveys to see if educational programs resulted in increased awareness of New Hampshire's forests.

Implementation: NH F&L, UNH Cooperative Extension, NH F&G, SPNHF, NHTOA, Harris Center, ASNH.

9. Acquiring and managing lands and easements for which there is a public interest and that complement the benefits provided on private forest lands.

Government ownership of land in the public interest, particularly in regard to forest lands, is a changing concept. In 1831 the state sold all of the lands in its possession in an effort to promote timber cutting and safeguard farmers from threats in the forest. Less than a century later, widespread concern about over-cutting, erosion and fires, reversed the situation. In 1911 people from New Hampshire played a pivotal role in passing the Weeks Act, authorizing federal land acquisition in the eastern states. And in 1912 a state land acquisition program was initiated, beginning with purchase of Crawford Notch to keep it from being cut over.

For over a century, policies have been drafted to address the issue of sustaining New Hampshire's forests. Early renditions of public interest focused simply on long-term protection of water and timber resources. The 1995 Forestry Title Recodification invoked a broader, more complex definition of public interest to include: providing forest benefits; demonstrating sound forest principles; protecting habitat for plants, animals and other organisms; conserving forested watersheds; preserving areas of rare and exemplary natural beauty and ecological value; and providing for perpetual public access and use. Building on this theme, the Steering Committee believes that public lands play an important role in achieving the Vision of sustaining New Hampshire's forests by complementing private lands and protecting land and amenities not provided elsewhere.

“As private forest land throughout the state is gradually being developed, the burden to provide certain ecological values is increasingly shifted to public land.”

Currently, almost 20 percent of forest land in New Hampshire is in some type of public ownership. Municipal governments own 79,000 acres of forest land, with more than 30,000 acres managed as town forests. The New Hampshire portion of the White Mountain National Forest comprises more than 720,000 acres, and includes a mix of designated Wilderness and managed forest land. The State of New Hampshire holds over 150,000 acres of state forest, and the Department of Resources and Economic Development manages an additional 10,268 acres under conservation easement. State forests provide myriad public benefits, including watershed protection, habitat for threatened and endangered species, outdoor recreation opportunities, and an average of four million board feet of timber per year--roughly two percent of the state's annual harvest. In the three southern counties, state forest and park lands represent some of the largest contiguous tracts of forest under single ownership.

Funds for managing state lands are limited. Between 1988 and 1994, 58,460 acres were added to the inventory of state forest lands through fee and easement. Although this was a 55 percent increase in land area, general fund expenditures for managing state forest lands

increased only 8 percent. In 1992, the Forest Management and Protection Fund was established, derived in part from timber and lease receipts, to supplement budgets for state forest management, forest health monitoring and protection, and law enforcement.

As private forest land throughout the state is gradually being developed, the burden to provide certain ecological values is increasingly shifted to public land. In areas where significant land conversion is occurring, such as southeastern New Hampshire, public lands are expected to provide an increasing proportion of wildlife habitat and recreation. Watershed protection to maintain quality supplies of drinking water will be increasingly important in locations that experience combined population growth and land conversion. Demonstrating sound forest principles while providing other public values is an additional role of public lands.

To meet these needs in the future, we must continue to set priorities for public land acquisition. From 1987 to 1993 the Land Conservation Investment Program (LCIP) and Trust for New Hampshire Lands provided a framework for acquisition prioritization. Since the completion of the LCIP, New Hampshire no longer has a coordinated process to prioritize state acquisition of land and conservation easements, nor any funding sources for local acquisition projects.

The Northern Forest Lands Council recognized the appropriate and vital role of public land acquisition and easements in conserving public values on what they called "exceptional or important lands." The Council also highlighted the importance of public dialogue in public land acquisition, noting the need to balance opportunities to protect public values with the fiscal reality of often insufficient funding for land management.

The goals for public land identified by the Steering Committee are shared by other groups and committee's working with state agencies. For example, the Lakes Management Advisory Committee established by the Department of Environmental Services includes preservation of watersheds and ecological management of lakes among their goals. A public planning process to develop a state acquisition program for land and easements would provide a forum to integrate goals shared by many agencies and organizations. The state's GIS system provides a tool to assist a cooperative effort to prioritize land conservation.

The Steering Committee believes it is in New Hampshire's interest to implement the Council's recommendations for initiating a goal-oriented public planning process, and endorsing the Land and Water Conservation Fund and Forest Legacy Program. The actions that follow include these recommendations, address funding of management of public lands, and develop strategies to increase land protection through the use of easements.

Actions:

- 9-1. Initiate a goal-oriented, public planning process to develop a state acquisition program for land and easements. The process should build upon the successful model of Land Conservation Investment Program and Trust for New Hampshire Lands. The process should include the following components, partially adapted from Northern Forest Lands Council recommendation #15:
- a. Criteria for identifying and setting priorities for public acquisition of conservation easements and fee title.
 - b. Parameters such as: acquiring land or interest in land from willing sellers, involving local government and landowners in the planning process, and efficiently using public acquisition dollars.
 - c. Consideration of the benefits already provided by private ownership versus the costs of acquiring and managing new public lands.
 - d. Policy for disposition of state lands that includes public involvement.
 - e. Realistic consideration of funding for management of new public lands and monitoring of easements. Examples of permanent within-state funding mechanisms might include income from a real estate transfer tax, subdivision tax, or land conversion penalty.

Implementation: NH F&L, NH F&G, Land Trusts, OSP, UNH-CSRC, communities, organizations and individuals.

- 9-2. Encourage New Hampshire's congressional delegation to support the following Northern Forest Lands Council recommendations:
- a. Fund the Land and Water Conservation Fund at the currently authorized level, with at least 60 percent of the funds going to the states. Revise the law to provide greater flexibility in state expenditure of the fund.
 - b. Revise the Forest Legacy Program to allow state ownership of easements purchased through the program. Provide funds for monitoring of easement compliance.

Implementation: Organizations and individuals.

- 9-3. Address decreases in funding for public land management. Explore opportunities for:
- a. Innovative partnerships for management of public land by private entities.
 - b. Increasing management funds by redirecting receipts from timber, lease and other public lands activities back to the managing agency instead of the general fund.

Implementation: NH F&L, NH F&G, USFS, landowners, organizations and individuals.

Acquiring and managing lands and easements

- 9-4. Develop policies to encourage the use of conservation easements.
- a. Improve awareness of the role of conservation easements in land protection and estate planning.
 - b. Review existing tax policies and propose modifications to provide incentives for donating perpetual easements.

Implementation: Land Trusts, SPNHF, NHTOA, TNC, NH F&L, USFS, UNH Cooperative Extension.

10. Enhancing awareness of the importance of conserving community forests for their ecological and social values.

New Hampshire is a predominately rural state, but with population increases in the last several decades, urban and suburban areas are growing. Development of forest land in some communities has changed aesthetic qualities valued by residents, and removed some forest from the available timber base. Community forests, (areas of forests in and adjacent to communities) and city trees are necessary to maintain the quality of life in towns, cities and rural neighborhoods.

Backyard forests, street trees, and public forest lands are important components of community ecosystems and economies. A vital part of the state's forest resource base, forests in urban and community settings can be managed for a variety of benefits. Those same trees and forests can also serve as educational sites where school children and the non-landowning public find opportunities to learn about forests.

Local land use planning plays a critical role in conserving forests in communities. The premise and actions for Objective 4, addressing the impact of local land use decisions, are equally important where concentrations of urban and community development mix with forests.

"For the majority of citizens who live in urban and suburban settings, trees in their communities and neighborhoods have a significant effect on their quality of life."

*Forest Resources Plan
Assessment Report*

Action:

- 10-1. Continue to expand community forestry programs with an emphasis on urban ecosystem benefits and public awareness. Focus on:
- a. City and community tree programs for urban ecosystem benefits such as ameliorating sound, improving heating and cooling, contributing to cleaner air, and providing urban outdoor spaces.
 - b. Public awareness and citizen involvement in the stewardship of forests in their community.
 - c. Backyard Tree Farm and other programs to maintain private forest land in suburban settings, and manage lots less than 10 acres for wildlife, biodiversity, recreation and forest products.
 - d. Open space planning in communities close to urban centers, including forest components of natural resources chapters in municipal master plans, (action 4-3), designation of Town Forests and Ecological Reserves (action 4-4), and increased use of conservation easements (action 9-4).

Implementation: NH F&L, UNH Cooperative Extension, Community Tree Commission, NH Tree Farm Program, Forest Stewardship Committee, NHACC, OSP, Conservation Commissions, Planning Boards, Land Trusts, consulting foresters.

11. Developing forest policy collaboratively, and organizing agencies to facilitate sustainable forest management.

New Hampshire has a tradition of cooperative forest policy development, with many successful examples of people working together to achieve common goals. Policies aimed at sustainable forest management, involving voluntary site-specific practices and landscape-level strategies, will require continual access to scientific information and successful communication between land managers and landowners.

New Hampshire does not have a single natural resources agency. However, several mechanisms are in place to facilitate communication among state agencies with common concerns. The Cooperative Land Management Program (CLMP) was formed in the mid 1970's to develop consistent land use policies and provide coordinated management of the state's natural resources agencies.⁶ At the project level, the state land management team (SLMT) provides coordinated, interdisciplinary resource planning and management assistance on state-owned lands.⁷

"Coordination between the public and private sector will be critical to successfully implement actions to address complex issues such as forest fragmentation."

At the policy level, the Council on Resources and Development (CORD) was formed in accordance with RSA 162-C to consult on "common problems in the fields of environmental protection, natural resources, and growth management."⁸ CORD is responsible for resolving differences or conflicts over development and resource management, reviewing disposition of state owned real property, and overseeing the LCIP monitoring program. The Public Water Access advisory board functions as a subcommittee of CORD. As currently written, the legislation authorizing CORD does not allow members to delegate voting authority to agency designees. CORD's effectiveness, therefore, fluctuates due to the difficulty many agency leaders have in being available to consistently attend meetings.

In 1987 CORD established a Technical Advisory Committee on GIS composed of state agency representatives. The Committee expanded to include federal (NRCS, USGS, USFS) and regional planning agencies. Their objectives in working together to develop GRANIT

⁶ Members of CLMP comprise an executive committee, which includes the directors of Fish and Game Department, Division of Forests and Lands, Division of Parks and Recreation, and Water Resources, and a working committee made up of key resource managers in each agency.

⁷ Core team members of SLMT are professional and technical specialists from Fish and Game Department, Division of Forests and Lands, Division of Parks and Recreation, Natural Heritage Inventory, Trails Bureau and Office of Historic Preservation.

⁸ Members of CORD are the agency leaders of the Office of State Planning, Division of Public Health, Fish and Game Department, Department of Resources and Economic Development, Department of Environmental Services, Department of Agriculture, Department of Safety, Department of Education, and Department of Transportation.

include maximizing limited financial resources by coordinating efforts, avoiding duplication when creating and updating elements in the GRANIT data base, and encouraging interagency cooperation on projects involving the application of GIS techniques. This Technical Advisory Committee is one of CORDs greatest successes.

While CORD, CLMP, SLMT and other means of communication exist to foster cooperative policy development among public agencies, there is no consistent mechanism to coordinate public agencies, private organizations and individuals in making joint policy decisions. Coordination between the public and private sector will be critical to successfully implement recommendations to maintain large forest ownerships, sustain managed forests, promote land use planning, protect biodiversity, and to address complex issues such as forest fragmentation. For example, a partnership of state agencies, utilities, local governments and landowners could work together to minimize forest fragmentation by reducing the impact of future roads, power lines, and other development. Developing joint strategies would help to protect wildlife habitat and maintain contiguous tracts of forest land.

The following actions are proposed to enhance existing mechanisms and seek new opportunities to work with all interests to implement strategies across landscapes and ownership boundaries:

Actions:

- 11-1. Create a task-oriented "umbrella" group based on the Northern Forest Lands Council concept of a State Forest Roundtable. Their role should be to advocate implementation of actions in this plan, coordinate forest policy development, facilitate dialogue between diverse interests, and assure opportunities for public participation in policy development. Specific activities could include:
 - a. Providing a forum to consider implementation of recommendations from the Forest Sustainability Standards Work Team, Ecological Reserve System Steering Committee, and other on-going initiatives.
 - c. Eliminating duplication in state policy development, promoting cooperation among state agencies (action 11-3), and supporting formal coordination efforts between public agencies, private landowners and other organizations that manage forests (action 11-2).
 - d. Coordinating with similar projects in neighboring states.

Implementation: NH F&G, NH F&L, DOT, OSP, ASNH, SPNH, NHTOA, TNC, RC&D, UNH Cooperative Extension, forest industry, sawmills, consulting foresters, loggers, USFS, local government, and others representing diverse NH interests.

- 11-2. Continue to improve formal coordination efforts between federal and state land management agencies, private landowners, and other organizations that manage forests, to meet common land management objectives that cross jurisdictional boundaries. Examples of common management objectives include wildlife habitat, conservation of biological diversity and maintenance of water quality and quantity. Formal coordination should be through written agreement, initiated by the state.

Implementation: NH F&L, NH F&G, USFS, US F&W, ASNH, SPNHF, TNC, NRCS, US F&WS, UNH Cooperative Extension, DES Lakes Program, local governments, forest industry, landowners and others.

- 11-3. Improve cooperation and communication efforts among state agencies to facilitate integrated management of watersheds, wildlife, and forests, and eliminate the artificial separation of resources such as recreation, public access, scenic vistas, timber and wildlife harvesting, and conservation of biological diversity, in state policies, programs and land management activities.
- a. Continue to support the efforts of the cooperative land management committees and state land management team to apply an interagency, interdisciplinary approach to state forest resource management and set clear goals for management.
 - b. Encourage full participation at meetings of the Council on Resources and Development.
 - c. Promote broader agency participation in existing forums on resource issues such as wetland impacts/mitigation, habitat fragmentation and biodiversity.

Implementation: NH F&G, DRED, DOT, OSP, DES, LMAC, NHDA, UNH Cooperative Extension.

- 11-4. Continue developing statewide Forest Resources Plans every ten years.
- a. Ensure future plans are based on up-to-date forest inventory data by timing them to coincide with the schedule of Forest Inventory and Analysis.
 - b. Update this Forest Resources Plan when the FIA data becomes available in 1998, using the new information to revise priorities to insure a positive impact on New Hampshire's forests and natural resources.
 - c. Fund the Forest Resources Planning program within the Division of Forests and Lands.

Implementation: NH F&L.

Conclusion

This planning process has been a creative collaboration of many different interests and perspectives. Central to all the deliberations over the past two years has been the complex task of balancing society's interests in preserving public values in forest land with the fundamental precepts of free enterprise and individual property rights and responsibilities.

New Hampshire has a long and proud tradition of protecting personal and property rights while working collaboratively to resolve public issues and problems. This plan presents many actions to address the question of *what* we must do to sustain New Hampshire's forests and the economy that depends on them, and *how* we might use various means to address the challenges and realize the vision we have set forth.

While developing actions contained in this plan, we have striven to include processes to encourage open communication between diverse and often opposing interests. Open communication fosters respect for different views, which in turn leads to creative solutions born out of trust and consensus.

This plan differs from those before it, just as each previous plan differed from its predecessor, in response to new issues and ideas important to the times. The focus in this plan is on forest sustainability and a more ecological approach to forestry. However, this emphasis does not diminish the role of the forest-based economy. Rather, it presents a new framework that defines the relationship between forests and the people and industries they support.

The task ahead is to implement actions that will realize the vision of New Hampshire's forests set forth in this plan. The combination of open communication and reliable information about New Hampshire's natural resources will be essential to success.

Appendix A.

Update on "Forests and Forestry in New Hampshire: Action Program for the Eighties."

In 1986 an Interim Report provided information on the implementation of recommendations in the 1982 plan. Of the 104 recommendations, 18 were completed, 16 were eliminated, 44 were combined with other recommendations or changed in some way as they were put into actions, and 26 were carried forward again for implementation.

This appendix provides a brief summary of recommendations executed since the Interim Report was released. On the next four pages is a chart summarizing the status of all 104 original 1982 plan recommendations. Following the chart is a narrative about each recommendation implemented between 1987 and 1995, with some examples provided.

Status of 104 Original Recommendations

Recommendations	Completed Before January 1986	Completed Since January 1986	Eliminated	Not Completed As Of September 1995
1. Landowner Training, Mass Media		X		
2. Intensive Management, Public Lands		X		
3. Mandatory Registration of Foresters		X		
4. Voluntary Registration of Loggers		X		
5. Aerial Photos Every 5 Years		X		
6. Aerial Photos w/Greater Definition		X		
7. Update INER Land Use Publications				X
8. Develop Computerized Data System		X		
9. Changes in Renewable Resources Evaluation			X	
10. County Forestry Advisory Bd. – 5 Year Rpt.			X	
11. Conservation Commissions – Local Data			X	
12. Define Important Lands		X		
13. Purchase Development Rights		X		
14. Promote Conservation Easements		X		
15. Landowner Management Cooperatives			X	
16. Workshops on Estate Planning		X		
17. Capital Gains Tax on Land Sales				X
18. Study Non-Forest Topics		X		
19. Amend Sub-Division Regulation				X
20. Adopt SAF Wilderness Position				X
21. Research Economics of Multiple Use			X	
22. SAF Granite State – Credentialling		X		
23. Continuing Education for Employees		X		
24. Centralize Training		X		
25. Short Course for Professionals		X		
26. Changes in Landowner Programs		X		
27. Expand Tree Farm Program	X			
28. Indirect Contact with Landowners		X		
29. SPNHF-Expand Camps				X

Recommendations	Completed As Of January 1986	Completed Since January 1986	Eliminated	Not Completed As Of September 1995
30. Landowner Courses-Non-Timber		X		
31. Acreage Guides for Landowner Contact		X		
32. Contact New Landowners		X		
33. Conservation Information Centers			X	
34. Neighbor to Neighbor Woodlot Visits		X		
35. Vocational/Technical Programs				X
36. UNH Accreditation	X			
37. UNH – Practical Courses		X		
38. Improve Industry Conditions		X		
39. Teach Conservation in School	X			
40. Expand the 4-H Forestry Program	X			
41. Foresters Lectures in Schools			X	
42. Standardize Publications			X	
43. More Non-Timber Publications		X		
44. SPNHF Publications		X		
45. PR Specialist for Forest Res. Committee			X	
46. Change Forestry Communications Council	X			
47. New Public Awareness Techniques		X		
48. Agency/Organization Questionnaire	X			
49. Low Quality Wood for Energy		X		
50. Coordinate Public Forest Programs		X		
51. Log Grading by Species		X		
52. Marketing Information and Dissemination	X			
53. Marketing Coops/Concentration Yards		X		
54. Attract Secondary Processors		X		
55. Education in Marketing Products		X		
56. Strengthen State/Town Fire Program		X		
57. Improve Forest Pest Program		X		
58. Improve Fire Communications		X		
59. Continue Using Fire Towers		X		
60. Expand Training of Local Officials		X		

Original Recommendations Completed since January 1986

The following are those recommendations that have been implemented since the last Interim Report was issued in January 1986. Listed below each recommendation are examples of some of the things that have been accomplished.

1. Make more use of the general media, and make more PSA's and other material available.

In 1990 a Forest Stewardship Committee was formed and a 5-year Forest Stewardship Plan was developed to address this issue and other issues dealing with forest land and forest landowners. In 1990 a Community Tree Commission was formed and a 5 year Urban and Community Forestry Plan was developed to address issues dealing with urban vegetation and urban dwellers.

2. Manage public lands intensively to serve as models for private woodland owners. Expanded use should be made of public lands as living demonstrations of proper forestry practices.

There are several examples of this around the state:

Urban Forestry Center	Town Forests
Shieling Forest	UNH Woodlands
Fox Forest	Nash Stream
Bear Brook State Park	Fish and Game Lands

3. A credentialling system should be established for foresters.

Forester Licensing went into effect in 1992.

4. Support efforts by the New Hampshire Timberland Owners Association to provide leadership to loggers, sawmills, and other forest industry people through its Forest Industries Committee.

In 1993 the New Hampshire Timber Harvesting Council was formed to promote a more favorable public image, improve logging and log trucking skills and safety, promote environmental awareness, and organize professional loggers and log truckers into a more cohesive group with a stronger voice. The Council's membership consists of logging and log trucking contractors, professional foresters, and representatives of wood manufacturing industries. Sponsors of the program are the New Hampshire Timberland Owners Association, UNH-Thompson School of Applied Science, and UNH-Cooperative Extension.

5. All agencies and organizations who need aerial photographs or remotely sensed data should pool their resources to obtain it at frequent intervals.

In 1991 and 1992 the state was flown for aerial photography. The New Hampshire Department of Transportation provided the matching funding of \$65,000 for this project. The frequency of these aerial photography flights is still approximately every 10 years.

6. Aerial Photos With Greater Definition. (Same as 5)

The present scale of the 1993 aerial photographs is 1:48,000.

8. Computerize Data Bases, including the current Forest Survey data.

The Office of State Planning has contracted with Complex Systems at the University of New Hampshire in Durham to maintain a Geographic Information System (GRANIT). A GIS Advisory Committee has been established to coordinate GIS needs of state agencies.

12. Develop a definition of Important Productive Lands.

In 1992 a Forest Land Evaluation and Site Assessment Task Force was established to oversee a pilot project for the implementation of FLESA in New Hampshire. The Town of Bath was the pilot community selected. The results of this project have just recently been released. The next step will be to determine where we go from here.

13. Purchase development rights on prime and important forest land.

Land Conservation Investment Program began in 1988 and ended in 1993. The first acquisition under this program was Nash Stream Forest.

14. Expand promotion of Conservation Easements statewide.

The Society for the Protection of New Hampshire Forests and other land trusts promote use of conservation easements.

16. Hold workshops on estate planning for landowners.

The Society for the Protection of New Hampshire Forests, in cooperation with other natural resource organizations and agencies, has sponsored many workshops on estate planning.

18. Resource managers should increase their awareness of and become involved in areas outside natural resources which affect the forest base.

Many resource professionals participate in their communities as selectmen, planning board members, and conservation commission members.

22. Mandatory Registration of Foresters. (Same as 3)

Forester Licensing went into effect in 1992.

23. Continue efforts to coordinate formal training sessions for Extension Service, Division of Forests and Lands, and other public forest resource related personnel whenever possible.

UNH Cooperative Extension, Division of Forests and Lands, and other public agencies coordinate training whenever possible. An example of this was a Best Management Practices for Timber Harvesting workshop that was coordinated with Department of Environmental Services, Water Resources Division, Wetlands Board.

24. A full series of "short courses" for professionals should be offered by educational institutions in the state.

Courses on various subjects pertaining to natural resources are offered to foresters and other natural resource professionals on a regular basis by several agencies and organizations.

25. Centralized Training. (Same as 24)

It is not practical for one organization or agency to take on all professional training.

26. Develop courses with several graded levels of proficiency with an accompanying testing and certificate program. Develop a procedure to test the effectiveness of programs and literature.

UNH Cooperative Extension offers an Advanced Woodlot Management Course, Advanced Wildlife Course, and most recently the Coverts Program. These programs supplement basic information programs that are provided to forest landowners. UNH Cooperative Extension, Division of Forests and Lands, and Fish and Game Department cosponsor the New Hampshire Backyard Tree Farm Program that is directed towards landowners with less than 10 acres, but more than an acre.

28. Actively seek out new landowners. Put a checklist on back of the Intent to Cut form asking landowners the questions they should be asking themselves before having a timber sale. Provide an information packet upon application for Current Use.

In 1987, a "Land Owner Information Kit" was developed by Sumner Dole, Belknap County Cooperative Extension. Five thousand notices were sent out to landowners about the availability of the kit. The target audience was landowners who had not previously participated in any Forest Land Owner Assistance Program.

In 1990, a Forest Stewardship Committee was formed and a five year Forest Stewardship Plan was developed. A 1-800 number was established with the help of UNH Cooperative

Extension to receive requests for information. A "Picture Your Forest" brochure and slide/tape program were developed with the assistance of the Society for the Protection of New Hampshire Forests to promote the program. A competitive grants program was established to solicit innovative ways of reaching landowners about stewardship. Several communities throughout the state supplemented the Intent to Cut form with an information sheet about what landowners should consider before having a timber sale.

Questions were placed on the back of the Intent to Cut. Landowners were to answer these questions about their timber sale and then send them to the Division of Forests and Lands. The questions were found to be ambiguous and the responses were difficult to correlate. This project only lasted one year.

30. Forestry Organizations should continue to offer non-timber topics in workshops and publications.

Workshops on Forest Stewardship Planning, Wildlife, Water Resources, Best Management Practices, Endangered Species, Ecosystem Management, Biodiversity, and other topics were targeted to professional foresters who in turn integrated what they learned into their management of private lands.

The following materials have been developed to address non-timber topics:

"Foresters Guide to Wildlife Management"
"Best Management Practices for Erosion Control" - Resource Manual /Field Guide
"Best Management Practices for Recreation Trails"
"Logging Aesthetics" - Book and Video
Ecosystem Management Video Conference

31. Maintain general guidelines for direct landowner contact along acreage size. The goal should be to spend a greater proportion of time with owners of 50 acres or more, who control 78% of the private non-industrial timberland.

This is presently in progress, but no one requesting assistance from UNH Cooperative Extension is turned away.

32. Contact New Landowners. (Same as 28)

34. Establish a neighbor to neighbor woodlot visitation program whereby a caller to a participating organization can be visited by a nearby landowner for information and assistance.

In 1995 the New Hampshire Coverts Program received funding from New Hampshire Fish and Game Department and the Ruffed Grouse Society.

37. The University of New Hampshire should add more practical, applied experience to its four year Forestry program.

Summer work experience for credit is now mandatory. Field trips and laboratories utilizing practicing foresters are now in place with an emphasis on the practical application rather than just theory.

38. Improve working conditions and pay scales within the forest products industry.

The New Hampshire Timber Harvesting Council - Professional Logger Program has conducted many workshops on the following topics:

- Trucking Safety and Regulations
- Timber Harvesting Laws
- Logging for Foresters
- First Aid and CPR Training
- Safe and Productive Harvesting
- Fundamentals of Forestry

In early 1994, Governor Stephen Merrill signed into law House Bill 1579, enacting comprehensive reform of the state workers' compensation system.

UNH Cooperative Extension now has a Forest Industry Specialist in addition to a Utilization and Marketing Specialist to work with the forest industry on a regular basis.

43. More Non-Timber Publications. (Same as 30)

44. Society for the Protection of New Hampshire Forests Publications (Same as 30.)

47. New Public Awareness Techniques. (Same as 28)

49. The Division of Forests and Lands should coordinate a comprehensive program of wood energy management to include education, forest land management, and technology transfer programs in the production, distribution, and use of wood energy.

In 1983, the U.S. Forest Service produced the publication "Biomass Statistics for New Hampshire." In 1984, Robert J. Berti produced the report "An Assessment of Biomass Harvesting on Small Woodlots in New Hampshire." In 1986, J.B. Cullen did an analysis and produced the report "New Hampshire's Forest Biomass Resource." In 1994, FORECO, Forest Resources Consultants did a reassessment of the 1984 activities and produced the report "Reassessment of Biomass Harvesting on Small Woodlots in New Hampshire."

The Governor's Energy Office has sponsored several workshops on the use of wood pellets as a fuel.

UNH Cooperative Extension has a Forest Industry Specialist and a Utilization and Marketing Specialist that are working with the forest industry on a regular basis to address this issue as well as many other issues.

50. All current organizations should be retained with a clear delineation of responsibilities to reduce overlap.

Current organizations have been retained and overlap of responsibilities have been reduced. Organizations are working in a more cooperative manner.

51. Establish appropriate log grading systems by species and encourage their widespread adoption. (same as 38)

53. Explore the feasibility of concentration yards for marketing forest products. (same as 38)

54. Attract new industries to the state, with emphasis on secondary processors.

UNH Cooperative Extension has a Forest Industry Specialist and a Utilization and Marketing Specialist that are working with the forest industry on a regular basis to address this issue as well as many other issues.

In 1986, four northeastern states (New Hampshire, Maine, Vermont, and New York) signed a charter creating the Northeastern Forest Alliance (NEFA). The Alliance's major goal is to promote the Northeast forest and its related products on a regional basis, to focus attention on natural resource issues and opportunities that transcend political boundaries, support a regional approach to forest planning, and to share technical expertise.

The publication "The Forest Resource and Wood Using Industries of New Hampshire" was produced as a component of the project, "Expanding New Hampshire's Forest-Based Economic Development Opportunities," a cooperative effort by the NH Division of Forests and Lands, North Country RC&D, and UNH Cooperative Extension. Funding for the project was provided by USDA Forest Service, Rural Development Program.

The publication "The Economic Importance of the Northeast Forest" was produced by NEFA as a result of a "Regional Economic Profile." Its purpose was to give local, state, and federal policy makers forest resource information to help them better understand the impact of their decisions.

55. Strengthen and expand educational programs for forest industries relating to market trends and marketing opportunities for manufactured wood products.

Since 1985 the annual Northeast Wood Products Exposition (NEWPEX) Show, has offered an excellent opportunity for wood products manufacturers to exhibit, to promote, and to sell their products to domestic and foreign buyers. In addition to the trade show, NEWPEX has

also presented a series of seminars on important topics such as: Exporting your product; Driving forces in the market for hardwood dimension parts and components; Government procurement; Legislative affairs; Sales and marketing; Market for the do-it-yourself hardwoods; Labor relations; how to use trade shows; Business plans; accounting for your business; and Wood Technology as it relates to manufacturing.

The Northeastern Forest Alliance (NEFA) has worked with the Coalition of Northeastern Governors Policy Research Center, Inc. (CONEG) to present two Waste Wood Fiber Pellet Conferences. These conferences were designed to bring together key people representing all aspects of wood fuel pellet manufacturing and use, including banking and economic development interests, and state government and industry representatives, to identify barriers and limitations which exist and hinder the full utilization of waste wood fiber.

Since 1993 the NEFA has attempted to educate wood product manufacturers about the use of trade shows, both foreign and domestic, to showcase and market their products. Wood product companies in cooperation with NEFA have displayed at the Interzum Wood Products Trade Show held in Cologne, Germany, Woodworkers Machinery and Furniture Supply Fair in Anaheim, California, and the International Woodworking Machinery and Furniture Supply Fair in Atlanta, GA.

56. The existing cooperative state / town forest fire control program should be continued and strengthened.

Existing programs have been continued and strengthened.

57. Conduct periodic surveys of the state for insect and disease problems, and signs of forest decline.

Within the Division of Forests and Lands, Forest Protection Bureau, a Forest Entomologist works in cooperation with other state and federal agencies to monitor insect and disease activities on forest land.

58. Improve the fire communications network by obtaining portable radios of the proper frequencies for Forest Rangers.

Portable radios and pagers have been purchased for Forest Rangers in order to improve their communications capabilities.

59. Continue the use of fire towers.

Fire towers continue to be used as part of the forest fire detection system supplemented by aerial surveillance.

60. Train local officials, such as Selectmen, Planning Board Members, and Conservation Commissions in forestry and forest laws.

Thru the Department of Revenue Administration, Office of State Planning, and the New Hampshire Association of Conservation Commissions significant progress has been made in training local officials. The use of Natural Resource Inventory Program and FLESA will supplement this training.

61. Encourage and support mutual aid.

Mutual aid has continued to receive support. The state continues to support the Northeastern Forest Fire Protection Commission.

64. Encourage Regional Planning Commissions to work with cities and towns in forestry and natural resources to develop an appreciation for the economic and social value of these resources.

The publications "The Forest Resource and Wood Using Industries of New Hampshire" and "The Economic Importance of the Northeast Forest" have been valuable tools to help increase understanding of the economic and social values of the state's forest resources. (see 54)

65. Improve Communications, Forest Interests. (Same as 60)

69. Encourage all organizations and individuals who operate trails to adopt the U.S. Forest Service or Appalachian Mountain Club trail design, construction, and maintenance criteria.

In 1994, the NH Department of Resources and Economic Development, Division of Parks and Recreation, Trail Bureau cooperated with many agencies and organizations in the production of the manual "Best Management Practices for Erosion Control During Trail Maintenance and Construction."

70. Provide public and private trails and strict enforcement for off-highway vehicle use.

The NH Department of Resources and Economic Development, Division of Parks and Recreation has a Trails Bureau with enforcement responsibilities for off-highway vehicle use.

There is a New Hampshire Trails Advisory Council.

74. Increase emphasis on deer yard management in the Department of Fish and Game.

New Hampshire Fish and Game Department has mapped a majority of the deer yards in the state and has had them placed on the GRANIT system.

Training of professional foresters in deer yard management has been provided by Fish and Game Department staff as well as UNH Cooperative Extension - Wildlife Specialist.

77. Non-game species, including endangered species of plants and animals, should be given more emphasis in current programs.

New Hampshire Fish and Game Department has established a Non-Game Program and hired a coordinator.

New Hampshire Department of Resources and Economic Development, Division of Forests and Lands has incorporated the Natural Heritage Inventory Program into its Forest Management Bureau. Stable long-term funding for the Natural Heritage Inventory Program has not been achieved.

The New Hampshire Forest Stewardship Committee includes a representative from The Nature Conservancy.

81. Atmospheric pollution and forest decline need aggressive investigation and publicity.

The U.S. Forest Service and several universities throughout New England continue to do research on atmospheric pollution and its effects on our forests.

82. Place more emphasis on the implementation of the Best Management Practices outlined in the state's 208 Plan to minimize erosion and sedimentation of the state's waters.

In 1990 a resource manual and a field guide "Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire" were produced.

Several workshops for foresters, loggers, and landowners have been held on Best Management Practices.

The Department of Environmental Services, Water Resources Division, Wetlands Board has incorporated the Best Management Practices into their rules and regulations. They have been very cooperative in developing a "Notification of Minimum Impact for Forestry Activities" that streamlined the permitting process.

83. Eliminate the overlap between RSA 483-A, "Fill and Dredge in Wetlands," and RSA 149:8-a, "Water Pollution and Disposal of Wastes," in the area of dredging, filling, and construction.

Guidelines have been more clearly defined so as to determine which RSA was applicable.

84. Reduce damage to residual trees during harvesting operations by intensified information programs and training.

Several workshops were held to cover damage to residual trees with biomass harvesting. Tree length logging required more care in skid trail layout than traditional operations.

86. Forest Planning for Regions. (Same as 64)

87. Forestry Publications for Planners. (Same as 64)

91. Continue to upgrade the Forest Nursery to provide adequate numbers of quality seedlings for forestry needs.

The State Forest Nursery located in Boscawen continues to operate.

93. Develop a coordinated program to improve financial information available to financial institutions, industries, and landowners.

The publications "The Forest Resource and Wood-Using Industries of New Hampshire," produced as a component of a USDA Forest Service grant "Expanding New Hampshire's Forest-Based Economic Development Opportunities" and "The Economic Importance of the Northeast Forest," produced by the Northeastern Forest Alliance (NEFA), have been valuable tools to help financial institutions, economic development groups, government agencies, communities, etc. to better understand the economic and social values of the state's forest resources. (See54)

102. Study the present structure of forest related laws .

In 1995 all New Hampshire Forestry Laws were recodified and are now in Chapter 227.

103. The Research Advisory Council should strive for research appropriate to New Hampshire's needs, and continue to communicate research results to users.

In 1992 the New Hampshire Natural Resource Network was established to address this issue.

104. Continue to Communicate Research Results to Users. (Same as 103)

Appendix B. Assessment Report Group Members

Human Assessment Group

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Jim McLaughlin, Office of State Planning
Don Merski, Boise-Cascade
Diane Schott, Society for the Protection of New Hampshire Forests
Mary Shriver, New Hampshire Wildlife Federation
Kirk Stone, Audubon Society of New Hampshire
John Twitchell, NH Parks & Recreation
Gail Vaillancourt, US Forest Service, State & Private Forestry
Gretchen Zeigler, NH Travel Council

Economic Assessment Group

Mildred Beach, NH Travel Council and NH state legislator
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Jamie Sayen, Northern Forest Forum
Kathryn Staley, White Mountain National Forest
Ellen Snyder, UNH Cooperative Extension
Tammara Van Ryn, Society for the Protection of New Hampshire Forests

Appendix C. List of Abbreviations

ASNH	Audubon Society of New Hampshire
CORD	Council on Resources and Development
CLMP	Cooperative Land Management Program
DES	Department of Environmental Services
DRA	Department of Revenue Administration
DRED	Department of Resources and Economic Development
DOT	Department of Transportation
ECOMAP	National Hierarchical Framework of Ecological Units
ELT	Ecological Landtype
FLESA	Forestland Evaluation and Site Assessment
FSSWT	Forest Sustainability Standards Work Team
GRANIT	Statewide Geographic Information System
GSD/SAF	Granite State Division of the Society of American Foresters
LCIP	Land Conservation Investment Program
LMAC	Lakes Management Advisory Committee
LTA	Landtype Association
NEFA	Northeast Forest Alliance
NFLC	Northern Forest Lands Council
NHACC	New Hampshire Association of Conservation Commissions
NHDA	New Hampshire Department of Agriculture
NH F&G	New Hampshire Department of Fish and Game
NH F&L	New Hampshire Division of Forests and Lands
NHNHI	New Hampshire Natural Heritage Inventory Program
NH P&R	New Hampshire Division of Parks and Recreation
NH SCOB	New Hampshire Scientific Committee on Biodiversity
NHTOA	New Hampshire Timberland Owners Association
NHWF	New Hampshire Wildlife Federation
NRCS	Natural Resource Conservation Service
MMBF	Million board feet
OSP	Office of State Planning
RC&D	Resource Conservation and Development
SBDC	Small Business Development Center
SLMT	State Lands Management Team
SPACE	Statewide Program of Action to Conserve our Environment
SPNHF	Society for the Protection of New Hampshire Forests
TNC	The Nature Conservancy
UNH	University of New Hampshire
UNH CSRC	University of New Hampshire Complex Systems Research Center
US F&W	United States Fish and Wildlife Service
USFS	United States Forest Service
WINGS	Wildlife in the Granite State
WMNF	White Mountain National Forest

Appendix C -- List of Abbreviations

Appendix D. Glossary

Biodiversity - the variety and variability of all living organisms

Community - a group of species that occur together in a particular habitat.

Community Type - a class of biological communities with definite species composition, consistent physical structure, and occupying a particular physical environment.

Ecosystem - a community (or group of communities) plus its physical surroundings, including atmosphere, soil, sunlight, and water.

Fragmentation - a process in which the area occupied by a community is reduced in area, subdivided into smaller units, or partitioned by barriers to movement.

Gene - a unit of genetic inheritance; that part of a chromosome coding for the production of a single protein.

Genetic diversity - the number of different genetic forms within a species or population.

Glaciation - the alteration of the land surface by the movement of glaciers.

Landscape - a mosaic of landforms, bedrock types, soils, and the biological communities they support.

Native - a species that occurs naturally in a particular area.

Riparian - along the banks of a river or stream.

Species - a group of organisms capable of interbreeding

Species diversity - a measure of the number of species within a prescribed area and their relative abundances.

Species richness - the number of species within a prescribed area.

Subspecies - a population that is so genetically distinct from other populations of the same species that it merits taxonomic recognition.

Succession - a gradual, directional change in the species composition of a community following a disturbance.

Sustainability - balancing the broad human and ecological needs of today without compromising the ability of future generations to meet their own needs.

Vernal pool - 1) an ephemeral body of water that fills in the spring, holds water for at least 10 days, and dries up by fall in some or all years. 2) a body of water without predatory fish in which certain indicator amphibians (e.g., spotted salamander) can breed.

