

AMMONOOSUC WATERSHED REGION CONSERVATION PLAN

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INTRODUCTION

The concept of developing a Conservation Plan for the Ammonoosuc Watershed Region stemmed from a pilot project conducted by the NH Ecological Reserve System Project, a program managed by UNH Cooperative Extension. The pilot project evaluated eight sites for ecological significance. These sites included public and private ownership. The next step was to take the results of the pilot project on individual properties and apply the principles and criteria to two New Hampshire watersheds.

The two watersheds selected for study included: a watershed with some urban land use – the Piscataguog River Watershed, and a Rural watershed – Ammonoosuc River Watershed. The project was funded by the United States Forest Service, State and Private Forestry. One of the critical factors in the success of obtaining these funds was the local support offered by the Piscataguog Watershed Association and the Ammonoosuc Conservation Trust, respectively.

The Ammonoosuc Watershed Region Conservation Plan began in earnest with two meetings of local residents, many of whom were active community members with scientific based backgrounds and interests.

To make this project as comprehensive as possible, a partnership of four organizations was developed; Ammonoosuc Conservation Trust (ACT), Watershed to Wildlife, Inc. (WTW), Society For the Protection of NH Forests (SPNHF), and University of New Hampshire Cooperative Extension (UNHCE).

SUMMARY DESCRIPTION OF PROJECT PARTNERS

Ammonoosuc Conservation Trust (ACT)

The Ammonoosuc Conservation Trust is the North Country's first locally based, grassroots land trust. ACT was founded in 1999 by a group of neighbors who shared a concern about the rapid loss of open lands in the western White Mountains. After successfully raising the funds to purchase a local property slated for subdivision, the group decided there was a need in the larger community for an institution that could assist in further protection of open lands in the area. They incorporated ACT with the State of New Hampshire and obtained tax-exempt status from the IRS. ACT is a completely volunteer, membership-based organization. ACT is a co-recipient of the grant for this project.

Watershed to Wildlife, Inc. (WTW)

Watershed to Wildlife, Inc. is a natural resource company formally incorporated on January 2, 2001. Both principals quickly recognized that a blending of differing educational and hands-on experiences, with a large amount of combined fieldwork, offered a uniquely comprehensive natural resources background. Watershed to Wildlife, Inc. strives to provide comprehensive land management and educational services to public and private landowners and institutions. Their mission is to help landowners maintain the integrity of ecosystems while still achieving land management goals; as well as to promote an understanding of wetland and wildlife ecology, environmental impact, sustainable yield, and adaptive management for short and long term planning. WTW was contracted to write the Conservation Plan for this project.

Society for the Protection of New Hampshire Forests (SPNHF)

Founded by a handful of concerned citizens in 1901, The Society for the Protection of New Hampshire Forests is now one of the country's most effective statewide land conservation organizations. As a nonprofit membership organization, the Forest Society is dedicated to protecting the state's most important landscapes while promoting the wise use of its renewable natural resources.

The Forest Society also provides assistance to land trusts, municipalities, state and federal agencies, and other conservation organizations to protect additional land throughout the state. The SPNHF was contracted to produce the GIS maps for this project.

University of New Hampshire Cooperative Extension (UNHCE)

The University of New Hampshire Cooperative Extension provides NH citizens with research-based education and information, enhancing their ability to make informed decisions that strengthen youth, families and communities, sustain natural resources, and improve the economy.

As a University outreach program, they have a network of professional Extension staff located in all 10 NH counties. Their staff works with local volunteers and specialists on the UNH campus to design and conduct educational programs that meet societal, environmental and economic needs. While many of their programs are conducted locally, they also use current communications technology including computer networking and interactive television. As part of the national land-grant university system, they also access the knowledge and expertise of other state land-grant universities throughout the U.S.

Cooperative Extension derives its name from the partnership structure which combines federal, state and county funding. This 'cooperative' effort ensures all people have local access to their state university and the knowledge and resources available to address needs and problems. The principal partner is the University of New Hampshire. As a state land-grant university it is charged by Congress to conduct resident instruction, research, and outreach to people beyond the classroom. UNHCE is a co-recipient and managed the grant for this project.

REGIONAL CONSERVATION STATUS

The conservation of land in the Ammonoosuc region has a long history. Much of the conservation movement was a reaction to the results of extensive logging in the last two decades of the nineteenth century.

The Federal Government is responsible for protecting the greatest portion of conserved land in the region. The 1911 passage of the Weeks Act gave the federal government the power to purchase lands in order to protect the flow of navigable rivers. The Clarke-McNary Act of 1924 authorized the federal government to acquire land in the watersheds of these streams for timber production. These two laws provided the basis for the creation and expansion of the White Mountain National Forest.

The State of New Hampshire protects land through the state parks program and land purchases by the Fish and Game Department.



View of Echo Lake from Artist's Bluff in Franconia Notch State Park
(Photo by Dartmouth College)

Municipalities protect land in the region through town forests, parks, and water supply protection areas.

Private conservation organizations have also been active in the region. The most successful is the Society for the Protection of New Hampshire Forests. The Forest Society was founded in 1901 and has become a major force for the conservation of New Hampshire land. The New England Forestry Foundation (1944) is a New England-wide organization that is responsible for land protection in the region. There are two organizations within the area that are responsible for land protection, the Ammonoosuc Conservation Trust (ACT) and the Upper Valley Land Trust. The latter's area of interest is centered on the Upper Valley of the Connecticut River and covers both New Hampshire and Vermont sides of the river. Its "territory" extends into the Ammonoosuc Region in the Towns of Haverhill and Bath, while ACT's "territory" is the area of this project.

Two principal conservation mechanisms are employed in the region, out-right ownership and conservation easements. Under the first, conservation organization (private or public) purchases the land from a willing seller and simply owns it. Under that arrangement, the organization owns the land and has complete control over it. The terms of the deed or other mechanisms may be appropriate to assure that the land will remain protected in the future. A conservation easement is a legally binding restriction on the activities that can occur on a specific parcel of land. The easement allows the organization holding the easement to enforce the terms of use defined, while the ownership of the land remains with the granting owner or those to whom the land is given or sold. The owner can continue to use and profit from the land for the uses defined in the easement, generally agriculture and forestry.

GOALS AND OBJECTIVES

The intent of this conservation plan is to identify ecologically significant areas, and guide management and human use in these areas.

The primary goal of this project is to develop and begin to implement a conservation plan for the Ammonoosuc River Watershed Region with participation from the communities throughout the watershed region. The objectives for this conservation plan are the following:

1. To conserve biological diversity using science-based criteria in setting conservation and management priorities.
2. To enhance the capacity of New Hampshire's land conservation community to include ecological criteria when setting conservation priorities.
3. To identify and protect areas of ecological significance in concert with conserving lands for wood products, drinking water, and rural character.
4. To guide landowners in protecting biodiversity through forest stewardship planning.

THE CONSERVATION PLAN AREA

The area covered by the conservation plan is defined as the watershed of the Ammonoosuc River, the tributaries of the Connecticut River in Dalton, Littleton, Monroe, and Bath, and portions of the Johns River watershed. The actual boundaries of the area are shown on the various maps developed for the plan (Please refer to the Maps Section of this report) and are described below. The area covers several towns and unincorporated places or portions thereof. Appendix B includes 2 tables describing the area. They are:

- Table 1 shows the towns and unincorporated places that are either totally or partially in the study area with the total acreage of the jurisdiction, the area of the jurisdiction within the plan area, and the amount of land currently under conservation protection within each. The total conservation plan area (the watersheds) covers just under 350 thousand acres, of which almost 108 thousand acres are currently under conservation. In this table a place type of "T" indicates an incorporated town and a "U" indicates an unincorporated place.
- Table 2 is a subset of all the towns in Table 1 with some basic measures of population and housing to provide an overview of the location of human activity in the conservation plan area.

METHODOLOGY

A set of natural resources inventory maps, together with input from the communities, was used as the basis for identifying priority conservation areas. The data used to compile the maps came from several sources, described below.

Map Data Sources

- The New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) - the State's database for use with geographic information systems
- Complex Systems Research Center (CSRC)
- New Hampshire Department of Environmental Services (NH-DES)
- United States Geological Survey USGS
- U.S. Fish and Wildlife Service - National Wetland Inventory (NWI)
- Natural Resource Conservation Service (NRCS) – Soil mapping
- NH Department of Transportation (NH DOT)
- Office of Energy and Planning (OEP)

Geographic Information System (GIS) Compilation and Analysis was performed by The Society for the Protection of NH Forests (SPNHF). All existing data sets were compiled and overlain in various scenarios, displayed in a series of five maps. One product of these overlays and analyses is a co-occurrence map, where SPNHF used a standard ranking system of weighted values. These maps are described below and are the:

1. Base map with conservation lands,
2. Aerial photography map,
3. Unfragmented lands map
4. Water resources map, and
5. Natural resource factor co-occurrence map

The Base Map with Conservation Lands

The base map shows the area covered by the conservation plan, composed of the Ammonoosuc River watershed, the portions of the Johns River watershed in the towns of Whitefield and Dalton, and the Littleton Tributaries of the Connecticut River. The principal towns covered are Carroll, Dalton, and Whitefield in Coos County; and Bethlehem, Littleton, Franconia, Easton, Landaff, Sugar Hill, Lyman, Monroe, Lisbon, Bath, and Haverhill in Grafton County.

The base map is composed of a number of features or layers:

- watershed and sub-watershed areas
- town boundaries
- contour lines (elevation)
- rivers and streams
- lakes and ponds
- highways, streets, and roads
- railroads
- airports
- power transmission lines
- land under conservation

The purpose of this map is to display the basic underlying physical features, boundaries of the study area and component towns, transport infrastructure, and currently conserved lands. For the purposes of the conservation plan, the significant layer is the currently conserved land. As of spring 2004, just less than 108,000 acres was under conservation or about 30.4 percent of the total study area.

The conserved land in the study area is protected by a number of organizations and by a number of different legal mechanisms. By far the largest block is owned by the federal government as National Forest; followed by the State of New Hampshire park lands; lands protected by the Society for the Protection of New Hampshire Forests; conservation easements with private landowners; town owned lands; and other conservation organizations.

Aerial Photography Map

The aerial photography map contains the same layers as the base map but these layers are displayed over the aerial photography image, known as Digital Orthophoto Quadrangles (DOQs), of the region. The aerial photography shows the general land cover of the region. Forests, some wetlands, fields and generally built up areas can be distinguished. Additionally, the contour interval for this map is 20 meters (65.6 feet) and is taken from 100,000 scale data. The aerial photography has been taken at two dates. As noted on the map, the area closest to the Connecticut River comes from 1998 photographs and the rest of the area was taken in 1992. Thus the data from the photography is somewhat dated but is the most recent available from the GRANIT system at the time of the maps were developed.

Unfragmented Lands Map

Unfragmented lands provide the extensive areas of undeveloped land that is essential for large animal habitat. The unfragmented lands map shows those areas where there is no development, specifically no houses or active roads. The areas of unfragmented lands are those outside a five hundred foot buffer from all active roads. The active roads are taken from the NH Department of Transportation data that includes all roads down to and including Class 6 roads. In a few cases field data was incorporated for some Class 6 roads that are no longer maintained by the town. One example is a stretch of the road between Landaff and Sugar Hill and a section of the Merrill Mountain Road in Landaff. These abandoned roads were not considered as separators of unfragmented areas.

The area has some very large unfragmented areas that are partially in the watershed area on the southern boundary that are part of the National Forest. The largest of these is Bethlehem and Franconia at just under 150 thousand acres, covering a large portion of the Pemigewasset Wilderness. The study area holds some other large blocks of un-fragmented land totally within the plan area; 19,600 acres in Easton, Landaff, and Sugar Hill, a significant portion of which is under protection in the National Forest. A block of 12,500 acres in Bethlehem and Carroll which is coming under some development pressure, a block of 10,000 acres in Monroe, Littleton, and Lyman, and 7,600 acres in Bath and Monroe. There are a substantial number of un-fragmented areas in the 1,000 to 2,000 acre range though out the area. The southern edge of the study area includes portions of major large un-fragmented areas (over 25,000) that are part of the White Mountain Forest. The fact that a particular un-fragmented area covers multiple towns means that the conservation of the areas will require some cooperation between towns to determine if they should be conserved and the means of conserving them.

Summary of Unfragmented Area				
Size Class - Acres	Gross Acres	Watershed Region Acres	Conserved Acres in Watershed Region	Percent Conserved
1,000 to 5,000	90,278.00	82,055.52	7,569.65	9.2
5,000 to 10,000	19,695.00	18,387.91	1,347.91	7.3
Over 10,000	176,532.00	133,750.09	86,391.58	64.6
Rest of land area	NA	120,534.83	12,464.33	10.3
Total		354,728.35	107,773.47	30.4

Water Resources Map

The water resources map shows those features that are important as sources for water supply and important for wildlife habitat. The water supply features are:

- municipal supply wells with their sanitary radii
- well head protection areas
- potentially favorable gravel well areas
- stratified drift aquifer areas

The riparian zones (shoreland areas) along streams and rivers offer significant wildlife habitat for fish, amphibians, reptiles, birds, mammals, and wetland plants. Wetland and riparian zones features have been defined at two levels:

- the buffer 300 feet back from rivers, stream, ponds, and wetlands,
- the buffer from 300 to 1000 feet from those features, and
- lands in the National Wetlands inventory

The map presents a table of the acreages for each of these resources showing the total area covered and the area currently under conservation. The proportion of these resources currently under protection ranges from one half for Sanitary Radii, though 30 percent for Favorable Gravel Well areas and Riparian Buffers, to around 15 percent for the stratified drift aquifers and National Wetland Inventory layers.

Natural Resource Factor Co-occurrence Map

One of the central issues for a conservation plan is to identify the specific areas in the region that have the highest priority for conservation. A number of different resources have been identified as being critical habitat for wildlife habitat, plus important for water supply, and other resources judged to be worthy of protection from development. The selection of these features is based on scientific knowledge of habitat required by wildlife, and other resources judged have significant conservation values for water supply, agriculture and forestry, as well as resources to preserve the character of the region; using the data available from GRANIT. Individual towns or agencies may well consider other features as important

for conservation. The current mapping program methodologies provide a framework for including those features in the future.

The natural resource factor co-occurrence map is a means of combining the individual natural resource features. Conceptually each of the features is located on a separate transparent map and then these maps are overlaid, so that the locations with more co-located occurrences of the separate factors appear darker than those locations with fewer occurrences. This was once accomplished with actual transparent overlays, but with the development of computer mapping, a summary map can be generated showing the locations where different numbers of factors are co-located. The co-occurrence map presents these locations by color ranging from light pink to dark brown, where the darker the color, the greater the number of factors exist; that is the greatest co-occurrence of conservation factors.

The co-occurrence model applies weights to each factor and sums the weighted score to derive the total co-occurrence value. The weights are based on judgments as to the importance of each factor and specific weights are applied to ranges of values for some factors. For example, weights are applied to the unfragmented areas based on the size of the area, with the highest score given to the largest areas. The factors and their weights are shown in the following table.

Table of Co-occurrence Model Factors and Weights	
Factor	Weight
Habitat Sub-model Features	
Unfragmented Land Areas	
1,000 – 5,000 acres	1
5,000 – 10,000 acres	2
> 10,000 acres	3
National Wetlands Inventory	
Non-emergent Wetlands	1
Emergent Wetlands	1
Undisturbed Riparian Zones	
0 – 300 Foot Buffer	2
300 – 1,000 Foot Buffer	1
Natural Land Cover Areas	1
Agricultural Lands / Other Open	1
Rare or Unique Habitats	
Alpine	1
Ledges	1
Tundra	1
Steep Slopes > 25%	1
S, SE, SW Slopes > 10%	1
Drinking Water Resource Sub-Model Factors	
Stratified Drift Aquifers	1
Potentially Favorable Gravel Well Areas	1
Source Water Protection Areas	1
Sanitary Radii	1
Soil Factors	

Factor	Weight
Hydric Soils	1
Prime Agricultural Soils	1
Soils of Statewide Importance	1

The maximum possible score would be 18 points, since some of the categories are mutually exclusive. (For example, an unfragmented area can only be in one size class, only one riparian buffer can apply, wetlands are either emergent or non-emergent.) The maximum score actually occurring is 11. Since the weights are based on judgment, the co-occurrence scores are sensitive to the selected weights. However, as the individual weights change, the total score would also change, so that the relative score within the total would not be affected as much. Individual towns or organizations may chose different weights per natural resources viewed as most important to them.

Identification of Significant Areas for Conservation

Based on the GIS co-occurrence mapping, 6 areas were identified as significant and relatively more important for conservation. Simply stated, the largest complexes of 'darker' colors derived from the co-occurrence analysis received priority over smaller, 'lighter' colored areas. The factors used are listed in the table under the 'Natural Resources Factor Co-occurrence Map' section above. The combination of multiple natural resources occurring in areas of large unfragmented areas are the dominate factors in this methodology.

The second and equally important criterion for identifying areas of significance was input from participants in two public meetings. These meeting were held in September, 2004, in two towns on consecutive dates; one in Sugar Hill and one in Bethlehem. Both meetings were moderately well attended and provided valuable discussion and questions.

It is important to note that individual towns and sub-watershed groups may want to further investigate and identify features within these six areas that are important locally. Verification and further detail from fieldwork may be necessary to accomplish this, especially at a parcel-based level.

LIMITATIONS OF THE DATA

The following table shows which data layers were used, their scale, and the National Mapping Standard accuracy measure (Refer to Appendix D). Since many decisions are based on parcels as they relate to rivers, roads, trails, ponds, wetlands and other features, it is important to point out the working accuracies of these data sources. Combining these sources in various overlays provides an excellent overview and planning tool, but does not replace the need to perform site-specific investigations for many developmental requests. Please refer to the table below to better understand some of these accuracy issues.

Accuracies of Existing Maps

Data	Source	Ratio	Scale	National Mapping Standard Accuracy
1992 and 1998 DOQ	GRANIT	1:5,000	1" = 416.7'	Acceptable accuracy within 12.48 feet
Topographic Contour Intervals	GRANIT	Contour Intervals = 65.7'	1" = 8,333'	Acceptable accuracy within 33 feet
Roads and Trails, Power Lines, Railroads, Hydrology, Conservation lands, NH-NHB Data	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Source Water, Stratified Drift Aquifers, Drinking Water, Potential...	NH-DES - Water Division	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Soils – hydric, and agricultural	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
National Wetland Inventory	U.S. Fish and Wildlife Service	1:100,000	1" = 8,333'	Acceptable accuracy within 250 feet
Profile of Ammonoosuc River – vertical data	USGS Topo map	Contour intervals = 20'	1" = 2,000'	Acceptable accuracy within 10 feet

Based on the objectives of this project as well as limited funding, no field work verification was performed. Recommendations in this report are based exclusively on input from the public meetings and the mapping work completed. Although a good tool for overview and large scale conservation planning within the area, field work verification may be necessary to improve the accuracy of the data.

Despite known mapping inaccuracies and lack of field work, information derived from this project provides an important tool to highlight areas to focus future work and develop conservation strategies in those areas. It is anticipated that this project will be an ongoing, dynamic, and evolving process. Future field work and updated GIS mapping layers will offer increased accuracy for future decisions. Past, present and future input from the towns and public in the Ammonoosuc Watershed Region will also be critical to aid in strengthening the data from this study.

POLICIES, REGULATIONS AND DOCUMENTS THAT SUPPORT CONSERVATION WITHIN THIS PROJECT AREA

- Master Plans – Most towns have a Master Plan, though many need updating
- Local Planning Regulations and zoning regulations – may need ordinances directed toward natural resources and conservation
- Regional Plan – Updated every five years by the Regional Planning Commission
- Town-wide Natural Resource Inventories – (Numerous towns have, or are currently conducting, natural resource inventories)
- Comprehensive Shoreland Protection Act
- Total Maximum Daily Load (TMDL) Program
- Groundwater Withdrawal Rules
- Instream Flow Protection
- EPA Wetland Regulations
- Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire
- Connecticut River Joint Commission – ‘Riparian Buffers’ and several guidebooks
- Ammonoosuc Corridor Study

For additional documents, resources, and guides please refer to the *Literature and Resource* section of this plan.

AREAS HIGHLIGHTED FOR CONSERVATION STRATEGIES THROUGHOUT THE AMMONOOSUC RIVER WATERSHED REGION

Based on mapping work with co-occurrence analyses, we identified 6 areas for additional work and development of conservation strategies. They are:

1. White Mountain National Forest Area
 - a. Headwaters of the Ammonoosuc River Area
 - b. Middle Ammonoosuc River and Northern Branch of the Gale River Area
 - c. Upper Wild Ammonoosuc River Area
2. Richardson Pond, Upper Johns River Headwaters Area
3. Chandler Pond, Ham Branch (Gale River), Pearl Lake Area
4. Comerford Dam Reservoir and McIndoe Falls Area
5. Alder Brook, Forest Lake, Burns Pond, Chase Bog, Lower Johns River Area
6. Connecticut River, Lower Ammonoosuc River Prime Agricultural Lands Area

These areas were chosen based on their size and multiple co-occurrences. They are listed from largest to smallest area in acres. Conservation strategy recommendations for each section will be described in more detail in the sections titled *Ammonoosuc River Watershed Region-Wide Recommendations* and the *Action Plans* for implementing these

recommendations. Refer the *MAPS* section of this report for overview maps of the six areas. Each of the six areas is described below.

Area 1: White Mountain National Forest Area

General description: The White Mountain National Forest area is the largest area identified from the co-occurrence analysis (approximately 108,000 acres). This large area makes up approximately one third of the Ammonoosuc Watershed Region and is located along the entire southeastern portion of the study. It is largely made up of steep slopes and mountains. The area also contains the headwaters and dividing topography for numerous sub-watersheds. Fragmentation of this area, into roughly two equal sections, occurs due to Interstate Highway I-93 which runs in a northeast-southwest direction through the entire project area. In addition, Franconia State Park and Crawford State Park link larger WMNF tracts. Other public roads further the divide this area to lesser degrees. A further breakdown of this area is described in three sub-areas that follow.

This region was identified as a significant conservation area of interest due to its large contiguous unfragmented nature. Because it is already classified as protected conservation land, many of the parameters applicable to other identified areas of this project do not apply to the WMNF area. The WMNF area includes three sub-areas described below.

Sub-Area 1A: Headwaters of the Ammonoosuc River Area

Description: The Ammonoosuc River begins in the alpine zone of the Presidential Range in the White Mountains at an elevation of 5,018 feet above sea level. It is part of the Upper Ammonoosuc River sub-watershed, and includes the unincorporated places of Thompson and Meserve, Chandlers Purchase, Crawfords Purchase, and Low and Burbanks. Route 302 heading over Crawford Notch is the only major road crossing through this region. This area is one of three sub-areas of the larger White Mountain National Forest and is approximately 24,000 acres.

Natural Resource Features: This unique area has steep slopes, fragile soils, alpine and subalpine zones. The New Hampshire Natural Heritage Bureau (NH-NHB) has listed several rare plants and animals, and exemplary natural communities throughout these unincorporated regions; the most common being New England alpine community, New England subalpine heath/krummolz community, and Northern New England high elevation spruce-fir forest. Lake of the Clouds is one of the sources of the Ammonoosuc River and is classified as a New England alpine/subalpine pond. See Appendix D for a list of NH-NHB data for the Ammonoosuc River Watershed Region.

Another unique feature for this area is the steepness of slope. From the Lake of the Clouds to the Crawfords Purchase/Town of Carroll line, the river drops from 5,018 feet in elevation to 1,640 feet over approximately 7 miles of river flow (nearly 10% average drop in slope). The slopes are much steeper at the headwaters.



Ammonoosuc River headwaters below Lake of the Clouds (Photo by Bob Ribokas)

Recommended Conservation Strategies: Fortunately, nearly all of this area is part of the White Mountain National Forest. In addition, a State Park along Route 302 (Crawford Notch State Park) conserves the southern part of the region. Because the area is already protected both federally and by the State, there are no recommended conservation strategies for the area. As the White Mountain National Forest updates their Forest Management strategies for the area, it should continue to be sensitive to the fragile alpine and subalpine environments and the many rare plant and animal species that live in these areas. In addition, it is assumed that future management planning will accommodate the highly erosive potential of the headwaters as they flow out of the Presidential Range.

Towns throughout the Ammonoosuc River Watershed Region should take active roles in working with the U.S. Forest Service when they update the Forest Management Plan for the White Mountain National Forest. This will benefit both parties as Forest Management plans evolve over time.

Sub-Area 1B: Middle Ammonoosuc River and Northern Branch of the Gale River Area

Description: This area includes a portion of the Middle Ammonoosuc River sub-watershed, almost the entire Northern Branch Gale River sub-watershed, and a portion of the Meadow Brook/Middle Tributaries sub-watershed. This area encompasses a small portion of the town of Carroll, the southeastern end of the town of Bethlehem, and a large portion of the Town of Franconia. This area also includes Franconia Notch State Park which links two larger tracts of the WMNF. The area is approximately 49,000 acres in size.

Natural Resource Features: Steep slopes and rock outcrops are common features throughout this area. Several community types are classified by the NH Natural Heritage Bureau as Northern New England acidic communities occurring on

predominately rocky conditions. This is also true in many instances in the water regime with acidic fens and swamps.

The peregrine falcon (*Falco peregrinus anatum*) is an excellent example of one of the state endangered species found in this area. Another is the Jack Pine (*Pinus banksiana*) listed as a species of High Importance in the State of NH.



Peregrine falcon in Franconia Notch State Park. Photo by Chris Martin.

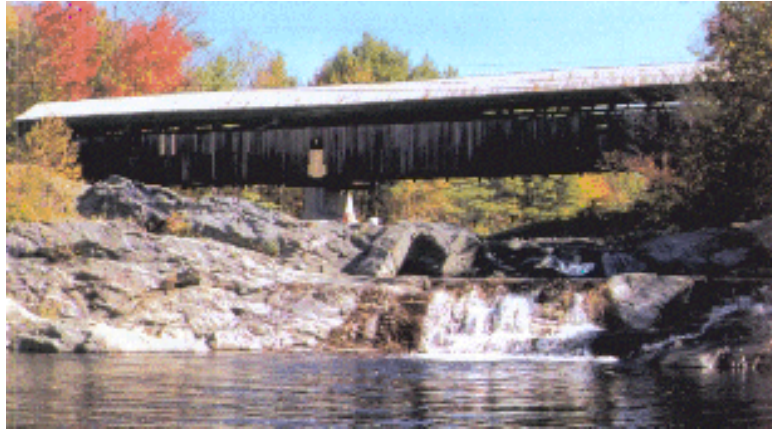
The value of recreational use is highlighted in this area by several natural landscape forms such as the Indian Head and, until recently, the ‘Old Man of the Mountain’. This area also contains miles of hiking trails, scenic views, the Tramway up Cannon Mountain, the Cannon Mountain and Mittersill Ski Slopes, an asphalt bike path, and a public campground, further offering unique natural resource-based tourist attractions.

The Gale River is used by the Town of Littleton as a main source of drinking water which also serves portions of Bethlehem. There are numerous private wells and transient drinking water systems throughout this area. In general pristine conditions exist here.

Recommended Conservation Strategies: Given the fact that this entire area is currently under WMNF or State ownership, there is little additional effort needed to conserve this area. It seems prudent that conservation efforts focus on other identified significant areas that are not currently conserved.

Sub-Area 1C: Upper Wild Ammonoosuc River Area

Description: The Upper Wild Ammonoosuc River area is a sub-watershed of the Ammonoosuc River Watershed. The towns of Benton and Easton make up most of this area with parts of Lincoln and Woodstock along the eastern portion. It is bisected by Routes 118 and 112. This area is the third of three sub-regions of the larger White Mountain National Forest and is approximately 35,000 acres.



Wild Ammonoosuc River in Bath (Photo from www.alder.stonemarche.org)

Natural Resource Features: As with the other two sub-areas, the Upper Wild Ammonoosuc has steep slopes, fragile soils, and alpine and subalpine zones. It covers vegetation communities ranging from New England alpine and subalpine communities to temperate hardwood and softwood communities. The elevations range from 4,800 feet to 1,100 feet above sea level. As with other portions of the White Mountain national forest, elevation drop and the large amounts of spring runoff and storm water flows have the potential to cause a great deal of erosion. In fact, NH-NHB data for the Town of Benton lists a Northern New England high-energy riverbank community as one of its exemplary communities (see Appendix D). The cliffs along these steep slopes provide habitat for peregrine falcons (*Falco peregrinus anatum*). These raptors are listed on the NH-NHB data base for the Town of Benton.

The wetland communities throughout this area increase the diversity for wildlife species. Data from the National Wetland Inventory show a diversity of wetlands including open water, emergent, scrub shrub, and forested. Wetlands are the core of life for many plant and animal species and offer diverse habitats with numerous ‘edges’ needed by many species. Current and future trails and observation points overlooking these wetlands provide excellent opportunity for wildlife viewing. Although most of these wetlands are found in the lower elevations where the topography has flattened out, there are a few higher elevation wetlands such as the New England alpine/subalpine bog found in Benton.

Recommended Conservation Strategies: As with the above two areas, this area is conserved by the White Mountain National Forest. One critical advantage of this is the protection of riparian habitat along the headwaters and riparian areas of the Wild Ammonoosuc and Ham Branch (Gale) Rivers. Although it will remain a working and multi-use forest, the WMNF will continue to manage the forest to ensure ecological integrity and diversity throughout the region into the future.

Town officials and residents of Easton, Landaff, and Benton should take active roles in working with the U.S. Forest Service when they update the Forest Management Plan for the White Mountain National Forest. This will benefit everyone in the area as Forest Management plans evolve over time.

Area 2: Richardson Pond, Upper Johns River Headwaters Area

Description: The Richardson Pond, Upper Johns River Headwaters area contains large acreage of wetlands and riparian buffer zones as well as a relatively large area of unfragmented land. It is approximately 20,000 acres in size. This area contains a small northern portion of the Middle Ammonoosuc River sub-watershed, a large portion of the Forest Lake/Bog Brook sub-watershed, a portion of the upper Johns River sub-watershed, and a small northeastern portion of the Lower Ammonoosuc sub-watershed. Towns within this area include Jefferson, Whitefield, Carroll, and Bethlehem. Topography is moderate to gentle sloping.

This area is fragmented by US Rte. 3 for a relatively short distance, approximately two miles, one Town of Whitefield road, and some currently used railroad tracks. Overall, this area is primarily unfragmented.

Natural Resource Features: This area contains good diversity in community types with a range of acidic to calcareous seeps and numerous wetland-based community types. It is largely forested in differing stages of succession due to logging and past agricultural practices.

This area offers a comparatively long narrow riparian complex of slow moving waters, significantly impacted by beaver activities. GIS data that identifies this area as a significant conservation area is supported from previous field studies conducted (Towns of Dalton and Whitefield Natural Resource Inventories, Johns River Conservation Group Study of the Johns River), verifying that the area is rich in wildlife and plant species, both in diversity and density. Connectivity of habitats along these long corridors further supports larger wildlife species in this area. Furthermore, the linkage of this large area with the Pondicherry Wildlife Refuge, currently containing over 5,000 acres of protected land, highlights the need to conserve it as a complete complex.

Within this area lies a large stratified drift aquifer, a portion of which is classified as having favorable gravel well potential, and a public drinking water well. In conjunction with extensive riparian zones and wetlands, the water resources are valuable for both wildlife and humans. The potential for development of a large public drinking water source is high and suggests a need for conservation of this area.

A rather unique feature is the amount of permanent habitat openings. There are three large hayfields: one along Rte. 3 at the northern end of the area – the Lufkin/Bean farm; one along Rte. 3 (both sides of the road) for part of the two mile fragmentation stretch - the Livingston flats; and a third abutting the Pondicherry Refuge- the White Mountain Airport/Hazen Pond. All three hayfield areas are in conservation easements.



View of one productive hayfield located in Dalton, NH

Recommended Conservation Strategies: Based on the analysis of this area, the following recommendations and options are available:

- Given the fact that a large portion of this area is in private land ownership, landowner education, outreach, and direct communication with key landowners may be the best approach to conserving this area. A demonstration of how linkages of individual parcels form connectivity and wildlife corridors should provide an overview of how important it is to maintain the relatively unfragmented conditions that exist in this area. Public education would be another useful tool to use here.
- Outright purchase may be an option for some parcels with willing sellers and should be explored. Partnering with the U.S. Fish and Wildlife Service may be an option in a continuation of expansion and connection of additional parcels and wetland complexes to the Pondicherry Refuge.
- Assistance in developing and implementing conservation easements may be an option acceptable to some landowners.
- Additional verification of refined wetland data would also be useful for the Planning Boards in this area, especially if combined with a wildlife study pertaining to corridors and connectivity.

Area 3: Chandler Pond, Ham Branch (Gale River), Pearl Lake Area

Description: This area contains portions of the Pearl Lake/Mill Brook, Ham Branch, and Salmon Hole Brook sub-watersheds along with parts of the towns of Easton, Landaff, Franconia, and Sugar Hill. Although a few public roads run through this area, the main road bisecting it is Route 118, through Franconia and Easton. This area is approximately 26,000 acres.

Natural Resource Features: This area was selected because of its size, proximity to the WMNF and potential linkage as a wildlife travel corridor, and the combination of natural resource features which increase the biodiversity of the watershed. In particular the combination of undisturbed riparian habitat, wetlands, stratified drift aquifers, and unfragmented (roadless) features, made this area stand out in the co-occurrence analysis.

Because there are relatively fewer roads in the area, it follows that there will be more habitat and travel corridors for wildlife, including those along riparian habitat. Riparian habitat and buffers are the most effective protection for the water resources throughout the Ammonoosuc River Watershed Region. These strips of herbaceous vegetation, shrubs, and trees along the banks of rivers and streams benefit the watershed by:

- Slowing runoff and allowing it to soak into the ground, recharging wells and reducing flooding
- Reducing erosion with roots that help hold the soil
- Filtering of surface and subsurface runoff, which could carry pollutants
- Providing habitat, cover, and travel corridors for a variety of wildlife species
- Creating shaded areas, cover, and reducing water temperatures; beneficial to native and stocked fish species
- Reducing sedimentation into the river/stream

Wetlands are critical for many species of wildlife. There are several types of wetlands throughout this area; most of them are associated with riparian habitat. Based on the aerial photograph of the area, many of these wetlands have been enhanced by beaver activities. The creating of beaver ponds throughout the area is a further attractant to many other wildlife species.



Typical beaver pond found throughout the Ammonoosuc River Watershed Region

There are three types of groundwater aquifers: Stratified-drift; till; and bedrock. The basic difference between them is that stratified drift and till aquifers are composed of unconsolidated glacial deposits (loose earth materials), while bedrock aquifers are within solid rock. In stratified drift aquifers, the materials are sorted sand and gravel. In till aquifers, the material is a gravel, sand, silt and clay mixture. In bedrock aquifers, the rock is fractured. Wells used by communities and private landowners draw groundwater from aquifers. The stratified-drift aquifers represent the greatest potential groundwater source for the Ammonoosuc River Watershed Region. These aquifers represent potential usable water sources for municipal purposes and should be protected to insure their future quality and availability.

In this particular area, there are some large aquifers along the Ham Branch of the Gale River in the towns of Franconia and Easton.

The overlap of undisturbed riparian habitat, wetlands and stratified drift aquifers created very diverse and unique habitat worthy of conservation strategies.

Recommendations for Conservation Strategies: Based on the analysis of this area, the following recommendations and options are available to the Towns of Easton, Landaff, Franconia, and Sugar Hill.

- Purchase of areas within this region to be maintained for conservation and working forest.

- Work with willing landowners to place relevant parts of their property into permanent conservation easements restricting development. Work with local, regional or statewide land conservation trusts such as Ammonoosuc Conservation Trust, New England Forestry Foundation, the Upper Valley Land Trust, or the Society for the Protection of NH Forests.
- Consider Prime Wetland Designation for towns where wetlands, undisturbed riparian habitat, and/or stratified drift aquifers co-occur.
- Develop an education and outreach program for landowners to raise their awareness about the importance of conservation, impacts of development and available conservation options.

Area 4: Comerford Dam Reservoir and McIndoe Falls Area

Description: This area is in portions of five sub-watersheds: the southwest portion of the Comerford Dam sub-watershed, the entire southern portion of the McIndoe Falls sub-watershed, the northern end of the Bath Tributaries sub-watershed, the northwest portion of the Petty Brook/Woodsville Tributaries sub-watershed, and the west-leg of the Ogontz Brook sub-watershed. It is approximately 12,000 acres.

The area is mostly comprised of Hunt Mountain and The Gardner Mountain range located in the towns of Monroe and Lyman, with a small section in southern Littleton. The area is also defined by the rolling hills, mountains, and slopes located southeast along the Coppermine Road, the east side of Rte. 135 in Monroe and south Littleton, the west side of the Under the Mountain Road in Lyman, and along the north side of the Hunt Road in Lyman and Monroe.

In addition, there are two roads that partially fragment this area, both on the Connecticut River side off Rte. 135 in Monroe, the Smutty Hollow Road and the Carter Brook Road.

The area is the headwaters of several drainages forming brooks that flow either to the west into the Connecticut River, or to the east eventually into the Ammonoosuc River. There are also two identified ponds in the area, Upper Mountain Pond located in Monroe and Lower Mountain Pond located in Lyman.

Natural Resource Features: This area has a large sloping face with southeastern exposure offering extended sunlight and warmth that may benefit many plant and animal species, particularly those in the northern limits of their ranges. This combined with abundant water resources, good vegetative cover, and a large block of unfragmented land, provides unique habitat for numerous species.

Natural Heritage Bureau data documents several calcareous seep community types with associated species that favor ‘sweeter’ soils (those higher in pH than acidic) in both Monroe and Lyman. Some indicator species of these conditions are ginseng (*Panax quinquefolius*), large yellow lady’s-slipper (*Cypripedium bupescens*), and showy Lady’s-slipper (*Cypripedium reginae*). Another outcome of these ‘sweeter’ soils may allow the assumption that some surface waters and drainages would record higher pH readings as well.

Due to past historic mining practices, caves exist in this area that offer unique denning and hibernating habitat for some wildlife species. Data from the NHB indicates a bat hibernaculum in at least one of the abandoned mines in this area. A further interesting note is that this area is part of the Ammonoosuc Gold Fields (circa 1851), extensive mineral deposits that have reportedly never been successfully mined.

A large transmission line runs north/south through this area providing permanent opening habitat and associated edge habitat broadening the matrix of diversity. This is especially beneficial given the abandonment of the practice of spraying chemicals to maintain these openings and the advent of the “brontosaurus” mechanical chipping equipment used to accomplish this task.

Other than the fragmentation caused by Rte. 135 and the lesser traveled Under The Mountain and Coppermine Roads, this area offers connectivity to riparian, floodplain, and open field habitats for many wildlife species in a continuum of abundant natural resources.



One of the many transportation structures throughout the watershed region.
(Photo by Tom Hildreth from www.vermontel.net)

Recommended Conservation Strategies: Based on the analysis of this area, the following recommendations and options are available:

- As with most areas in this study, private landowners hold most of the parcels, suggesting that the best method of gaining conservation assurance is through outreach and education, conservation easements, or outright purchase. An added advantage in this area may be the proximity to the Comerford and McIndoe dams where the US Generating Company holds large acreages and has a vested interest in the area. USGen could be a major player in a concerted Conservation effort.

- Another approach to conserving this area may be the joined efforts of Monroe and Lyman through their conservation commissions, board of selectmen, and planning boards.

Area 5: Alder Brook, Forest Lake, Burns Pond, Chase Bog, Lower Johns River Area

Description: This area contains portions of the Lower Ammonoosuc River, Dalton Tributaries, Forest Lake, and Johns River sub-watersheds in parts of the towns of Dalton, Littleton, and Whitefield. Route 116 between Littleton and Whitefield borders the southeastern portion of this area, and Route 142 in Dalton and Whitefield borders the northeastern portion. The area is approximately 16,000 acres.

Natural Resource Features: This is a relatively large area of contiguous land with few roads, several connected and diverse wetland complexes, stratified drift aquifers, and undisturbed riparian habitat. Past studies indicate it to be a large wildlife travel corridor from the Alder Brook drainage in Bethlehem, to the Johns River confluence with the Connecticut River in Dalton. There are numerous potential opportunities for future recreation and income from both tourism and forestry.

Past studies in Dalton and Whitefield have shown that these areas are connected by large sweeping wetlands and drainages. In 2003 and 2004, an in-depth study of the Chase Bog wetland complex was completed by the Dalton Conservation Commission. This study involved an assessment of the functionality of the wetland and adjacent uplands, and made recommendations for conserving the area (Dalton Conservation Commission, 2004). The connectivity of this area with Forest Lake, Burns Pond and the Alder Brook wetlands would increase conservation potential for larger tracts of wetlands throughout this area.



View from Dalton Mountain showing connectivity of wetlands and uplands at a landscape level.

As with other areas in the Ammonoosuc Watershed Region, this one contains a combination of wetlands and undeveloped riparian buffers. This type of habitat is preferred by many wildlife species. In addition the combination of these wetland complexes and adjacent upland habitats further increases the biodiversity.

There is a large stratified drift aquifer that particularly stands out in the towns of Dalton and Whitefield. It begins west of Burns Pond in Whitefield and runs along the Chase Bog Brook and wetland complex. It then follows the Johns River downstream to the Connecticut River. The aquifer continues along the Connecticut River. The total size of this aquifer is approximately 5,300 acres.

In addition, this area had higher values in the co-occurrence analysis because of pockets of agricultural soils; prime agricultural soils, and soils of statewide importance. There is a large area of farmland soils along the Johns River where it enters the Connecticut River. Prime Farmland soils, as defined by the U.S. Department of Agriculture, are the lands that are best suited to food, feed, forage, fiber, and oilseed crops. They can be cultivated land, pasture, woodland, or other land, but does not include urban and built-up land or water areas. They are either used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce a sustained high yield of crops in an economic manner. Farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Another factor that influences farmland along the major rivers and lakes throughout this region is the presence of an abundant volume of moving water along the Johns and Connecticut Rivers. The fact that water reacts much more slowly than air to temperature changes provides a micro-climate within the floodplain area, offering cooler temperatures in the extreme heat of summer and warmer temperatures (including the formation of fog) in the fall, extending the growing season.

Because of the large size of this area, it can be used as a sustainable working forest. The upland areas are forested with mixture of hardwood and softwood stands, both of which have value in the timber market.

As with other areas highlighted in this conservation plan, this area is excellent habitat for a diversity of wildlife species (terrestrial and aquatic). The Bald Eagle (*Haliaeetus leucocephalus*) is listed on the NH-NHB records for Littleton, and several have been sighted recently along the Connecticut River in the Ammonoosuc Watershed Region. The Northern Harrier (*Circus cyaneus*) is also listed as having been sighted in Whitefield. Both of these species require larger tracts of land (and water) for survival. In addition, the endangered Dwarf Wedge Mussel (*Alasmodonta heterodon*) has been documented at the confluence of Johns and Connecticut Rivers.

Recommendations for Conservation Strategies: Based on the results of this study, the following recommendations and options are suggested for the Towns of Dalton, Whitefield, and Littleton:

- Purchase of areas within this region to be maintained for conservation and working forest.

- Work with willing landowners to place relevant parts of their property into permanent conservation easements restricting development. Work with local, regional or statewide land conservation trusts such as Ammonoosuc Conservation Trust, New England Forestry Foundation, the Upper Valley Land Trust, or the Society for the Protection of NH Forests.
- Consider prime wetland designation for towns where wetlands, undisturbed riparian habitat, and stratified drift aquifers co-occur.
- Develop an education and outreach program for landowners to raise their awareness about the importance of conservation, impacts of development and conservation options available to landowners.

Area 6: Connecticut River/Lower Ammonoosuc River Prime Agricultural Lands Area

Description: This area is unique in that it is a very long (approximately 21 miles) narrow band of mostly floodplain along the Connecticut River, including the Ammonoosuc river confluence. This area begins below the Moore Reservoir and is located in the Comerford Dam Reservoir sub-watershed, the McIndoe Falls sub-watershed, the Bath Tributaries sub-watershed, the Petty Brook/Woodsville Tributaries sub-watershed, and the Haverhill Tributaries sub-watershed.

This area is comprised of numerous smaller non-contiguous areas that color in the ‘dark’ shades due to multiple co-occurrence, including Prime Agricultural soils. These are best described as floodplain areas containing deep rich topsoil. Most of these areas are periodically inundated with water for some time, in some cases annually. Fragmentation does occur in numerous places due to roads, confluences with many brooks and rivers, gravel/sand pits, and soils that are not Prime Agricultural soils.

Another unique characteristic (for northern New Hampshire) of these areas is that they are most often relatively flat in slope, between 3% and less than 1%, and nearly stone free.

Natural Resource Features: Deep rich, stone-free sandy loamy soils provide excellent crop growing opportunities in these areas. There exists a long history of farming and agricultural practices, highlighted by the peak of the Agricultural era in the mid-1800s and presently, though currently waning, dairy farming. Complete cultures have evolved around farming practices linked to these Prime Agricultural soils.

Forested riparian floodplains contain erosion resistant trees that can withstand major storm events and flooding, exemplified by silver maple (*Acer saccharinum*). These forests and herbaceous ground cover provide unique wildlife habitat and travel corridors throughout the entire area. Other tree species such as oak (*Quercus sp.*) and american butternut (*Juglans cinerea*) provide mast (nuts, seeds and fruits) for wildlife in these areas. Dead trees provide snags for nesting and perching spots for numerous birds. Those that overhang water or fields are especially critical for raptors.

Wetlands found along the borders of these areas tend to maintain water levels even in drier years due to the flatter slopes, their position on the landscape, and retention of floodwaters. It is interesting to note that many wetland ditches and areas were created from past agricultural practices in draining numerous areas via ditching or installation of subsurface

ricing. A close connection exists between the rich deep soils, nutrients applied to crop fields, and the lush growth of native (and unfortunately invasive) plant species in these areas. The existing multiple edge habitat makes these areas extremely diverse in wildlife species.



Working prime agricultural land with a vernal pool in Woodsville, NH

Another natural phenomenon in these areas is that of an extended growing season due to the slow cooling of the nearby large volumes of water (Connecticut and Ammonoosuc Rivers) and the formation of fog which prevents early frost from occurring. Feed crops such as corn are grown in these areas by farmers while many upland fields, away from the floodplain, are utilized for hay or pasture.

The majority of these areas contain favorable gravel well opportunities and are underlain with highly transmissible (over 6,000 ft²/day), permeable stratified drift aquifers that could potentially be drinking water sources for much of the local region. This may be one of the most convincing values for conservation of these areas.

The NH Natural Heritage Bureau documentation lists numerous unique communities in these areas, such as 'high-energy riverbank', 'lake sediment/river terrace forest', 'riverside outcrop', 'rich mesic forest', and 'riverside meadow', containing a long list of rare, endangered, or threatened plant species as well as vertebrates such as the Northern Harrier (*Circus cyaneus*), the Bald Eagle (*Haliaeetus leucocephalus*), and invertebrates (Mollusks), the Dwarf Wedge Mussel (*Alasmidonta heterodon*). (Please refer to Appendix D for NH-NHB data)

Though controversial to many, the hydro-electric energy provided along these areas by conversion of water power to electricity is a use of a natural resource that has benefited numerous municipalities in the region. While this practice has provided additional recreational uses such as boating and scenic picnic sites, the dams are an obstacle to fish and

other aquatic species passage. Numerous studies worldwide have been done attempting to assess full impacts and overall effects on the ecosystem. Many more are currently being done, and future research will continue; all seeking an acceptable solution.



Dam and Generating Station in Gilman, VT on the Connecticut River (© B.B. Greenbie)

Recommended Conservation Strategies: Based on the analysis of this area, the following recommendations and options are available:

- Local enforcement of no-build floodplain zoning regulations will address most of these areas. Likewise, the enforcement of the Comprehensive Shoreland Protection Act will help to conserve some of these areas.
- Most of the areas are currently, or were in the past, used for agriculture. A high priority should be given to the preservation of working farms and similar traditional 'ways of life'. The exception might be to enforce minimum riparian buffers where needed. Working with the Connecticut River Joint Commissions as a partner could enhance this strategy.
- The USGen New England Company and other companies have an overriding investment in these areas and a strong need of good public relations. This could be the basis of forming a strong partnership in the promotion of conservation easements in these areas.
- Fortunately, most of these areas have historic and cultural interest acceptable to utilizing public awareness and education as tools for conservation practices. Assistance in creating easements should be generally well received and successful.

- Unfortunately, these level open places are easily developed and often become targets for large sprawl-type businesses. Strict enforcement of floodplain and wetland rules combined with well constructed Master Plans for each community is a start in conserving these unique areas. Refer to the Literature and References section for a list of publications and contact information to aid in conserving farmland within this area.

AMMONOOSUC RIVER WATERSHED REGION-WIDE RECOMMENDATIONS

A. Future Mapping Possibilities

The maps developed for the current study should be considered as a basis for future work. First of all, some of the map features are dynamic and will require updating over time. As the region continues to experience development, areas that are considered unfragmented lands may change. Conservation efforts are ongoing so that the areas under conservation will expand. Secondly, field verification and local knowledge will identify areas that should be added to some of the features mapped in this project. For this reason, it is critical that these maps be updated regularly.

The features used in this conservation plan analysis were primarily chosen for their relevance to biological diversity. There are other factors that would also be relevant to other conservation objectives. Towns might want to identify road sections and scenic landscape features that provide significant views.

Tax Map Integration

A logical step for future conservation of these and other identified areas would be to integrate tax maps as towns develop Geographic Information Systems and update their parcel maps in digital format. If done accurately, tax maps will assist with conservation of the regions highlighted in this conservation plan, providing another useful planning tool.

B. Formation of a Watershed Region Group for the Ammonoosuc River Watershed Region

To aid the implementation of the conservation strategies it is recommended that a watershed region group be established with representatives from each of the towns. An advertised meeting (newspaper, email, public postings, and contact with area Conservation Commissions) seeking interested parties is one venue to begin this process. The watershed region organization could be responsible for the following:

- Distribute educational brochures and information
- Develop a website for access to up-to-date information
- Provide technical assistance to interested landowners
- Seek funds from federal, state or private organizations
- Provide funding, or links to potential funders, to defray costs to landowners

C. Overall Land Conservation Possibilities for the Identified Areas

Based on the results of this study, the following recommendations and options are available to the Municipalities within the Ammonoosuc River Watershed Region.

1. Educate landowners about the values of natural resources, the importance of conservation, and the impacts of development.
 - a. Some landowners may be more receptive to conserving their land through an outreach program focused on the value of these areas within the Ammonoosuc River Watershed Region
 - b. Ecological value may outweigh monetary gains for some landowners
 - c. May benefit entire regional database in documentation of land areas into proper classifications as well as benefiting landowners with resultant tax savings of unproductive land

The following factors could be used to encourage landowners:

- a. Protection of water quality and water resources, particularly in areas where there are aquifers
 - b. Wetlands are an important part of the mosaic of areas constituting wildlife habitat
 - c. Wildlife and recreational values increase as wildlife travel corridors with wetlands and upland habitat are kept intact
 - d. Tax incentives for conservation
2. Identify and work with willing landowners to place relevant parts of their property into permanent conservation easements restricting development. Work with local, regional and statewide land conservation trusts such as Ammonoosuc Conservation Trust, New England Forestry Foundation, the Upper Valley Land Trust, or the Society for the Protection of NH Forests.

Landowners may not be willing to incur the costs to put their land into a conservation easement. Land conservation trusts and towns could assist by providing funding to entirely or partially defray landowner costs. There may also be grant opportunities for this purpose
 3. Purchase of areas by local, regional or state land conservation organizations, or towns within this region to be maintained for conservation and working forests. This option requires the following:
 - a. Public support if it is purchased by municipalities
 - b. Landowners willing to sell their property (or portions) to conservation organizations or towns
 - c. Possible Federal, State, or Foundation funding – this is particularly possible with some of the areas proximity to the White Mountain National Forest
 - d. Large scale fund raising as an additional source of funding

Although an outright purchase of most of the land identified in these areas could be expensive and difficult, if it can be accomplished. It will give towns control over entire areas into the future. This will ensure its sustainability for future generations. Because of their size and the number of forested areas, conservation organizations and towns could generate future revenue from timber harvesting or agriculture. The benefits also include future hunting, recreational activities, research studies, and educational opportunities.

4. Consider Prime Wetland Designation for towns where wetlands, undisturbed riparian habitat, and/or stratified drift aquifers co-occur
 - a. Other wetlands throughout the Towns must also be evaluated for comparative purposes
 - b. The process requires Town votes of approval at Town Meetings
 - c. The areas identified as Prime Wetlands must contain over 50% very poorly drained soils, as classified by the Natural Resource Conservation Service. The wetland complex designated as Prime may be smaller than the entire area as a whole, thus reducing its overall value and hydrological connectivity.
 - d. Wetland impact permits may still be approved by the NH DES Wetlands Bureau under some circumstances.

Prime wetland designations have advantages of making it harder for people to dredge, fill, or impact them, thus protecting water quality, biodiversity, and wildlife travel corridors.

5. Develop and Enforce Town and Watershed-Wide Ordinances
 - a. Regulations based on the Comprehensive Shoreland Protection Act
 - b. Regulations based on floodplains to prevent building in these areas
 - c. Regulations based on ecological areas to maintain ecosystems and connectivity

D. Continue to Improve the Current Water Quality throughout the Ammonoosuc River Watershed Region

Overall the entire study area enjoys good water quality and in fact has improved over the past 30 years. Passage of the Clean Water Act is the driving force behind implementation of many improvements. Rivers that were once considered places to stay away from are now rated as Class B or more commonly known as 'swimmable, fishable, and suitable for contact recreation'. Most of the rivers and tributaries are Class A waters more commonly known as 'drinkable' (with treatment). Several factors have contributed to this phenomenon: mill wastes that used to be dumped into the rivers and wetlands are now controlled and treated; public sewerage that used to be dumped directly into local rivers and wetlands is now collected in EPA approved systems, treated and tested on a regular basis before being sent to receiving waters; and the formerly common practice of locating town dumps on steep banks along rivers, streams, or wetlands has ceased with the advent of sealed lined landfills and an increase in recycling at transfer stations. There are also stormwater regulations to control non-point source pollution and erosion controls are common practices at construction sites

throughout the region. Timber harvesting now requires best management practices (BMPs) and vegetated buffers remain along waterways and wetlands.

One of the objectives of this Conservation Plan for the area is to encourage the maintenance of these water quality conditions through conservation of identified areas, continued monitoring programs (and the implementation of additional monitoring), and land use practices that contribute to high water quality standards in a sustainable working landscape.



Multi-meter used for water quality sampling in Bog Brook below Richardson Pond

1. Gather existing water quality testing results from other studies, organizations, municipalities, State and Federal Governments
2. Develop a data base to house and combine all data gathered from previous work
3. Form a comprehensive, region-wide Volunteer River Assessment Program (VRAP) partnering with NH Department of Environmental Services to monitor water quality.

E. Monitor Instream Flows and Large Groundwater Withdrawal throughout the Ammonoosuc River Watershed Region

Based on concerns expressed at the Public Meetings, and the limited potential gravel well sites and high-yield aquifers in this region, the following recommendations and options are suggested as a means of protecting valuable water resources throughout the Ammonoosuc River Watershed Region.

1. Adhere to the NH-DES existing rule or programs:
 - a. Groundwater Withdrawal Rules (Minor and Major)
 - b. Instream Flow Protection Program
 - c. Total Maximum Daily Load (TMDL) Program
2. Develop and submit a Water Management Plan to NH-DES containing the required:
 - a. Conservation Plan
 - b. Water Use Plan
 - c. Dam Management Plan

ACTION PLANS FOR THE AMMONOOSUC RIVER WATERSHED REGION

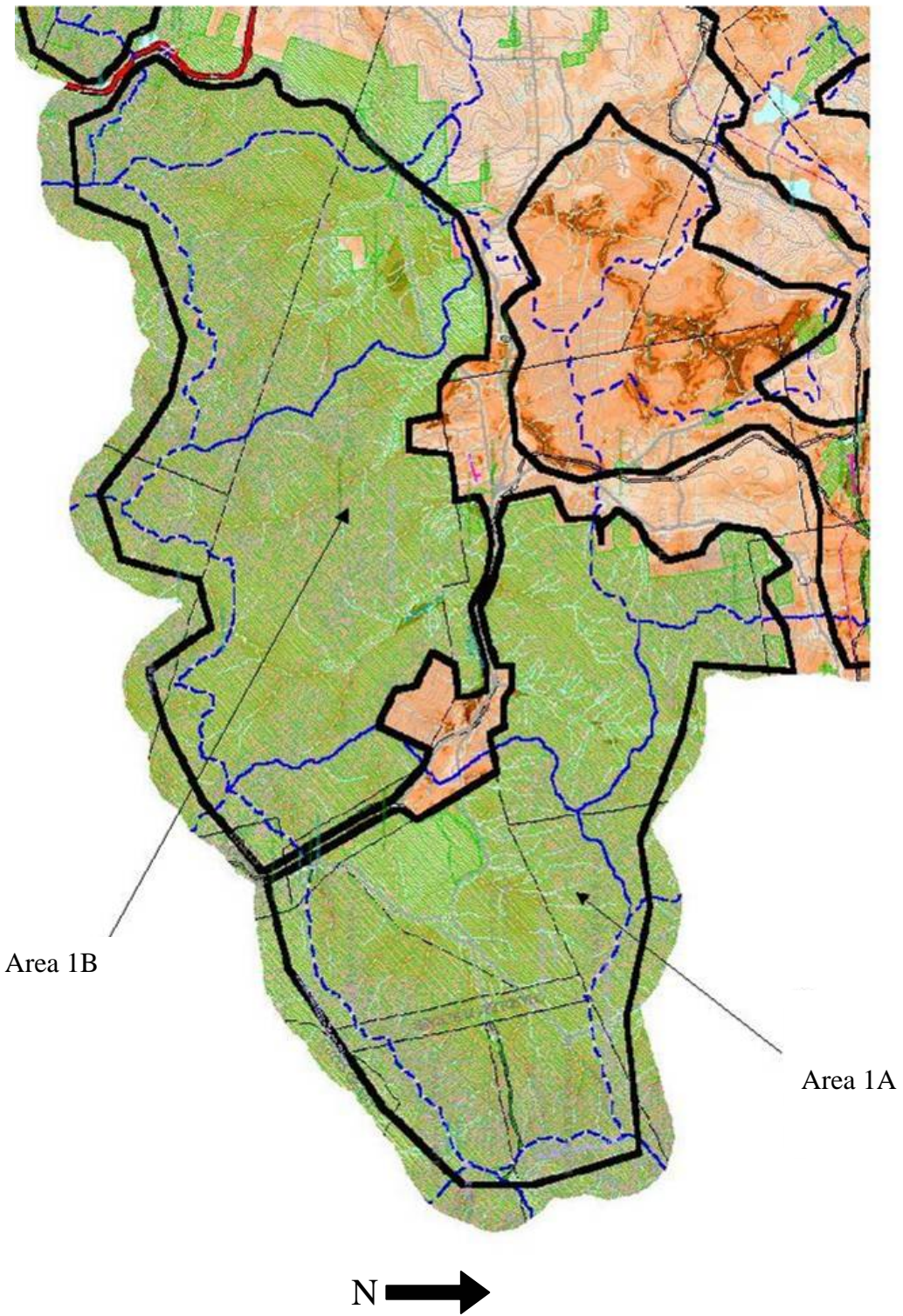
Strategy	Tasks	Potential Responsible Organization
Education	Distribute Educational Brochures and Information	Newly formed Watershed Region Group, Conservation Commissions (CCs)
	Provide Guidebooks in each Town Office	ACT
	Workshops and Demonstrations with Guest Speakers (rotational locations)	Town CCs
	Develop website for access to up-to-date information	Watershed Region Group
	Encourage attendance to US Forest Management Plan meeting and other Land Use Hearings	ACT, Town CCs, UNHCE
	Provide all Towns with Project Digital Data	ACT
Conservation Easements	Increase Acceptability of smaller parcels (4 to 50 acres)	ACT, SPNHF, UVLT
	Provide Technical Assistance to Interested Landowners	Watershed Region Group, ACT, CCs, UNHCE
	Develop funding sources to help defray “out of pocket” costs to landowners needing financial assistance	Watershed Region Group, ACT
	Manage transactions	ACT, Towns
	Hold easements	ACT, Towns
Outright Purchase (Willing Landowners)	Develop local funding sources (i.e. change of use assessments, timber tax) for land acquisition	Towns
	Work with conservation organizations such as The Nature Conservancy, US Fish and Wildlife, and others to raise funds to protect critical parcels	Watershed Region Group, ACT
	Encourage town bond monies or other municipal funding for purchase of key parcels	Towns, CCs

Strategy	Tasks	Potential Responsible Organization
Prime Wetland Designation	Evaluate and Rank Wetland Complexes Town-wide	CCs
	Assist with Warrant Article Language	NH-DES, Regional Planning Commissions (RPC)
Town & Watershed Region Ordinances	Update Town Master Plans and Include Conservation Strategies	Town Planning Boards, CCs, RPC
	Develop and Enforce Local Regulations based on Shoreland Protection Act	Town Planning, Zoning Boards, RPC
	Develop and Enforce Local Regulations Controlling Development in Floodplains	Town Planning and Zoning Boards
	Develop Planning Regulations Based on Co-occurrence Analysis and Field Verification	Town Planning and Zoning Boards with input from CCs
Maintain and Improve Water Quality	Compile existing water quality monitoring data from other studies, organizations, municipalities, State and Federal Governments	Watershed Region Group and CCs
	Develop a data base to house and combine all data gathered from previous work	Watershed Region Group and CCs, ACT
	Form a comprehensive, region-wide VRAP partnering with NH Department of Environmental Services to monitor surface water quality	NH-DES, Watershed Region Group and CCs
Water Resource Protection	Develop stream flow gauge stations in choice locations Develop a Water Management Plan	Watershed Region Group and CCs, NH-DES, ACOE

MAPS

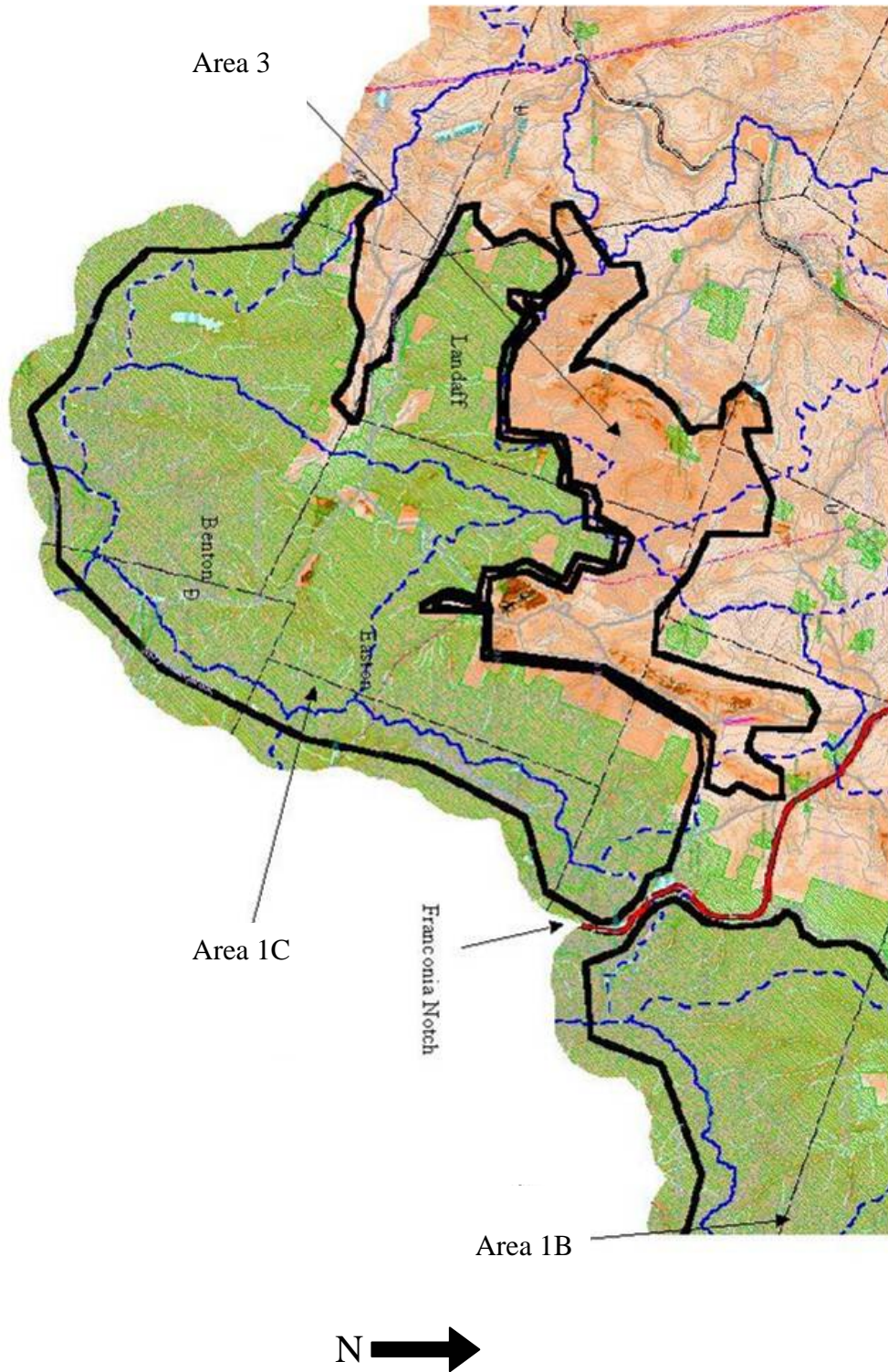
Area 1A: Headwaters of the Ammonoosuc River

Area 1B: Middle Ammonoosuc and Northern Branch of the Gale River



Conservation area map created by Ammonoosuc Conservation Trust

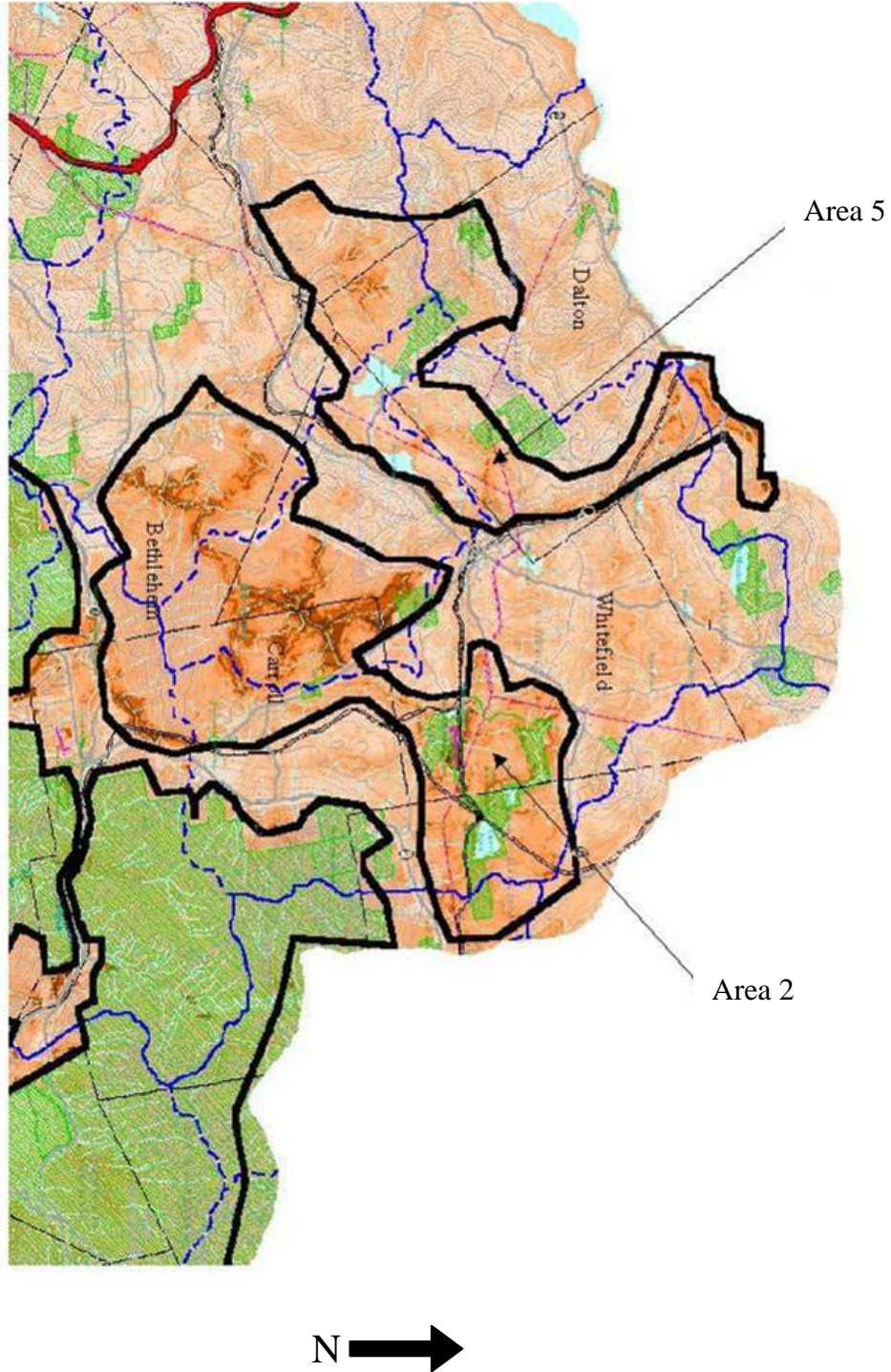
Area 1C: Upper Wild Ammonoosuc River
Area 3: Chandler Pond, Ham Branch, Pearl Lake



Conservation area map created by Ammonoosuc Conservation Trust

Area 2: Richardson Pond, Upper Johns River Headwaters

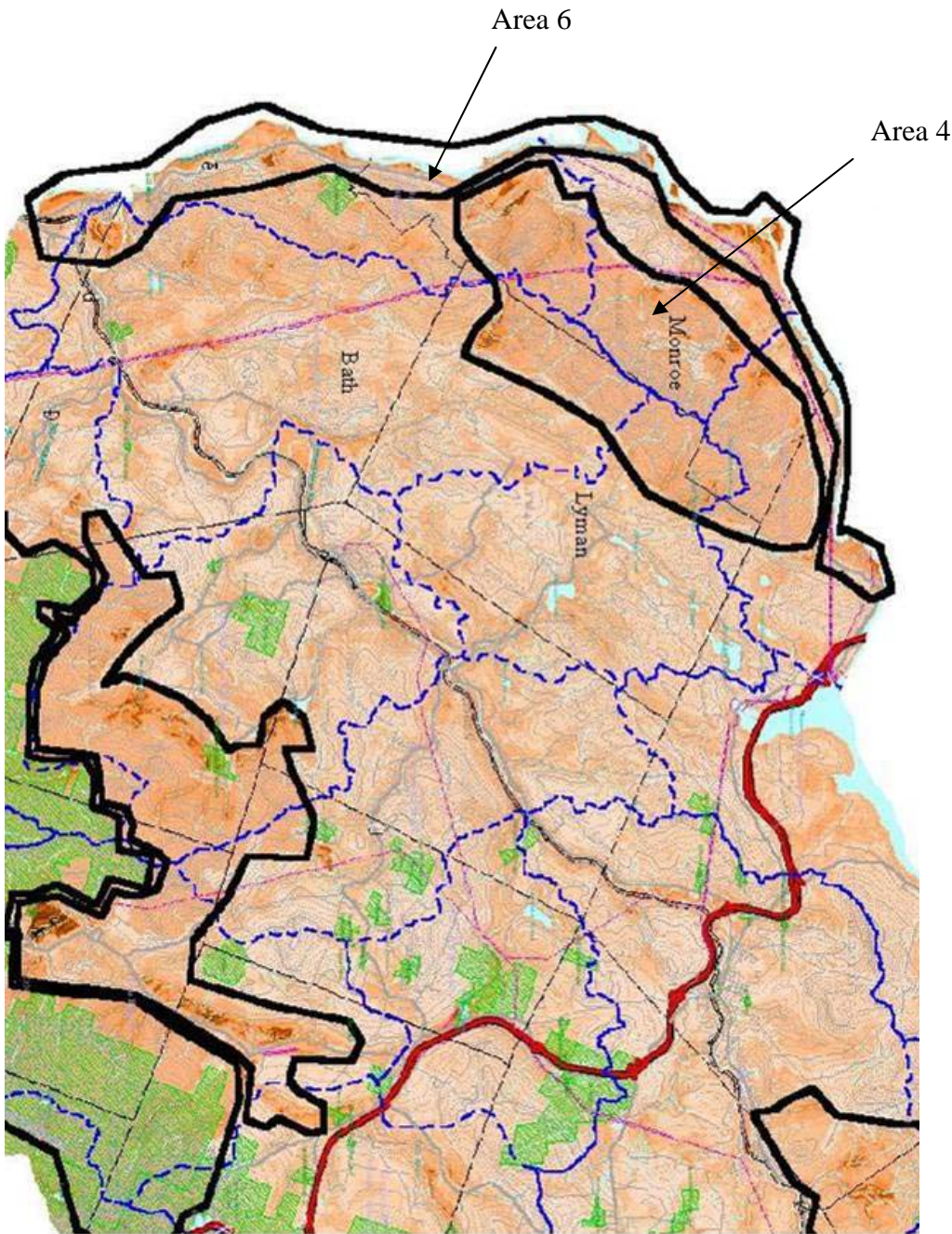
Area 5: Alder Brook, Forest Lake, Burns Pond, Chase Bog, Lower Johns River



Conservation area map created by Ammonoosuc Conservation Trust

Area 4: Comerford Dam and McIndoe Falls

Area 6: Connecticut River, Lower Ammonoosuc Prime Agricultural



Conservation area map created by Ammonoosuc Conservation Trust

APPENDIX A

GLOSSARY

Best Management Practices (BMP) – a practice or combination of practices determined to be the most effective and practicable means of preventing negative impacts of silvicultural activities.

Biodiversity – the variety and variability of all living organisms. This variety includes the diversity of plants, animals, fungi, algae, etc. their genetic variability, and the natural communities in which they live.

Clean Water Act (33 U.S.C 1251-1387) – established to restore and maintain the chemical, physical, and biological integrity of the United States waters. It provides for the control of discharges into rivers, both from point and nonpoint sources. The CWA is administered by the U.S. Environmental Protection Agency (EPA) and the NH Department of Environmental Services.

Comprehensive Shoreland Protection Act – (CSPA) – sets minimum standards and requirements for the development, use, and subdivision of all land within 250 feet of the water's edge (reference line). The protected shoreland is essential to maintain the quality of our rivers, lakes, ponds, and tidal waters. The CSPA became effective July 1, 1994, is enforced by the NH Department of Environmental Services, and is enforceable for all lands adjacent to 4th order streams or higher.

Conservation Easement – a legal agreement between a landowner and a conservation organization or agency. The agreement separates the rights to exercise more intensive uses – such as construction, subdivision, and mining – from other rights of ownership. Land under easement is still privately owned and managed. Typically, it is used for agriculture, forestry, wildlife habitat, scenic views, watershed protection, recreation, and education. Conservation easements are granted in perpetuity and apply to land regardless of who may own it in the future. A qualified non-profit, tax-exempt conservation, such as a land trust or conservancy, may hold a conservation easement, as can federal, state, or local government entities. Conservation easements may be donated or sold.

Ecosystem – A community of species (or group of communities) and its physical environment, including atmosphere, soil, sunlight and water.

Erosion – physical breakdown, chemical solution, and movement of broken down and dissolved rock materials.

Floodplain – the area of land adjoining the designated portions of the river and tributaries which will be inundated by a flood which has 1% chance of occurring or being exceeded in any given year (100-year floodplain). Areas determined by hydrologic studies or through having a history of flooding or are delineated by the best available information on flooding in the area.

Geographical Information Systems (GIS) – technology designed to store, retrieve, manipulate, and display geographic data, usually in the form of maps. It is a package consisting of four basic parts: hardware, software, data, and an operator. It is used to support decision making for planning and management of land use, natural resources, environment, transportation, urban facilities, and other administrative records.

Groundwater Withdrawal Rule Categories – **Minor** large water withdrawal draw a daily maximum of less than 144,000 gallons per day over a 30 day period;
Major large water withdrawals draw 57,600 gallons or more during a 24 hour period on a seasonal or annual basis.

Instream Flow – expressed as ‘7Q10’, which is the lowest average flow for 7 consecutive days on an annual basis with an expected recurrence interval once every 10 years. Flow (Q) is expressed in units of cubic feet per second for a square mile (cfsm) of drainage area within the watershed.

Open Space – any publicly or privately owned undeveloped land, including floodplains, woodlands, and farmlands.

Permanent Habitat Openings – areas maintained as herbaceous opening (grass and legumes) and those that will be maintained to encourage succession and native vegetation. The vegetation in a permanent opening offers food for deer, wild turkey, rabbits, grouse, song sparrows, broad-winged hawks, flickers, and many other wildlife species.

Prime Farmland Soils – lands that are best suited to food, feed, forage, fiber, and oilseed crops. They can be cultivated land, pasture, woodland, or other land, but do not include urban and built-up land or water areas. They are either used for food or fiber crops or are available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce a sustained high yield of crops in an economic manner. Farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Riparian – habitat along the banks of a river or stream.

Sedimentation – the process in which mineral or organic matter carried by water or ice is deposited.

Standards for Water Classification - Class A waters are considered as being potentially acceptable for water supply uses after adequate treatment. Class B waters are considered to be acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies. Class C waters are suitable for recreation in and on the water, fishing, aquaculture, propagation and restricted harvesting of shellfish, industrial process and cooling water supply, hydroelectric power generation and navigation and as a habitat for fish. Class D waters encounter intractable or very difficult pollution problems. Both Class C and D waters today indicate unacceptable quality; the goal is to implement practices to upgrade all waters to Class B or Class A.

Total Maximum Daily Load (TMDL) – refers to the calculation of the maximum amount of a pollutant that a waterbody can receive, and attain or maintain water quality standards for its designated use. (Often used for receiving waters treated municipal sewerage.)

Watershed – Total land area that drains directly or indirectly into a particular stream or river. Watersheds cross many political boundaries and are generally broken down into sub-watersheds. For example, the Baker River watershed is a sub-watershed of the Pemigewasset River Watershed, which, in turn, is a sub-watershed of the Merrimack Watershed.

Wetland – Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Zoning – The specification of areas within a municipality and regulation of how land and structures can be used for business, industrial, residential, and other purposes.

**APPENDIX B
CONSERVATION PLAN AREA TABLES**

Table 1: Ammonoosuc Watershed Region - Towns and Unincorporated Places

County	FIPS Code	Town Name	Place Type	Total Acres	Watershed Acres	Conserved Acres	Percent Town in Watershed	Percent of Town-Wshd Conserved
CARROLL	3050	HARTS_LOCATION	U	12,302.3	28.5	28.5	0.23	100.00
COOS	7010	BEANS_GRANT	U	6,182.7	3,247.6	3,247.6	52.53	100.00
	7030	CARROLL	T	32,188.3	26,930.0	12,031.7	83.66	44.68
	7035	CHANDLERS_PURCHASE	U	1,360.9	1,176.2	0.0	86.43	0.00
	7055	CRAWFORDS_PURCHASE	U	5,242.8	5,242.8	5,163.3	100.00	98.48
	7065	DALTON	T	18,104.9	17,690.8	1,103.3	97.71	6.24
	7110	JEFFERSON	T	32,206.4	4,021.6	726.6	12.49	18.07
	7120	LANCASTER	T	32,763.0	3,925.5	459.6	11.98	11.71
	7125	LOW_&_BURBANKS	U	16,728.7	2,221.7	2,221.7	13.28	100.00
	7170	SARGENTS_PURCHASE	U	16,558.9	2,064.7	0.0	12.47	0.00
	7205	THOMPSON_&_MESERVE	U	11,848.8	2,857.8	0.0	24.12	0.00
	7215	WHITEFIELD	T	22,231.8	20,932.6	490.9	94.16	2.35
GRAFTON	9015	BATH	T	24,684.2	24,679.7	285.8	99.98	1.16
	9020	BENTON	T	31,201.7	15,004.8	12,897.7	48.09	85.96
	9025	BETHLEHEM	T	58,205.3	54,916.7	28,917.5	94.35	52.66
	9055	EASTON	T	19,934.1	19,934.0	13,153.9	100.00	65.99
	9070	FRANCONIA	T	42,123.4	27,154.3	15,855.8	64.46	58.39
	9090	HAVERHILL	T	33,510.8	3,333.0	0.0	9.95	0.00
	9105	LANDAFF	T	18,223.8	18,223.6	4,965.0	100.00	27.25
	9115	LINCOLN	T	83,844.3	2,701.6	2,701.6	3.22	100.00
	9120	LISBON	T	17,065.5	17,065.6	76.5	100.00	0.45
	9125	LITTLETON	T	34,555.3	34,555.3	194.4	100.00	0.56
	9130	LYMAN	T	18,356.0	18,355.9	0.0	100.00	0.00
	9140	MONROE	T	15,248.9	15,248.9	0.0	100.00	0.00
	9167	SUGAR_HILL	T	11,027.6	11,027.6	1,230.1	100.00	11.16
9190	WOODSTOCK	T	37,752.2	2,190.4	2,190.4	5.80	100.00	
Total Watershed				NA	354,731.2	107,942.0		30.43

Table 2: Summary Population and Housing Characteristics in the Ammonoosuc River Watershed Region

	Total Population	Total	2000 Housing Units		Seasonal	Total Population	Total	1990 Housing Units		Seasonal
			Occupied	Vacant				Occupied	Vacant	
Coos County										
Carroll	663	740	279	461	427	517	611	206	405	381
Dalton	927	520	374	146	114	808	475	326	149	122
Whitefield	2038	1158	829	329	232	1928	1111	728	383	280
Grafton County										
Bath	893	450	350	100	72	764	438	299	139	114
Benton	314	155	91	64	60	330	126			
Bethlehem	2199	1307	924	383	251	2033	1221	762	459	324
Easton	256	187	117	70	60	213	171	91	80	71
Franconia	924	702	384	318	291	825	646	323	323	244
Haverhill	4416	2148	1755	393	257	4164	2031	1557	474	316
Landaff	378	214	154	60	35	363	196	144	52	42
Lisbon	1587	727	629	98	55	1629	769	693	76	35
Littleton	5845	2746	2514	232	93	5821	2668	2468	200	24
Lyman	487	280	211	69	58	395	269	153	116	87
Monroe	759	333	310	23	12	791	304	266	38	25
Sugar Hill	563	385	258	127	87	456	328	188	140	106

APPENDIX C LITERATURE AND RESOURCES

Adapted from UNH Cooperative Extension

Unless otherwise noted, the publications listed below are available from the organization publishing the document (see list of contact addresses at end of this section).

NATURAL RESOURCE INVENTORIES AND CONSERVATION PLANNING

Natural Resources Inventories: A Guide for New Hampshire Communities and Conservation Groups (2001). Amanda J. Lindley Stone, UNH Cooperative Extension.

Preparing a Conservation Plan (2001). Fact Sheet. Frank Mitchell and Amanda Stone, UNH Cooperative Extension.

LAND PROTECTION

Conserving your Land Options for New Hampshire Landowners (2004). Brenda Lind, Center for Land Conservation Assistance, Society for the Protection of NH Forests.

Conserving the Family Farm (2002). Annette Lorraine. NH Coalition for Sustaining Agriculture. Available from the UNH Cooperative Extension Publications Center.

Conservation Easements: Questions and Answers. Fact sheet, Society for the Protection of NH Forests

Conservation Easements For NH Farms (2001). Coalition for Sustaining NH Agriculture. Obtain from UNH Cooperative Extension (Sharon Hughes 862-1029 or sharon.hughes@unh.edu)

Conservation Easements: A Step by Step Guide. (2001). Fact sheet. Frank Mitchell and Phil Auger, UNH Cooperative Extension, Durham, NH.

Conservation Options: A Landowner's Guide. (1996) Land Trust Alliance, Washington DC

Does Open Space Pay? (1996). Fact sheet. Phil Auger, UNH Cooperative Extension (Call Sharon Hughes 862-1029)

How Greenways Work: A Handbook on Ecology. (1992). 2nd edition. Jonathan Labaree. National Park Service and Atlantic Center for the Environment, Ipswich, MA.

New Hampshire's Land and Community Heritage at Risk (1999). Citizens for New Hampshire Lands and Community Heritage.

New Hampshire's Changing Landscape - Population Growth, Land Use Conversion and Resource Fragmentation in the Granite State. (1999). Dan Sundquist and Michael Stevens. Society for the Protection of NH Forests. *(Document currently out of print, but is available on-line at: www.spnhf.org)*

Open Space for New Hampshire: A Toolbook of Techniques for the New Millennium. (2000). Dorothy Tripp Taylor, NH Wildlife Federation.

Our Drinking Water Supply Lands: How Safe Are They? (1998). Society for the Protection of NH Forests, NH

Permanently Protecting Water Supply Lands with Conservation Easements. (1997). Sarah Thorne, Society for the Protection of NH Forests, Concord, NH.

Preserving Family Lands: Book 1. Essential Tax Strategies for the Landowner (1998) Stephen J. Small (Attorney at Law), Landowner Planning Center, Boston, Massachusetts.

Protecting Your Land: Conservation Options for NH Landowners. Fact sheet. Society for the Protection of NH Forests

Saving Special Places: Community funding for Land Conservation. (2002). Brian Hart and Dorothy Tripp Taylor. Society for the Protection of NH Forests.

WATER RESOURCES

A Guide to Developing and Re-developing Shoreland Property in New Hampshire. A Blueprint to help you live by water (1995, 2nd edition). Raymond Lobdell. North Country Resource Conservation and Development Area, Meredith, NH.

A Guide to Identifying Potentially Favorable Areas to Protect Future Municipal Wells in Stratified-Drift Aquifers, Volume 1 (1999). NH Department of Environmental Services, Water Division

Buffers for Wetlands and Surface Waters: A Guide for New Hampshire Municipalities (1997 - revised edition). Vicki Chase, Laura Deming and Francesca Latawiec. Audubon Society of NH.

Following the Flow: A Watershed Non-point Source Pollution Evaluation System for Citizen Monitors (2001, in press) Jeff Schloss, UNH Cooperative Extension & Alan Ammann, Natural Resources Conservation Service.

Interpreting Results of Water Quality Tests in Streams and Rivers. (1991). Mitchell, Frank and J. Schloss. UNH Cooperative Extension.

Stream Study & Water Quality Assessment Guide, (1997). MacKenzie, Kelle and F. Mitchell. NH Fish & Game Dept and UNH Cooperative Extension.

The DES Guide to Groundwater Protection (1996). New Hampshire Department of Environmental Services (NHDES-WSPCD-96-4)

Know Your Watershed, undated. Series of booklets on watershed planning: *Getting to Know Your Local Watershed*, *Putting Together a Watershed Management Plan*, *Managing Conflict*, *Building Local Partnerships*, *Leading & Communicating*. Conservation Technology Information Center

WETLANDS

Buffers for Wetlands and Surface Waters: A Guide for New Hampshire Municipalities (1997 - revised edition). Vicki Chase, Laura Deming and Francesca Latawiec. Audubon Society of NH.

Identification & Documentation of Vernal Pools in NH (1997). Anne Tappan (Editor). NH Fish & Game Department.

Habitat Values of New England Wetlands. (1995). Cathy Pedevillano. US Army Corps of Engineers and US Fish & Wildlife Service

A Study Guide to New England's Freshwater Wetlands (1994). Miller, Ronald, F. Mitchell, and L. Ryder, NH Fish & Game Dept. & UNH Cooperative Extension.

Municipal Guide to Wetland Protection (1993). Amanda J. Lindley Stone, Janet M. Bourne, Julie L. Cummings, Marjory M. Swope, Kenneth N. Kettenring, James F. McLaughlin. NH Office of State Planning. Available from the NH Association of Conservation Commissions, and NH Office of Energy and Planning

Method for the Comparative Evaluation of Non-Tidal Wetlands in New Hampshire (NH Method) (1991). Alan P. Ammann and Amanda J. Lindley Stone. NH Department of Environmental Services.

Classification of Wetlands and Deepwater Habitats of the United States (1979). Cowardin, Lewis, V, Carter, F. Golet and E. Laroe, 1979.. US Fish & Wildlife Service, Office of Biological Services. Available from Superintendent of Documents, US Govt. Printing Office, Washington, DC 20402.

AGRICULTURAL RESOURCES

Conservation Easements for NH Farms (2001). Coalition for Sustaining NH Agriculture. Obtain from UNH Cooperative Extension (Sharon Hughes 862-1029 or sharon.hughes@unh.edu).

Conserving the Family Farm (2002). Annette Lorraine. NH Coalition for Sustaining Agriculture. Available from the UNH Cooperative Extension Publications Center.

Developing an Agricultural Profile for Your Town (1999). David Seavey, UNH Cooperative Extension

Preserving Rural Character through Agriculture Resource Kit (1999). NH Coalition for Sustaining Agriculture.

FOREST RESOURCES

A Citizens Guide to Conserving Riparian Forests (1995). Peterson, Susan C. and K.D. Kimball. Appalachian Mountain Club Research Dept. Available from AMC, PO Box 298, Gorham, NH 03581, 466-2721 or 5 Joy St, Boston, MA 02108, (617)523-0636, e-mail 6129891@mcmail.com.

Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire (1996). Cullen, J.B., 1996. NH Div. Of Forests & Lands and UNH Cooperative Extension.

Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (1997). NH Forest Sustainability Standards Work Team. Society for the Protection of NH Forests and DRED, Division of Forests & Lands.

New Hampshire's Vanishing Forests Report (2001). Society for the Protection of NH Forests, Concord, NH.

Planning for the Future of Local Forests: A Guide for New Hampshire Towns Using the Forestland Evaluation and Site Assessment Process (FLESA) (2001). North Country and Southern New Hampshire Resource Conservation and Development Area Councils.

SOURCES FOR OBTAINING PUBLICATIONS AND INFORMATION

Ammonoosuc Conservation Trust
80 Old Post Road
Sugar Hill, NH 03585
<http://aconservativetrust.org>

Audubon Society of New Hampshire
3 Silk Farm Road
Concord, NH 03301
224-9909
<http://www.nhaudubon.org>

Center for Land Conservation Assistance
54 Portsmouth Street
Concord, NH 03301
717-7045

Citizens for NH's Lands and Community Heritage
PO Box 1566
Concord, NH 03302-1566
230-9729
<http://www.specialplaces.org>

Land Trust Alliance
1319 F Street NW
Suite 501
Washington DC 20014-1106
202-638-4725
<http://www.lta.org>

Landowner Planning Center
PO Box 4508
Boston, MA 02101-4508
617-357-1644

NH Association of Conservation Commissions
54 Portsmouth Street
Concord, NH 03301
224-7867
<http://www.nhacc.org/nhacc.html>

NH Department of Environmental Services
Public Information Center
6 Hazen Drive
Concord, NH 03301
271-2975
<http://www.des.state.nh.us>

NH Fish & Game Department
2 Hazen Drive
Concord, NH 03301
271-2462
<http://wildlife.state.nh.us>

NH Office of Energy & Planning
57 Regional Drive, Suite 3
Concord, NH 03301
271-2155
<http://www.nh.gov/oep>

NH Wildlife Federation
54 Portsmouth Street
Concord, NH 03301
224-5953

Natural Resource Conservation Service
Federal Building
Durham, NH 03824
868-7581
<http://nh.nrcs.usda.gov/>

Resource Conservation and Development, Southern Area
Office
The Concord Center
10 Ferry Street
Concord, NH 03301-5081
223-0083

Society for the Protection of NH Forests
54 Portsmouth Street
Concord, NH 03301
224-9945
<http://www.spnhf.org>

UNH Cooperative Extension
Publications Center
Nesmith Hall, Room 16
131 Main Street
Durham, NH 03824-3597
862-2346
<http://ceinfo.unh.edu/pu>

APPENDIX D

UNITED STATES NATIONAL MAP ACCURACY STANDARDS

With a view to the utmost economy and expedition in producing maps which fulfill not only the broad needs for standard or principal maps, but also the reasonable particular needs of individual agencies, standards of accuracy for published maps are defined as follows:

1. **Horizontal accuracy.** For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale; for maps on publication scales of 1:20,000 or smaller, 1/50 inch. These limits of accuracy shall apply in all cases to positions of well-defined points only. Well-defined points are those that are easily visible or recoverable on the ground, such as the following: monuments or markers, such as bench marks, property boundary monuments; intersections of roads, railroads, etc.; corners of large buildings or structures (or center points of small buildings); etc. In general what is well defined will be determined by what is plottable on the scale of the map within 1/100 inch. Thus while the intersection of two road or property lines meeting at right angles would come within a sensible interpretation, identification of the intersection of such lines meeting at an acute angle would obviously not be practicable within 1/100 inch. Similarly, features not identifiable upon the ground within close limits are not to be considered as test points within the limits quoted, even though their positions may be scaled closely upon the map. In this class would come timber lines, soil boundaries, etc.
2. **Vertical accuracy,** as applied to contour maps on all publication scales, shall be such that not more than 10 percent of the elevations tested shall be in error more than one-half the contour interval. In checking elevations taken from the map, the apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale.
3. **The accuracy of any map may be tested** by comparing the positions of points whose locations or elevations are shown upon it with corresponding positions as determined by surveys of a higher accuracy. Tests shall be made by the producing agency, which shall also determine which of its maps are to be tested, and the extent of the testing.
4. **Published maps meeting these accuracy requirements** shall note this fact on their legends, as follows: "This map complies with National Map accuracy Standards."
5. **Published maps whose errors exceed those aforesaid** shall omit from their legends all mention of standard accuracy.
6. **When a published map is a considerable enlargement** of a map drawing (manuscript) or of a published map, that fact shall be stated in the legend. For example, "This map is an enlargement of a 1:20,000-scale map drawing," or "This map is an enlargement of a 1:24,000-scale published map."
7. **To facilitate ready interchange and use of basic information for map construction** among all Federal mapmaking agencies, manuscript maps and published maps, wherever economically feasible and consistent with the uses to which the map is to be put, shall conform to latitude and longitude boundaries, being 15 minutes of latitude and longitude, or 7.5 minutes, or 3-3/4 minutes in size.

U.S. BUREAU OF THE BUDGET

Issued June 10, 1941
Revised April 26, 1943
Revised June 17, 1947

APPENDIX E

**NEW HAMPSHIRE NATURAL HERITAGE BUREAU
RARE PLANT, RARE ANIMALS, AND EXEMPLARY COMMUNITIES
LISTING FOR TOWNS AND UNINCORPORATED PLACES**