EATON FOREST MANAGEMENT PLAN

DECEMBER 16, 2008

Prepared for the Town of Warren Conservation Commission

Prepared By:

R. J. Turner Company
Bristol, Vermont

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Many others were contacted and supplied information. The Friends of the Mad River shared work on the geomorphic assessment. Arrowwood Environmental summarized information from their natural heritage assessment; County Forester Russ Barrett and State Lands Forester Matt Leonard volunteered extensive time in the completion of the forest inventory and forest stewardship plans. Ecologist Brett Engstrom, biologist Steve Hagenbuch from Audubon, and Timber and Stone trail planner Josh Ryan all contributed their expertise to this plan. Reta Goss was a huge help in bringing the history of these parcels to life.

We also had support from all the Warren town staff and boards including the town clerk, town manager, zoning administrator, and listers office.

Funding for the project came from several different sources. These included funds allocated from the Warren general fund; grants from the VT Department of Housing and Community Affairs for the natural heritage assessment and the Northern Forest Alliance for the Town Forest Project and Forest Celebration events, and the Timber & Stone trail plans; and no-fee services provided by our County and State foresters for the timber management plans and Audubon Vermont for the bird habitat assessment. One area of contribution that is harder to quantify is the countless volunteer hours that have been put into this project from many participating Warren residents.

Finally, we offer our sincere gratitude to the citizens of Warren. This is an amazing community of caring individuals who offer freely of their time to make our community a better place.

ADOPTION OF THIS PLAN

This Management Plan was adopted by the Selectboard on December 16, 2008.

It will remain in force for a period of ten years, during which time it may be amended by a vote of the Selectboard, after additional public input and the consideration of all pertinent factors. Specific activities and management actions listed in Section III may change due to many factors, but all activities should be consistent with the goals and guidelines contained in this document.

READER'S GUIDE

This document guides future actions on the Eaton Forest. After a preface introduces the reader to the plan development process, the body of the plan follows, and is organized into three main sections that collectively serve to direct the management this parcel. Section I. states the vision and management goals for the property; Section II contains a discussion of the parcel's features and capacity; and Section III outlines the management actions that will be implemented as a result of this plan.

I. A VISION FOR THE FUTURE

The *Vision Statement* communicates the priorities for the future use and management of the Eaton Forest. The vision attempts to integrate the interests and goals for the use of this property with the inherent features and capacity of the property to meet the goals. Specific goals for the major uses of the property are also outlined in this section and much of the document is organized around these goals.

Both the vision and the goals were developed with input from the public. They are also informed by the practical, legal, and physical characteristics of the property itself.

II. PROPERTY DESCRIPTION AND GUIDELINES FOR STEWARDSHIP

Organized around the goals from Section I, this section offers a comprehensive description of property features and limitations. It sets management objectives consistent with the goals and offers a set of management guidelines that are intended to frame management actions. The guidelines are shaped by what is known about the opportunities and limitations at the Eaton Forest and the priorities set out in the vision and goals. Guidelines reference established, scientifically sound management practices.

III. GETTING TO THE VISION: AN EATON ACTION PLAN

The last section of the plan brings what we know about the property and what we want for the property together into a set of management actions. Some of these actions relate to the general stewardship of the property and some relate to very specific goals. Some will be undertaken by town boards or citizens; others may engage contracted professionals, non-profit groups, students, or state personnel.

A *Schedule of Management Activities* outlines specific activities that should be undertaken in the next 10-15 years to work toward meeting the long-term goals identified in the *Vision Statement and Goals.* The schedule describes how and when particular activities, such as boundary maintenance, timber harvests, trail building, and educational activities will take place and who will bear the responsibility for implementation.

PREFACE

WHY PLAN?

We ask a lot of our undeveloped lands. We value and use them as places for recreation, as part of the backdrop of the Vermont rural landscape, as economic resources, and as systems that provide us and other living organisms with critical habitat and ecological services. With so many potentially competing values and uses, planning becomes a critical step in the land management process. The process of planning requires that landowners prioritize their values and goals, develop an understanding of the capacity of their forest, and think through management activities that will help them meet their goals while maintaining the health and integrity of their forest for a long time to come. Without a plan, the complex nature of forests may go unconsidered, forest health and ecological function may be compromised, and short-term gain may be chosen over long-term investment. Even with the best of intentions, it can be easy to make very bad mistakes in the management of forests. Good planning facilitates wise – rather than reckless – use.

The Warren Town Plan (2005) addresses the question of why planning is important at the town-scale: planning allows towns to "protect community interests, maintain a measure of local control, better manage public investment and the allocation of scarce tax dollars, protect important resources, promote development in appropriate locations, and nurture the institutions that define community life." The same rational for planning applies at the scale of the town-owned land. The planning process allows the town to identify and act to protect land and its resources, address possible conflicts between different uses and interests, anticipate potential legal and liability issues, and plan for expenses and revenue associated with the management of the land.

PLANNING FOR WARREN'S TOWN-OWNED FORESTS

Since most of Warren's forestland is federally or privately owned, Warren's town-owned lands are unique. The 114-acre Eaton Forest is adjacent to the Warren Elementary School and Brooks Recreational Field on the rugged west-facing, lower slopes of the Warren Pinnacle.

This parcel may be relatively small in acreage, but town-owned forests have value beyond their size. A few of these are highlighted here:

Southerly view from the ledges

- They can serve as a place for community programs, celebrations, education, demonstration, and stewardship.
- They can support various services
  - Watershed protection
  - Forest Products
  - Wildlife Habitat
- They provide a place for public recreation – maintaining access to open space in a time when land is becoming increasingly broken up and restricted.

Planning for the management of these forests is complicated and enriched by the fact that they are owned collectively by all of Warren's residents – current and future. Just as in the process of town planning, people must come together to share and debate their values, opinions, and beliefs related to the use of the forests. They must also work together to define actions that will serve the forest and the community for generations to come.

Red Oak seedling

WHAT IS A FOREST MANAGEMENT PLAN?

At a minimum, a forest management plan is a written document or series of documents that:

- Defines landowner(s) management goals and objectives.
- Describes the forest (including maps).
- Outlines a schedule for specific management activities.
- Addresses how these activities will act to meet the management goals and objectives.

Historically, management plans for forested or predominantly forested parcels have focused primarily on maximizing revenue from timber (Donovan, 2002). Today, many plans, such as this one, address and attempt to balance a wide range of values placed on economic, social, and ecological resources associated with the land, such as recreation, water quality, wildlife habitat, and renewable energy. For example, management plans may act to identify areas where active management or use by humans are not appropriate, such as in particularly rare or fragile natural communities.

Management plans come in many different formats, depending how they will be used and by whom. Plans that are created and used solely by professional foresters may be very brief with little background information. However plans intended to be interpreted and used by a diverse audience, such as this one, can include much more extensive background information and explanation. The plan hopes not only to guide, but to educate and connect the community to the property.

Since forests are dynamic, changing systems and our knowledge about how they function is constantly being expanded by scientific research, the management plans should be evaluated and updated every 10-15 years.

WHY HAVE A FOREST MANAGEMENT PLAN?

In addition to providing a framework for the planning process, management plans are a form of documentation and communication that help ensure high-quality and consistent management over time (Donovan, 2002). A plan is an organized record of what is known about the land, what is wanted from the forest, what has been done, and what will be done (Snyder, 2006).

In this case, since these lands are town owned, documentation is particularly important to ensure the clear communication of Warren residents' values and decisions to public officials who will interpret and implement the plan. With changes over time in municipal staff, elected officials, public servants (such as County Foresters), and in the resident population itself, there are likely to be many different people who look to this plan to provide direction for the management of the Eaton Forest; the more people who are involved, the more important it is to clearly document and communicate.

There are other practical reasons why management plans are a good idea. In Vermont, individual landowners are required to create a forest management plan in order to be in the state's Use Value Appraisal (UVA) Program – also known at the Current Use Program – which provides property tax relief to landowners who actively manage their forests. Third-party certifiers concerned with setting standards for ecological and sustainable forest management, such as SmartWood and Vermont Family Forests, also require landowners to submit management plans as part of the certification process.

HOW WILL THESE PLANS BE USED?

Talus slope

Overseeing the management of the Eaton Forest and Warren's other town-owned parcels is the responsibility of the Warren Select Board. It is the role of the Warren Conservation Commission to advise the Select Board and support the appropriate stewardship of town-owned lands. This plan is an official document that [will be] adopted by the Select Board and will direct the decisions that these governing bodies make regarding the future of the Eaton Forest.
[0]

The *Action Plan* in Section III calls for specific activities to be carried out on the forests over time (see *Schedule of Management Activities*). Management activities, such as boundary line maintenance, timber harvests, and trail construction, will be carried out with the help of professionals, such as the Washington County Forester. These plans give those professionals the specific information they need to implement those treatments or activities so that they work to meet the long-term goals and objectives outlined in other sections.

This management plan is meant to be read and used by others as well, including:

- Public officials and town staff
- Teachers
- Students
- Private forest landowners
- Hikers, bikers, walkers, naturalists, hunters etc. – anyone who uses and visits the forest

Warren residents who own forestland can find ideas and approaches in the plan that may be helpful to them in planning for the management of their own forests. Teachers and students can find information that helps them understand the ecology, function, and human use of the properties and think about and plan educational opportunities in the forest. This plan is an educational resource for all Warren residents to learn more about the Eaton Forest, forest management, and Warren's forested landscape. The plan is meant to enrich the experience of everyone who spends time at the Eaton Forest – or wants to – by offering an opportunity to learn more about these special public places.

CREATING THE PLANS

THE CALL FOR A MANAGEMENT PLAN

Overseeing the management of the Eaton Forest and Warren's other town-owned parcels is the responsibility of the Warren Select Board. It is the role of the Warren Conservation Commission to advise the Select Board and support the appropriate stewardship of town-owned lands. This plan is an official document adopted by the

Select Board and intended to direct the decisions that these governing bodies make regarding the future of the Eaton Forest.

GATHERING PUBLIC INPUT

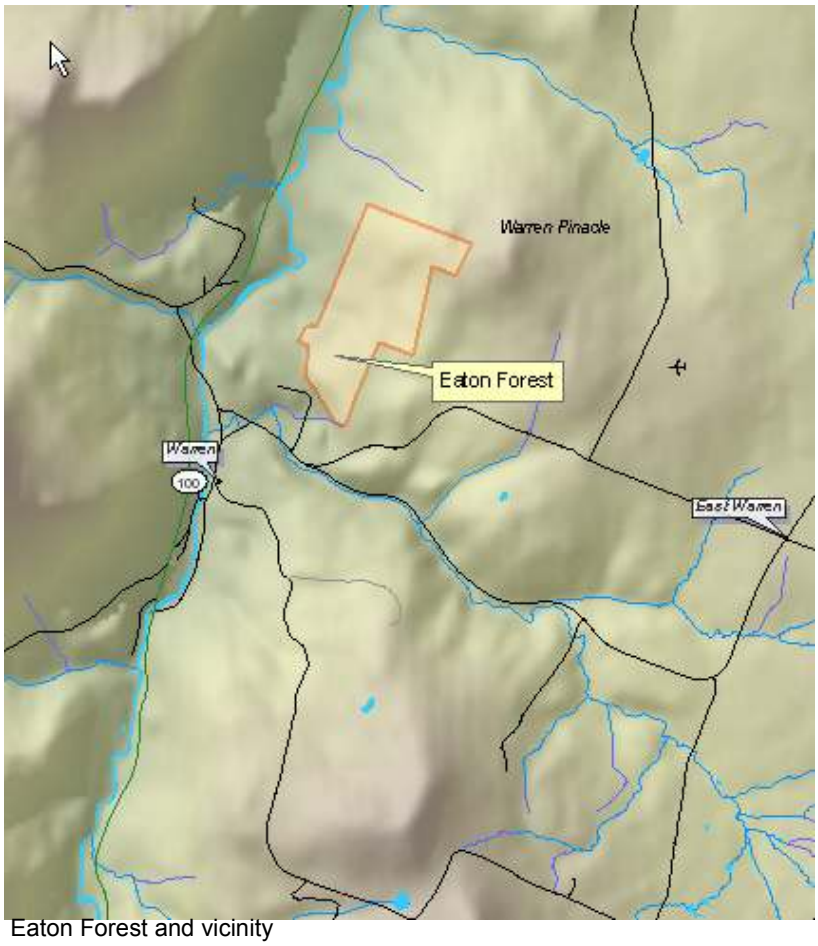
The creation of this plan was guided by the input from Warren's residents:

- 2005 Warren Town Plan
- 2006 Town meeting survey
- 3rd/4th Grade Interviews of Elders and Forest Statement, Spring 2006
- Listening sessions Oct 25 and 30 2006
- Municipal property charrette – November 2006
- Management Plan Steering Committee
- Public input sessions – February 2008

LEARNING ABOUT THE FOREST

In order to gain a better understanding of the capacity and features of the forest, the Conservation Commission undertook the following assessments:

- Natural Community Inventory of the Eaton, Gravel Pit, and Riverside Park Parcels, Warren, VT – June 2007 (Brett Engstrom, Ecologist)
- Town-wide Natural Heritage Inventory – 2008 (Arrowwood Environmental)
- Timber and forest resources – County and State Foresters (2007)
- Bird Habitat - Audubon Vermont (2007)
- Trail assessment and recommendations – Timber and Stone (2007)
- History – local residents



Eaton Forest and vicinity

PUTTING IT ALL TOGETHER

In June 2007, the Warren Conservation Commission released a request for professional assistance to collect and analyze the information generated from a wide variety of sources, to conduct public input on proposed goals and management actions, and to assemble and integrate this material into a plan document. Proposals were received from two contractors and were then reviewed by the Conservation Commission. Interviews were conducted and R. J. Turner Company of Bristol, VT was selected as the contractor.

I. A VISION FOR THE FUTURE

VISION STATEMENT

Envisioning a desired future takes effort! In 2006, Warren's school children and townspeople put considerable effort into a "process that would engage the community in actively thinking about how it wants to interact with its forested landscapes." (Warren Town Forest Project, 2007). A vision for the role of forests in the general community (see below) was an important outcome of the Listening Sessions.

Building on the vision for Warren forests in general, the following statement articulates a vision for the future use and management of the Eaton Forest by the Town of Warren:

We as a community in Warren, collectively and individually, rely on the forested landscape in our town for our health, well being, economy, and sense of place. As a town-owned forest, we value the Eaton Forest as a public place where we can come together to enjoy, learn about, and care for the forest and its inhabitants for many generations to come.

We appreciate that the Eaton Forest is a unique public space that is easily accessible by many residents due to its close proximity to the Village and school. We want the Eaton Forest to be a place where people can walk, hike, ski, hunt, and find space for quiet contemplation. We want all of Warren's residents to continue to have the opportunity to personally experience and identify with this important resource in the town so that generations to come will continue to have personal ties to Warren's forests.

We recognize that the Eaton Forest is home to a diversity of wildlife species, some of whom are reclusive and need space away from human development. We want to respect the needs of these species so that they will continue to thrive in Warren's landscape. We would like to maintain the secluded and undisturbed attributes of the more remote parts of the forest for this reason.

We feel that Warren's forests have been – and continue to be – intricately tied to our economic well being and sense of identity. We want the Eaton Forest to be a place that continues to celebrate this connection through low-impact management for local forest products to be used for the benefit of our community, education and study related to forest management practices, and as a place in which the community can gather to continue to celebrate and learn about Warren's economic, social, and ecological ties to the forested landscape.

We also recognize that a limited portion of the Eaton Forest along the existing road frontage may be suitable as a site for affordable housing, of which we have a pressing shortage in Warren. Although there are no plans to develop this portion of the forest at this time, we feel an obligation to leave open the possibility of building affordable housing for families here until we have more information on this option.

MANAGEMENT GOALS FOR THE EATON FOREST

The vision frames the future direction of activities on the forest in terms of a desired future condition. Goals are designed to provide an organizing framework for management guidelines and actions. Eight goals for the property are stated below.

Forests in general and public forests in particular are being asked to supply a much greater range of public services than was true in the past. Most of the actions undertaken to achieve the below goals will be compatible with each other, but conflicts will inevitably arise. To guide current and future managers, these goals are listed in order of their importance, based on the opinions of the steering committee and on the results of other forms of pubic input.

Eaton Forest Goals

1. Sustain and Enhance Ecological Health: The Town will manage this property such that the functioning of ecological systems will be protected or enhanced. Forests provide a range of ecological services, such as filtering water, providing wildlife habitat, and removing carbon dioxide from the atmosphere, in addition to the production of wood products. To the extent possible with consideration for site conditions, legal restrictions, and current knowledge, activities and practices will not degrade the ecological health of this parcel.

2. Permanently protect the benefits of this forest through a conservation easement: Effective management and stewardship are inhibited until the permanent status and use of this property is decided by the citizens of Warren. A conservation easement will be placed on all areas of the property, but reserving two areas, at least temporarily, until the suitability of these two areas for other uses has been resolved.

3. Sustain and Enhance Wildlife Habitat: Impacts to a wide range of game and non-game species will be considered in actions that promote recreation or research. Ensure that wildlife plans consider the broader landscape and coordinate with other landowners.

4. Provide Diverse Opportunities for Place-Based Education and Interpretation: The Town will pursue grants and partnerships with a variety of groups to support the use of the Eaton Forest as an outdoor classroom, for children and adults.

5. Promote Use of the Forest for Low-impact Recreation: Management actions will encourage and support recreational uses consistent with the goals above.

6. Model Sustainable Management Practices: As a demonstration to the present generation and as a legacy to future generations, the Town's management will employ practices that model sustainability, adapting and changing as this concept continues to evolve.

7. Use the Tangible Products of the Forest: Management will support the production of forest products, where this is consistent with other goals stated above.

8. Recognize and Appreciate Cultural History*:* Cultural features of the landscape will be managed along with the physical features. Opportunities to research, protect, and share the cultural history and features will be pursued.

COMMENTS ON THE PUBLIC INPUT PROCESS

These properties are owned by the public and citizens should have a voice in their management. This is often easier said than done, partly because opinions are diverse and difficult to assess, but also because the issues are complex and diverse, often requiring additional information to become "informed." The Warren Conservation Commission has endeavored to follow the "early and often" maxim regarding public input, employing a diverse group of methods over an extended period. Town-owned lands were the subject of a 2006 town meeting questionnaire, where citizen's opinions about a variety of uses were compiled. Later in 2006, Warren's forests were the focus of two Listening Sessions. These sessions resulted in the mandate to gather more background and data about these properties, culminating in this document, the Management Plan. (Hamilton, 2007)

One of the initial actions by the Conservation Commission at the inception of the management planning process was the creation of a broadly constituted steering committee of Warren residents. This committee consisted of three Conservation Commission members, the director of the Mad River Path Association, a Selectboard member, a Planning Commission member (also on the school board), a naturalist, and an elementary school teacher. The committee's job was to guide the planning process, provide feedback on drafts of the plan, a represent their constituents' values as sincerely as possible. The draft plans that resulted were then presented to the public in January 2008.

Rich site indicator: Blue Cohosh

On February 8, 2008, the community was invited to a public forum. The forum was designed to summarize the information for each property, extracted from the plans, and then to solicit opinions about the relative importance of the goals. Suggestions were also taken on modifications to the goal language and for any additions to the list of goals. Approximately 40 residents attended the forum. The results of the forum process (interpreted and reviewed by the steering committee) established the order and priority of the goals listed above. The results of the forum voting and a summary of attendees' comments are included as Appendix B.

The issue of affordable housing on this parcel deserves special attention. At the public forum in February, we added *Affordable Housing* on a restricted part of this parcel as a goal to the above list and solicited feedback from those attending. While Affordable Housing was a "first choice" goal for some, their number was small (but passionate!). There was also strong sentiment that this parcel is inappropriate for housing development. Ultimately, the steering committee felt that Affordable Housing was as not appropriate as a management goal since management actions had little ability to affect the goal. Instead, this plan addresses the public interest in affordable housing as a potential *constraint* to the management of this parcel. This issue is discussed further at the end of Section II.

Input from the community on the management of these properties doesn't end with the publication of these plans. The plans are designed to *guide* management, not to dictate management. Specific actions and activities are suggested here, but exactly which activities are undertaken, how and when they are attained will mostly likely rely on continued direction and commitment from residents.

II. Property Description and Management Guidelines

This section of the plan offers descriptions of many of the important features and characteristics of the Eaton Forest. At the end of each descriptive section are statements of general management goals, along with guidelines that direct how this parcel will be used and managed in the future. The guidelines are shaped by what is known about the opportunities and limitations of the parcel and the priorities described in the *Vision Statement* and *Goals*.

Figure 1 Aerial photo with Eaton Forest boundaries

CULTURAL HISTORY

PRE-TOWN FOREST: AN AGRICULTURAL PAST

Warren Mills 1907

Given the long history of settlement and agriculture in Vermont, it is likely that people have used the Eaton Forest for a long time. However, its steep, rocky terrain would have made the Forest unsuitable for cultivation and only marginally suitable for grazing even the hardiest livestock. Therefore, it is possible that the Forest was never fully cleared and was used historically as a woodlot and/or sugarbush, especially in the steepest, most rocky places.

Prior to 1983, John C. Eaton owned Eaton parcel. John had purchased the property from Henry and Lena Brooks in 1960 (deeds). Ella N. Diovall had deeded the Forest – which is referred to in the deeds as "a portion of the Diovoll Farm" – to Lena in 1937. Ella's husband, Clarence A. Diovall, had died in 1927 at which time his estate was divided equally between his wife and daughter, Nina. Nina deeded the Eaton Forest to her mother in September of 1937 a month after her father's estate was distributed.

The Diovall Farm was larger than the Eaton Forest is now and is referenced in the deeds as including "all lands north and northeast of Freeman Brook." In addition to farming, the Diovalls sugared since, in addition to the land, Ella conveyed "all the farming tools and sugar tools on said place" to Lena Brooks in 1937 (deeds). The sugarhouse foundation along the southeast boundary of the Eaton Forest property boundary, may have been constructed and used by the Diovalls or by prior owners.

It is unclear in the deeds who owned the Eaton Forest before Clarence and Ella Diovall. However, the 1873 Beers *Atlas* shows a number of houses along Freeman Brook, including one labeled as "M. Divol" which could have included a farm that encompassed the Eaton Forest. With more time, it would be possible to construct a more complete record of historic land ownership and use of the Eaton Forest. Such a project could be ideal for students at the Warren School.

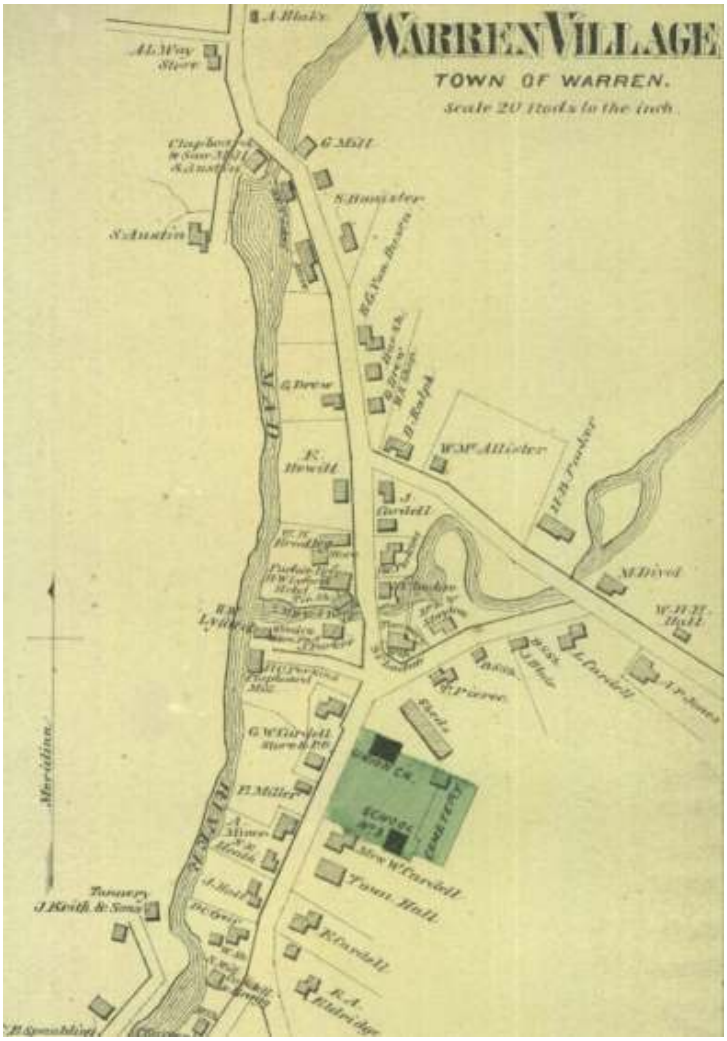
TOWN-OWNED FOREST: 1983 – PRESENT

The forest reclaims an old sugar-house foundation and a rusty sugarpan in the Eaton Forest.

The Town of Warren purchased the 114-acre Eaton Forest from the estate of John C. Eaton on December 3, 1983 for $135,000 (deeds). The decision to purchase the Forest was made by Warren's residents at Town Meeting with the intent of protecting it from a potential condominium development (personal communication, Reta Goss and Margo Wade, October 16, 2007).

Since the purchase of Eaton Forest, there has been little official management or record of activities on the parcel. In 2004, a new field was cleared adjacent to the existing Brooks Recreational field along the western edge of the parcel. At this time some selected trees were removed from the Eaton Forest, adjacent to the Mad

River Path. Other than the 2004 work, no widespread timber harvesting has occurred since the town acquired the parcel. Recreational use has been limited to the existing Mad River Path and bushwhacking though the rest of the parcel. Teachers at the Warren Elementary School have a long tradition of using the forest for scientific explorations, writing activities, and for simply getting outside (Beth Young, personal communication, October 29, 2007). The after-school program and Warren Summer Camp also have a history of walking, learning, and playing in the woods with young people (Beth Young, and Warren Town Plan).



With the beginning of the project that led to the development of this management plan, there has been renewed interest among Warren residents in considering the potential of the Eaton Forest. On September 17, 2006, with funds from the Vermont Town Forest Project, the Warren Conservation Commission sponsored the *Warren Forest Discovery Day* at the Eaton Forest, which included activities, discussions and walks led by local naturalists, foresters, educators, and birders (Hamilton, 2007). This event, the public listening sessions held in October 2006, and the resulting assessments of the Eaton Forest, the Austin Forest, and Riverside Park, are all intended to better inform and involve the public in developing a clearer plan for the on-going management and use of Warren's town-owned lands.

Objective 1 Provide opportunities to celebrate and teach about the Eaton Forest's cultural history.

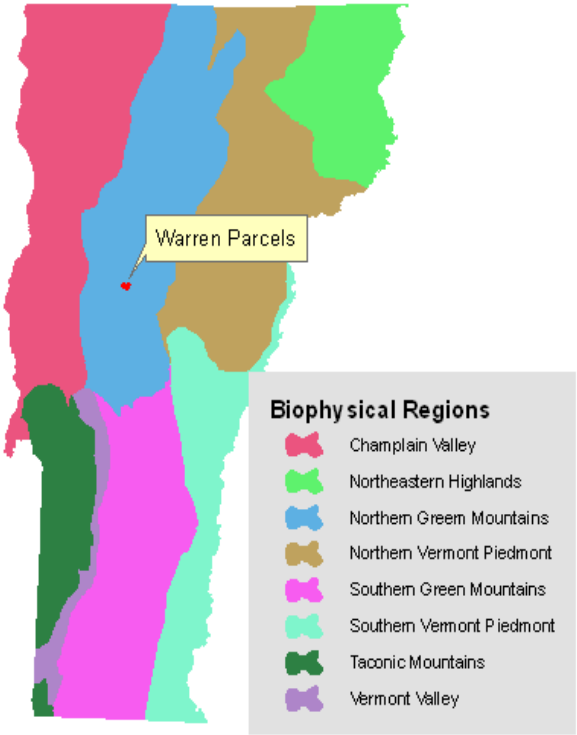
Recommended Guidelines and Practices:

- *Protect and highlight remnant cultural features in the Eaton Forest including old sugarworks, stonewalls and line trees.*
- *Encourage further research and study of the Eaton Forest's cultural history, particularly by Warren Elementary School students.*
- *Conduct and record interviews of community elders who have memories of the Eaton Forest.*
- *Research historic uses including agriculture and timber production..*
- *Consider an official "Town Forest" designation by the State of Vermont.*

GEOLOGY, TOPOGRAPHY, AND CLIMATE

BIOPHYSICAL REGION

Biophysical regions categorize the landscape into units that share aspects of topography, geology and climate (Thompson and Sorenson, 2000). These units provide an organizational hierarchy for understanding aspects of the underlying physical and vegetative landscape. The Eaton Forest lies in the Northern Green Mountains biophysical region and is fairly typical of the region lying south of the Winooski River.



BEDROCK GEOLOGY

The bedrock of Warren is the solid rock that creates the shape of the town's mountains and valleys. At the Eaton Forest, the bedrock is never very far from the surface and protrudes in places as outcrops and cliffs. The bedrock not only defines the Forest's topography, but also often affects the fertility and properties of the soil above it, which has a significant impact on the plants growing on the site.

The bedrock that is exposed at these outcrops and cliffs and sits just below the soil throughout much of Eaton Forest is part of the Pinney Hollow Formation, which is dominated by phyllites and schists. These metamorphic rocks were originally sedimentary mudstones which formed by the slow processes of deposition, compaction, and cementation of fine-grained sediments in the waters of the ancient Iapetus Sea – a shallow, tropical ocean that covered the area that is now Vermont 650 – 445 million years ago. From about 550 – 440 million years ago, these mudstones were uplifted, metamorphosed, folded, and faulted into the Green Mountains by the crushing heat and pressure of a mountain-building event called the Taconic Orogeny. The north-south orientation of Vermont's mountains, as well as many of the smaller ledges and cliffs at Eaton Forest, is due to this event, which was caused by the force of the westward movement of a tectonic plate. The rocks at Eaton Forest, and in much of the rest of the Green Mountains, were later further deformed by another mountain-building event that created the White Mountains to the east. Since their formation, the Green Mountains have been slowly weathering and eroding into the landscape that we know today.

The schists and phylittes at Eaton Forest are acidic and non-enriched, which means that they lack the minerals such as calcium and magnesium that increase the fertility of soil. However, it is likely that there are small inclusions of other rock types in the schist and phyllite bedrock matrix, such as greenstone and amphibolite (Engstrom,

2007). These inclusions could contribute to the occurrence of plant communities, such as the Rich Northern Hardwood Forest, at Eaton Forest, which contain plant species that rely on the mineral enrichment these rock types contribute to the soil.

SURFICIAL GEOLOGY

A much more recent geologic event – the last ice age – had a lasting impact on Warren and Eaton Forest's topography and soils as well. The sediments deposited by retreating glaciers that covered Warren during this time are critical resources for the people of Warren and are extracted from sand and gravel pits along the Mad River Valley. These sediments also affect the texture, drainage, and fertility of many of the area's soils. Since soils are so critical to the growth of plants, surficial sediments are an important part of understanding the ecological capacity and limitations of Eaton Forest.

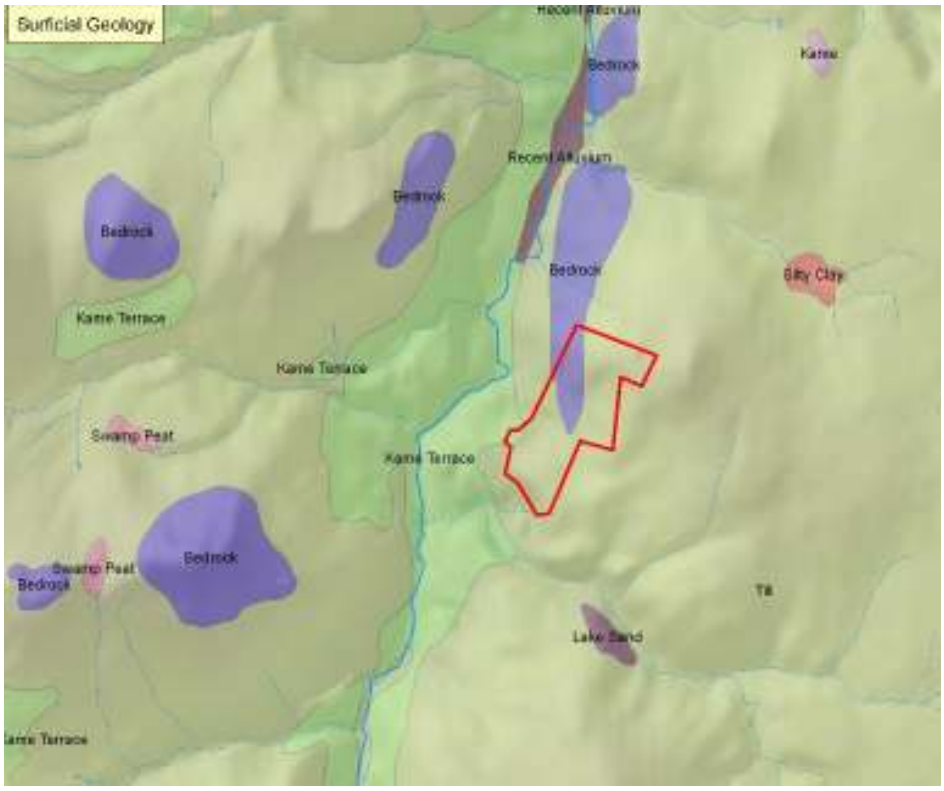


Figure 3 Surficial Geology in the vicinity of the Eaton Forest

Fourteen thousand years ago, the ice sheet that covered Warren and the rest of New England began to melt and retreat northward. In its wake, it deposited a rocky, jumbled mix of sediments, called glacial till, over most of Vermont's scoured landscape. Where the bedrock is not exposed, till covers the slopes of Eaton Forest and is the source of stones in the site's rocky soils (surficial map, VTGS).

The melting ice also generated a tremendous amount of meltwater that collected in valleys throughout the region, creating a series of glacial lakes. The glacial lakes that flooded the Mad River Valley during this time changed in depth as the lake waters gradually broke through barriers and found drainages to the south. One of the earliest and deepest lakes, Glacial Lake Granville, was deep enough to cover the top of Warren Pinnacle (surficial map, VTGS). As water levels dropped, the flooded Mad River Valley became part of Glacial Lake Winooski, a large glacial lake that flooded the Winooski River Valley, as well as the Lamoille River Valley and the path of Route 100 north to Eden up to elevations of 915 feet. Finer clay, silt, and sand sediments were carried by draining water into Glacial Lake Winooski, where they collected in the valleys at the bottom and along the edges. The flat field at Eaton Forest, the site that the school sits on, and the Town garage and sand pit below the school, are all part of a large terrace that was formed by deposits of sand and gravel that fell out of the fast-moving waters of Freeman Brook where they met the standing waters of Glacial Lake Winooksi.

TOPOGRAPHY AND ASPECT

The Eaton Forest is part of the lower, west-facing slope of Warren Pinnacle. Most of the terrain is rugged, rising steeply from 900 feet at the flat, open field to about 1500 feet. West-facing rock outcrops are exposed throughout the upper elevations of the property, with an especially dramatic north-south-running cliff extending the length of the parcel, which is visible from the Warren School (steepest slopes highlighted in orange). Slope and accessibility limit the opportunities for management on the upper section of the parcel.

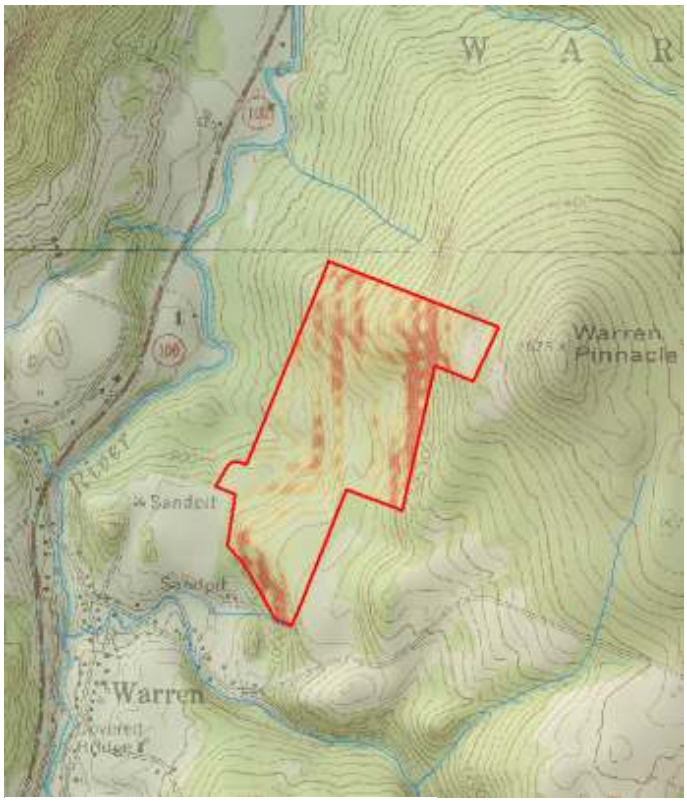


Figure 4 Topography and slope

CLIMATE

Climate describes the average weather patterns in an area over time, particularly temperature and moisture parameters. Climate is an important consideration in forest management because of its impact on soil development and erosion and plant growth, which is particularly impacted by the length of the growing season. All of Warren is part of the Northern Green Mountain biophysical region, which is defined by high elevations, cool summers, and acidic, metamorphic bedrock (Thompson and Sorenson, 2000). The tree species that grow the best in the forests of the Northern Green Mountains are well adapted to long, cold winters, and nutrient-poor soils.

Climate also impacts forest management. In Vermont, the seasons often dictate when it is best to do different management activities. For example, logging during the winter when the ground is frozen would minimize damage to thin and wet soils at Eaton Forest.

Objective 2. Protect the physical attributes and processes that are unique to Eaton Forest.

Objective 2.1 Ensure that any proposed activities or management actions are appropriate for the physical characteristics of the site

Recommended Guidelines and Practices:

- *Any permanent or semi-permanent improvements should carefully consider the disturbance to the site and the capacity of the site to support the use.*
- *Minimize disturbance to the site to protect soil and vegetation.*
- *Slope steepness affects erosion and access for management. Topography should be an important consideration for forest management and recreational uses.*

SOIL

Without soil, Eaton Forest would look very different – dominated by bare rock and blowing sands. There certainly wouldn't be any trees covering the hillside. Soil is the relatively thin boundary, comprised of mineral particles, organic matter, air and water that create the transition between the non-living bedrock and sediment layers below and the living world at the surface.

Soil and dirt are not the same thing. Soil refers to the complex substrate that supports plant, microbial, and animal growth. Trees and other woodland plants take up water and essential nutrients from soil through their roots, and return nutrients and organic matter to the soil through the leaf litter and decomposition of woody material. Soil microbes and invertebrates influence the chemical properties of soil by through the decomposition of organic matter and can also act to aerate soil through activities such as tunneling.

Not all soils are the same. The complex structure and characteristics of different soils are derived from interactions between: the parent material (the primary input of new mineral material into soil, such as bedrock or sand), climate, time, topography, and vegetation. Each of these factors influences the development of a soil's structural, chemical and biological properties.

Unit Code	Name	Acres	%
39A	Colton gravelly loamy sand, 0 to 3 percent slopes	5.3	4.4%
39D	Colton gravelly loamy sand, 15 to 25 percent slopes	0.2	0.2%
63D	Berkshire fine sandy loam, 15 to 35 percent slopes, very stony	40.1	33.1%
72C	Tunbridge-Lyman complex, 8 to 15 percent slopes, very rocky	7.4	6.1%
72D	Tunbridge-Lyman complex, 15 to 35 percent slopes, very rocky	38.6	31.8%
72E	Tunbridge-Lyman complex, 35 to 60 percent slopes, very rocky	29.7	24.5%
		121.3	100.0%

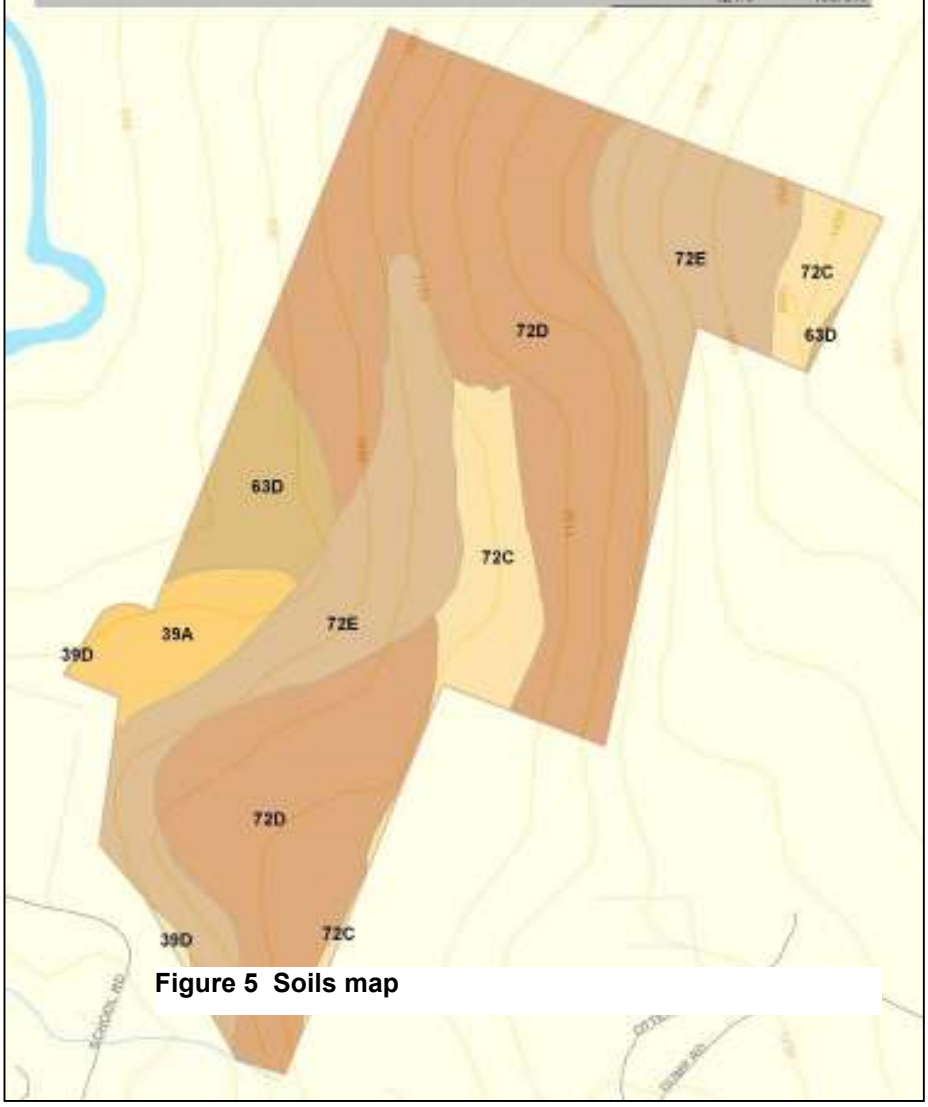


Figure 5 Soils map

The structural, chemical, and biological characteristics of soil on a particular site are directly connected to that site's productivity – or fertility. It is difficult and often prohibitively expensive to enhance the productivity of a forest's soil; forests cannot be fertilized in the way that cultivated fields can. However, it is very easy to lower the productivity of a site through poor management. Soils can quickly be lost and damaged by compaction and disturbance caused by heavy equipment, which leads to erosion. Recognizing

that soils take a long time to form and have a fundamental role in forest growth and health is critical for the sustainable management of forests.

SOIL TYPES

TUNBRIDGE – LYMAN COMPLEX

This grouping of stony soils formed from glacial till and bedrock covers the majority of Eaton Forest. In the less-steep areas, such as on shoulders and backslopes, the soil is able to accumulate and is moderately deep and drained. In the steeper areas and on summits and shoulders where soil is constantly moving down slope, the soils are thinner and excessively drained. This complex also encompasses the bedrock outcrops and ledges at Eaton Forest where soil has not accumulated, or only exists in a very thin layer.

BERKSHIRE FINE SANDY LOAM

This soil covers a small gently-sloping area of Eaton Forest northwest of the beginning of the Mad River Path. The deep, fine sand that is the parent material for this soil is at the edge of the sand and gravel terrace that underlies the playing fields, school, and town garage. The relatively large sand particles and intermixed gravel and stones in this soil make it well drained.

COLTON GRAVELLY LOAMY SAND

This soil underlies the recently cleared field at Eaton Forest. The soil is very deep, and forms the flat surface of the sand and gravel terrace.

Objective 3. Maintain soil productivity through practices that avoid soil disturbance and promote nutrient retention.

Recommended Guidelines and Practices:

- *When possible, perform timber harvests in winter when the ground is frozen to minimize soil compaction and erosion, and disruption of soil layers and processes.*
- *Follow best management practices (BMPs) for control of soil erosion when logging and constructing or maintaining skid and recreation trails.*
- *Perform regular maintenance on recreation trails, including clearing water bars, culverts, and ditches.*
- *Avoid whole-tree removal on low-fertility sites where lost nutrients will have an especially high impact on site productivity*
- *Avoid or severely limit the use synthetic herbicides, pesticides, or fertilizer anywhere on Eaton Forest.*

WATER

Eaton Forest is located within the Mad River Watershed. Therefore, water that drains off the Forest's steep slopes eventually ends up in the Mad River, which flows into the Winooski and then into Lake Champlain.

Intermittent stream

STREAMS

There are no permanent streams at Eaton Forest, but there are intermittent streams and a few places where groundwater rises to the surface at Eaton Forest.

WETLANDS

The natural communities inventory on the Eaton Forest identified and mapped 4 seeps, one vernal pool, and a 1.4-acre area of seepage forest. While none of these areas are rare, they are special and should be treated with care.

Erosion is a particular concern at Eaton Forest since water traveling downslope is more likely to carry away soil particles from seeps and steep areas.

Objective 4. Protect the wetlands on the parcel (vernal pools, seeps, seepage forests).

Recommended Guidelines and Practices:

- *Forestry activity will be excluded from wetland areas.*
- *Protective strips -- characterized by minimal soil disturbance, nearly-complete canopy closure, and many large, mature trees - should be maintained along the access network (roads and trails) and surface waters according to Table 4 in the Vermont Acceptable Management Practices for Maintaining Water Quality (AMPs).*
- *Areas of exposed soil that occur within the protective strip should be seeded using native species and sources to the maximum extent possible and mulched with material free of invasive exotics and applied according to Table 3 in the AMPs.*
- *Stream buffer strips should: be kept free of logging vehicles; have only little or no tree cutting; and be at least 25 feet in width.*
- *Sediment should be prevented from reaching streams by using turn-ups or broad-based dips on truck roads and skid trails prior to all stream crossings.*
- *Drainage ditches should not feed directly into streams or other surface waters.*

VEGETATION

A forest is made of much more than trees; it includes rocks, soil, water, wildlife, as well as all the ecological processes that connect these individual pieces. Plants, because they have particular growing needs and tendencies, are an expression of the soils and other abiotic components of the ecosystem, so we also often think about ecosystems in terms of what plants are growing in them. Since plants are central to the interconnections within ecosystems, we can categorize different places and sites by the communities of plants found there.

This section examines the vegetation growing on the Eaton Forest from two related but different perspectives: n*atural communities* and *forest stands.*

NATURAL COMMUNITIES

Since forests are dynamic and changing systems, ecologists find it useful to classify them, not only by how they are now, but also by their *potential*. Classifying the forest into natural communities is a process that evaluates the current vegetation and physical site to suggest the type of plant community that will persist on a site over time in the absence of major disturbances, including natural disturbances, such as wind storms, or human disturbances, such as logging. As defined in *Wetland, Woodland, Wildland*, a natural community is "an interacting assemblage of organisms, their natural environment and the processes that affect them" (Thompson and Sorenson, 2000).

Having an informed prediction of the forest types that will persist on the Eaton Forest over time helps managers tailor their management practices to complement the natural development and tendencies of a forest and to mimic ecological processes, such as the most likely natural disturbance regimes. Knowing about any rare or unusual natural communities also helps managers protect these areas.

TYPES

The natural communities in Eaton Forest were classified in a report by ecologist, Brett Engstrom. They are shown in the Natural Communities map on the following page and described in Table 1 (page 20).

- Alder Swamp
- Hemlock Forest
- Hemlock- Northern Hardwood Forest
- Mesic Red Oak – Northern Hardwood Forest
- Northern Hardwood Forest
- Northern Hardwood Talus Woodland
- Red Pine Forest/Woodland
- Rich Northern Hardwood Forest
- Seep
- Sloping Seepage Forest
- Temperate Acidic Cliff
- Vernal Pool

SIGNIFICANT NATURAL COMMUNITIES AND SPECIES

The State of Vermont has ranked all the known natural community types in Vermont based on how common they are. This ranking system allows landowners and managers to recognize an unusual community that may have significant value as a source of biodiversity and/or habitat and, therefore, deserve special protection. None of the natural communities surveyed on the Eaton Forest are large or rare enough to be of statewide significance. However, it is possible that Eaton Forest's hemlock and hemlock – northern hardwood forests could be significant when considered together with forests of the same types on adjacent properties (Engstrom, 2007).

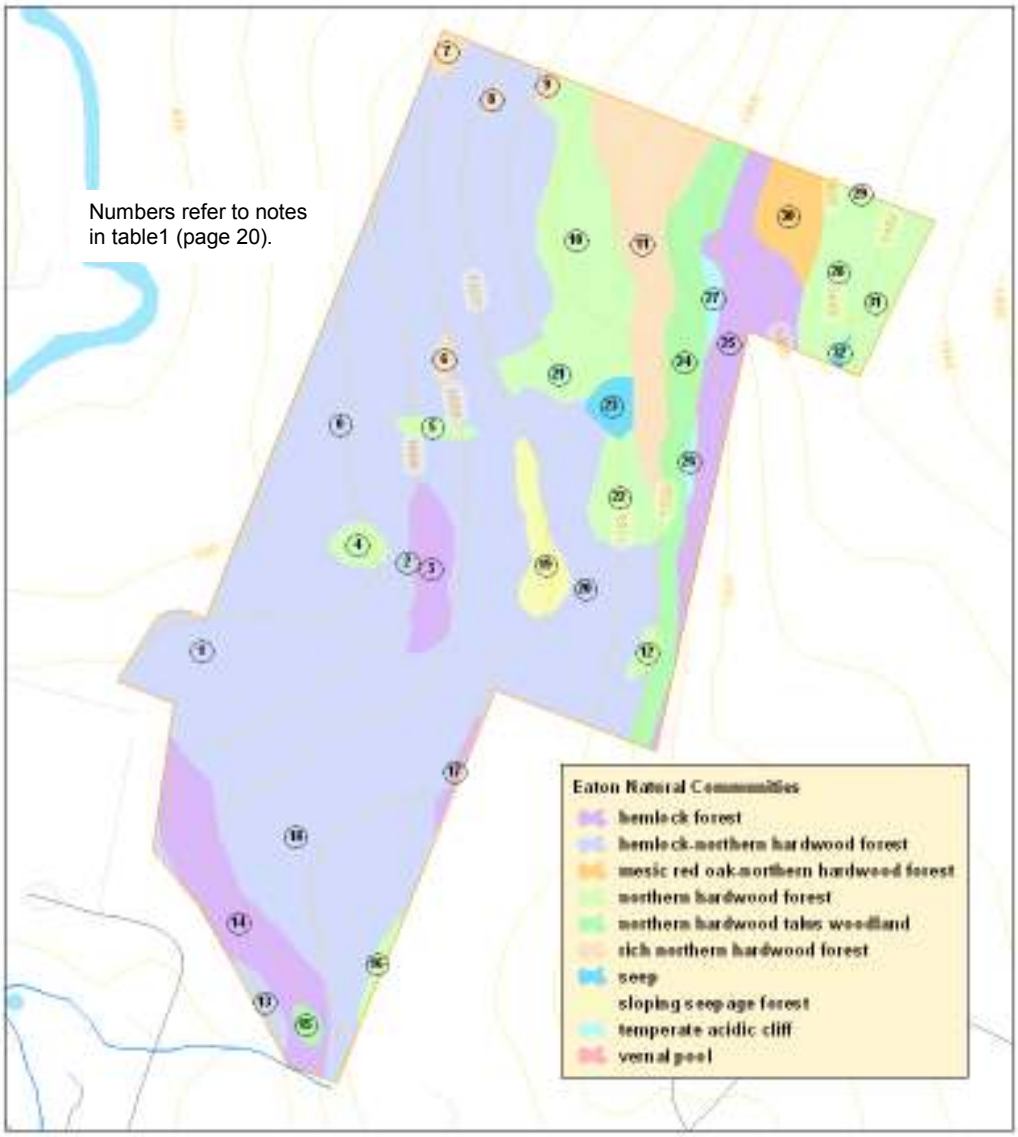


Figure 6. Natural communities

There are several natural communities at Eaton Forest that are locally significant within the town of Warren due to their rarity and/or good condition (Engstrom, 2007). The rich northern hardwood forests are in good condition and have high plant diversity. The mesic red oak – northern hardwood forest is special since oak is scare in the upper Mad River Valley. This community also supports growth of a diversity of other plant species, including the rare (state ranked S1) summer sedge (*Carex aestivalis*) and uncommon (state ranked S3) Back's sedge (*Carex backii*) (Engstrom, 2007). Showy orchis. (*Galearis spectablis*), Braun's holly fern (*Polystichum braunii*), and Goldie's fern (*Dryopteris goldiana*) are other uncommon plants that were found growing in the northern hardwood talus woodland along the Mad River Path (Natural Community Map; Engstrom, 2007). This community, along with the temperate acidic cliff, vernal pool, sloping seepage forest, and seep are all locally rare and collectively make a significant contribution to Eaton Forest's – and Warren's – biodiversity.

Table 1. Natural Community Observations (from Engstrom, 2007)

Map Id	Acres	Natural Community Type	NC Rank	Notes
0	53.87	hemlock-northern hardwood forest	S4	Matrix hemlock-northern hardwood forest in mature condition; includes areas which are quite rich
1	5.50	hemlock-northern hardwood forest	S4	Colton gravelly loamy sand soils, excessively drained, on broad terrace w/ school and rec fields.
2	0.03	northern hardwood talus woodland	S3	15x15m boulder talus pile. Mossy, ferny (especially intermediate wood fern)
3	1.77	hemlock forest	S4	Mature hemlock forest on steep, ledgy, WNW-facing slope N. of intermittent stream.
4	0.58	northern hardwood forest	S5	Small patch (0.25ha) of semi-rich mixed forest on concave slope N. of brook.
5	0.39	northern hardwood forest	S5	Swath of semi-rich mixed forest associated w/ intermittent stream wash on steep slope.
6	0.21	rich northern hardwood forest	S4	0.1 ha pocket of rich woods in cove below shaded 10m high phyllite ledge + talus.
7	0.33	rich northern hardwood forest	S4	20x50m rich swath along trail in N. corner at toe of moss ledge.
8	0.09	rich northern hardwood forest	S4	Unusual 7x30m rich ledge on W. slope of small hogback. Lush, mossy, shallow to bedrock
9	0.21	rich northern hardwood forest	S4	10x40m ledge toe-slope rich pocket straddling N. boundary.
10	6.68	northern hardwood forest	S5	
11	5.89	rich northern hardwood forest	S4	Maturing, even-aged, rich hardwood forest with a few very large sugar maples. Esp. rich @ledges.
12	0.32	northern hardwood forest	S5	Semi-rich hardwood cove, ~30x60m, below shaded cliff. mature, even-aged.
13	0.40	hemlock-northern hardwood forest	S4	Sliver on toe slope while hemlock forest on steep back-slope above.
14	4.60	hemlock forest	S4	Mature hemlock-red spruce + white pine &balsam fir on steep, ledgy slope.
15	0.26	northern hardwood talus woodland	S3	25x40m semi-rich, bouldery talus slope below 10m shaded phyllite cliff.
16	0.37	northern hardwood forest	S5	Flat along southeast boundary; one 98cm diameter sugar maple just off property.
17	0.46	hemlock forest	S4	Mature hemlock-red spruce forest on bedrock spine and flat along SE boundary.
18	7.56	hemlock-northern hardwood forest	S4	Even-aged yellow &paper birch, red maple, red spruce, black cherry with a few sugar maple
19	1.44	sloping seepage forest	UNK	Very broken hemlock, yellow birch, red maple canopy with lush herb layer and shallow muck soil
20	0.01	seep	S4	2x12m spring/seep, with springhouse. Exposed channels, sheet flow.
21	0.03	seep	S4	10x20m seep on gentle SW slope at base of steep, ledgy slope.

Table 1. Continued

Map Id	Acres	Natural Community Type	NC Rank	Notes
22	1.86	northern hardwood forest	S5	
23	0.64	seep	S4	Large (40x40m) seep on broad bench gently sloping south.
24	5.14	northern hardwood talus woodland	S3	Bouldery talus with variable tree cover, esp. y. birch, white ash, & basswood.
25	8.00	hemlock forest	S4	Narrow band of hemlock forest along crest of cliff/ledge.
26	0.16	temperate acidic cliff	S4	Sunny, acidic cliff, ca. 15+m high by ~100m long. Scattered sapling paper birch and red spruce.
27	0.34	temperate acidic cliff	S4	SW aspect, with small artificial opening/viewpoint on crest.
28	4.34	northern hardwood forest	S5	Northern hardwoods + red spruce, hemlock on sub-summit. Substantial paper birch; beech grove.
29	0.01	vernal pool	S3	40x10m vernal pool bisected by N. property line. W/ islet.
30	1.85	mesic red oak-northern hardwood forest	S4	Dense, even-aged (20-30cm diam) red oak + red spruce, hemlock, white ash, sugar maple woods
31	0.36	northern hardwood forest	S5	30x65m semi-rich, rocky, sugar maple-hop hornbeam-white ash forest on short, W-facing slope
32	0.08	seep	S4	5-10x40m touch-me-not seep flowing S. in small valley SE of sub-summit.

Wood fern

INVASIVE SPECIES

Invasive vegetation that displaces native vegetation represents a serious problem in Vermont. Both the number of invasives and the extent of invaded areas are increasing. Forests are most at risk from for Multiflora rose (*Rosa multiflora*) bittersweet (*Celastrus orbiculatus)*, Japanese barberry (*Berberis thunbergii)*, honeysuckle (*Lonicera spp)*, garlic mustard (*Alliaria petiolata),* winged euonymus (*Euonymus alatus),* common buckthorn (*Rhamnus cathartica),* Norway maple (*Acer platanoides)*, and smooth buckthorn (*Rhamnus frangula)*. These species were not noted in the recent inventories, but volunteers should be trained to recognize these species and invasive monitoring should occur. Most of these species tend to establish themselves initially in openings in the forest canopy.

Infestations are best treated early, when mechanical removal (cutting/pulling) is most effective. *Herbicides treatments should be used only after mechanical alternatives are deemed insufficient.*

FOREST STANDS

In the Eaton Forest, there are several different types of forests within the larger one. These forest types are typically classified by foresters into smaller units called stands, based on similar characteristics such as: tree species composition, age, and spacing; land slope and aspect; and other physical site characteristics such as soils and geology. While natural communities groupings are based on site conditions and vegetation assuming *no disturbance,* stands descriptions take a "management" orientation. They reflect primary considerations for silviculture. Silviculture – the art and science of forest management – is applied at the stand level, so it is important that these subunits be clearly described in this plan.

Stands are classified based on how the forest is now. However, forests are dynamic systems; characteristics such as tree species composition, age, and spacing change over time due the natural processes of forest succession and disturbance, as well as the impact of human activities such as logging. Therefore, the boundaries and types of the stands classified and described in this plan could change over time and will need to be reassessed in the future. Current stands are based on a formal inventory of conditions conducted during the winter of 2006. The discussion below draws heavily from the Forest Stewardship Plan for this parcel, prepared by Russ Barrett, Washington County Forester. This document is important as a companion to the summary presented here.

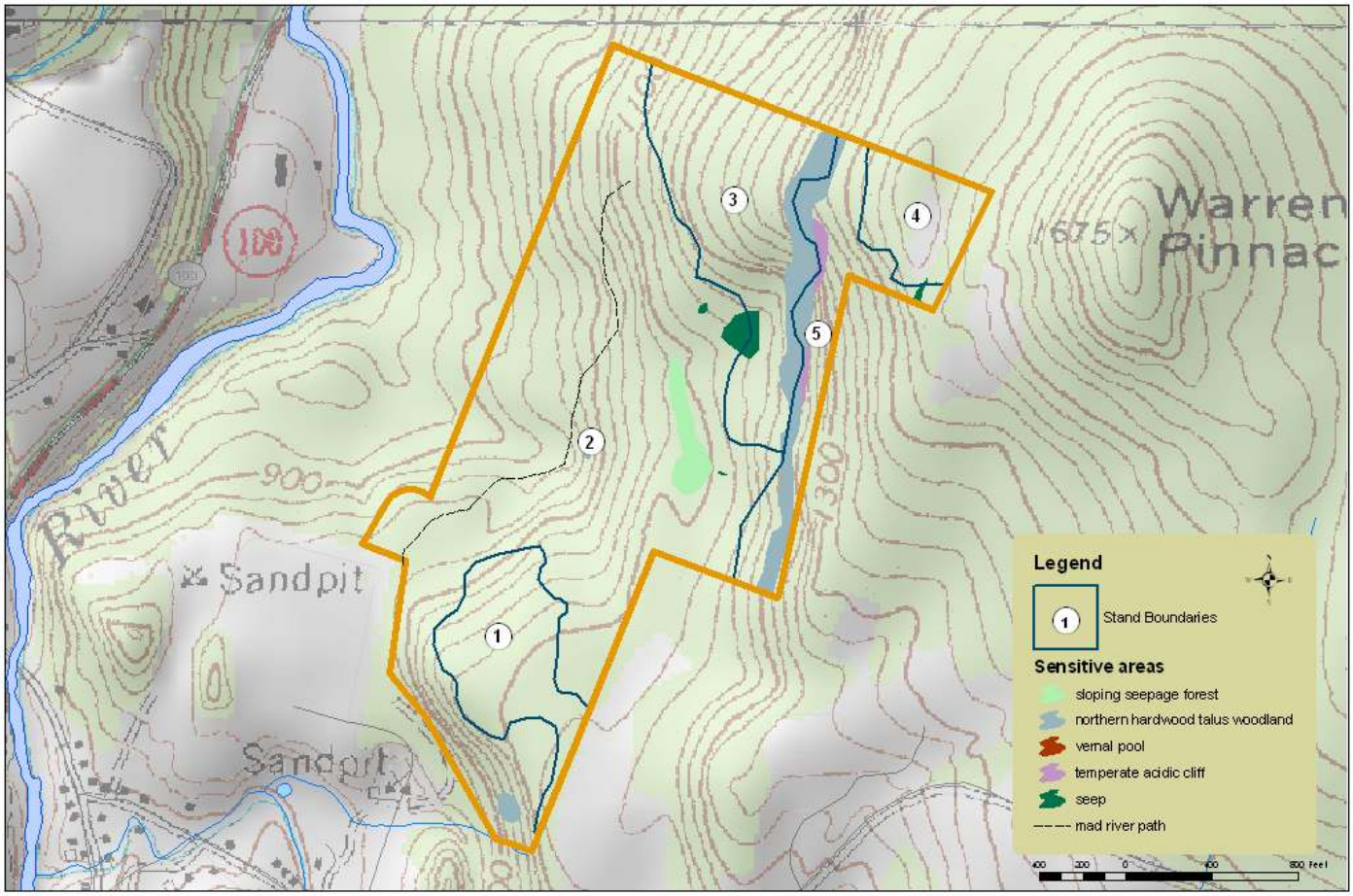


Figure 7 Forest stand map

Table 2. Eaton Lot Stand Summary

UNIT	COVER TYPE	Comments
Stand 1 12 Acres	Mixed wood	Two-aged mixed wood stand dominated by red spruce, sugar maple, hemlock and red maple. The stand is adequately stocked with small saw timber trees (11.5 – 17.5”). Timber quality is variable, with some good quality trees. There are few restrictions for logging equipment. The stand has high wildlife values and is mapped as a deer wintering area. There is also good potential for trails and educational opportunities. Timber quality: medium; Volume: 6,800 board feet per acre Management opportunity: Let grow for this planning period. However, if work is being done in adjacent stands, declining fir, birch and spruce could be salvaged. Any harvesting should attempt to enhance deer wintering cover.
Stand 2 58 Acres	Hemlock- Hardwoods	A maturing hemlock-hardwood stand, this stand includes the highest quality deer winter cover on the property. Hemlock, yellow birch, red maple and red spruce dominate the species mix. The stand is adequately stocked to overstocked with small sawtimber trees (11.5-17.5”) dominating. This stand is mapped as a deer wintering area and has several small streams with associated riparian and wetland areas. The stand also has some beautiful ledge areas. It could easily be used as an outdoor classroom. Timber quality: medium; Volume: 8,550 board feet per acre Management opportunity: Develop trail system that avoids wetlands, ledge outcrops, steep areas and remnant large white pines. Conduct uneven-aged harvest using group selection and reduce residual basal area to no lower than B-level. Favor hemlock, yellow birch and red spruce.
Stand 3 17 Acres	Northern Hardwoods	A two-aged northern hardwood stand dominated by white ash, sugar maple, yellow birch and white birch. The stand is adequately stocked to overstocked with trees in the small sawtimber size class (11.5 – 17.5”). This stand has very good potential to grow hardwood timber. Although mapped as a deer wintering site, this stand lacks significant softwood cover. The stand has impressive ledges and cliff-like terrain, large trees and possible cave sites. Timber quality: medium; Volume: 4,220 board feet per acre Management opportunity: Manage for multiple objectives including timber, wildlife and recreation. Fix and maintain old roads. Conduct uneven-aged harvest reducing residual basal area to about 90 sq. ft.

Stand 4 7 Acres	Northern Hardwoods	Small, somewhat isolated stand of northern hardwoods dominated by sugar maple and white ash. The stand is stocked is adequately stocked to overstocked with trees in the medium sawtimber size class (17.5-23.5”). The stand is located above the central cliff/ledge area in the forest and will likely need to be accessed through a neighboring property. Lots of turkey scratch was noted in this stand. Scattered red oak adds to the diversity of this stand. Timber quality: medium. Volume: 9,640 board feet per acre Management opportunity: Manage for multiple objectives including timber, wildlife and recreation. Any timber harvesting will be dependent upon access through adjacent properties. Light, all-aged harvest recommended to reduce basal area to 90 sq. ft./acre.
Stand 5 8 Acres	Cliff and Rock Outcrop – Non-productive	This area includes the steepest and most severe portions of cliff and rock outcrop. This area has great vistas, and cliffs and ledges may provide important habitat. Could develop a trail to the top of the cliffs to take advantage of the vistas. Management opportunity: No forest management is recommended in this area.

The Stewardship Plan contains more detailed descriptions of the stands listed in Table 2 and makes recommendations for management. In general, the plan recognizes little short-term opportunity for generating income from forest management, but finds considerable opportunity for recreation and educational activities, which are considered more fully below.

Objective 5.1 Promote the development and/or maintenance of natural forest composition, structure, and dynamics.

Objective 5.2 Protect rare and locally rare plant species and natural communities that contribute significantly to the biodiversity of Eaton Forest, Warren, and Vermont.

Objective 5.3 Conform to management standards that are consistent with Forest Stewardship Council (FSC) Green Certification principles.

Objective 5.4 Monitor and treat invasive vegetation.

Objective 5.5 Broaden the scope of inventories to include herbaceous and brushy vegetation, snags and den trees, and down woody material.

MANAGEMENT STANDARDS AND GUIDELINES

Standards for forest management activities are essential to maintaining the health and productivity of the forest. The goal of ecologically based forest management can be stated as intending to conserve native biodiversity, water quality, site productivity and scenic beauty (VFF, 2007). The management guidelines below were developed by Vermont Family Forest to support ecologically based forest management and are adopted in this plan to guide foresters and managers. These standards are consistent with FSC principles for the Northeast.

VEGETATION MANAGEMENT

- The single tree and small group selection methods should be used for communities with gap-phase replacement (e.g. northern hardwoods) and the irregular shelterwood method should be used for communities with stand-replacing disturbance regimes (e.g. spruce-fir). Uneven-aged management by area regulation is recommended. Where the group-selection method is employed, canopy openings of 0.25 acres or less are preferred but up to 1.25 acres are accepted. Where the group shelterwood method is employed, the size of the regenerated areas can be increased. Clear-cutting should be avoided.

- Promote an uneven canopy in the forest by creating small canopy gaps through natural processes or by cutting.

- Gradual or soft edges between habitats are preferred. Allow native shrubs, saplings, and some overstory trees to remain along the harvest boundary. Edges may also be “feathered” by retaining more trees closer to the uncut forest and gradually fewer trees closer to the harvested area.

- Manage for at least of 6 cavity, snag, and/or decadent, living trees per acre on average, with one exceeding 18 inches diameter breast height (DBH) and 3 exceeding 16 inches DBH. Leave trees that have cavities of varying sizes and are located in the upper trunk of the tree. Also, give priority to hardwood trees with cavities, rather than softwood, as they remain intact longer.

- Manage for at least 2 down trees or logs per acre exceeding 14 inches in diameter on average. (To address safety issues, this may be accomplished by clustering cavity and snag trees in areas such as riparian zones and wetlands and away from access roads and trails.)

- Grow the largest trees and use the longest rotations possible within site and log quality limitations. Use uneven-aged management by area regulation whenever possible. Intermediate treatments should generally raise the average (mean) diameter of the residual dominant and co-dominant trees of the forest while improving timber quality.

- Any forest management in natural communities that are ranked as “very rare”(S1) and “rare” (S2) or in natural communities ranked as “uncommon” (S3), “common” (S4), and “very common”(S5) but with little or no evidence of past human disturbance should be reviewed and approved by the VT F&W Natural Heritage Biologists.

- When planting, use only local sources of native species, plant three or more species, and include deciduous species.

- When thinning or regenerating stands, favor native species over non-native species and trees and shrubs that produce seeds and fruits.

- Use natural regeneration to the maximum practical extent.

- Biological legacies of the forest community -- including coarse dead wood, logs, and snags; trees that are large, living, and old; buried seeds; soil organic matter; invertebrates; sprouting plants; and mycorrhizal fungi -- should be protected to aid in post-harvest recovery and to keep the forest from becoming "oversimplified".

- Promote the seed bearing capacities of poorly represented members of the forest.

- Tree felling should be avoided on slopes exceeding 60%.

- Leave all materials that are less than 3 inches in diameter on the site.

- Promote a vertical stand structure that includes over-story, mid-story, shrub, and herbaceous vegetation layers.

- The use of pesticides -- including insecticides, fungicides, and herbicides -- should be extremely limited and only those pesticides accepted by the Northeast Organic Farming Association should be used.

- The use of non-petroleum bar and chain oil and hydraulic fluid is strongly encouraged.

- The use of genetically modified organisms or “GMOs” should be avoided.

- Residual stand damage -- including basal wounds, broken and/or scraped tops, and exposed roots -- should be confined to 10% or fewer of the dominant or co-dominant trees.

- It is recommended that all trees to be removed be marked prior to the inception of harvest.

- Average annual removal of woody biomass from the site should not exceed 70% of the average annual growth.

SKID TRAILS, TRUCK ROADS, AND LOG LANDINGS

- Truck roads, skid trails, and log landings should be built and maintained in compliance with the standards contained in the Vermont Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont.

- Avoid spring harvests and/or rutting that extends beyond the A soil horizon.

- It is strongly recommended that all skid trails, truck roads, and log landings be flagged or otherwise marked prior to the inception of harvesting

- Properly buffer and protect special habitats such as cliffs, caves, talus slopes, beaver meadows, vernal pools, spring seeps, and remnant patches of old growth forest.

- Use logging equipment that minimizes residual stand damage and soil compaction.

- The timber harvesting access network -- including truck roads, skid trails and log landings -- should be carefully designed and constructed and should not expose mineral soil on more than 10% of the treated area.

- Winter harvesting is preferred to protect breeding birds. When possible, delay summer harvests until after August 1st.

- Skid trails, truck roads, and log landings -- located on easily compacted soils -- should only be used when adequately dry or frozen. Employing small forwarders can reduce impacts and may allow some sites to be operated under less than ideal conditions.

- Minimize the width, number and extent of truck roads and skid trails -- particularly in or near sensitive areas such as stream crossings, protective strips, and steep slopes.

- Road and trail networks should be planned to avoid fragmenting forest blocks and to avoid creating linear openings in the forest. These can serve as vectors for predators or contribute to desiccation of leaf litter on the forest floor.

- Truck roads and skid trails should be properly drained during and after use according to Table 1 in the Vermont Acceptable Management Practices (AMPs). The drainage structures should remain fully functional with post-harvest use.

- Log landings should: be located on nearly-level, stable ground; be kept away from protective strips; have water diversions installed; and be graded to prevent erosion and sedimentation.

PROTECTIVE STRIPS AND BUFFER STRIPS

- Protective strips -- characterized by minimal soil disturbance, nearly-complete canopy closure, and many large, mature trees - should be maintained between the access network and surface waters according to Table 4 in the Vermont AMPs at a minimum.

- Areas of exposed soil that occur within the protective strip should be seeded using native species and sources to the maximum extent possible and mulched with material free of invasive exotics and applied according to Table 3 in the AMPs.

- Stream buffer strips should: be kept free of logging vehicles; have only little or no tree cutting; and be at least 25 feet in width.

STREAM CROSSINGS

- Stream crossings should be restored and non-permanent structures should be removed as soon as possible.

- Streams should be crossed with bridges or culverts which are properly sized according to Table 2 in the Vermont AMPs and installed at right angles.

- Sediment should be prevented from reaching streams by using turn-ups or broad-based dips on truck roads and skid trails prior to all stream crossings.

- Drainage ditches should not feed directly into streams or other surface waters.

CLOSEOUT

- Post-harvest use of the access network should be restricted in order to prevent erosion, compaction, and site disruption.

SENSITIVE AND SPECIAL HABITAT AREAS

Areas including wetlands, raptor nests, upturned tree roots, seeps, vernal pools, hard mast species, and other unique or fragile, natural or cultural sites including areas of historical or community significance sites require identification and protection.

Harvesting and road building in wetlands, including the construction of new roads or expansion of the width of existing roads by more than 20%, will require a permit or review by the Wetlands Office of the Water Quality Division (802) 241- 3770. The UVM publication "Wetlands Rules and Regulations: What they mean to your logging operation in Vermont" should be referred to when building or upgrading access and managing vegetation around wetlands.

WILDLIFE HABITAT

When managing a forest, it is important to identify and consider habitat features that are particularly critical to the survival of wildlife, especially if human use or management activities could affect the integrity of these habitat elements. The following are critical habitat features that have been identified at Eaton Forest so far.

LEDGES, CLIFFS, TALUS AND RIDGES

The north-south running band of cliffs that rises up toward the Warren Pinnacle in the eastern portion of the Eaton Forest is the most stunning physical feature on the property. These cliffs and the loose, broken rock – or talus – below them are also important habitat for wildlife. They offer good vantage points for hunters, shelter from extreme heat and cold, and spaces that are defendable. A few species, such as ravens, peregrine falcons, cliff swallows, and some bat species nest and roost directly on cliff surfaces in Vermont (Arrowwood Environmental, 2007). Ravens also sometimes nest in tall trees on the edges of cliffs.

Talus deposits

A greater diversity of species utilizes the talus that accumulates at the base of these cliffs. The small trees and shrubs, such as mountain maple and elderberry, compete well in these areas with minimal soil that are continually disturbed by falling and shifting rocks and also contribute to the shelter – and food – animals can find on and near the talus. Porcupines den in the talus (a porcupine carcass was found at the base of the talus area in Eaton Forest). Fishers and coyotes seek shelter in talus while moving through their ranges. Bobcats use rock outcrops and talus for hunting, courting, breeding, and as protected areas for rearing their young.

Like humans, many wildlife species, such as bear, deer, coyotes, and bobcat, will wear trails along ridgelines as they move between habitats in their ranges. The area above the cliffs in Eaton Forest is part of a north-south running ridge below the Warren Pinnacle, which species such as these may use as travel corridors to move through the forest.

DOWNED WOODY MATERIAL, SNAGS, AND CAVITY TREES

Porcupine jaw

The Eaton Forest has not been logged since the town purchased the land, with the exception of trees removed in the vicinity of the Mad River Trail (2004-05). One of the best indicators of this fact is the large number of dead and downed trees on the property. These trees probably would have been removed before they had a chance to die if the forest had been harvested in recent years. To many people, dead trees and debris can make a forest look “messy.” However, standing and dead wood are essential components of healthy forests; they serve several important ecological functions, including providing critical habitat for a many species large and small.

Downed woody material – logs and limbs lying on the forest floor – is home to microorganisms, insects, and other invertebrates during its various stages of decay. These organisms decompose the woody material and are also important food sources for birds, mammals, and amphibians. Even larger species, such as black bear, can have diets that rely heavily on invertebrates found in decaying logs, such

as ants and larvae. Downed logs are also used by wildlife species for shelter, displaying, resting, basking, and traveling across barriers such as streams.

Snags – standing dead trees – also provide habitat for many small organisms that contribute to the decay of wood which are food sources for species such as woodpeckers. Birds, including woodland raptors and owls, perch on the dead branches of snags in order to rest or as a vantage point for hunting. These species, as well as other bird species and small mammals, also often nest or den in excavated cavities in snags and living tress. Most species only nest and den in cavity trees of a minimum size; larger trees provide better insulation and more room to house large clutches and litters, as well as better protection from predators and more perches (Flatebo et al., 1999). Larger cavity trees are also more likely to stay standing for a longer time.

Fox den on upper Eaton

MAST

Trees, such as oak, beech, apple and cherry, and other plants, such as raspberry, that produce large volumes of hard mast (nuts and seeds) or soft mast (fruit and berries) are especially important to wildlife survival. The northeast corner of Eaton Forest above the vista supports a community of northern red oak and other hardwoods species including American beech. Oak and beech produce hard mast that is especially high in fat and protein. Red squirrels, wild turkey, black bears, mice and other wildlife are dependent on these mast species for survival, particularly through the winter.

Trees such as maple, birch, white ash, and eastern hemlock, can be found throughout Eaton Forest. These trees produce crops of small seeds that are important food sources for small mammals and songbirds, such as red squirrels, mice, pine grosbeaks, black-capped chickadees, and nuthatches.

Herbaceous plants growing on the forest floor also provide small fruits and seeds that contribute to wildlife food sources. At Eaton Forest these small plants include: Canada mayflower, trillium, sarsasparilla, and partridgeberry.

VERNAL POOLS

Vernal pools are seasonal, semi-permanent, or permanent bodies of water usually formed where rainwater, meltwater, or groundwater collects in topographical depressions. Since these pools often dry up annually or in times of drought and rarely have natural inlets or outlets, they are free from predatory fish. The absence of these fish species make vernal pools critical breeding habitat for a diversity of amphibians, such as spotted salamanders and wood frogs that mate and lay their eggs in these pools. Vernal pools are unique ecosystems in themselves, which also provide habitat for many smaller organisms, such as aquatic insects, snails and fairy shrimp that feed on each other and decaying leaf litter that falls into the pools from the surrounding forest canopy. Larger species, such a weasels and birds, may visit vernal pools to feed on insects and amphibians eggs, as well as to drink and bathe (Flatebo et al., 1999).

Community Engagement Idea

Organize community volunteers or school groups to monitor amphibian populations (flip boards and do counts each spring). Send data into citizen science monitoring group.

One vernal pool has been documented at Eaton Forest (Engstrom, 2007). The 40mx10m pool in the northeast corner of the Forest is bisected by the northern boundary line and lies partially on the adjacent property of William and Mary Rodgers

(Natural Community Map #29). By June 2007, the water levels had dropped significantly, but the pool was full of wood frog tadpoles.

Vernal pools are especially sensitive ecosystems and can be easily compromised by human activities, such as logging. Harvesting trees around vernal pools can increase exposure to sunlight causing a rise in water temperature and a reduction in dissolved oxygen. Removing the forest canopy around pools also reduces the input of leaf litter into the pools that forms the basis of the vernal pool food chain. Treetops and limbs that are left in vernal pools from trees that are felled nearby can interfere with amphibians' ability to move about. Operating heavy equipment around vernal pools can cause rutting that leads to changes in the water levels and drainage of the pools; crush amphibians buried under the leaf litter; create physical barriers to dispersing juvenile amphibians during their terrestrial life stage; and degrade the water quality of the pool by causing an increase in sedimentation due to soil compactions and erosion (Flatebo et al., 1999). All of these factors can affect the survival and reproductive success of amphibian species.

SEEPS

Forest seep

Three seeps have been identified in Eaton Forest (Engstrom, 2007). One is quite large (40mx40m) and is located on a broad bedrock bench below the cliffs. The second is smaller (10mx40m) and drains south through a small valley in the northeast part of the property above the cliffs. This seep was dry in early October, but could become wet again after fall rains. The smallest seep (#20) is fed by a spring and includes the remains of a springhouse. In June 2007, two dusky salamanders were found under stones in the seep and two spring salamanders were found in the springhouse (Engstrom, 2007). All of these areas would be good places to watch for wildlife throughout the winter, spring, and summer.

Seeps are small areas (usually less than ¼ acre) where the soil is saturated by ground water that flows to the surface for part or all of the year. These areas are particularly important food and water sources for many winter wildlife residents, such as wild turkey, deer, and moose, because they can remain unfrozen throughout the winter. They are also early sources of green vegetation and invertebrates for hungry animals in the spring. Early migrants, such as the American robin and American woodcock rely on the food and water seeps provide, especially after late snowfalls (Flatebo et al., 1999). Skunk cabbage, grasses and the roots of plants growing in seeps can comprise a major part of black bears' spring diets, and grasses, sedges, jewelweed, and the bulbous roots of plants growing near seeps can be a major part of their summer diets (Elowe, 1984 in *Society for the Protection of NH Forests*, 1997). In addition, amphibians burry themselves in the mud and leaf litter around seeps to hibernate through the winter. Amphibians also use seeps during the warmer months, which attracts skunks, raccoons, and other hunters.

DEER YARD

More than 90 percent of the Eaton Forest has been mapped by the Vermont Department of Fish and Wildlife as part of a large deer yard that extends onto portions of adjacent properties (Deer Yard Map; Barrett, 2007). This deer yard is an example of a particular habitat feature whose quality and function have been protected because it has not been fragmented by human development. The Warren Town Plan (2005) specifically identifies deer wintering areas as habitat features that

should be protected from “development and other uses that threaten the ability of the habitat to support deer” (Objective 3.3).

Deer yards are mixed stands of evergreens and hardwoods that provide food and shelter critical for the survival of deer and other wildlife through the winter months. Under the dense evergreen canopy at Eaton Forest, temperatures are slightly warmer, winds are more moderate, and the snow pack is shallower, which helps deer expend less energy staying warm and moving about. Deer yards also provide critical habitat for other wildlife species. For example, more than 40 bird species breed in the conifers in deer yards (Flatebo et al., 1999).

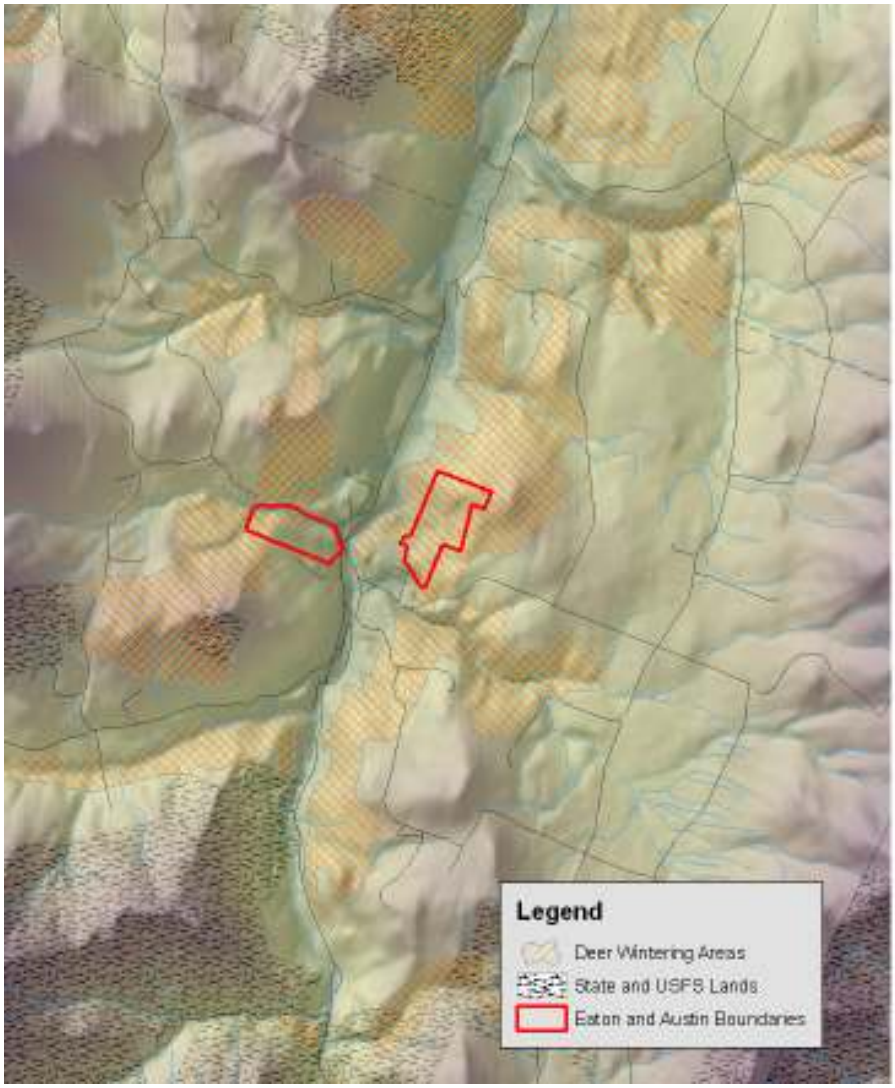


Figure 8 Deer wintering areas

In combination with the shelter provided by the dominant softwood cover at Eaton Forest, the smaller hardwood communities in the parcel offer sources of browse. The intermixed hardwood stands and patches containing young maple, moosewood, hobblebush, mountain maple, and birch provide easily accessible browse for deer so that they do not need to draw on precious energy reserves to travel through deep snow in search of food (Flatebo et al., 1999). The northern red oak – northern hardwood community in the northeast part of Eaton Forest contained moosewood in the understory that had been heavily browsed, as well as moose and deer scat in October 2007.

Deer do not necessarily use all forests with dense evergreen cover as wintering areas year after year; therefore mapped areas must be regularly monitored for use and updated (Flatebo et al., 1999).

Management Objective 6.1. Manage for at least of 6 cavity, snag, and/or decadent, living trees per acre on average, with one exceeding 18 inches diameter breast height (DBH) and three exceeding 16 inches DBH. Manage for at least two down trees or logs per acre exceeding 14 inches in diameter on average.

Recommended Guidelines and Practices

- Leave trees that have cavities of varying sizes and are located in the upper trunk of the tree. Also, give priority to hardwood trees with cavities, rather than softwood, as they remain intact longer.

- Avoid damaging existing downed woody material, snags or cavity trees during harvest operations, especially large trees of stumps greater than 18" diameter.

- Leave downed woody material, such as tree limbs, on the site after harvests when possible.

- Leave several different sized logs of low timber quality dispersed throughout the harvest.

- Inventory standing and dead coarse woody material and cavity trees.

Management Objective 6.2 To maintain a variety and abundance of mast-producing plant species at Eaton Forest.

Recommended Guidelines and Practices

- Retain beech, oak and cherry trees with the potential for good fruit production, when they are scattered throughout other stands (i.e. northern hardwood, hemlock).

- Red Oak: Cut stands less frequently (manage on long rotations) to encourage the development of large trees with large crowns that have the potential to produce many acorns.

- Beech trees: Leave trees that show signs of resistance to beech blight. Leave some large trees, regardless of health, that have the potential to produce mast.

- Apple trees – retain, release, and prune carefully.

- Maintain small openings throughout that can support early-successional mast plants, such as raspberry.

- Particularly in stands where oak and beech are concentrated, monitor use of mast species by wildlife, such as bear.

Management Objective 6.3 To maintain the vernal pools at Eaton Forest as undisturbed sites and protect the habitat around the pools.

Recommended Guidelines and Practices

- Mark the edge around any vernal pool in the vicinity of a planned harvest area in the spring when it is full to prevent damage by harvesting during times when the pool is difficult to detect.

- Maintain 100- to 500-foot management buffers around vernal pools (depending on significance of the pool, season of harvest, etc.).

- Document and monitor the pool for use by indicator species.

- Look for and document other pools in the spring season.

- Keep slash and debris out of the vernal pool depression (if falls in during breeding season, remove after to avoid disturbance).

Management Objective 6.4 To monitor deer activity on the parcel and assess the winter use of softwood stands.

Recommended Guidelines and Practices

- Consider managing the mapped dear yard as a larger unit in collaboration with neighboring landowners in order to enhance habitat function.

- Small patch cuts included within a softwood matrix can provide regeneration and sources of browse.

SURROUNDING LANDSCAPE

Eaton Forest is connected in many ways to the larger landscape that surrounds its boundaries. Ecological features, such as natural communities, and processes, such as water flow and the movement of wildlife, observe boundaries defined by the physical features of the landscape, rather than by human property boundaries. Landowners are impacted by the land use choices made by their neighbors. Therefore, it is important to consider Eaton Forest's context in the surrounding landscape and the impacts management activities could have outside of its boundaries.

ZONING

The Town of Warren's Land Use and Development Regulations, or zoning, play a critical role in balancing community interests with the rights of individual landowners, protecting important natural and cultural features, and promoting development in appropriate places (Warren Town Plan, 2005). Eaton Forest is located in the Rural Residential District, which, together with the Forest Reserve District, accounts for over 90% of Warren's land. The primary purpose of the Rural Residential District is to "protect environmental resources while allowing for low density development" with a maximum density of one dwelling per acre (Warren Town Plan, 2005). Moderate or high-density development that models a historic pattern of clustered farmyards surrounded by open fields could be considered within this district in "appropriate areas."

CORE AREA AND CONNECTIVITY

Eaton Forest is part of a larger unfragmented block of forest that encompasses Warren Pinnacle at its center. The interior forest in this core area is removed from humans and their development, which includes powerlines, roads, houses, and active agricultural fields. Interior forest habitat, such as that in Eaton Forest and the core area it is a part of, provides:

- Roaming and foraging space for animals with large ranges and territories, such as raptors, woodpeckers, and most medium- and large-sized mammals (Flatebo, 1999);
- Critical nesting, denning, and mating sites, and food sources for many species, including many species of forest songbirds, only found away from the edge of forests;
- Protection from predators and parasites that prefer the habitat on the edges of forests and along trails and roads through the forest.

Larger blocks of forests can also support larger populations of many species than smaller forest fragments. These larger, interbreeding populations are important for providing a source of individuals who can repopulate smaller forest areas whose populations may be too small to reproduce successfully (Flatebo, 1999). Core areas

of forest are also important for the reproductive success of species that cannot or will not travel long distances or travel across human development to mate.

The core block the Eaton Forest a part of is bounded by Route 100 to the west; the school, Brooks Recreation Field, and Brooks Road to the south; and the Dump and Airport Roads to the west and north. For the most part, houses and agricultural fields are along these roads on the edge of the core area and do not permeate far into the forest. However, the forest is divided into several different parcels owned by different landowners. Parcelization can eventually lead to fragmentation if all landowners do not work together to protect the integrity of the larger core area.

Many forest wildlife species travel between large and small patches of forest to forage for food, find mates, disperse from over-populated areas, and find new habitat if their old habitat is destroyed or no longer useable (Flatebo, 1999, p113). Riparian areas along streams, rivers, and wetlands; culverts under roads; and hedgerows along fields often serve as travel corridors for species moving between patches of forest. Arrowwood Environmental has been working on a town-wide inventory of Warren's natural resources over the past year which will include the identification of potential travel corridors used by wide-ranging animals and places where amphibians cross roads in large numbers each spring to reach breeding grounds. Preliminary results from this study suggest the importance of the Eaton Forest to the surrounding blocks:

> *The Eaton Forest's proximity to the Mad River, as well as its participation in a large and diverse contiguous habitat unit makes it likely to support a variety of wildlife. The south eastern tip of the parcel may participate in a travel corridor especially useful to white-tailed deer moving between the hemlock forest in and around the Eaton Forest and hemlock forests to the south across Dump and Brook Roads.(Aaron Worthley, Arrowwood Environmental, personal communication)*

BATTELL FOREST BIRD HOT BLOCK

The North American Bird Conservation Initiative (NABCI) has identified the entire town of Warren as being part of the Atlantic Northern Forest Bird Conservation Region, which encompasses expanses of temperate forest from eastern New York up through Vermont, New Hampshire and Maine into the Maritime Provinces of Canada (Hagenbuch, 2006). These forests have been identified as being particularly critical breeding habitat for northern bird species, especially neotropical migrants.

In Vermont specifically, Vermont Audubon has identified several large, core areas within the Atlantic Northern Forest Bird Conservation Region. The Battell Forest Bird Hot Block is one of these areas. The Battell Block encompasses approximately 127,000 acre of contiguous forestland bounded by the Winooksi on the north, Mount Horrid on the South, Route 100 on the east, and Route 116 on the west (Hagenbuch, 2006). Although it is not part of the Battell Block, Eaton Forest is located very close to this core area just to the east of Route 100. Eaton Forest also contains the general forest types that the NABCI has identified as being particularly critical breeding habitat for forest birds: northern hardwood and mixed deciduous-coniferous forests.

Birds that may utilize the northern hardwood forest at Eaton Forest for breeding include: ruffed grouse, yellow-bellied sapsucker, wood thrush, veery, black-throated blue warbler, American redstart, ovenbird, blue-headed vireo, and rose-breasted

grosbeak (Hagenbuch, 2006). Species that may breed in the hemlock-northern hardwood forest at Eaton Forest include: Canada warbler, blackburnian warbler, and black-throated green warbler. The yellow-bellied sapsucker has already been observed at Eaton Forest by Steve Hagenbuch from Vermont Audubon (2006), along with several other bird species including: eastern phoebe, barred owl, golden-crowned kinglet, blue jay, and wild turkey.

FOREST RESERVE DISTRICT

Relative to the expansive core areas of forest in Warren's Forest Reserve district, which includes all the National Forest land in the town, the core area that Eaton Forest is a part of is only medium-sized. This Eaton Forest core area is not directly connected to any of Warren's National Forest or Forest Reserve District land. However, it is positioned in the valley directly between the high elevation forests of the Green and Northfield mountains that make up most of the Forest Reserve District. Therefore, the Eaton Forest core area could serve as a steppingstone for large, wide-ranging animals, such as fisher, bobcat, and black bear that may travel between these larger Forest Reserve core areas.

Management Objective 7.1 Pursue opportunities for the conservation of other lands adjacent to the Eaton Forest and within the same core area.

Recommended Guidelines and Practices

- Explore the possibility of enlarging the Eaton Forest to encompass the wetland just east of the property boundary.
- Communicate and collaborate with abutting landowners and others in the core area to maintain the function and integrity of the interior forest and wildlife habitat features, such as the deer yard.

Management Objective 7.2. Integrate results from the Natural Heritage Inventory and data from other regional sources, including the State's Wildlife Action Plan and VT Audubon, into wildlife management for the Eaton Forest.

Recommended Guidelines and Practices

- Consider breeding forest bird habitat in management activities, since the Forest is near the Battell Forest Bird Hot Block.

RECREATION

Outdoor recreation is culturally very important to Warren's residents and to the town's tourist economy (Warren Town Plan, 2005). Objective 8.5 in the Warren Town Plan calls for the maintenance of "the land resource necessary to support recreation and public access to recreation areas."

Due to its proximity to the Brooks Recreation Field and the school, Eaton Forest is easily accessible to a large number of residents for recreation and has been used informally for walking, hunting, and naturalizing since it was acquired by the town in the 1980s. Warren's residents have identified education and recreation as long-term management priorities for Eaton Forest. Recreation can also be a means to educate and involve the community by improving access to the forest and providing opportunities for involving the community in trail building and maintenance.

TRAILS

The only trail currently maintained at Eaton Forest is a portion of the Mad River Path that runs north through the low elevations of the property from the open field. Currently, the path ends at the northern property boundary. Walking through the rest of the property currently requires off-trail bushwhacking. The vista overlooking the school appears to be a popular bushwhacking destination due to the presence of a fire ring and trash.

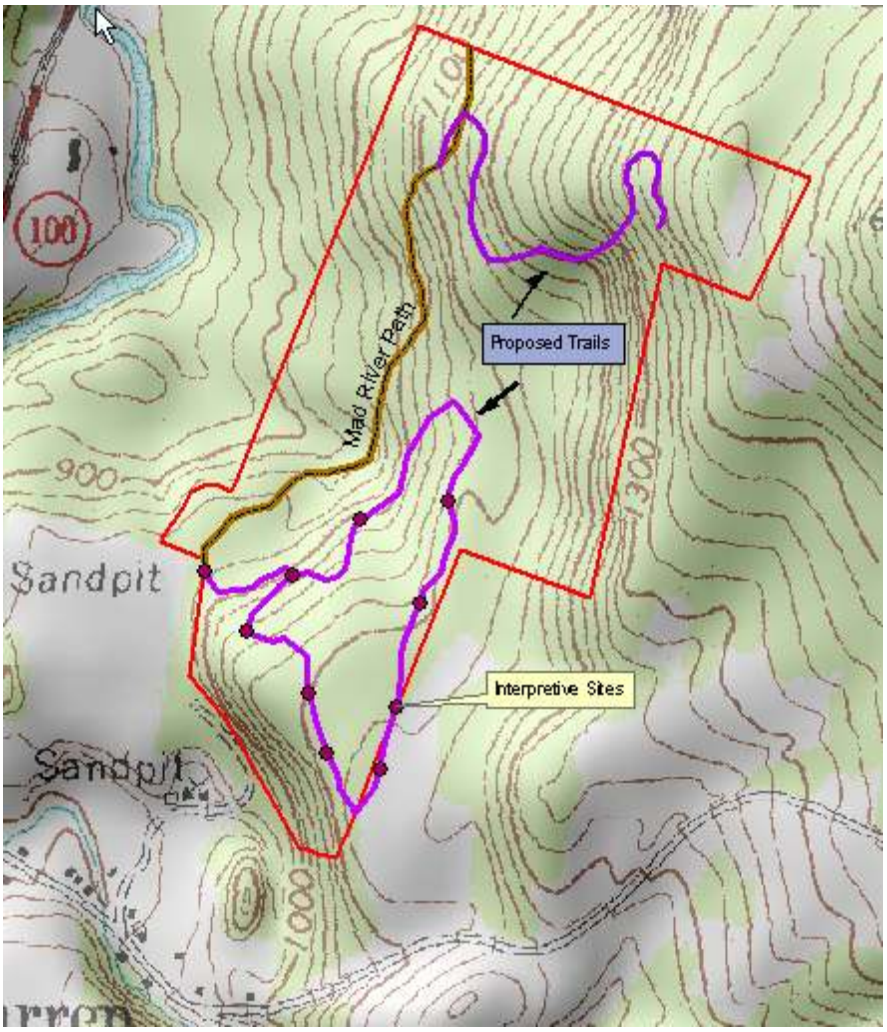


Figure 9 Trails, actual and proposed

Based on public interest, in 2006 the Warren Conservation Commission obtained funds to hire the trail construction company *Timber and Stone* to create plans for improving and expanding the trail network at Eaton Forest. In its final report to the Conservation Commission, *Timber and Stone* identified priorities for the trail network at Eaton Forest and action plans for their implementation, *Proposed Trail Management Priorities for Eaton Forest, Warren Town Forest*, 2007). After finalizing the vision statement for the forest and reviewing the other data collected on the forest, these recommendations

were all found to be in line with the management priorities for Eaton Forest and are described briefly below. For further details, see *Timber and Stone*'s 2007 report.

MAD RIVER PATH

The trail is currently in need of maintenance to improve drainage, slow erosion, and clear brush from around the trail. There is significant interest in exploring the option for extending the path northward onto the neighboring property and beyond. Measures should be taken at the trailhead to prevent use by motorized vehicles.

EATON FOREST INTERPRETIVE TRAIL

This proposed trail would loop through a "plateau" area encompassing parts of forest stands 1 and 2. The gradient of this trail would be moderate and intended for extensive use by the public. Interpretive stations are envisioned.

EATON FOREST VISTA TRAIL

The Vista trail is proposed to climb steeply to the Eaton Forest's height of land, affording close views of the cliffs and talus areas and a rewarding view. The specific location of this trail should be determined with the aid of a botanist or ecologist. The proposed route carries it too close to possibly important denning sites and potential habitat for bobcat, fox, bear and porcupine – as well as the northern red oak stand which contains rare sedges.

The Vista Trail offers an attractive destination yet winds through some of the most sensitive areas on the Eaton Forest. Its potential popularity warrants careful planning for these additional concerns: safety (along steep slopes and ledges), erosion, overuse, trash and possibly vandalism.

HUNTING

The Eaton Forest is popular with deer hunters. Hunting and educational uses of this property by school children do not need to conflict. In fact, hunters can become strong conservation allies. However, prudence dictates that precautions are exercised both by hunters and by non-hunting users, especially during rifle season for deer. Hunters (and children of hunters in the school) should be encouraged to share their enthusiasm for their sport with non-hunters. Likewise, the town should consider establishing a safety zone (no hunting within 500') as a compromise to recreational non-hunters who find their walking opportunities curtailed during rifle season.

Objective 8.1. Construct and maintain a trail network at Eaton Forest limited to the Mad River Path, the Eaton Forest Interpretive Trail and the Eaton Forest Vista Trail as described in the 2007 plan by *Timber and Stone*.

Guidelines and Recommended Practices:

- Hold an annual Trail Building/maintenance day that involves students from the school and community members.

- Work with the Town Recreation Committee or form a trails committee that would solicit additional pubic input on trail design and construction,

monitor the use and condition of the trails, and deal with any unauthorized activities.

- Create signs and maps for public use

Objective 8.2. Coordinate with the Mad River Path Association to maintain the Mad River Path through the Eaton Forest.

Guidelines and Recommended Practices:

- Encourage community stewardship of the path.

Objective 8.3. Limit recreational use at Eaton Forest to non-motorized travel.

Guidelines and Recommended Practices:

- Block the Mad River Path and Interpretive Trail trailheads to discourage use by motorized vehicles.
- Post signs at trailhead saying “No motorized vehicles.”

Objective 8.4 Use the trails as an educational resources.

Guidelines and Recommended Practices:

- Teach residents about trail building and maintenance through work days
- Post interpretive information about forest ecology and management
- Encourage teachers to take their classes in the forest using the trails and to be involved in trail building and maintenance.
- Partner with teacher and students to create interpretive materials for the trails (materials to be posted at kiosk, brochures, trail maps)

Objective 8.5. Support hunting as a recreational use.

Guidelines and Recommended Practices:

- Encourage hunters who use the property to be part of planning the trail network. Their local knowledge of wildlife use can be an asset.
- Engage local hunters in educating non-hunters.
- Post “Safety Zone” signs around the perimeter of the school and recreational fields, tennis and basketball courts, and skate park.

EDUCATION

WARREN ELEMENTARY SCHOOL

Students and teachers at the Warren Elementary School have a strong tradition of using Eaton Forest for a variety of educational and recreational activities (Beth Young, personal communication, October 29, 2007). Classroom teachers have used the Forest as a part of science units and writing activities, as well as a place to hike and enjoy time outside. The after-school program at the school and the Warren Summer Camp also make use of Eaton Forest for a variety of forest-based activities from fort construction to hiking to simply playing outside.

The following list of possible activities resulted from an interview with classroom teachers:

- Trail building and maintenance -- improved access
- Interpretive materials (signs, brochures, posters, maps)
- No Child Left Inside
- Scientific investigations (citizen science, monitoring)
- Quest
- Physical education – snowshoeing, hiking etc.
- Overnight camping?
- Outdoor structures? (picnic shelter, outdoor classroom, amphitheater)
- Alternative energy – design, installation, serving the school
- Partnerships with community organizations, like the Warren Conservation Commission
- Cultural history research – interviewing elders about land use
- Researching the feasibility of wood energy for the school
- Envirothon (high school program)

COMMUNITY EVENTS AND PROGRAMS

In 2006, the Town of Warren received funding from the Vermont Town Forest Project to conduct a series of events designed to promote connections between the community and its forests. The activities of this project included:

- Interviews between the 3rd and 4th grade Warren Elementary School students and Warren residents with a strong connection with the woods
- Creation of a “Forest Statement”
- Warren Forest Discovery Day
- Photo Exhibit of Vermonters working and recreating in the state’s woodlands
- Two Stewardship Listening Sessions
- Implementation of stewardship priorities determined during Listening Sessions

The Town Forest Project resulted in a number of suggestions and recommendations including sponsoring:

- Trail building and maintenance days
- Guided field walks
- Citizen monitoring (birds, amphibians)
- Annual Forest Discovery/Celebration day
- Small-scale forestry projects that benefit community/have educational focus (harvesting timber to be used in flooring, bookshelves, building structures etc).
- Community Firewood

Community-sponsored events could also include workshops and projects that demonstrate sustainable management for town landowners. Some towns have taken on small-scale harvests that benefit community projects in need of wood including town forest flooring in the Hinesburg Town Hall, library bookshelves from the Starksboro Town Forest, and community gazebos or other structures.

Objective 9.1. Work with the teachers at the Warren elementary school to integrate the Eaton Forest into the curriculum.

Guidelines and Recommended Practices:

- Investigate existing natural resource curricula available through a variety of sources including:
    - Four Winds program
    - Northern Woodlands
    - Vermont Audubon
    - State of Vermont, Department of Forest, Parks and Recreation.

Objective 9.2. Build on the history of community events in Warren and other towns to showcase the Eaton forest.

Guidelines and Recommended Practices:

- Review the results of the Warren Town Forest Project for ideas
- Participate in the Vermont Town Forest Project Events
- Establish relationships with other town forests in the area for project and activity ideas

THE QUESTION OF AFFORDABLE HOUSING

In 2001, in response to the need for more affordable housing in Warren and the Mad River Valley, the Warren Planning Commission partnered with the Central Vermont Community Land Trust (CVCLT) and Housing Vermont to work on the Warren Housing Development Project. Due to their proximity to the school and Village, the Project selected two sites in Eaton Forest (east of the tennis courts and the area of the newly cleared field adjacent to Brooks Field) and a site in the Town Cemetery, to be analyzed for their suitability for development by an architectural engineer. A report by Mark Bannon of Bannon Engineering was released in June 2002 and found that the physical characteristics of all three sites met state and local guidelines for multi-unit development (Bannon, 2002). However, the project was never brought to a vote due to public concerns about access and use of the Eaton parcel, which was bought in 1983 to prevent development (Steering Committee conversation – November 1, 2007). The project was put aside. However, affordable housing is still a pressing issue in Warren and interest in using the sites at Eaton Forest for affordable housing units has persisted (Warren Conservation Committee, 2006; Warren Planning Commission, 2006; Pers. Conv. Michael Ketchel, 2008).

Figure 10. Eaton boundaries with potential housing areas highlighted.

The Eaton Forest has diverse features and attributes and a primary purpose of this planning effort was to document them. Some areas are ecologically fragile and merit a “hands-off” approach. Other areas are more suited to a range of uses from passive recreation, to education, to forest management. A few areas are potentially suitable for more intensive uses. The map highlights two possible areas for development.

One of these areas (Area 1) is the mowed field in the southwest corner of the property, beyond the edge of the school playing fields. While there are undoubtedly trade-offs to developing this site, it represents the one area of the property that is likely to be the easiest to develop. Another possible site is adjacent to the access

road (Area 2). This site abuts the Eaton Forest and development of the site may impact the ledge areas adjacent to the boundary. Most other areas of the property are considered to be inappropriate due to soils, slope, or the proximity to sensitive areas.

Objective 10.1. Work with the citizens of Warren and the town's boards to decide whether these areas are appropriate for development as affordable housing.

Objective 10.2. Pursue the permanent protection of the remainder of the Eaton Forest through a conservation easement.

III. MANAGEMENT ACTIONS

Section III of the plan brings together what we want for the property with what we know about the property and forms the basis for actions.

Below, the actions are presented, clustered around the goals. Following that, the actions are presented in a summary matrix organized by priority and "feasibility." Finally, a subset of preferred actions are listed along a time line, associated with responsible parties and estimated costs.

Some of these actions pertain to the general stewardship of the property; that is, they represent the obligation of the town to responsible stewardship. Others relate very specifically to broader management goals.

Goal 1: Sustain and Enhance Ecological Health

The Town will manage this property such that the functioning of ecological systems will be protected or enhanced. Forests provide a range of ecological services, such as filtering water, providing wildlife habitat, and removing carbon dioxide from the atmosphere, in addition to the production of wood products. To the extent possible with consideration for site conditions, legal restrictions, and current knowledge, activities and practices will not degrade the ecological health of this parcel.

Actions:

- Inventory/monitor:
  - Status of existing roads and trails: do they meet State Acceptable Management Practices? Are they stable?
  - coarse woody material (dead and down trees)
  - cavity trees
  - shrubs and herbaceous cover for wildlife
  - invasive plants and pathogens
  - streams water quality and health

- Set up permanent plots to monitor growth and change. This could include trees, other vegetation, wildlife use, and other aspects depending on the availability of interest and resources.

Goal 2: Permanently protect the benefits of this forest through a conservation easement.
Effective management and stewardship are inhibited until the permanent status and use of this property is decided by the citizens of Warren. A conservation easement will be placed on all areas of the property, but reserving two areas, at least temporarily, until the suitability of these two areas for other uses has been resolved.

Actions:

- Draft and adopt a conservation easement on the parcel to permanently protect those areas of the parcel determined to be most sensitive and needing protection.
-

Goal 3: Sustain and Enhance Wildlife Habitat
Impacts to a wide range of game and non-game species will be considered in actions that promote recreation or research.

Actions:

- Use the Eaton Forest to demonstrate wildlife enhancement practices targeted at Species of Greatest Conservation Need (SGCN), while educating the community on the importance of broader habitat implications.
- Inventory and map special habitat areas and features such as early successional forests, mature forests and forest openings. Habitat features may include dens, apple trees, deer beds, browse areas, etc.
- Set up monitoring of wildlife activity and use—Keeping Track© transects, visit vernal pool locations in the spring.
- Review results of Arrowwood Environmental analysis for corridor and other extra-property wildlife habitat considerations.

Goal 4: Provide Diverse Opportunities for Place-Based Education and Interpretation
The Town will pursue grants and partnerships with a variety of groups to support the use of the Austin Forest as an outdoor classroom, for children and adults.

Actions:

- Involve community groups in stewardship activities such as trail maintenance, wildlife habitat improvement, apple tree pruning and release, timber stand improvement, boundary line maintenance, etc.

- Plan hikes to build community experience with the forest: bird walks, wildlife walks.
- Involve the school in forest and wildlife monitoring.
- Continue to record and document the use and history of these parcels.
- Work with teachers to research appropriate curricula and ideas for student involvement.
- Encourage public celebrations using this property: Solstice celebration, May Day celebration.
- Explore possibilities for coordinating timber stand improvement work with the provision of firewood to needy families.

Goal 5: Promote Use of the Forest for Recreation
Management actions will encourage and support a wide range of recreational uses consistent with the goals above.

Actions:

- Finalize design for recreational trails. Apply for trail grant funding.
- Explore opportunities for expanding the trail network across abutters' lands (or perhaps to specific destinations: Pinnacle, Sugarloaf Mountain, Mad River Trail).

Goal 6: Model Sustainable Management Practices
As a demonstration to the present generation and as a legacy to future generations, the Town's management will employ practices that model sustainability, adapting and changing as this concept continues to evolve.

Actions:

- Investigate designation as an official "Town Forest" through the State of Vermont.
- Investigate FSC or other green certification options (may require updates to stewardship plans)

Goal 7: Use the Tangible Products of the Forest

Management will support the production of forest products, where this is consistent with other goals stated above.

Actions:

- Implement Forest Stewardship plan recommendations (Timber stand improvement).

- Use timber suitable for firewood to support the local community. Efforts could include a community biomass project, firewood for needy community members.

- Use harvested timber for local community projects.

Goal 8: Recognize and Appreciate Cultural History
Cultural features of the landscape will be managed along with the physical features. Opportunities to research, protect, and share the cultural history and features will be pursued.

Actions:

- Continue to document the use and history of this parcel through interviews with residents that have history to share. Extend this research into the town records. Aspects that could be pursued include:
    - Where was the town rope tow? How long did it operate? Are there photos? Does any evidence exist on the property?
    - Can historic land uses be documented? Were there structures? Can evidence of farming be documented with a combination of field evidence and record research?
    - Map stone walls, cellar holes and other cultural features.

- Integrate historical information with recreation planning, educational activities, and forest management planning.

SCHEDULE OF MANAGEMENT ACTIVITIES

Priority	Activity Date	Activity	Responsible Individual or Organization	Goal #	Notes
High	2008 Summer	Apply for Trail Grant	WCC	5	Will need a grant administrator if grant is awarded
Medium	2008 Fall	Trail Walk	WCC	8	Invite local naturalists, County Forester to lead discussions. Invite Selectboard, Other Boards, School, community members
Medium	2009 Spring	Inventory/monitor: - Status of existing roads and trails - coarse woody material (dead and down trees) - cavity trees - shrubs and herbaceous cover for wildlife - invasive plants and pathogens - streams water quality and health	WCC, MRPA, school students, FoMR, etc.	1	
Medium	2009/2010	Set up permanent plots to monitor growth and change.	WCC and other groups with similar interests	1	
High	2008 Fall	Develop and adopt conservation easement on portion(s) of parcel prioritize for conservation	WCC, Selectboard	2	Publicize, publicize, publicize
Medium	TBD	Use the Eaton Forest to demonstrate wildlife enhancement practices	TBD	3	
Medium	TBD	Inventory and map special habitat areas and features	School?	3	
Medium	TBD	Set up monitoring of wildlife activity and use	WCC	3	Keeping Track could be a partner.
High	2008 Fall	Review results of Arrowwood Environmental analysis for corridor and other extra-property wildlife habitat considerations.	WCC	3	Needs to be done for full report and in conjunction with Fayston & Waitsfield
High	Ongoing	Involve community groups in stewardship activities such as trail maintenance, wildlife habitat improvement, apple tree pruning and release, timber stand improvement, boundary line maintenance, etc.	Selectboard, PC, CC	4	Schedule and publicize

SCHEDULE OF MANAGEMENT ACTIVITIES - CONTINUED

Priority	Activity Date	Activity	Responsible Individual or Organization	Goal #	Notes
High	Ongoing	Plan hikes to build community experience with the forest: bird walks, wildlife walks.	All Groups	4	Schedule and publicize
High	TBD	Involve the school in forest and wildlife monitoring.		4	
High	Ongoing	Continue to record and document the use and history of these parcels.	Selectboard, Town Historian	4	
High	Ongoing	Work with teachers to research appropriate curricula and ideas for student involvement.	TBD	4	Trail Plan interpretive component
Medium	Ongoing	Encourage public celebrations using this property: Solstice celebration, May Day celebration.	TBD	4	
High	2008 Fall	Explore possibilities for coordinating timber stand improvement work with the provision of firewood to needy families.	TBD	4	Is too late to cut wood for this fall??
High	2008 Fall	Finalize design for recreational trails. Apply for trail grant funding.	WCC, MRPA, MRRD	5	Grant in hand, move forward with trail work
Medium	2009 Spring	Explore opportunities for expanding the trail network across abutters' lands (or perhaps to specific destinations: Pinnacle, Sugarloaf Mountain, Mad River Trail).	TBD	5	
High	2008 Winter	Investigate designation as an official "Town Forest" through the State of Vermont.	TBD	6	Determine next steps and move forward
Medium	2008 Winter	Investigate FSC or other green certification options.		6	
High	2008 Winter	Implement Forest Stewardship plan recommendations (Timber stand improvement)		6	Check timer harvest schedule in plan
Medium	Ongoing	Continue to document the use and history of this parcel through interviews with residents that have history to share. Extend this research into the town records. Aspects that could be pursued include.		8	
Medium	Ongoing	Integrate historical information with recreation planning, educational activities, and forest management planning.			

RESOURCES

MAPS

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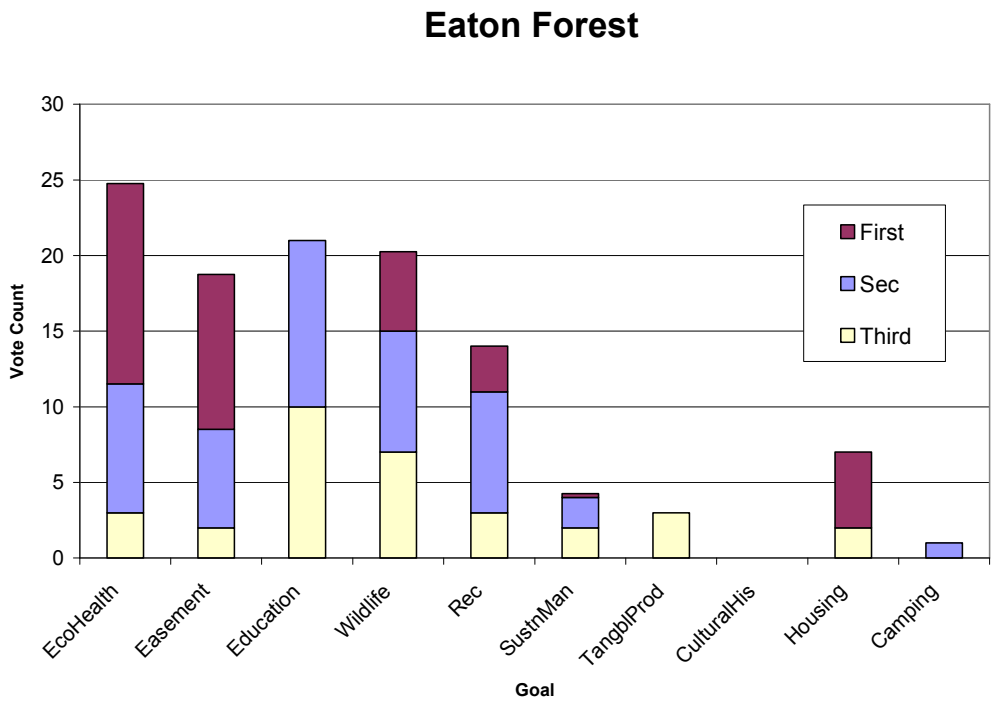
APPENDICES

APPENDIX A. RESULTS AND COMMENTS FROM FEBRUARY 7, 2008 PUBLIC FORUM

The attendees at the February forum listened to an overview of the information in this plan and then were asked to discuss and vote on their highest priority goals. A summary of the voting is presented in the chart below and comments from participants follow.

These results were reviewed by the Steering Committee and informed changes to the priority listing of goals and changes to objectives and actions.



EATON PARCEL FORUM NOTES

Dogs

- Loose dogs incompatible with wild life (can be)
  - Time of year
  - Children, games

Ecology/Wildlife

- Sustain and enhance eco health (physical) - All other proposed goals are management "Actions"
- Maintain habitat

- Top priority is #1 ecology
- Also include wildlife because it is complimentary
- Tie up 1st goal (ecology)
- Ecology / wildlife / sustain / preserve, are all compatible and could be combined

Education

- Leave as is; tie-in education
- Location near school ideal for education

Housing

- Housing – area 2 – better of the two areas
- Housing not appropriate in area 1 – keep as extension of rec field, Mad River path
- Area 1 – no go for housing
- Housing – area 1 not okay, re: access traffic issue
- Area 2 could be okay
- Area 1 should be investigated for workforce housing – integrated property would not conflict other uses
- Both areas within walking distance to town facilities, bus.
- Housing would need to diversify the demographics – not okay to make it all low income, same household structure
    - Include seniors
    - Consider co-op type housing
- Affordable housing needs revisiting – priority
- Initial negative reaction to affordable housing in general
- Concern about affordable housing; potential to spoil what we have
- Housing incompatible with adjacent use (school and recreation) don't violate treasure
- Terrible place for housing
- Side note: no town garage, no housing
- Others okay with rehab of town garage site for housing

MISC

- Improve EC/basin drainage to function properly (below storm water basin eroding)
- As Village res, magical amazing place / to be able to walk to wood – advantage to school
- Leave property as is
- Challenges in prioritizing/priorities
- Who will be responsible for realizing objectives?
- Opinion – hands off management best
- Any management costs increases taxes, grants increase taxes, stay away from grants
- Have a low impact (low as possible)
- Issue / challenges
- Parcel is diverse and should be managed for multi-use in sustainable way
- Parcel has numerous opportunities, focus on use as a natural area with exception to area 1
- Proximity to school an asset; low impact essential – minimal improvements
- Respect adjacent landowners and bring them onboard for low impact use
- Efforts to increase management / education should be reflective of level of volunteerism
- Leave it the way it is; minimal recreation

EATON PARCEL FORUM NOTES – Continued

Permanent Protection/Conservation Easement

- Perm protect (political / strategic) → Goal
- Don't want to see town permanently forego future use of land re: housing
- Preserve greater part of parcel
- Start with easement
- Concern about costs
- Preserve parcel as is – don't change too much
- Conservation key → potential conflict with recreation and housing as opposed to preservation and conservation

Recreation

- New field needs work – not usable as athletic field / logical place to expand if habilitated
- Overnight camping – lean-to (public, no cost, opt in $, geared town residents)
- Basic structures (rustic – no power, tv)
- New rec trails and place based education
- Don't forget the Mad River path
- Liability issue with recreations / trail ?
- Conflict with trails and logging and hunting supports trails
- Concern for neighboring landowners, need to be involved in discussion of paths, concern with Mad River Path and path-goers
- Ensure compatibility between recreation and sustaining ecological health
- Critical issues – path extension (maintenance, dog waste issue, frustrating)
- "Kids" hunting area / teaching place

Timber

- And sustainable management also complimentary
- Look at neighboring properties and include in good management
- Thin soils, little timber value preclude logging / forestry