

NORTHFIELD Town Forest STEWARDSHIP PLAN

Adopted by Northfield Selectboard
October 22, 2019



Prepared By:



The Northfield
Conservation Commission

And



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This plan was compiled in 2016 by Arrowwood Environmental (AE) under contract with the Northfield Conservation Commission (NCC), whose members include Christine Barnes, Russ Barrett, Joe Dalrymple, Laura Hill-Eubanks, Pam Knox, Leslie Matthews, Nathaniel Miller, Jane Pekol, Ruth Ruttenberg, John Sears, Don Wallace, and Deborah Zuaro. However, considerable portions were taken directly from draft text researched and prepared by the Northfield Conservation Commission. AE's primary area of focus was to inventory and assess the natural resources present on the property, and that makes up the bulk of the Natural Resource Inventory section of this Plan. The remainder is the direct result of the diligent research, field investigations and writing conducted by the NCC and for that, they deserve considerable credit.

Russ Barrett, NCC member and retired Vt. Department of Forest Parks & Recreation Washington County Forester supplied significant information and working knowledge of the land. Several consultants and experts preceded and informed AE's investigations including Rose E. Beatty, Consulting Forester, Katie Manaras from Audubon Vermont and Kristen Sharpless of Sharpless Ecologic. In addition, the NCC spent time researching other town's Town Forest Management Plans with particular support from Leo Laferriere, Chair, of the Waitsfield Conservation Commission and Kristen Sharpless, author of the Hinesburg Town Forest Management Plan (2012). Finally, historic information and trail descriptions were gleaned from a wonderful booklet called "Paine Mountain Guidebook" by William E. Osgood and published in 1997.

INTRODUCTION

PROPERTY DESCRIPTION

The Northfield Municipal Forests consist of 705 acres and includes the Paine Mountain and Cheney Farm parcels, and Dustin's Pasture parcel. The contiguous Paine Mountain and Cheney Farm parcels are the focus of this plan, and referred to as the Northfield Town Forest hereafter. The approximately 400 acre Northfield Town Forest property is located to the east of Northfield Village, south and east of Turkey Hill and west of the summit of Paine Mountain. The land is part of a large block of contiguous forest running north-south along the Irish Hill-Paine Mountain ridge, with a Route 12 boundary to the west and Interstate 89 to the east. Roughly 17 acres of the property are open field, and the remainder forested or wetland.

STEWARDSHIP VISION

The NCC vision for the Northfield Municipal Forests is to conserve these lands for scenic, educational, and non-commercial, non-motorized recreational purposes, and to maintain or enhance their value for watershed protection, habitat and biodiversity conservation, forestry, and sustainable forest products. The NCC intends the town's stewardship of these lands to serve as an exemplary demonstration and an inspiration for other forest

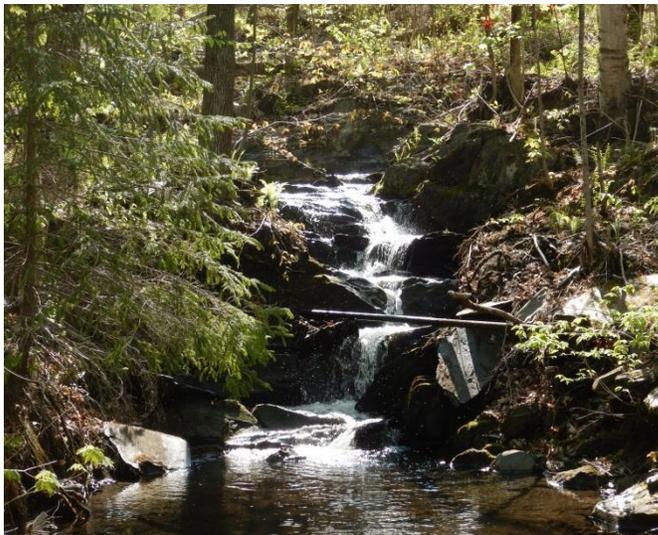


Figure 1 Falls near the outlet of the beaver complex

landowners.

STEWARDSHIP PHILOSOPHY

The Northfield Town Forest will be managed for the benefit of the local community under the concept of multiple-use management. The forest is diverse and every site will not support every use. Allowed uses and management activities must be compatible with maintaining or enhancing water quality, wildlife habitat, and general ecosystem function and health over the long term. Permitted uses and management should be reviewed and modified as needed based on operational experience and the best information available from the scientific and land conservation communities.

ROLE OF Town Forests

Knowing the value that Town Forests play throughout the State of Vermont and New England region, the NCC recognizes the following roles for the Municipal Forests:

Community forests:

- Can be a significant component in a mosaic of conservation strategies for landscape scale conservation by buffering ecologically sensitive lands or existing conserved lands and by linking conservation lands.
- Offer a potent tenure option at both the local and regional levels to conserve productive forestland, wildlife habitat, watersheds, and open space as they offer an alternative to state and federal ownership, expand the constituency for conservation, leverage partnerships, and expand the financial pie for conservation.
- Can be a valuable component of economic development strategies by expanding the assets of a community. They can create revenue and jobs, protect ecological services, and provide a resource base for economic activity.
- Can reinforce community development objectives by building social capital and community capacity and can provide support for other community priorities such as education and recreation.

- Can serve as a classroom to educate and engage citizens on forest stewardship and the components of sustainable forestry, as well as science, math, culture, history and literature.
- Can be sustainably managed under a management plan.
- Can deepen the connection between townspeople and the forested landscape and bring community members closer to each other.
- Can serve as a demonstration site as a model for best practices for those with private land.

Sources: "Community Forests: A Community Investment Strategy"; "The Vermont Town Forest Stewardship Guide"

ABOUT THIS PLAN

PURPOSE

This plan is intended to guide the stewardship and management activities on the Northfield Town Forest into the future. The concepts, recommendations and preferences laid out herein should be utilized in the development of future forest management plans, recreational infrastructure planning, and on-site management activities including trail building, timber harvesting and habitat management.

ADOPTION PROCESS

The Northfield Conservation Commission was given the task of writing a stewardship plan for the Northfield Town Forest (Northfield Town Plan, 2014) wherein it states: "*The Conservation Commission will...develop an inventory and stewardship plan for Northfield's Municipal Forests*". Construction of the Town Forest Stewardship Plan has been ongoing over several years, with opportunities for public input, drafts of various sections of the plan, and multiple discussions over the issues. In 2013-14, members of the Conservation Commission began to compile information, locate other Town Forest stewardship plans to use as models, and develop a plan to guide

the public use of the forest, while simultaneously committing to the awareness and protection of natural resources and wildlife on the property.

Members of the Conservation Commission met with outside experts and members of other towns' conservation commissions to better understand the stewardship planning process and products as undertaken in other communities.

In the fall of 2014, Conservation Commission members went on an extended guided walk in the forest to see for themselves the beauty and ecological attributes of the forest, to observe the more fragile areas of the forest, and to explore the parameters of stewardship which might be



Figure 2. Wild leeks grow abundantly in a Rich Northern Hardwood Forest.

appropriate for this land. The NCC sees its primary responsibility is to ensure the well-being of the forest as a natural resource asset for the town, and to discover ways to share the attributes of the area with townspeople in a manner that preserves the forest and wildlife. Such concerns include a focus on maintaining undisturbed portions of the land for human-shy wildlife, water quality protection, and a healthy environment for wild plants and trees to thrive.

The Commission has been mindful of the current and historic use of the forest for recreational activities including hiking, mountain biking, cross-country skiing, snowshoeing, and hunting and has taken these factors into

consideration as the stewardship plan has developed. This plan contains substantial opportunities for education and recreation, through combined efforts with students in the area, as well as through the promotion of the forest to members of the community for their enjoyment. The NCC believes that when the people of the town value the attributes of a forest, responsibility for sustainability is an accepted part of the process.

The Stewardship Plan includes a Forest Management Plan (Appendix 1), developed in 2000 by a consulting forester and approved by the County Forester. The Forest Management Plan presents a detailed strategy for sustainable forestry, maintaining the health of the trees and supporting land, and serves as a more focused guide for those purposes. As of the completion of this report, portions of the Forest Management Plan are due for updates.

The Town Forest Stewardship Plan was approved and adopted by the Northfield Selectboard on October 22, 2019. The plan will continue to be a flexible and living document, subject to periodic revision as forest conditions change and as stewardship responsibilities evolve.

A Town Forest Stewardship Sub-committee (TFSSC) will be created by the Selectboard and the Conservation Commission, to be composed of representatives of the following interests: Wildlife and natural resource management and protection, the local education community, and recreational users. The committee will consist of five members: two Conservation Commission members, and three members of the specified user groups. The Conservation Commission will nominate members for appointment to the TFSSC, and forward those nominations to the Selectboard for their approval. The TFSSC will act as a subcommittee of the NCC and will develop, and help to implement, management policies for the Town Forest, including use guidelines and restrictions, signage, trail maintenance, and user oversight.

Applications for special uses or events will be made to the TFSSC, which will make recommendations to the town administration for a final decision. If and when matters of financial, legal, policy or controversial consequences arise, the subcommittee will make recommendations for action to the Conservation Commission who will then make recommendations for action to the Select Board for a final decision.

GOALS

The multiple-use concept of forest management recognizes that a parcel of land may provide for timber, recreation, wildlife habitat, clean water and other public and natural resource values concurrently. This appears to be an attainable goal for this property: the property has



Figure 3. A large hemlock tree.

productive timber sites with the ability to grow beautiful, healthy trees; there are trails available for hiking, snowshoeing and skiing; wildlife habitats are present and can be enhanced by sound management; there are streams, springs and wetlands whose integrity can be maintained and enhanced.

This plan recognizes the following goals utilizing the multiple-use forest management concept:

- Maintain the forest in at least its present parcel size and configuration with minor additions as opportunities arise or through donations and gifts.
- Conserve habitat for native plants and animals, including game and non-game wildlife. Limit non-native invasive species to the extent possible.
- Conserve biodiversity and protect threatened or endangered species.
- Protect riparian buffers, aquatic habitats, wetlands, waterways, water quality and stream flow.
- Allow natural processes to govern the ecosystems and model any active management on these processes to the extent possible.
- Conserve the scenic beauty and open space values – including space for quiet solitude – of the forests, trails, vistas, wetlands and waterways.
- Demonstrate sustainable forestry practices that protect and enhance the ecosystem function and health.
- Maintain and/or enhance ecological and recreational connections between the forest and the surrounding landscape.
- Use the forest as a model and example of the value of forests



Figure 4. Trail closure sign.

to the community, including promotion of educational and community uses that are compatible with other goals as described in this plan.

- Promote and manage non-commercial, non-motorized recreational uses that are compatible with other goals as described in this plan.
- Protect and promote the natural and human made elements of historic and environmental significance for educational and cultural purposes.
- Monitor and respond to changes.

HISTORY OF THE NORTHFIELD Town Forest

GEOLOGIC HISTORY

The Northfield Town Forest is located on the western slope of Paine Mountain in central Vermont, descending to the village of Northfield, nearly to the Dog River. According to the Bedrock Geology Map of Vermont (Ratcliffe, et al. 2011.) the property is underlain primarily by two phylites dating to the Upper Silurian and Lower Devonian ages. We know that in addition to these mapped formations, slate (a protolith, or parent rock of phyllite) is present and has played a part in the more recent history of the property. Upwards of 13 slate quarries were present in the area over the past century, and their evidence is still quite obvious in the Northfield Town Forest.

Some 20,000 years ago, the Northfield Town Forest was covered up to a mile deep by the Laurentide ice sheet (Klyza et al 1999). The glaciers of this era scoured the landscape, carving U-shaped valleys and grinding boulders and bedrock to fine sands and gravels. As the ice sheet melted 12,000-15,000

years ago, the meltwater washed much of this material into the valleys, leaving often heavily compacted unsorted sediment on the valley sidewalls overlaying the bedrock foundation.

As vegetation recolonized the landscape left bare by the glaciers, topsoil was created and soon the forest took hold covering the area once again.

POLITICAL & CULTURAL HISTORY

The Dawnland Abenaki people created a byway which follows today's Berlin Pond Road, which they called Cohosh Trail. There is archaeological evidence of encampments near Berlin Pond, and it is likely that these first peoples



Figure 5. Aerial photo of the Northfield Town Forest in 1962.

made hunting trips into the area that is now the Northfield Town Forest. In the later part of the 18th century, European settlers who moved into the region began farming corn, oats, rye, and wheat, and this farming expanded

through the early 19th century, when Merino sheep herding gained popularity in Vermont. The railroads built in the mid-19th century had a significant effect on the landscape as the early locomotives were powered by wood burning, and many hillsides around Vermont were cleared, including Paine Mountain. Cattle eventually replaced sheep as the grazers who made use of the cleared land. Not so long ago, the Paine Mountain area viewed from town had more pasture than forest. Erosion was an issue here, as it was throughout much of Vermont at this time.

Slate and Water Resources

The most significant resource after timber and pasture on Paine Mountain was the slate, most easily accessible on the west-facing slope. Northfield's



Figure 6. Slate outcrop

slate industry started in the 1860s, thriving for about 30 years. Many Welsh immigrants were attracted to Northfield by the booming slate industry. The

slate was primarily used for roofing, but also for gravestones and other building and ornamental uses. The slate formation that runs through the town is thought to be the largest contiguous deposit of slate in the country

Water is another resource on Paine Mountain and the Northfield Town Forest, which we still rely on today. Seventy-five separate springs on the mountain, linked together, served village residents until 1955. Today, reserve wells located in Cheney field serve the Town, should the need arise. The complex of waterways on the east side of the ridgeline drain to Berlin Pond, which is the water supply for the city of Montpelier.

Historic Ownership

The area that is now our Town Forest was owned by many farmers and homesteaders throughout the years. The summit of Paine Mountain was purchased from J.C. Rice by the Northfield Commerce Club in 1914. In late summer of 1914, the Commerce Club organized a group hike (102 people!) to the summit, inviting everyone to “in brief and simple way dedicate that spot a park for the use and behalf of all who come to view this mountain home of free Vermonters.” They also had six loads of lumber hauled up Turkey Hill Road to erect a 40’ high observatory and shelter. The summit was eventually sold to the Northfield Telephone Company, now TDS, and the town reserved in the contract the right to cut trees to maintain a view.

Northfield was one of the first Vermont towns that, by 1926, had established and started planting a municipal forest. The primary goal for the Northfield municipal forest was watershed protection, and later management for timber, wildlife habitat, and conservation. Dustin’s Pasture, another town-owned and managed forest parcel once served as a source of water for fire protection. Two underground reservoirs in the Cheney field at the west end of the

Northfield Town Forest provide the town with a secondary drinking water source.

The Paine Mountain, Cheney Farm, and Dustin's Pasture properties were originally deeded to the Village of Northfield; the Town and Village of Northfield merged in 2014. The 325 acres of "pasture and woodlands" on the western slope of Paine Mountain were deeded to Northfield in 1915. The "land buildings, and water rights" of the 130 acres known as the Cheney Farm were acquired in 1966. The 200-acre parcel known as Dustin's Pasture was apparently acquired by Northfield in 1925 and includes land in Northfield and Berlin. The three properties were formally classified as Municipal Forest in accordance with Vermont state statutes on March 1, 1972. In October of 2018, the town of Northfield purchased the 49.8-acre parcel at the summit of Paine Mountain from TDS Telecom, and added the property to the Town Forest.

When the town lands were approved by the state as Municipal Forest, it was with the understanding that the forest would be managed "in accordance with approved conservation principles." In return, the state agreed to provide assistance with "marking and marketing timber sales and planning and carrying out a plan of land management." Trees in the Municipal Forest have been pruned, planted, harvested and sold at various times throughout its existence.

A 1972 news article describing the newly designated Municipal Forest noted that the primary function of the lands was to serve as a watershed that produced a quality water supply, but that other uses such as management for timber, wildlife, and recreation could occur without impacting the water quality. The article further explained that timber practices could enhance wildlife viewing and hunting by providing habitat such as deer yards and

“areas of young trees and openings,” and that the forest could be used “for such undeveloped recreational pursuits as hiking, snowshoeing, and cross-country skiing made possible through the use of existing logging roads.”

REGULATIONS AND PERMITS

The property in the Town Forest is subject to state and local regulation, and the Northfield Town Plan and zoning bylaws.

Town Plan and Zoning Bylaws

Use of the Northfield Town Forest is subject to all relevant provisions of the Northfield Town Plan and the regulations in the land use zoning bylaws. The Northfield Town Plan (2014) recommends that the Paine Mountain area, including the Town Forest, “be protected from development other than that associated with recreation, conservation, or forestry so that these uses are not diminished and can be enjoyed by future generations.” One of the policies of the town plan is to “Protect the Paine Mountain area for its recreation, wildlife habitat, biodiversity, watershed, and forestry value.”

The Town Forest is part of a larger block of unfragmented forest and as such is an important area for wildlife habitat. The town plan recognizes the importance of protecting large blocks of unfragmented forest. The town plan includes a policy to avoid the fragmentation and degradation of critical wildlife habitat such as large blocks of unfragmented forest, and encourages its conservation and stewardship.

As the Northfield Town Plan and zoning bylaws are periodically updated and amended, it is imperative that the Town Forest be protected from development that is not related to conservation, recreation, wildlife habitat, forestry, and water quality.

Easement and Permits

In 2011, the Town of Northfield granted Norwich University an easement for a small section of the Town Forest to be used as part of the university's recreational trail system. That section extends into the Town Forest where the trail winds along the edge of its southern boundary and the southwest corner of the Cheney Field. The Norwich University trail system on Paine Mountain is subject to a state Act 250 permit (#5W1541). The section of the university trail system that extends into the Town Forest is also subject to this permit and is further described in the permit and its accompanying map. Any further trail development may require additional permits.

NATURAL RESOURCE INVENTORY

This information is based on a natural resource inventory conducted by Arrowwood Environmental from autumn 2015 to early summer 2016. This inventory consisted of a remote review and mapping of resources as well as a field inventory. During the field inventory, the town had not yet acquired the parcel which includes the summit of Paine Mountain. The assessment on this parcel therefore consisted only of a remote analysis.

GENERAL OVERVIEW

The land occupied by the Northfield Town Forest sits on the summits and western slopes of the Irish Hill-Paine Mountain ridge. This area is considered part of the Northern Green Mountain Biophysical Region which is characterized by the cool, high elevation forests along the spine of the Green Mountains (Thompson and Sorenson, 2000). The Town Forest, however, sits near the border of the Northern Vermont Piedmont region, which is characterized by rolling hills and calcareous bedrock, and displays many of these features as well.

The bedrock geology underlying the Town Forest consists of two closely related types. The Cheney Farm parcel contains carbonaceous phyllites of the Northfield Formation. To the west on the Paine Mountain parcel, these phyllites are also accompanied by beds of quartz-rich limestone and are part of the Waits River formation. The effects of this calcareous limestone can be seen in the occurrences of Rich Northern Hardwood Forests on this parcel.

Overlaying the bedrock, the glaciers left their signature by depositing an unsorted mixture of material referred to as glacial till. From this glacial till, developed the following soil types: Glover-Vershire complex, Taconic-Hubarton complex, Vershire-Dummerston complex and, in the Cheney field, Buckland loams. All of these soil types are loams that form over glacial till and have varying degrees of permeability, amount of surficial rock and depth to bedrock.

The topography of the Town Forest is characterized by a mixture of northern and western facing slopes and wide benches. The western end of the Forest also includes the summit of Paine Mountain. There are two main drainages that originate in the Forest and flow east into the Dog River. The Forest is also home to numerous ground water seeps which feed these drainages.

The complex interaction of geology, topography and hydrology of the Forest has shaped the development of a wide variety of wetland and upland natural communities which are described below.

WATER RESOURCES: STREAMS, WETLANDS, VERNAL POOLS**Streams**

There are two primary stream courses located on the Northfield Town Forest, both of which are headwater streams which join to form an unnamed stream north of the Town Forest. This unnamed stream flows directly into the Dog River in the Village of Northfield.

The largest stream system is fed by a watershed area that covers much of the northern and eastern portions of the Town Forest including the side slopes of Paine Mountain and Turkey Hill. This unnamed stream is fed by several small tributaries primarily located east of the large Beaver Complex Wetland. The flow in this stream system originates with several small Seepage Wetlands and a significant spring located on the steep side-slopes of Paine Mountain near the Barrows Road/Clark Route Trail. The flow from one or more of these springs presumably was the source of the historic water supply located on the property, and pipes are visible emerging from the ground which were producing significant output in May 2016. By the time this stream collects several intermittent tributaries into a single channel just east of the Beaver Complex Wetland, it becomes a perennial (continuous flow in all but the driest years) stream which feeds directly into the Beaver Complex and is dammed at several locations by the beavers. The perennial stream flows out of the wetland complex to the west into a steep and confined stream valley where it leaves the Town Forest.



Figure 7. Stream channel just prior to entering Beaver Complex Wetland

There is little evidence of a significant erosion issue with this stream, and the channel appears to be in a more or less natural condition with occasional moderate bed and bank adjustment occurring due to the steep conditions. Because of the “dugway” characteristics of the trails uphill of the stream, surface flow is interrupted and the trails likely concentrate some flow, reduce soil absorption and increase input to the streams. This surface water, however, does not appear to be a major contributor to the stream hydrology compared to the seeps and springs. Downstream of the beaver wetland, the trail crosses the stream on stepping stones. Depending on the type and frequency of traffic on this trail, a crossing structure may be appropriate in the future, and if so should be sized appropriately to maintain natural flow

and aquatic organism passage. A footbridge, with abutments set well back from the stream bank would be most suitable.



Figure 8. Looking upstream at trail crossing below Beaver Complex wetland.

The second stream system is fed from a watershed located mostly off-property to the south and east of the Town Forest. Within the Town Forest, the Alder Swamp wetland forms a primary headwater for this step-pool stream, with other seepage wetlands located occasionally on or near its banks as it descends the slopes. This stream crosses the Paine Mountain/Cheney Route Trail near the narrow point between the Cheney Farm and Paine Mountain portions of the Town Forest. A small intermittent tributary rises out of small seepage wetlands along the trail, which joins with the larger channel off-property. This stream likely remains intermittent all the way to its confluence with the larger brook north of the Town Forest.

This stream may see minor amounts of sedimentation as a result of the trail crossing. A crossing structure, such as a bridge, should be designed in this location to accommodate the trail traffic, natural stream flow and aquatic organism passage. An oversized culvert with a natural bottom could also function effectively here. Trail stabilization efforts should focus on minimizing trail erosion and keeping sediment from entering the stream channel.



Figure 9. Looking upstream at stream crossing on Paine Mountain/Cheney Trail.

New trail crossings of streams elsewhere on the Town Forest should be avoided, especially in areas of steep slopes. Proper trail design and maintenance will help prevent additional sedimentation that impacts invertebrate, amphibian and fish habitat downstream. Trail design should include properly spaced waterbars and uninterrupted flowpaths as well as

attempts to maintain sheet flow of surface water rather than channelization into ditches and encouraging reabsorption into the soil utilizing green infrastructure concepts.

(see <http://dec.vermont.gov/watershed/cwi/green-infrastructure>)

Wetlands

A summary of the wetland natural communities found on the Northfield Town Forest is shown in Table 1. The Beaver Wetland near the center of the Forest is the largest wetland in the Forest. In addition, there are 10 small mapped Seepage Wetlands scattered

Table 1. Wetland Community Summary

Natural Community	# of Occurrences	Total Acreage	Locally Significant	State Significant
Alder Swamp	1	1.15	No	No
Beaver Wetland	1	3.91	Yes	No
Seep	10	1.30	Yes	No
Vernal Pool	3	0.44	Yes	Yes, in part
Total	15	6.8		

throughout the Forest, an indication of the numerous groundwater discharge areas. A single Alder Swamp sits at the headwaters of a small stream. And though small in acreage, the three Vernal Pools in the Forest play an important role on the ecological landscape. Each of these types is discussed below.

Vernal Pools

Vernal Pools are small, ephemeral wetlands that are isolated from surface waters and provide critical habitat for a suite of amphibians and invertebrates. Three Vernal Pools were mapped and assessed in the Town Forest. A brief description of each of these pools is provided below.

Vernal Pool 1

This large, deep pool located roughly in the center of the Paine Mountain parcel sits in a narrow low area between two ridges. At the time of the site visit, numerous wood frog tadpoles and over 300 spotted salamander egg masses were documented in this pool. A wide variety of invertebrates including caddisflies, daphnia, ostracods, predaceous diving beetle larvae and water striders were recorded. Though the pool was dry in the autumn of 2015, there was 18” of water present in the spring of 2016. Overall, this is

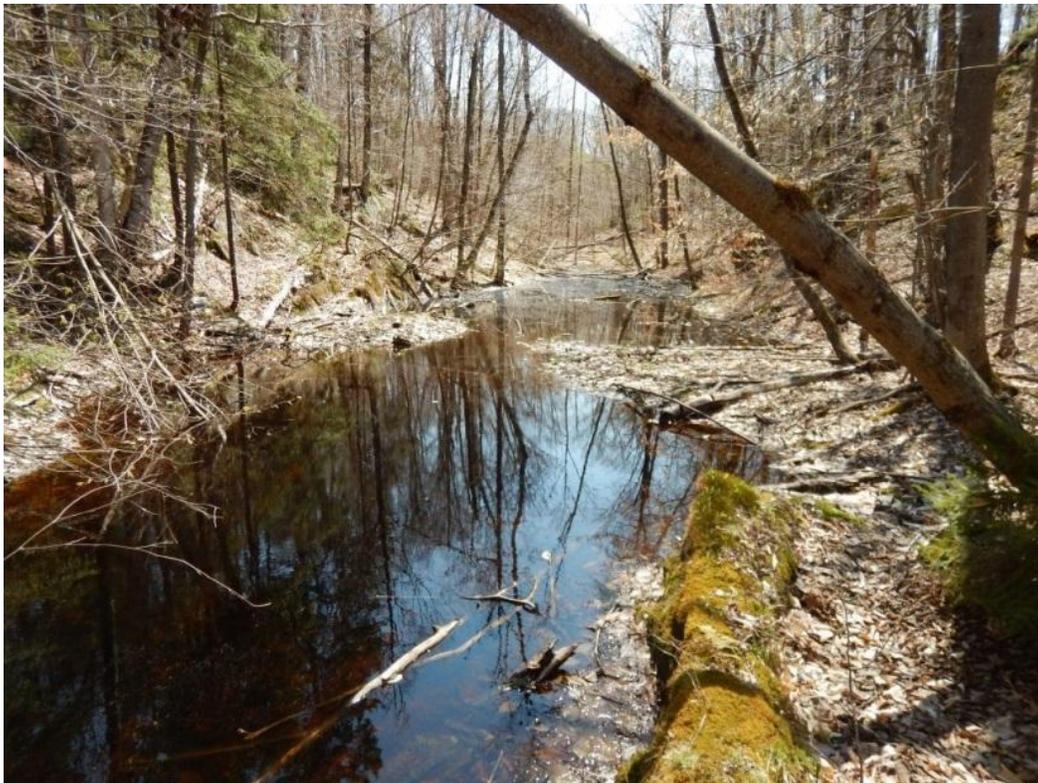


Figure 10. Vernal Pool 1 is a deep, diverse and productive pool.

the largest and most productive Vernal Pool in the Forest. It likely provides stable habitat for the amphibians and wide variety of invertebrates that rely on it. Its size, extensive use by amphibians, condition and landscape context combine to make this a state-significant pool. This pool is a conservation

priority in the management of the Forest and may be utilized as an exceptional educational site.

Vernal Pool 2

This Vernal Pool is located in the south-central portion of the Paine Mountain parcel and is narrowly attached to a much larger wetland at the headwaters of a stream. It is isolated, however, in that it does not appear to be hydrologically connected to or influenced by the stream. This is a fairly large pool, and may be influenced by groundwater; the presence of standing water and mucky soils suggests that it holds water long enough to support amphibian reproduction in most years. At the time of the site visit in May, 2016, many wood frog tadpoles and 3 spotted salamander egg masses were documented. It is likely that many more salamander egg masses were present but visibility was limited due to leaf litter on the water surface.



Figure 11. Vernal Pool 2 is a large, significant pool.

Overall, this is a very nice pool which appears to provide stable habitat for the wildlife that use it. The combination of amphibian use, the condition of

the pool and buffer and the larger landscape combine to make this a state-significant Vernal Pool.

Vernal Pool 3

This small Vernal Pool sits on a bench on the lower, south-western portion of the Paine Mountain parcel. It is hydrologically isolated and likely receives runoff from its local watershed. Wood frog tadpoles were documented in this pool in May, 2016. While no spotted salamander egg masses were seen, visibility was limited and they may be present. Invertebrate diversity was relatively low. This pool appears to be ephemeral and may dry up before amphibians complete metamorphosis in drier than normal years. Because of its small size and limited use, this pool is not considered state significant.



Figure 12. Vernal Pool 3 is a shallow pool that sits on a bench.

This pool is locally significant.

Seepage Wetlands

Seeps are typically small wetlands that are the site of groundwater discharge. They can form the headwaters of small streams or occur alongside streams. A total of seven Seepage Wetlands were mapped in the Northfield Town Forest. Dominant vegetation includes slender mannagrass (*Glyceria melicaria*), rough-stemmed sedge (*Carex scabrata*), orange jewelweed (*Impatiens capensis*) and foam flower (*Tiarella cordifolia*), though vegetation can be highly variable depending on the site. These seeps occur as canopy openings because the wet conditions typically exclude trees. Surface water is usually present and occurs either as sheet-flow across the wetland or, in some cases, channelized flow through the wetland.



Figure 13. Small seepage wetland near barn foundation.

Seepage Wetlands are significant for a number of wetland functions and values. They perform a water quality function and contribute to fisheries habitat because they contribute cold, clean water to streams. The seeps that occur along streams are important for erosion control. They can also be important for wildlife, providing habitat for spring and dusky salamanders and as feeding grounds for mammals such as deer and black bear in the spring.

The relatively large Seepage Wetland that occurs adjacent to the Beaver Wetland is the only seep that is considered locally significant in the Forest. This is discussed under the Beaver Wetland section.

Alder Swamp

There is a single example of this community type in the Forest. Though mapped as an Alder Swamp, it does not fit very well into that classification. This site is dominated by 30% cover of willow (*Salix spp.*), red maple (*Acer rubrum*) and some honeysuckle (*Lonicera sp*) shrubs. The herbaceous layer is fairly diverse and includes common Joe-pye weed (*Eutrochium maculatum*), sensitive fern (*Onoclea sensibilis*), gynandrous sedge (*Carex gynandra*), fowl mannagrass (*Glyceria striata*), and umbellate aster (*Doellingeria umbellatus*). This site is somewhat unique in that it has a significant bryophyte (moss) layer of peat moss (*Sphagnum spp.*), *Thuidium spp.* and *Rhytidiadelphus spp.* The soils are 12" of sapric (well-decomposed) peat over a dense layer of fine sand. This wetland is likely the site of groundwater discharge and forms the headwaters of a small stream.

At just over 1 acre, this site is too small to be ranked as a significant natural community. In addition, while the hydrology appears to be undisturbed, the presence of invasive honeysuckle throughout this wetland degrades the

condition of the community. This wetland, however, is significant for the water quality and erosion control functions.

Beaver Wetland

The Beaver-Influenced Wetland Complex which sits on a wide bench in the Paine Mountain parcel is a diverse wetland complex consisting of four different community types. Open Water, Alder Swamp, Shallow Emergent Marsh, and Seep communities all are interspersed in this basin. As the beaver activity fluctuates through the years, the distribution and abundance of these wetland communities changes. At the time of the site visit, this wetland complex consisted of 3 different



Figure 14. Beaver complex in winter.

beaver ponds and was surrounded by early successional Alder Swamp areas. Herbaceous emergent marshes were also interspersed throughout these communities. Willow (*Salix spp.*), red-osier dogwood (*Cornus sericea*), sensitive fern (*Onoclea sensibilis*), rough-stemmed goldenrod (*Solidago rugosa*), marsh marigold (*Caltha palustris*), and sedge (*Carex spp.*) were among the dominants.

Because they are a mosaic of different wetland communities, Beaver Wetlands do not get ranked using the Natural Heritage protocol. However,

this dynamic system is a locally significant feature for many functions and values including wildlife, erosion control, aesthetics, and recreation. This wetland provides important habitat for a wide array of wildlife including beaver, salamanders, frogs, shorebirds, songbirds, mink, black bear and deer. This open wetland also is a draw for hikers and birders who use the Town Forest.

Streams Management

Streams include intermittent streams that have a defined channel and evidence of sediment transport, regardless of whether such streams have surface water flow throughout the year or throughout the channel. The riparian areas along streams are important for preserving water quality and ground water recharge, for providing important wildlife habitat, and for maintaining overall ecosystem health. A minimum undisturbed and vegetated buffer of 50 feet on both sides of streams shall be required to limit erosion, to filter out sediment and other pollutants, and to enhance wildlife habitat. Any activity that encroaches on a stream or riparian area must be designed to minimize impacts and to maintain the natural condition of the stream. Vermont's Forestry Acceptable Management Practices (AMP's) shall be followed and the number of stream crossings shall be minimized.

Wetland Management

A fair bit of scientific work has been conducted on the value of buffers for wetlands. These buffers are intended to protect the functions and values of the wetlands and prevent direct and indirect impacts to wetlands from development or Forest management activities. For most wetlands, a minimum of 50' buffer, and often larger, around the wetland is sufficient to protect the wetland resource. Within this buffer zone, logging activities should be excluded. In areas that receive a lot of recreational use or are

important for wildlife habitat (such as the beaver wetland complex), larger buffers may also be appropriate. If logging or other motorized machinery is used in the vicinity of wetlands, care must be taken to prevent soil disturbance or rutting. The creation of ruts can disrupt local hydrology of a wetland or its watershed, thereby negatively affecting the condition of the wetland. Soils disturbance can also lead to invasion by non-native invasive species.

Specific management recommendations by wetland type are provided below.

Seeps

The primary functions of Seeps in the Forest are water quality (providing cold, clean water to surface waters) and wildlife habitat. Since Seeps are the sites of ground water discharge, they are often wet throughout the year, sometimes remaining unfrozen during the winter. As such, they are vulnerable to impacts from winter-time logging operations. A 100' forested buffer shall be established for these areas and any logging must follow required state guidelines. Care must be taken that access roads, skidder trails and harvesting operations avoid these sensitive areas. Recreation trails must also be kept out of these seepage areas. If current trails go through these wetlands, they will be re-routed or proper trail crossing structures will be implemented to prevent disruption of the hydrology.

Beaver Wetland

The primary considerations for management of the Beaver Wetland Complex are the wildlife habitat that it provides and the recreation activities that it attracts. A buffer of at least 100' will be maintained for this wetland based on providing undisturbed cover for wildlife such as deer, bear, spotted salamanders and wood frogs. Recreation trails are generally compatible with

the wildlife habitat present, but will be re-routed to avoid direct wetland impacts. Finally, invasive species control should be implemented in this wetland (see Invasive Species Section below).

Alder Swamp

The primary function of the Alder Swamp relates to its association with the stream that flows from it. It provides water quality and erosion control functions. It also provides a limited amount of wildlife habitat. Given its position on the landscape, a 50' buffer from logging activities should be sufficient to protect these functions and values and must be established.

Vernal Pool Management

The wood frog and spotted salamanders that have been documented in these pools spend most of their lives in the upland forests that surround the pools. For this reason, Vernal Pool conservation is closely linked to the management of the surrounding uplands.

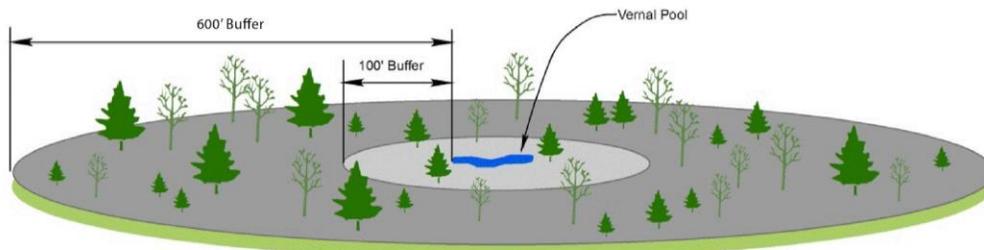


Figure 15. Vernal pool buffers.

There have been a number of scientific studies concerning the value of buffers around Vernal Pools. The amphibians that breed in Vernal Pools actually spend most of their lives in the forests surrounding the pools. In this regard, the health of the surrounding forest is directly tied to the health and functioning of the Vernal Pool.

Figure 15 shows two buffer zones around a Vernal Pool. These buffer distances are based on the work of Semlitsch (1998), Calhoun and Klemens (2002), and Calhoun and deMayandier (2004). The first buffer distance is 100' in diameter and is important because the density of amphibians within this area is very high both during the spring breeding period and the fall juvenile dispersal period. The nature of the forest immediately around the Vernal Pool has a tangible effect on the nature of the pool itself. Shading from surrounding trees can drastically prolong the hydroperiod of a pool. In addition, leaf litter that enters the pool from the surrounding trees forms the basis for the food chain in the Vernal Pool ecosystem.

The condition of the forest in this 100' buffer zone is therefore strongly linked to the condition of the Vernal Pool itself. For this reason, it is recommended that the Vernal Pool envelope be managed in a way that will not interfere with the functioning of the Vernal Pool. This includes maintaining a complete forested cover within this envelope. Light selective removal of canopy trees is, in most cases, acceptable but should come no closer than 25' to the pool's edge. Since many amphibians require a dense leaf litter on the forest floor with un-compacted soils, logging should occur when the soils are frozen and there is adequate snow cover. The creation of ruts in this area can often disrupt the hydrology of the nearby Vernal Pool. Development and other barriers to amphibian movement must be avoided within this buffer zone.

The next buffer shown in Figure 15 is calculated at 600' from the Vernal Pool habitat, as recommended by Vermont Department of Fish and Wildlife (2013). This is termed the "amphibian life zone" or the "critical terrestrial habitat". Amphibians that breed in Vernal Pools spend most of their adult lives in the forests surrounding their natal pools. These amphibians require a forest with dense leaf litter, decomposing woody debris, uncompacted soils,

and adequate canopy cover. Calhoun and deMaynadier (2004) recommend maintaining at least a 50% forested cover within this life zone to retain adequate habitat for forest dwelling amphibians when logging and forestry management occurs. Semlitsch (1998), and Calhoun and Klemens (2002) recommend maintaining a minimum of 75% forested cover where development occurs. If logging is to occur in this area, it should whenever possible occur in the winter when the ground is frozen and there is adequate snow cover. Ruts that occur in the life zone can fill with water and create population sinks as amphibians lay eggs in the ruts and never reach the more reliable Vernal Pool. Compaction of the soil can also result in direct loss of habitat for mole salamanders.

More in-depth forest management guidelines for protecting Vernal Pools can be found in Calhoun and Klemens (2002), and Calhoun and deMaynadier (2004).

UPLAND NATURAL COMMUNITIES

A summary of the upland natural communities found on the Northfield Town Forest is shown in Table 2. The Northern Hardwood Forest community makes up the vast majority of the acreage of the Forest. Some areas that contain mineral-rich soils have been mapped as Rich Northern Hardwood Forests. The steeper slopes, narrow ridges and river banks are dominated by mixed forests where hemlock or red spruce share dominance with northern hardwoods. There are two areas that contain historic conifer plantations. Each of these types is described below.

Table 2. Upland Natural Community Summary

Natural Community	# of Occurrences	Total Acreage	Locally Significant	State Significant
Hemlock Forest	4	5.17	Yes	Yes
Hemlock-Northern Hardwood Forest	5	41.21	Yes	No
Northern Hardwood Forest	1	200.57	Yes	No
Conifer Plantation	2	16.98	No	No
Rich Northern Hardwood Forest	2	96.39	Yes	Yes
Red Spruce- Northern Hardwood Forest	5	29.07	Yes, in part	No
Total	18	389.39		

Hemlock-Northern Hardwood Forests

The Hemlock-Northern Hardwood Forests in the Northfield Town Forest are restricted to the western part of the property. With one small exception, they are interspersed with areas of dense hemlock which were mapped as Hemlock Forests. Some human disturbance is evident in the scattered



Figure 16. Hemlock-Northern Hardwood Forest.

stumps, but these are fairly old. The cutting of ski trails has impacted this community going back to the 1960s. The canopy of these forests is dominated by hemlock (*Tsuga canadensis*), American ash (*Fraxinus americana*), paper birch (*Betula papyrifera*) and yellow birch (*Betula alleghaniensis*). A shrub layer of hop hornbeam (*Ostrya virginiana*), striped maple (*Acer pensylvanicum*) and American beech (*Fagus grandifolia*) is present at 5-20% cover. The herbaceous layer is around 10% and contains a scattered evergreen woodfern (*Dryopteris intermedia*), marginal wood fern (*Dryopteris marginalis*), and Christmas fern (*Polystichum acrostichoides*). There are a few areas of enrichment where the hardwoods become more dominant. Some invasives species such as honeysuckle and barberry are scattered throughout these mixed woods.

The Hemlock-Northern Hardwood Forest community is an S5 community, which indicates that it is common and widespread in the state. Overall the examples of this type on the Town Forest are nice stands, but their history of disturbance and small size relative to other in the state result in them falling short of the state significance designation. However, these forests are locally significant.

Hemlock Forests

Hemlock Forests comprise approximately 5.2 acres on the Town Forest and occupy areas of steep slopes and shallow soils. They are dominated by a dense canopy of hemlock (*Tsuga canadensis*). This dense canopy and frequent bedrock outcrops make these stands unique in the Town Forest. Hardwoods such as American beech (*Fagus grandifolia*), paper birch (*Betula papyrifera*) and yellow birch (*Betula alleghaniensis*) may also be present, though at less than 20% total cover. A shrub layer of red spruce (*Picea rubens*), striped maple (*Acer pensylvanicum*) and canopy species is present at

5-20% cover. As is typical for these dark forests, the herbaceous layer is very sparse, consisting of a few scattered individuals of evergreen woodfern (*Dryopteris intermedia*) and northern running-pine (*Lycopodium complanatum*).

Some areas contain nice, large hemlock 18"-22" diameter. Dense canopy appears to shade out invasive species that are present in many forests on the property. Standing dead wildlife trees (snags) are scattered throughout these forests. Some deer sign is present, although the only likely deer winter habitat is mostly off-property. A few old stumps (>20years old) are the only sign of human disturbance. As mentioned above, the soils are typically shallow, less than 8-10" deep over rock. Bedrock and surficial rock outcrops are common.

The Hemlock Forest community is an S4-ranked type, which is found throughout most of Vermont with the exception of the high elevations and

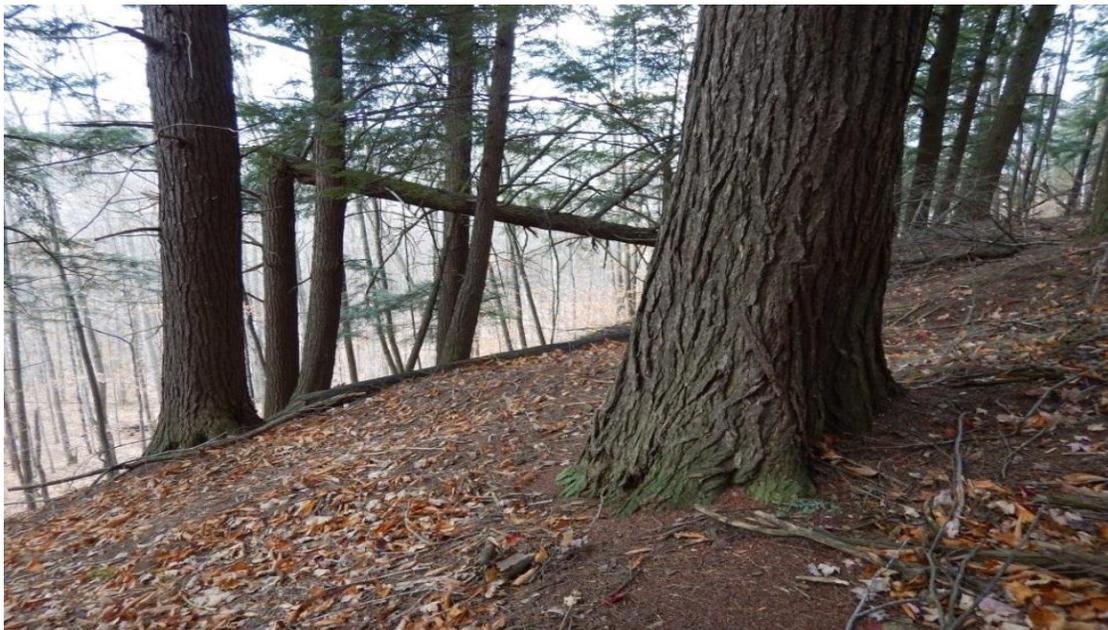


Figure 17. Hemlock Forests occupy steep slopes and are characterized by dense hemlock.

parts of the Northeast Kingdom. Though somewhat small compared to other Hemlock Forests, these sites lack significant disturbance, are in good condition and located in a good landscape. These factors result in a B-ranking of these Hemlock Forests and a state significant designation.

Conifer Plantations

A plantation is not, strictly speaking, a natural community. There are two areas that were historically planted to Red pine (*Pinus resinosa*), White pine (*Pinus strobus*), and Norway spruce (*Picea abies*). In some areas, these conifers have given way to northern hardwood species. In these cases, the site was mapped as Northern Hardwood Forest. In the areas that retain conifer dominance, the “Plantation” designation was retained. Over time, both of these sites will likely succeed to Northern Hardwood Forest.

Rich Northern Hardwood Forests

The Rich Northern Hardwood Forest is a community that is cherished by those that love spring wildflowers. These forests are habitat for spring wildflowers such as blue cohosh (*Caulophyllum thalictroides*), Dutchman's breeches (*Dicentra cucullaria*), Virginia spring beauty (*Claytonia virginica*), wild leeks (*Allium tricoccum*), common maidenhair (*Adiantum pedatum*), common waterleaf (*Hydrophyllum virginianum*). The presence of this suite of herbaceous species is a distinctive feature of this natural community and is the result of mineral enriched soils. The tree canopy is dominated by American ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*) and yellow birch (*Betula alleghaniensis*). The enriched soils provide excellent growing conditions for these trees and can produce stands of large, healthy trees. Some larger American ash are > 23” DBH (diameter at breast height), though in most cases, the average tree is around 16” DBH. The sub-canopy consists of canopy species as well as an

occasional hop hornbeam (*Ostrya virginiana*). A shrub layer comprising 20-30% cover consists of striped maple (*Acer pensylvanicum*), paper birch (*Betula papyrifera*), yellow birch and American beech (*Fagus grandifolia*). Occasional natural canopy openings are scattered throughout these forests where regeneration of the canopy species is occurring.

No signs of recent logging activity were seen in these forests, though historical timber harvest has certainly occurred. Scattered invasive species such as honeysuckle and barberry are found throughout these communities, though not in high abundance.



Figure 18. The Rich Northern Hardwood Forests are habitat to spring ephemerals like these wild leeks

The Rich Northern Hardwood Forests on the Town Forest are relatively large examples of this natural community type. Their full extent outside of the Town Forest has not been mapped. However, it is likely that they are connected to the large Rich Northern Hardwood Forests that were mapped as

part of the Berlin Pond Watershed Natural Communities. As such, these are very large rich forests that occupy much of the Paine Mountain slopes and surrounding hills. Because of their large size, good condition and landscape, they are considered A-ranked state significant natural communities.

Northern Hardwood Forest

Northern Hardwood Forests are the matrix or “background” forested natural community in Vermont. These common and widespread forests are found in a wide range of elevations, slopes, aspects and soil conditions. The Town Forest contains approximately 200.57 acres of this community. The canopy is dominated by sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), American ash (*Fraxinus americana*), and American beech (*Fagus grandifolia*). The sub-canopy and shrub layers consist of the canopy species as well as striped maple (*Acer pensylvanicum*), and an occasional red spruce (*Picea rubens*). The herbaceous layer is typically around 30% and is dominated by evergreen woodfern (*Dryopteris intermedia*), Christmas fern (*Polystichum acrostichoides*), marginal wood fern (*Dryopteris marginalis*) and Canada mayflower (*Maianthemum canadense*). In some areas, a variant of this community, the *sugar maple-white ash*-Jack-in-the-pulpit Northern Hardwood Forest is interspersed with the standard Northern Hardwood Forest. This variant develops from slightly enriched soils and is intermediate between the Northern Hardwood Forest and the Rich Northern Hardwood Forest



Figure 19. The Northern Hardwood Forests are highly variable and found throughout the Town Forest

Like the Hemlock-Northern Hardwood Forest, the Northern Hardwood Forest is an S5 community, which indicates that it is common and widespread throughout the state. Because of this, only A-ranked examples of this community are considered state significant. The Northern Hardwood Forest on the Town Forest is considered a B-ranked example of the type and is locally significant.

Red Spruce-Northern Hardwood Forest

This mixed type is mapped in five stands on the Town Forest. There are two small north-south running ridges near the center of the Paine Mountain Parcel, one area on the summit of Paine Mountain and two sites on the upper slopes in the southeastern corner of the Forest. These sites on the upper

slopes, though connected, are mapped separately based on land-use history. The southern of these two parcels was historically grazed and still shows signs of this use. The northern parcel is relatively undisturbed and contains the bulk of the acreage of this type in the Town Forest. Especially where the spruce is dense, this forest has a montane feel to it, with dense conifers, steep slopes and a moss-covered forest floor. Red spruce (*Picea rubens*) dominates the canopy, with lesser amounts of paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*) and red maple (*Acer rubrum*) present. There is



Figure 20. This example of the Red Spruce-Northern Hardwood Forest is a locally significant community.

a sub-canopy of 30% consisting of the canopy species. The shrub layer is restricted to canopy openings (more common in the northern part of this stand) and consists of canopy species as well as striped maple (*Acer pensylvanicum*) and American beech (*Fagus grandifolia*). There is a sparse herbaceous layer of evergreen woodfern (*Dryopteris intermedia*) and hay-scented fern (*Dennstaedtia punctilobula*). Some of the spruce trees in this stand are fairly large: 22" DBH and approximately 150 years old. This forest can be difficult to navigate because of

the steep slopes, numerous fallen trees, standing snags and canopy openings. This “messy” appearance, however, is common in undisturbed mature forests. The soils at this site are shallow (2-6” deep) loams over rock with a few pockets of deeper soils to 12”. This main stand is a steep, west-facing slope with numerous surficial rocks and some small bedrock outcrops.

The Red Spruce-Northern Hardwood Forest is an S5 community in the state, which indicates that it is common and widespread. The acreage of this type in the Town Forest is quite small compared to much larger stands mapped elsewhere. For this reason, these forests are B-ranked and not considered state significant. The large stand described above, however, is considered locally significant.

Upland Natural Communities Management

The management approach for upland forests is dependent upon the type of natural community present. Natural communities can be broken up into types that are “matrix” forming communities and those that form “patches” on the landscape. Which category the natural community falls into can guide the decision making process. Some general guidelines are presented below.

Matrix Forests: Northern Hardwood Forests and Rich Northern Hardwood Forests

Because of the large size of these communities, the management recommendations for maintaining their integrity are very different than those for smaller patch communities. With these two community types, it is not an individual acre that is as important as the forest as a whole. Maintaining the integrity of these communities is more a matter of maintaining the un-fragmented nature of the community and limiting impacts into the interior of these sites.

Unlike many wetland communities or smaller patch communities, matrix and larger patch communities tend to be more ecologically resilient. Active forest management including a wide variety of forestry practices generally does not threaten the ecological integrity of these sites. Many of these practices can mimic natural disturbance regimes and provide valuable wildlife habitat. Nearly all manners of recreation can be a part of the overall management plan for these sites.

Patch Communities: Hemlock Types and Red Spruce-Northern Hardwood Forest

The recommended management for these communities is similar to that presented above for the matrix communities. It differs primarily in the matter of scale. Because they are generally smaller than patch communities, active forest management can have greater impact on the overall condition rank of patch communities. Whereas in matrix communities, an area of clear-cut may not affect the overall rank of the community, patch communities may be significantly affected by these cuts. If logging is to occur in these significant patch communities, selective logging is generally recommended over small clear-cuts. In addition, the Hemlock Forests that typically occur along the banks of streams will be excluded from logging operations to protect the stream resource. Finally, the steep slopes of the locally significant example of the Red Spruce-Northern Hardwood Forest likely prevented the site from being logged in the past. Excluding this site from future logging is the best practice.

RARE & UNCOMMON SPECIES

No new surveys for rare, threatened or endangered species were conducted as part of this inventory. However, the Town Forest is known to provide habitat for a population of male fern (*Dryopteris filix-mas*). The male fern is a state

threatened species with only 20 extant populations known in the state. Other uncommon fern species known to be present are goldies fern (*Dryopteris goldiana*) and Braun's holly fern (*Polystichum braunii*). Since a goal of the Forest Stewardship Plan is to protect the biodiversity of the Forest, protection of these species is a priority. Rare species in the vicinity of human activity are particularly difficult to protect because the precise location of the population should remain confidential. Re-routing of trails, signage or other means to exclude human activity from this location must be adopted.

WILDLIFE HABITAT

Black Bear Habitat

Black bear utilize a considerable range of forest types and conditions, but are typically shy and maintain a moderate distance from human disturbance. There are two specialized habitats recognized in Vermont as being important to the survival of black bears: hard mast stands, and “bear wetlands”.



Figure 21. Bear-scarred beech tree.

Hard Mast Stands

Hard mast are tree species that produce fat-rich nuts critically important to feeding black bear in the fall as they bulk up their fat reserves for the winter hibernation. In this region, the tree species associated with bears are American beech and red oak. Bear leave evidence of their use of these resources by the claw marks that remain on the tree trunks as they climb to reach the beech nuts in September and October. Field work indicates that there are only scattered beech trees on the property that are being utilized

by black bear. These few climbed trees were found in the south central portion of the Paine Mountain parcel, due south from the beaver complex wetland and red pine/Norway spruce plantation. Elsewhere in the Town Forest, beech is a significant component of the understory, however many of these trees are still too young to produce beechnuts. Where mature beech do occur, they tend not to be concentrated to the degree that they would attract feeding bear and be considered a “stand”.

Red oak acorns are also a favored food of black bear as well as wild turkeys and several other wildlife species. Oak is not generally a canopy component in the Forest, however there are a few large red oaks in the northwest portion of the Paine Mountain parcel. These oaks are on steep south facing slopes and at least one exhibited evidence of being climbed by a bear in search of food.



Figure 22. Towering red oaks

The mast presence in the Forest does not rise to a level considered “critical wildlife habitat”, however they are important to resident bears none-the-less. Due to the infrequent nature of these nut-producing trees on the landscape, future forest management should favor the retention of these species in general, and especially those exhibiting evidence of bear use.

Bear Wetlands

Black bear are known to utilize seepage type wetlands that are the first places to grow green plants in early spring due to the warmer groundwater coming to the surface. Bears come out of hibernation very hungry and seek out these habitats to feed on the emerging vegetation when little else is available. As with other feeding habitats, size appears to be important- the greater the food resource, the more likely it is to be sought out by bears. Often these visiting bears will leave territorial marking sign at the edge of wetlands as warning or information to other bears by clawing, biting, and rubbing on trees at the wetland edge. Occasionally, large areas of grazed herbaceous vegetation can be found after bears have been present



Figure 23. Bear-marked tree at the edge of the beaver complex wetland.

The Northfield Town Forest contains two fairly sizeable wetlands, but the Beaver Complex is by far the largest. Bear sign was noted at the edge of this wetland indicating this is at least occasionally an important resource for bears in the area. The smaller Alder Swamp may provide occasional bear

food, however being dominated by shrubs rather than forbs reduces its desirability as a food source.

Other Bear Sign

In addition to marking territory at spring feeding wetlands, bears leave their territorial marking across the landscapes in which they live. Bear marking sign was observed in numerous locations throughout the central portion of the Paine Mountain parcel, most notably on remaining red pines within the former plantation area. Interestingly, this marking was directly between the few observed climbed beech trees and the Beaver Complex. But more telling, the concentrations of bear sign were located in the area of the property with the lowest trail density and greatest distance from established trails. The lack of routine human disturbance is apparently sufficient for bears to utilize this portion of the property regularly. Trails should be excluded from areas with high concentrations of bear sign.



Figure 24. Bear claw marks on red pine.

Deer Winter Habitat

White-tailed deer are at the northern edge of their range here in Vermont, and as such have devised strategies to better survive the historically long and cold winter. Deep snow and cold sap the energy reserves of deer during the winter months when food is scarce and less nutritious. In cold and snowy winters, deer will congregate in forests with a significant conifer overstory. The conifer overstory provides a “roof” for the snow, resulting in shallower snow depths on the ground and a “ceiling” for heat, maintaining slightly warmer temperature underneath. Hemlock and cedar dominated forests tend to provide the best deer winter cover in the Northfield region, although other conifer dominated natural communities, and even mixed conifer/hardwood communities can provide important winter protection. The most reliable way

to document the use of deer winter habitat is to visit in the winter when deer are congregating in these habitats and use is apparent in copious tracks and scat focused under the conifer canopy. The natural resource inventory and assessment of the Northfield Town Forest was conducted over the course of the 2015/16 winter, however this was not a “yarding” year for deer. There was very little snow, and above average temperatures throughout the season which led to very little deer utilization of winter habitats state-wide. It is possible to see evidence of deer winter habitat use outside of the winter season by investigating concentrations of twig and bark browse. The Hemlock Forest located primarily off property west of the Paine Mountain parcel exhibited signs of historic winter deer use, however only a small portion of this community is within the Town Forest. For a Fish and Wildlife map of forest deer yards refer to the Vermont ANR Natural Resource Atlas (<http://anrmaps.vermont.gov/websites/anra5/>).

The Hemlock and Hemlock-Northern Hardwood Forest communities located in the Cheney parcel and along the western edge of the Paine Mountain parcel should be managed specifically to enhance the conifer overstory and hemlock regeneration which would serve to enhance the value of the habitat for wintering deer. Prohibit the introduction of new trails, especially which would be used in the winter, in these forest types to help deer using those habitats by reducing stress.

Songbird Habitat

There are three primary songbird habitats present in the Northfield Town Forest, each supporting a specific assemblage of bird species. While more specific information can be gleaned from the Forest Bird Habitat Assessment conducted by Audubon Vermont in 2010 (Appendix 2), this plan provides an overview of these habitats below. Focused bird monitoring as recommended by Audubon would provide additional information as well as an opportunity for additional exploration of the Forest.



Figure 25. Edge of deer winter habitat that continues off-property.

Grasslands

While we were unable to conduct a grassland bird survey during the course of this inventory, the Cheney meadow at the western end of the Cheney parcel may be just large enough to support nesting grassland birds such as bobolink and likely provides periodic habitat for other birds such as American woodcock who



Figure 26. Cheney meadow.

might conduct mating displays here, and for tree swallows and bluebirds feeding on insects over the open meadow.

Conducting any mowing after August 1 of each year, and mowing at least once every 3 years will maintain the best and most productive grassland habitat for these species. A rotating schedule for mowing different sections in different years could help provide habitat diversity for wildlife. Consider an educational project to install nest boxes in the Cheney meadow to provide nesting areas for bluebirds, swallows and others.

Early Successional Habitat

Early successional habitat is young forest that is in the process of re-growing, and is dominated by “brambles” such as blackberry and raspberry, shrubs and saplings. A guild of migratory bird species nest only in this uncommon habitat type including Nashville warbler, rose-breasted grosbeak and mourning warbler and gamebirds such as ruffed grouse and woodcock use these areas for feeding and mating displays. The blackberry, raspberry and



Figure 27. Early succession habitat at Butternut Junction.

tree fruit such as cherry and serviceberry that occur in early succession habitats are important foods for a variety of wildlife, including many interior forest nesting bird species who seek out these food sources in preparing for the migration to winter grounds at the end of the breeding season.

Early succession habitat in the Northfield Town Forest is primarily limited to small natural disturbance areas, beaver-influenced wetland edges and man-made disturbances. Natural disturbances such as from windthrow and ice damage are infrequent. In climax or old-growth forests, large old trees succumb to disease and age, dying or toppling to leave canopy openings that create cycles of early succession habitat. The overall younger forest conditions in the Town Forest means this is a very infrequent event. The beavers at the large Beaver Complex Wetland do an excellent job of creating early succession habitat by keeping the canopy trees at bay in the surrounding upland edge. As ponds are cyclically abandoned new young growth will shoot up, to be drowned out again when the pond is reclaimed by beavers.



Figure 28. Early successional habitat and invasive shrubs at hawk watch.

Forest management activities are the third source of early succession habitat in the Northfield Town Forest. Cutting trees results in openings that will regenerate with shrubby young growth preferred by early succession species. As would be expected, the larger the clearing area, the more early succession habitat is created. The largest area of managed early succession habitat is associated with the Hawk Watch lookout. The effort to secure panoramic vistas at this summit location has resulted in a vigorous early succession habitat; however it is also inundated with invasive species.

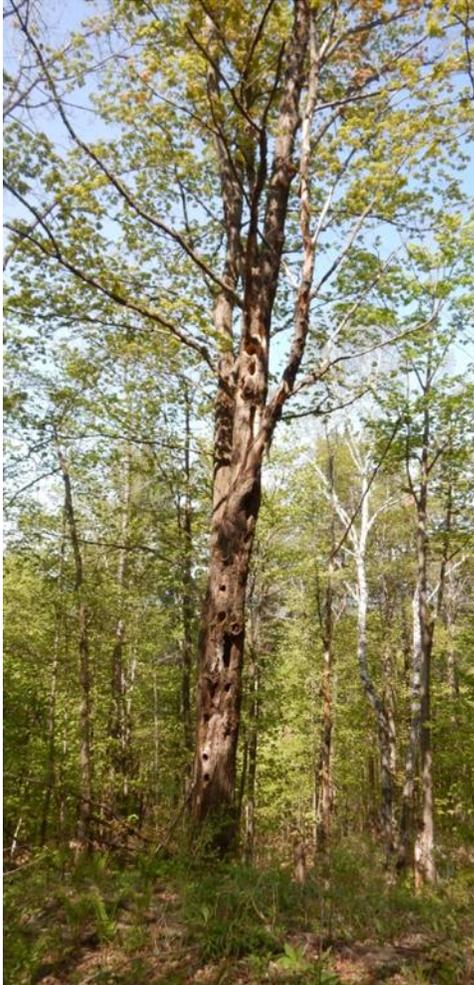


Figure 29. A large cavity tree with many nest holes.

As would be expected, the larger the clearing area, the more early succession habitat is created. The largest area of managed early succession habitat is associated with the Hawk Watch lookout. The effort to secure panoramic vistas at this summit location has resulted in a vigorous early succession habitat; however it is also inundated with invasive species.

The Northfield Town Forest is challenged by a number of invasive shrub species that will quickly outcompete native shrubs and trees in forest openings. These invasive plants usually produce fruit, but it is less nutritious and sometimes harmful to native

birds. For this reason, any forest openings that are created through management activities need to be designed to discourage invasives and monitored, and controlled if necessary, to be sure they do not become established before the mature forest regrows.

Early succession openings should be located away from any existing populations of invasive species and kept relatively small (1-2x canopy tree height in diameter) to avoid new invasive species incursions. These small

openings will not support some early succession species, but will best mimic a natural disturbance regime and discourage new invasive plant populations.

Interior Forest

Interior forest is usually considered any forestland that is 100 meters or more from human landscape activity such as residences, roads, agricultural land and maintained open land. The bulk of the Northfield Town Forest is made up of interior forest and the bird species that occupy this declining habitat type can be found nesting throughout the Forest. Pileated woodpeckers, black-throated blue warblers, ovenbirds, blue-headed vireos, wood thrushes and scarlet tanagers, all classic interior forest nesters were observed within the Forest during the inventory.

Interior forest habitats are best exemplified by uninterrupted canopy cover, varied tree species composition, a healthy and diverse understory, decomposing woody debris on the forest floor and standing dead trees, or snags throughout. These provide important habitat for nesting birds and other wildlife, and should be left undisturbed.

Management through silvicultural activities that focus on these features will benefit the interior nesting birds using the Town Forest and serve to enhance the overall forest health.

General Wildlife Habitat

Besides the species and specific habitat elements discussed above, the Northfield Town Forest provides habitat for a range of wildlife species. These include everything from amphibians and reptiles to birds and bats and wide-ranging carnivores such as fisher, bobcat, fox and coyote. The juxtaposition of healthy habitat types such as grassland, early succession and interior forest, combined with portions of the property relatively undisturbed by

regular human activity will continue to provide for a diverse suite of wildlife species.

Finally, the Northfield Town Forest makes up but a portion of a larger habitat “block”- or large area of unfragmented forest. Maintaining healthy forest ecosystems and wildlife habitats in the Northfield Town Forest will benefit wildlife that makes its home in this wild pocket nestled between the Dog River valley and Interstate 89.



Figure 30. Apple tree near Butternut Junction

Apple Trees/Soft Mast

There are several areas throughout the Town Forest with anywhere from one to several apple trees, hawthorn and other “soft mast” species. These are

likely old openings, fields, or homesteads where these fruit bearing trees were either planted, or became established. Apples are eaten by a wide variety of wildlife species from black bears to ruffed grouse but will die off when shaded by surrounding canopy trees, and this is happening in some places. They can be “released” by removing nearby trees that are shadowing the apples and in many cases can be brought back to vigor through knowledgeable pruning.

Routine maintenance of apple trees and other soft mast can often be coupled with maintenance of small early succession forest patches as they are quite compatible.

FOREST MANAGEMENT & SILVACULTURE

In 1984, Northfield resolved to manage the Municipal Forest for wildlife, including deer winter areas, and timber management as part of an agreement with the State of Vermont. The agreement was made in order to mitigate the impacts on wildlife habitat that would result from the construction of the Mill Hill access road to I-89. A forest management plan for timber harvesting was prepared in 1985 that included management objectives to support wintering deer, ruffed grouse, and nongame wildlife species. Descriptions of the tree stands and associated management recommendations are also included in the plan.

A forest management plan was also later prepared by Rose Beatty in 2000 and includes descriptions of the Forest’s tree stands, wildlife habitat, trails, surface waters, and related options for timber harvest (Appendix 1). In 2010, a Forest Bird Habitat Assessment of the Municipal Forest was prepared by Katie Manaras as part of the Audubon Vermont’s Forest Bird Initiative (Appendix 2). The purpose of the document was to provide an assessment of Forest bird breeding habitat, and to offer management options and

considerations that would protect, enhance, and/or create quality breeding bird habitat for forest bird species whose significant breeding population is found in the Northern Forest region.

The 2000 forest management plan is due for an update. The Forest would be served by incorporating management recommendations contained within this Stewardship Plan and the 2010 Audubon Vt. document as silvacultural activities are proposed and planned.



Figure 31. Site of past forest management

While tree harvesting can sometimes be perceived as environmentally insensitive (and done wrong, it can be), modern forestry can benefit the habitats and wild animals that inhabit the landscape by incrementally repairing past land uses and replicating natural processes on an advanced timeline. Conducting silvacultural activities under a well thought out plan

could be a great opportunity for public outreach and education. Harvests on Town Forests throughout Vermont have been successfully implemented in this manner.



Figure 32. Paine Mountain Trail.

RECREATIONAL ACTIVITIES

TRAILS

The trail system on Paine Mountain is primarily made up of old roads that have traditionally been used for hiking, skiing, and snowshoeing. Norwich University owns the land adjacent to the Paine Mountain tract and has developed a system of multi-use trails to be used for hiking, biking, and skiing. A small section of the Norwich University trail system extends into the Town Forest and borders the edge of the southwest

corner of the Cheney field and the southern edge of the Town Forest.

The trails in the Forest range in size, condition and use. The NCC has mapped trails throughout the property, including old logging skidder roads that are not currently used for recreational purposes. Most trails on the property are shared by pedestrian and mountain bike users. Some trails have been utilized by ATV riders, although that activity is prohibited. ATV use damages trails, causes erosion and negatively impacts water quality and

wildlife habitat. Forest users who witness or find evidence of ATV use in the Town Forest should report to the Town Forest Stewardship Sub-committee.

Portions of several trails, especially the heavier used trails on steeper slopes such as the Paine Mountain Trail are in need of maintenance and repair work. Long term use has resulted in “dugway” trail conditions that channel stormwater runoff down along trails further eroding and exacerbating the washed out condition. A trail inventory should be conducted and work initiated to improve stormwater runoff throughout the trail system. Use of the guidelines laid out in the booklet “Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont” (see internet link in References) will provide a good baseline for installation of drainage structures. Basic recommended structure spacing is provided in Table 3.

The Town Forest Stewardship Sub-Committee will establish policies regarding user types allowed on each trail. Accompanying signage will make clear to all which trails are appropriate for which type of use.

New trail installation will follow a strict and pre-determined process of approval. Portions of the property will be maintained as trail free to allow for remote and less-frequently disturbed areas. Recommended trail free areas are shown on Map 6. To be approved, new trails must avoid all wetland areas and ensure adequate buffers, minimize stream crossings and use appropriate crossing structures, avoid steep slopes and be designed so as not to alter hydrology or cause soil erosion.

Table 3. Trail Structure Spacing

% Trail Slope	Waterbar Spacing (ft)	Culvert Spacing (ft)
1	400	450
2	250	300
5	135	200
10	80	140
15	60	130
20	45	120
25	40	65
30	35	60
40	30	50

The Paine Mountain Trail was recently relocated to avoid crossing the large beaver complex wetland on the Paine Mountain parcel. The old route through the wetland is closed, will remain closed, and will be allowed to revegetate. A portion of the route that crosses the stream below the beaver area is still within the wetland buffer. This trail must not be expanded. It should remain only as a narrow path that maintains full canopy cover.



Figure 33. Backcountry/alpine ski run.

USES

One goal of the management of the Northfield Town Forest is to allow and encourage multiple uses that will benefit the greatest possible cross-section of the community while protecting the natural resources of the Forest. Some uses have more potential for adverse and lasting impacts than others, and certain areas of the Forest are more sensitive to human activity. Careful planning is needed to balance the interests of recreationists with natural resource conservation imperatives. Table 4 details allowed and prohibited use types as deemed appropriate by the Northfield Conservation Commission.

Table 4. Forest Uses

Use Type	Allowed/ Prohibited	Comments
Hiking/Walking	Allowed	Encourage on-trail; to the extent that off-trail use occurs, it should be infrequent and unconcentrated
Mountain Biking (nonmotorized)	Allowed	Allowed only on specified trails
Cross-Country Skiing	Allowed	No motorized grooming of trails
ATVs, Dirt Bikes, Etc	Prohibited	
Snowmobiles	Prohibited	
Alpine & Backcountry Skiing	Allowed	No cutting of understory vegetation without explicit permission from the Town Forest Stewardship Subcommittee
Hunting	Allowed	Tree stands must be fully removed after each season; no permanent tree stands or blinds permitted
Trapping	Prohibited	Incompatible with recreational use; exception for nuisance animals as directed by Selectboard
Short-term Camping	Permission Only	Committee must approve camping requests. Follow Leave No Trace principles
Long-term Camping	Prohibited	
Campfires	Prohibited	
Tree Cutting	Prohibited	Except under the oversight of a qualified forester and approved forest management plan
Invasive Plant Management	Permission Only	To be conducted only by authorized and qualified individuals
Educational Activities	Allowed	
Trail Maintenance	Permission Only	Only under supervision and approval by the Subcommittee

INVASIVE SPECIES

Non-native Invasive Species (NNIS) are scattered throughout the Northfield Town Forest. The main species of concern are honeysuckle (*Lonicera spp.*) and barberry (*Berberis sp.*), though buckthorn (*Rhamnus spp.*) is also occasional. Fortunately, with a couple exceptions, the overall cover of these NNIS is low. The most notable exception is the cleared area around Hawk Watch, where these NNIS have become dominant. If an effort to control NNIS in the Forest is undertaken, the highest priority areas are the Hawk

Watch clearing and any occurrences within wetlands. The Beaver Wetland Complex, in particular, has an infestation of honeysuckle that should be controlled. Many other small canopy openings have small populations of invasive species, notably the open area near Butternut Junction, and the smaller open area near the homestead and stone barn foundation both in the northern part of the Paine Mountain parcel.

CONTINUING CHALLENGES

Certain aspects of the Stewardship of the Northfield Town Forest have not been resolved to date. These items require further community discussion and decision making process to resolve.

- **Parking:** Public parking is not currently available on the Town Forest property. Exploration of available options and a plan to establish formal and acceptable parking in proximity to Town Forest access point(s) should be a priority.
- **Beaver Conflicts:** Beaver activity will have a cyclical effect on the area around the beaver complex wetland on the Paine Mountain parcel, and potentially in other locations. While beavers generally have a positive ecological impact, conflicts may occur with other uses such as trails and silvacultural activities.
- **Hunters/Hikers:** In most cases in Vermont, hunters and other users can coexist amicably. However, occasionally conflicts do arise. Hunters should be advised that hikers are likely to be present. Likewise, hikers should be advised during deer rifle season that hunters may be present, and should be encouraged to take appropriate precautions.

- Hikers/Mountain Bikers: Mountain bikers tend to travel faster than hikers and can create uncomfortable or even unsafe conditions for each other. Hikers should always have the right-of-way on multi-use trails. Biking is allowed on the Paine Mt Trail, as indicated on map 2. Bikers will control their speed. If conflicts arise, policy may be established to manage the conflicts. Trail maps and signage should be distributed to clarify allowable activities for all users.
- Sugaring: Maple syrup production by a private party on the Town Forest is unlikely to be compatible with the other uses prioritized in this Stewardship Plan.
- Any leases or lease renewals to private parties for any use must be approved by the Selectboard.
- Management of Off-Property Trails: Some trails continue off property onto neighboring land that may or may not have the same use restrictions in place as the Northfield Town Forest. Coordinated management so that neighboring landowners understand the management and use objectives in the Forest will help avoid future conflicts.
- Campsites: Some camping has taken place in the Forest, sanctioned or not. There remains evidence of campsites, in some cases with a considerable amount of trash, and in others fire rings or cleared areas. The Town Forest Stewardship committee shall adopt clear camping restrictions and guidelines.

RECOMMENDATIONS

Following is a summary of specific stewardship and management recommendations proposed elsewhere in this document.

FOREST MANAGEMENT

- Update 2000 Forest Management Plan to incorporate natural resource inventory information and recommendations contained in this report and in the 2010 Audubon Vt. Forest Bird Habitat Assessment. The management plan update could also include the recently acquired parcel on the summit of Paine Mountain.
- Identify management zones where more intensive timber harvesting and habitat management can occur and others that can be left to natural forest succession.
- Hold public educational sessions in concert with Forest management activities to highlight responsible forest management and wildlife habitat improvement.
- Conduct invasive species management activities at Hawk Watch and other locations throughout the property.
- Release apple trees to provide soft mast for wildlife.
- Paint and blaze all Town Forest property boundaries.

ECOLOGICAL

- Except for necessary construction on stream crossings, a minimum undisturbed and vegetated buffer of 50' on both sides of streams is required.
- Implement Vernal Pool protection zones where new trails and forestry activities are not permitted.

- Maintain buffers around all wetlands of at least 50' from all activities.
- Designate “low-disturbance” areas where concentrated activity such as new trails will not be allowed. Initial designations are indicated as of December 31, 2016, in Map 6.
- Implement an invasive management plan to tackle the growing invasive plant populations throughout the property.

TRAILS/USES

- Close and block trails in sensitive or unnecessary areas
- Provide signage detailing allowed/prohibited trail uses
- Conduct a comprehensive trail inventory, mapping existing conditions.
- Plan and conduct trail maintenance to improve water drainage on trails. Aim to move water off trail surface in frequent small quantities or sheet flow.
- Consider documenting the various ecological and historic elements of the property by developing interpretive trail markers or a brochure and map.

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APPENDIX 1. FOREST MANAGEMENT PLAN – ROSE BEATTY

FOREST MANAGEMENT PLAN

Property of

THE VILLAGE OF NORTHFIELD

PAINE MOUNTAIN & CHENEY FARM PARCELS

in

Northfield, Vermont

Prepared by Rose E. Beatty, Consulting Forester

April 2000

Certified by Rose Beatty on 4/13/00

INTRODUCTION

The Village of Northfield's property is located just east of the actual village. Two parcels make-up the Village property, they are the Paine Mountain parcel and the Cheney Farm parcel which include the pumping station and what is known locally as Cheney Field. The property is located south of Turkey Hill Road and north of Barrows Road. It goes east almost to the top of Paine Mountain.

The total acreage is 385.0 +/- acres. The majority of the parcel is forested with 362.0 acres productive forest land, 17.0 acres in the open condition and 6.0 acres in swamp and the old ski trails. The property has not been surveyed and most of the boundary lines are marked by old wire fence which can be a little difficult to locate on the ground.

The terrain of the property varies from gently sloping to quite steep in a few locations. The majority of the property is operable by conventional equipment. There are numerous rock outcroppings and seeps which must be taken into account when logging. This is also indicative of shallow soils.

There were some thinning done in the past. These logging operations took place mainly in map area 2, the plantations, however, portions of areas 1 and 4 were also thinned.

The multiple-use concept of forest management is one where a parcel of land provides timber, recreation, wildlife and a clean water supply. This appears to be an attainable goal for this property. There are trails which are in good condition and do provide access to the property. There has been a great deal of work done to these trails which can be used for numerous activities such as walking, running, bird watching, snowshoeing, and snowmobiling to name but a few. These trails obviously, could be used for logging purposes but it would be imperative that the trails are restored to their present condition or improved.

As I worked on this project, I talked to a variety of people who use and enjoy this property. I feel quite strongly that this area can be enhanced by sound forest management and at the same time be a truly multiple-use forest. The property has productive sites with the ability to grow beautiful, healthy trees; the trails are there for recreation, wildlife habitats are present and can be enhanced and by sound management and the springs and wetlands found can be kept clear and clean and their integrity can be maintained.

So with the multiple use concept in mind, a field cruise was undertaken in the winter of 2000 to gather pertinent information about the woodland. Specific inventory information regarding timber types, tree size, quality, and limitation on harvesting was gathered using systematic sampling procedures. In addition, the objectives of increasing the health and vigor of the timber and maintaining and increasing the wildlife habitat that exists as well as the recreational potential of the property was explored. All these goals must be met by utilizing sound forest management practices and accomplished in aesthetically pleasing manners.

Base on the field data the woodland has been divided into six separate management areas or stands. Descriptions of and prescriptions for each area are included in this report. There is also a forest stand map, a schedule of logging activities and a glossary of common forestry terms. The property is found on orortho photo number 140180, Paine Mountain. This was used in conjunction with aerial photos and the field data and the 1985 forest management plan by Russ Barrett to prepare the map and management plan.

Detailed inventory data is available from Rose E. Beatty, consulting forester, located in Northfield, Vermont.

MAP AREA: 1

ACRES: 67.0

COVER TYPE: Northern Hardwood - Heavy ice storm damage

DESCRIPTION

Occupying this above average site are the typical northern hardwoods: sugar maple, beech, yellow birch and paper birch. This map area includes land found along both the northern and southeastern boundary line. Unfortunately the ice storm of 1998 hit the majority of the trees and adversely affected them. There are a few pockets that, for some reason did not receive any damage, but 75% of the basal area was affected by this storm. Many stems are uprooted or have had their entire tops broken off. Some of these trees do not have enough leaf surface area remaining to keep the tree growing and healthy.

Portions of this stand appear to have once been open land. In these areas the timber is in the pole stage of development. There is even scattered white pine in a few of these areas. As one goes toward the top of Paine Mountain however, the stems are larger in diameter and this area was not pastured as long. The diameter range here is from six inches to large overmature trees.

The understory is composed of the same species mix with the addition of red spruce. The height range is from half a foot to 30 feet. There is evidence of browse by various wildlife species, but the seedlings and saplings appear to be adequately stocked at this point in the development of the stand. This stocking level is important because of the storm damage to the overstory. These saplings will now be released to take over the site.

Access is gained from existing trails but care must be taken near the brook and any water lines present. These water lines are old and rotting and should be further located prior to starting any logging operation.

The wildlife habitat is fair to good. The area meets the summer and spring requirements of a variety of species. Song birds, grouse, deer and even turkey tracks were noted.

MANAGEMENT PRESCRIPTION and OBJECTIVE

MAP AREA: 1

At the present time the stand is in need of a salvage cut to gain the value of the timber destroyed by the ice storm. Stems that do not have the crown left to keep the tree alive should be harvested. Trees that will not survive or that will deteriorate rapidly, in the next twenty years, should be harvested.

The overall goal of management is to grow sawlogs on the even-aged basis but progressing toward uneven aged management where feasible. In areas that were not heavily hit by the storm, the stems can be left to develop larger diameters before a thinning is necessary. This salvage operation should take place within the next three to five years to prevent further loss of timber. It is expected that this will reduce the basal area to approximately 58 square feet per acre. This is just below the "B" line on the northern hardwood stocking guide. The "B" line represents the minimum stocking level desired to have a fully stocked stand. This will also reduce the amount of debris on the forest floor therefore reducing the fire danger as well. Some large stems can be left as nesting sites for the benefit of wildlife.

TECHNICAL DATA

Total BA/Ac: 105	Acceptable BA/Ac: 68	Unacceptable BA/Ac: 37
Stems/ Ac: 231	Mean Stand Diameter: 9.0	
Slope: 10-25%	Aspect: westerly	Site Class: I

Stocking Level: Adequate, just below the A line on the northern hardwood guide.

MAP AREA: 2

ACRES: 31

COVER TYPE: Plantations: Norway Spruce and Red Pine

DESCRIPTION

Once open land these two areas were planted many years ago with Norway spruce and red pine. In 1974 a thinning was done to remove pulpwood and sawlogs. The residual stand was adequately stocked with beautiful trees ranging from eight inches to eighteen inches D.B.H.

The ice storm hit this area quite heavily. The Norway spruce were able to withstand the storm better than the red pine. In many places the tops of the red pine were completely broken off and now a stub remains. Many trees were uprooted which has resulted in a tangled mess of rotting trees, tops and debris on the forest floor.

The thinning did allow more light to hit the forest floor and numerous seedlings sprouted. These are both hardwood and softwood species, however it appears at this time, that the hardwoods will dominate. The species present are striped maple, a preferred food of the moose, paper birch and beech. Spruce and an occasional red and white pine are also present. The overall height range is from half a foot to five feet. There are numerous raspberries present as well.

This area does provide a small amount of relief to a variety of wildlife species from the winter snow. Fresh moose sign was noted while cruising as was deer sign.

Access is gained via existing trails and care should be taken near the brook and the water lines. There are no limitations to conventional logging.

MANAGEMENT PRESCRIPTION and OBJECTIVE

At the present time a salvage cut is needed in portions of this area hardest hit by the ice storm. Red pine is very susceptible to wind damage so it is recommended that either all the red pine be removed or a wind break be left to try and protect the plantations from further damage. Management will be on the even-aged basis with a rotation age of 100 years the goal for the stems that remain.

TECHNICAL DATA

Total BA/Ac: 98	Acceptable BA/Ac: 93	Unacceptable BA/Ac: 5
Stems/ Ac: 193	Mean Stand Diameter: 9.0	Age: 40-50 years
Slope: 5-15%	Aspect: westerly	Site Class: I

Stocking Level: Just adequate, halfway between the C and the B lines on the pine guide.

MAP AREA: 3

ACRES: 18

COVER TYPE: Red Spruce

DESCRIPTION

Red spruce and paper birch are the main species found on this site. The spruce appears to have entered the site first and is in the larger size classes. In some cases it is fairly bulky with regard to its form. This is especially true below the main hiking trail and near the semi-open or hawk watch area.

The diameter range of the red spruce is from saplings and small poles, 1-2 inch stems, to old 14-16 inch trees. The paper birch is mainly in the pole stage of development with an occasional 10 inch tree present. There is red maple in this same stage of development.

There are pockets of dense softwood regeneration with the seedlings ranging in height from half a foot to twenty feet. This probably occurred where more sunlight reached the forest floor and the seedling could become established.

The overall quality of the stand is fair to good with many softwood stems having the necessary characteristics to be sawlogs now or in the future. The ice storm did a minor amount of damage to this stand. The species affected the most was the paper birch which is to be expected. The spruce seemed to hold up better due, in part, to the sturdy branches of this species.

Access is gained via the existing trails and there are no limitations to conventional logging. Wildlife habitat is quite good due to the location of this area near a hardwood stand and a semi-open field. Many species will feed in these areas but return to the cover provided by softwood for nesting and the lower snow depth in the winter.

MANAGEMENT PRESCRIPTION and OBJECTIVE

The long range goal is to produce sawlogs on the uneven-aged basis. The red spruce will be favored, but there will probably always be a small hardwood component to this stand. Because spruce is shallow rooted, and this appears to be a fairly shallow-soiled site, the patch cut system of thinning is recommended. This thinning scheme reduces the possibility of wind damage in the future and encouraged the establishment of softwood regeneration. The basal area will be reduced to approximately 100 square feet per acre and the selection cut is prescribed for 2005. The target diameter for the red spruce and paper birch is 14-16 inches D.B.H. Cutting cycles will be 15-20 years apart.

TECHNICAL DATA

MAP AREA: 3

Total BA/Ac: 124

Acceptable BA/Ac: 103

Unacceptable BA/Ac: 21

Stems/ Ac: 290

Mean Stand Diameter: 8.5

Slope: 10-25%

Aspect: westerly

Site Class: II

Stocking Level: Adequate, above the B line on the spruce-fir guide.

MAP AREA: 4

ACRES: 111.0

COVER TYPE: Northern Hardwood - light to moderate storm damage

DESCRIPTION

Occupying this above average site are a variety of hardwood species. Fortunately, the ice storm damage is considered light to moderate, and in a few areas, there was no damage at all.

The species composition is mainly sugar maple, occupying 68% of the number of stems per acre. The common associated species present are beech, yellow birch and paper birch, red maple, white ash, butternut, and occasionally red oak, aspen, black cherry, white pine and red spruce.

Diameter distribution is found in all size classes. Portions of this stand were once open land. In these areas the trees are in the pole stage of development with a few scattered larger trees present. Looking at the area as one unit, the stems now range from poles, 4-8 inch trees to 16-18 inch stems. There is also an adequately stocked understory containing the same species mix and ranging in height from half a foot to 30 feet.

The hardwoods found in this map area are beautiful. The stand is found in many parts of the property from the northwest corner of the Paine Mountain parcel, to the top of the old ski area on the Cheney Farm parcel. Many of the pole size stems have the potential to develop into sawlogs if properly managed. This is an important point in the development of a stand. It is important to maintain a dense basal area or stocking level in order to promote the development of high quality stems but, at the same time, the stocking level cannot be too thick to reduce growth rates. If the proper balance is achieved, a beautiful, healthy stand of trees can be the result.

Terrain is quite variable from gently rolling to steep. Most of the area is considered operable with conventional equipment. There are a few very steep sections and rocky areas that will be difficult to log. Great care must also be taken in those areas that are found near the brook and water lines of the Paine Mountain parcel.

Insect and disease damage noted were the beech scale necrotic complex, sugar maple borer damage and dieback of the butternut. The white ash is showing signs of maturity and dieback as well.

Wildlife habitat is fair to good for a variety of game and non-game species. It is expected that the animals pass through here in the summer, spring and fall and use it during the nesting seasons. It does not provide the winter requirement but is located adjacent to a softwood area that does meet the cover requirements so it is important to numerous species.

MANAGEMENT PRESCRIPTION and OBJECTIVE**MAP AREA: 4**

The management goal is to grow hardwood sawlogs on the all-aged basis. This stand has not had the severe ice storm damage as stand 1, therefore the thinning is scheduled for 2005-2010. At that time the basal area will be reduced to 80-90 square feet per acre. The thinning will be an integrated harvest, or an improvement cut, in which mature sawlogs as well as poor formed stems are removed. In areas of pure pole size timber, the thinning will be very light to maintain the proper density. The target diameter will be 18-20 inches for the final crop trees and cutting cycles will be 15-20 years apart. It should be noted that this stand's thinning will be worked in sections due to the different locations of the timber and therefore the different locations of the log landings.

TECHNICAL DATA

Total BA/Ac: 98	Acceptable BA/Ac: 79	Unacceptable BA/Ac: 19
Stems/ Ac: 251	Mean Stand Diameter: 8.5	
Slope: 5-40%	Aspect: north, south and westerly	Site Class: I

Stocking Level: Adequate, below the A line on the northern hardwood guide.

MAP AREA: 5

ACRES: 48

COVER TYPE: Reverting Pasture

DESCRIPTION

This area was probably pastured longer than other portions of the property. It has now been naturally reforested with paper birch and aspen as the main species. The common associated species present are white ash, sugar maple and even scattered white pine.

At the present time, the stand contains trees in the pole size classes and they are developing nicely. The diameters are concentrated in the 4-8 inch range and the overall quality is quite good. Paper birch and aspen are considered pioneer species and invade open land first. They also mature quickly, in forestry terms, and therefore are the first stems to die out allowing the more climax forest to take over. Aspen is especially important to the habitat of ruffed grouse. The buds of an aspen are a preferred food source for this species and are available early the spring of the year. The root sprouts of an aspen are also eaten by deer.

Here again, it is very important to maintain the proper density in ensure quality sawlogs in the future. If poles and saplings are kept relatively close together, the branches of one stem knock off the branches of the adjacent tree and smoother, cleaner, more valuable sawlogs are created. In this area, the species to monitor for future sawlog growth are the paper birch and the more valuable climax species, such as white ash and sugar maple.

The hiking trails and brook are found in this area. There is also a beaver pond and a swamp found here as well. Apple trees were also noted that could be released or pruned to benefit wildlife.

There was a small amount of damage from Hurricane Floyd which passed through Vermont in the summer of 1999. The storm was noted for its high winds that uprooted aspen, for the most part. That is exactly what happened in this stand. The damage is scattered and considered minimal.

There was no insect or disease damaged noted and the terrain is easily worked with conventional equipment.

MANAGEMENT PRESCRIPTION and OBJECTIVE**MAP AREA: 5**

The long range goal is to grow sawlogs on the even-aged basis. Management will try and progress toward uneven-aged management in future thinnings. This means that larger longer lived species, such as white pine, white ash or sugar maple, will be left both as a seed source and to create the three age classes needed for uneven-aged management.

Due to the beauty of some of the paper birch and the quality of the site, Timber Stand Improvement, (T.S.I.) is recommended if funding is available. The stand really needs time to mature and increase its diameter size before any commercial operation is scheduled. The area should be re-evaluated in ten years for a possible commercial thinning. A rotation age of 100 years for the final sugar maple, white pine and white ash climax forest is the goal.

TECHNICAL DATA

Total BA/Ac: 98	Acceptable BA/Ac: 84	Unacceptable BA/Ac: 14
Stems/ Ac: 333	Mean Stand Diameter: 7.0	
Slope:5-15%	Aspect: westerly	Site Class: I

Stocking Level: Adequate, below the A line on the paper birch and northern hardwood guide.

MAP AREA: 6

ACRES: 37.0

COVER TYPE: Hemlock - Hardwood

DESCRIPTION

This area is occupied by a variety of commercial species. There are softwoods as well as hardwood stems present. Hemlock is the main softwood component while the northern hardwoods make up the deciduous species.

Diameter range is from small four inch trees to very large overmature 24-26 inch hemlock. Hemlock is very important for the winter requirement of the deer and other wildlife species. It not only reduces the snow depth, but equally as important, it acts as a thermal barrier so it is actually warmer under a hemlock stand than in other softwood areas. This can be even more important that a food source on those cold winter nights. Hemlock is also a very slow growing species so can be held in a stand for a very long period of time. This is the main occurrence of hemlock on the entire property so it is very important to maintain this stand in order to increase the diversity of the property as well as for the wildlife habitat it provides.

There is red spruce found in this area which is showing signs of maturity and could be harvested to release and improve the hemlock. The hardwoods are generally of lower form and quality as well. The site appears to be better suited for softwood growth, specifically hemlock, and this species should be favored.

There were a few hiking trails noted in this area. In addition a beautiful old quarry was seen that was covered with ice. Care should be taken while working or hiking in this area.

MANAGEMENT PRESCRIPTION and OBJECTIVE

The management objective is to grow sawlogs on the uneven-aged basis and to encourage hemlock and maintain the mixed condition. In five to ten years a very light thinning is prescribed which will concentrate on removing red spruce and low grade hardwoods. This will reduce the basal area to 80-90 square feet per acre. Hemlock will be carried to provide diversity and wildlife habitat while the northern hardwoods will be harvested at 18 inches D.B.H. The target diameter for red spruce will be 14-16 inches D.B.H. Cutting cycles will be 15-20 years apart. Due to its relatively small size, this stand should be worked with portions of stand 4 which will be landed in the field near the pumping station.

TECHNICAL DATA

MAP AREA: 6

Total BA/Ac: 135

Acceptable BA/Ac: 113

Unacceptable BA/Ac: 22

Stems/ Ac: 341

Mean Stand Diameter: 7.5

Slope: 5-25%

Aspect: westerly

Site Class: II

Stocking Level: Adequate, above the B line on the hemlock-hardwood guide.
(Hemlock 50-100%)

MAP AREA: Open

ACRES: 17.0

COVER TYPE: Open field

DESCRIPTION

This area is an open field.

MANAGEMENT PRESCRIPTION and OBJECTIVE

Maintain in the open condition in order to benefit the wildlife species.

TECHNICAL DATA

Slope: 5-10% Aspect: west

MANAGEMENT SCHEDULE

THE VILLAGE OF NORTHFIELD

Northfield, Vt.

- 2001-2004** Due to the ice storm of 1998 a salvage operation is scheduled in area 1 and portions of area 2 . Where possible the individual tree selection system will be used. This thinning is dependant on a red pine pulpwood market and a hardwood pulpwood market. Due to the number of acres involved, 98.0 +/-, a heavy cut permit is required by the State of Vermont.
- 2005-2010** Thinning in area 3, removing mature spruce and releasing advanced regeneration.
Improvement cut in areas 4 and 6.
- 2010** Update management plan.
Re-evaluate area 5 for possible commercial thinning and/or T.S.I.
- 2015** Second entry into areas 1, 4 and 6, as needed.
- 2020** Update management plan.

APPENDIX 2. AUDUBON BIRD ASSESSMENT



Forest Bird Habitat Assessment

**Northfield Village Forest
Paine Mountain & Cheney Farm Parcels
Northfield, VT**

**Prepared by
Katie Manaras
January 11, 2010**

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Landscape Context

A consideration of the property's surrounding landscape (2,500 acres) is an important component of assessing current habitat conditions and making management recommendations.

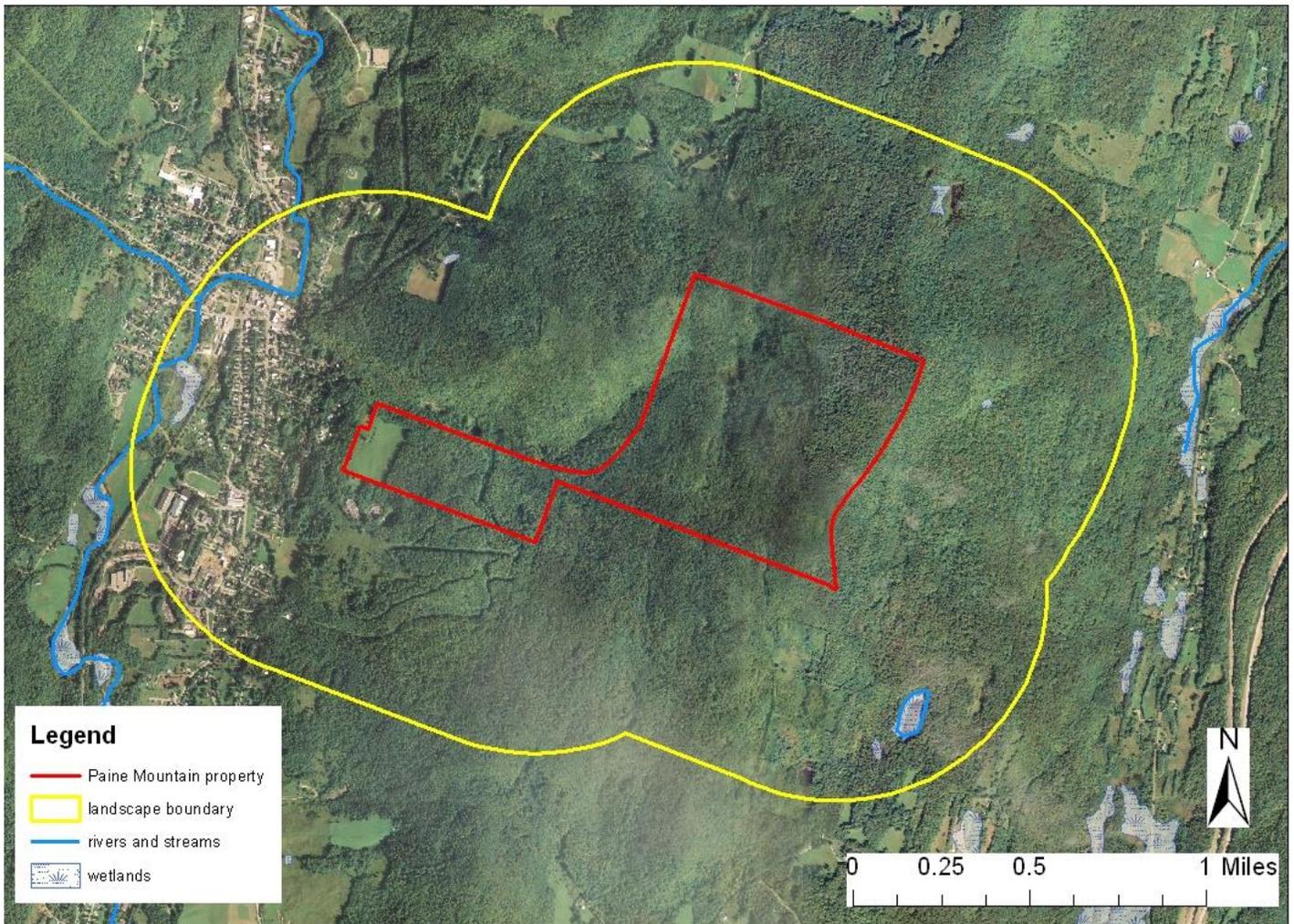


Figure 2. 2,500 acre landscape surrounding the Northfield Village Forest - Paine Mountain Property.

While the western arm of the Paine Mountain parcel is close to Northfield Village and associated development, the main section of the property is located within a large block of contiguous forest running along the Northfield Mountain Range and roughly bounded by Route 12 to the west and Interstate 89 to the east. The contiguous nature of this forest is beneficial to interior forest or area-sensitive birds, a subset or responsibility species whose reproductive success is higher in interior than in fragmented forest habitat.

Early-successional or young forest habitat appears to be at a minimum in this landscape at this time. Small patches of this habitat type are present on the tip Paine Mountain's southern ridge, where a shelter and view-point are located, as well as surrounding the beaver pond. These areas are important components of the landscape because they are examples of a dwindling and

underrepresented habitat type in the region. Abandoned ski trails may provide additional areas of this habitat type over the next 15-20 years.

Overall, the landscape lends itself to management for interior forest conditions, perhaps with some more intensive cutting in lower elevations near the village, with the collateral benefit of creating early-successional habitat.

Landowner Objectives

The 2000 Forest Management Plan by Rose Beatty establishes goals for the forest according to the multiple use concept. Values to be protected and encouraged include high-quality timber production, water quality, wildlife habitat, non-motorized and responsible motorized recreation, and aesthetics. The local Conservation Commission has taken the lead on management of this parcel.

Definitions

Terms defined below are in **bold** in the text of this report.

General habitat terms

Area-sensitive Bird Species

Bird species which increase in abundance, occur more frequently, and/or achieve higher nesting success with increasing forest patch size such as the wood thrush and scarlet tanager.

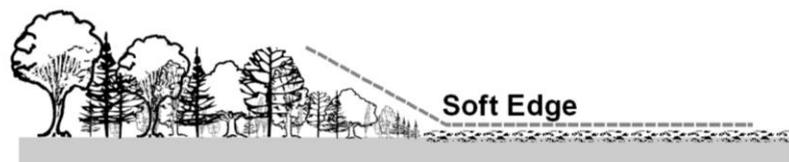
Early-Successional Habitat

Regenerating forest and brushy, overgrown fields are two of the most common types of early-successional habitat. The vegetative conditions of these areas are often similar; a high density of small, woody-stemmed vegetation. This may include tree seedlings and saplings, blackberry and/or raspberry, and meadowsweet. These conditions are temporal; generally lasting for 15-20 years in regenerating forest area, longer on old fields. Responsibility bird species that require this habitat type for all or a portion of their needs are chestnut-sided warbler, mourning warbler, white-throated sparrow, American woodcock, ruffed grouse, magnolia warbler, and Canada warbler.

Edge

At the edge between forest and open land, the transition from low herbaceous vegetation to tree canopy can be considered either a “soft” or “hard” edge. A soft edge refers to a gradual change in vegetation height moving into the forest. This gradual transition is important for buffering interior forest specialists like the wood thrush from the incursions of nest predators (such as raccoons and skunks) and nest

parasites (such as the brown-headed cowbird) that are frequently found in open and developed areas. A gradually increasing canopy height will help shield interior nesting birds from view by predators and parasites. Additionally, the brushy conditions that often develop in a soft edge may provide breeding habitat for early-successional bird species including chestnut-sided warbler and white-throated sparrow.



Fragmented Forest

Forest that is broken into smaller, unconnected patches, primarily due to some form of development (e.g. residential, commercial, major roads). A fragmented forested landscape is more likely to support “generalist” wildlife species, such as raccoons and skunks, which can decrease nesting success of interior forest birds.

Interior Forest

Forest condition that occurs with increasing distance from a forested/non-forested edge. As perceived from a bird's perspective, interior forest conditions occur at least 600 ft. from an edge, more for some species. It is at this distance that negative edge-associated effects such as nest predation and parasitism generally no longer occur. Bird species that are labeled interior forest specialists tend to avoid edges.

Structural Complexity

Structural complexity refers to the complexity of vegetation as it is spatially arranged in the forest, both vertically and horizontally. A forest with a well developed under-story, mid-story, and canopy exhibits complex or diverse structure, which offers habitat for a greater array of bird species compared with a structurally simple forest. Non-living features, such as coarse woody material, and canopy gaps, contribute as well.

Habitat parameters

The following attributes of forest structure were evaluated during the field visit:

Cover Type

Cover type is a generalized description of the dominant vegetation of a habitat unit; such as mixed forest, forested wetland, and open field. Focus is given to how the area may be perceived by breeding birds.

Dominant Canopy Trees

Tree species that are most abundant in the dominant and co-dominant forest canopy classes. Applicable only when habitat unit is forested. Some tree species have notable value to responsibility bird species. Yellow birch has been shown to be preferentially chosen by some species of insect eating songbirds as a foraging substrate. Among these are scarlet tanager, black-throated green warbler, and blackburnian warbler. Cherry species are also important, particularly during the post breeding/pre-migration period, as their fruits become a significant component of many bird species diets.

Tree Size Class

Size class(s) of trees in the dominant and co-dominant canopy classes. Determined by measuring the diameter of a tree at breast height (dbh), which is 4 ½ ft. from the ground. Classes include seedling/sapling (≤ 3.9 inches), poletimber (4-8.9 inches for softwoods, 4-11.9 inches for hardwoods), and sawtimber (≥ 9 inches for softwoods, ≥ 12 inches for hardwoods).

Responsibility bird species are often associated with 1 or more size classes. As a general rule, a pre-dominance of seedlings/saplings will provide habitat for early-successional bird species such as chestnut-sided warbler, while pole and sawtimber is more suitable for wood thrush and blue-headed vireo.

Understory Vegetation

Understory vegetation includes the most abundant woody-stemmed vegetation 1-20' in height, such as tree seedlings and saplings along with understory trees and shrubs such as hobblebush. The fruits of understory species such as serviceberry provide food for a number of responsibility

bird species; while the structure created by hobblebush is an ideal nesting substrate for birds that nest in this forest layer (see Understory Development for further detail).

Understory Development

A qualitative, relative measurement of the amount of woody-stemmed vegetation 1-20' in height; described as low, moderate, or high. For some responsibility bird species this is one of the most important habitat features. Black-throated blue warbler and wood thrush are two species that nest almost exclusively in this forest layer. Other species including American redstart and ovenbird spend a portion of their time foraging in the vegetation within this height range.

Understory growth is initiated when light reaches the forest floor, which can happen in the event of natural disturbances, such as fire, wind, or other agents of tree death. Human disturbances such as logging can mimic natural disturbances and have a similar effect. Cutting groups of trees will often provide better understory regeneration than single tree removal.

Snags (standing dead trees)

Snags are important nesting habitat for several species including the yellow-bellied sapsucker and northern flicker. In order to provide adequate nesting opportunity for these and other responsibility species, retaining six snags per acre of forest is recommended. Three of the six snags should be of a large size class, greater than 16" diameter at breast height (dbh). This can be accomplished through retaining dead, dying, and old trees and by girdling trees of poor form and quality. Qualitative measurements used are low (overall low abundance of any snags), moderate (snags present, but of small diameter(s)), or, minimal abundance of snags of target diameters), and high (abundance of target diameter snags).

Ground Cover

All layers of the forest are important, including the forest floor. Coarse woody material (CWM) is made up of large woody material (*ie.* tree trunks), branches, limbs, and slash piles. This mix of material provides nesting opportunities for species such as white-throated sparrow that tend to build their nests in and under brush piles. Additionally, ruffed grouse utilize CWM as perches from which to drum during the mating season. Forest management provides an opportunity to increase the amounts of CWM on the forest floor. An abundant layer of moist leaf litter is home to an array of insects, mites, and spiders. These arthropods make up a significant component of an ovenbird's and wood thrush's diet during the breeding season. Management activities that lead to dessication of the leaf litter can negatively effect the habitat suitability of the area to these bird species. Amounts of CWM and leaf litter are described qualitatively as low, moderate, or high.

Trails/Roads

Recreational trails, access roads, and skid trails are often an important component of a habitat unit. In a landscape that is predominately forested, these man-made features generally do not degrade the habitat quality. Research has shown that roads/trails less than 25 ft. in width, when combined with a greater than 70% canopy cover over the road/trail, have minimal negative impact on the forest bird community.

Additional Significant Features

Wetlands and streams sides (riparian habitat) provide nesting and feeding opportunities for a variety of forest nesting birds and wetland specialists. Larger fast moving stream may support nesting of the Louisiana waterthrush, a responsibility species whose nesting is strongly associated with fast moving streams with forested buffers. Protecting this riparian buffer will ensure it is available for Louisiana waterthrush nesting. Other forest features have a high level of value to other wildlife in addition to birds. For this reason, significant habitat elements such as vernal pools, deer winter habitat and bear feeding areas may be taken into account when making management recommendations.

Habitat Assessment

Based on an August 8, 2009 field visit, the property was divided into habitat units, or areas currently providing different habitat conditions for responsibility species (Map 1).

This section includes:

- 1) General management considerations applicable to all properties
- 2) Description of the habitat units and assessment of their current habitat value
- 3) Description of desired future conditions for enhancing responsibility species habitat in each habitat unit, and management options specific to the property, aimed at achieving the desired conditions

Recommendations are provided for a 10-15 year period. While not always discussed in the report, the recommended practices will also benefit a variety of other bird and other wildlife species. The recommendations are designed to be discussed with the property's forester or land manager and implemented where practical and appropriate. If the property is enrolled in the Use Value Appraisal program, it is important that the forest management plan be amended or updated before any actions not in the plan are taken.

Contact Katie Manaras at 802-453-6710 or kmanaras@audubon.org for more information or questions about the report.

General Management Considerations

The following management considerations can be implemented throughout any forested property to protect and enhance the quality of breeding habitat for responsibility species.

✓ **Retain yellow birch**

The branches and foliage of yellow birch are preferentially chosen foraging substrates for insect eating responsibility bird species, including blackburnian warbler, black-throated green warbler, and scarlet tanager. This preference may be due to higher densities of potential prey and the ability of these bird species to forage effectively among the branching and foliage structure of this tree species (Holmes and Robinson 1981). Retain as many individuals, across all size classes, as possible.

✓ **Conduct harvesting operations outside the bird breeding season**

The forest bird breeding season roughly extends from May-August. Harvesting during frozen ground conditions is preferable as it has no direct negative impact on the breeding bird community. Winter harvesting can also help protect advanced regeneration and understory shrubs from damage. If harvesting outside of this time frame is required, schedule it after the second or third week of July, which will allow most birds to fledge a first brood.

✓ **Retain standing snags**

Standing dead trees are of significant value to a number of responsibility bird species including northern flicker, chimney swift, and olive-sided flycatcher as well as many other species of wildlife. To the extent possible retain a minimum of six snags and/or cavity trees per acre, with one exceeding 18 in. dbh and two additional exceeding 16 in. dbh. Priority should be given to hardwood snags as they remain intact longer. Also, retain some live trees of poor form and quality during harvests to serve as the next cohort of snags. If target number of snags does not exist, consider girdling poor quality trees in order to achieve abundance objectives.

✓ **Retain large diameter aspen and birch spp.**

Yellow-bellied sapsuckers and northern flickers frequently excavate nest cavities in trees in the sawtimber size class (≥ 13 in. dbh). aspen and birch spp. Cavities are often made in trees with the heartwood decay fungus *Phellinus tremulae* (*Fomes ignarius* var. *populinus*) (Kilham 1971) and *Fomes fomentarius* and sapwood decay fungi (*Trichaptum biformis* and *Traemetes versicolor*).

✓ **Retain coarse and fine woody material**

Small limbs and branches, including the tops of harvested trees, on the forest floor provide cover and feeding sites for ground and understory foraging bird species such as veery and white-throated sparrow. Larger diameter logs serve as drumming sites for male ruffed grouse and singing perches for songbirds including ovenbird. Refrain from widespread use of whole tree harvesting and leave slash (branches, limbs, etc.) in the forest.

✓ **Minimize extent of forest access roads**

Forest access roads can serve as pathways for increased nest predation and parasitism, particularly in forests within an agricultural matrix. Maintain < 15 percent of a property in roads

and access trails and utilize the current trail system as much as possible. Minimize long, straight stretches of access roads into the forest interior. Road/trail widths <20 ft. are preferred (Rich et al. 1994). Wider forest roads may decrease habitat quality for ground foraging bird species such as ovenbird along the road edge due to decreases in leaf litter moisture, increased leaf litter temperature, and subsequent lowered densities of leaf litter arthropods. Densities of birds and reproductive success may be affected (Ortega and Capen 1999).

✓ **Soften edges between field and forest habitats**

At the interface between forest and open land, the transition from low herbaceous vegetation to tree canopy can be considered either “soft” or “hard”. A soft edge refers to a gradual change in vegetation height moving into the forest. This gradual transition is important for buffering interior forest bird species like the wood thrush from the incursions of nest predators (such as raccoons and skunks) and nest parasites (such as the brown-headed cowbird) that are frequently found in open and developed areas. A gradually increasing canopy height will help shield interior nesting birds from view by predators and nest parasites. Additionally, the brushy conditions that often develop in a soft edge may provide breeding habitat for early-successional bird species including chestnut-sided warbler and white-throated sparrow.

✓ **Monitor and control invasive plants**

The fruits of invasive plants such as buckthorn and honeysuckle are eaten by birds, but are of low nutritional value. Because many migrants focus their diets on fruits in the fall as they prepare for long migrations, their choice of these plants comes at an energetic cost at a critical time. Additionally, bird nests in invasive plants are more vulnerable to nest predators. When new light is allowed to reach the forest floor, due to either natural or human-induced changes in forest structure, the growth on invasive plants can be stimulated, and they can outcompete native, desirable plants. If invasive plants are present in an area, their response to any canopy openings should be monitored closely. For information about controlling invasive plants contact Sharon Plum, The Nature Conservancy’s “Wise on Weeds” coordinator, at splumb@tnc.org or 802.229.4425 x120.

✓ **Retain streamside buffers**

The edges of swiftly flowing, gravelly to rocky bottomed streams imbedded in a forest matrix can provide suitable nesting habitat for Louisiana waterthrush. Retain streamside buffers sufficient to protect water quality and potential nesting sites for this responsibility bird species. Features to preserve include small hollows or cavities within the root base of upturned tree, within bank of stream, or under fallen log.

Habitat Units

1. Hardwood forest – approximately 215 acres

Area Description

This dominant habitat type on the property accounts for 58% of the total acreage and ranges across the elevation gradient of the property.

Assessment of Current Conditions

Habitat Unit Current Conditions		
Variable	Condition/Amounts	Notes
Cover Type	Hardwood forest	small coniferous component
Dominant Canopy Trees	Sugar maple, white ash, paper birch, aspen, red maple, white pine	
Dominant Understory Trees	Sugar maple, stripped maple, beech, hop hornbeam, red spruce	
Dominant Tree Size Class	Pole with some sawtimber	
Understory Development (woody-stemmed vegetation 1-20' in height)	Generally low within the closed-canopy forest	
Snags (standing dead trees)	Diameter and density targets not met	
Ground Cover (fine and coarse woody material/leaf litter)	Low to moderate amounts of coarse woody debris on the ground; ample deciduous leaf litter	
Trails/Roads	System of trails throughout the property is generally well-drained and sufficiently narrow to protect interior forest conditions (<20 ft wide)	Conservation commission is concerned about ATV use and impact on soil, water quality
Additional Significant Features	Stream running out of the beaver pond (habitat unit 4)	
Responsibility Bird Species Noted	Yellow-bellied sapsucker	Field visit was late in the breeding season, and partly in the rain

Suitable habitat for a range of ground, shrub and canopy nesting and foraging birds of hardwood forest is found in this habitat unit. Where foliage is present in multiple layers (for example, under-story, mid-story, and upper canopy), the habitat is enriched for forest birds. In a forest with many vertical layers, a diversity of birds can be supported within a vertical column.

Ample deciduous leaf litter on the ground is providing foraging opportunities for ovenbird and wood thrush and nesting opportunities for ovenbird. **Snags** and **coarse woody material** on the ground are in moderate densities, but can be enhanced through management.

Forest structure varies with the habitat unit due largely to variable levels of damage from the 1998 ice storm. The higher elevation areas of the unit (mapped as stand 1 in the 2000 forest management plan) were more heavily damaged. They now have a dense under-story due to new

light reaching the forest floor since the ice storm. Here, shrub-nesters such as black-throated blue warbler and wood thrush are expected to thrive. The heavily damaged area is now serving as an example of how disturbance-based silviculture can enhance **structural complexity**.

The stream may be providing nesting habitat for one or more pairs of Louisiana waterthrush.

Desired Future Habitat Conditions

The management goal for this unit should be to encourage a structurally diverse forest and enhance diversity over time. As the forest ages, opportunities to maintain larger-sized trees, **snags** and **coarse woody material** on the ground will arise and should be pursued. Limiting the size of canopy openings will protect interior forest conditions. These goals are commensurate with the forest management plan's stated goal of moving towards uneven aged management.

Target Responsibility Bird Species

- Ovenbird
- Wood thrush
- Veery
- Yellow-bellied sapsucker
- Eastern wood-pewee
- Scarlet tanager
- Northern parula
- American redstart
- Louisiana waterthrush
- Black-throated blue warbler

Management Options

- ✓ **Enhance structural complexity while maintaining forest interior conditions**

Responsibility bird benefit:

Bird species specialize in using different foliage strata for nesting and foraging. For example, black-throated blue warblers tend to nest low in the understory, but forage above 5' in height. Blue-headed vireos nest between 6' and 15' on average, scarlet tanagers tend to forage and nest in the upper canopy. For this reason, maximizing the diversity of foliage height will maximize bird diversity in the forest. Non-living structures such as **snags** and **course and fine woody material** on the ground contribute to **structural diversity** as well.

Management strategy: For regeneration cuts, single-tree and group selection harvests that create canopy openings with a diameter < 2x the height of dominant canopy trees will help release advanced regeneration, promote shrub development, and enhance nesting site opportunities for black-throated blue warbler and wood thrush while maintaining forest interior conditions. Hobblebush is of particular value and high density patches should be protected from harvesting disturbance. Timber stand improvement treatments (e.g. canopy thinning, crop tree release) would likely have a similar effect, depending upon their intensity.

2. Coniferous and mixed forest – approximately 130 acres

Area Description

This habitat unit includes two areas of softwood plantations (stand 2), a red spruce-dominated area near the southeast corner of the parcel (stand 3), and the hemlock-hardwood stands near the Cheney Farm field (stand 6). It accounts for about 35% of the property's acreage.

Assessment of Current Conditions

Habitat Unit Current Conditions		
<u>Variable</u>	<u>Condition/Amounts</u>	<u>Notes</u>
Cover Type	Coniferous and mixed forest	
Dominant Canopy Trees	Red spruce, hemlock, Norway spruce, red pine, white ash, paper birch	
Dominant Understory Trees	Sugar maple, stripped maple, mountain maple, beech, paper birch, American elm, black cherry	Raspberry/blackberry
Dominant Tree Size Class	Sawtimber and pole	
Understory Development (woody-stemmed vegetation 1-20' in height)	Low between 0 and 5', moderate between 5 and 20'	
Snags (standing dead trees)	Density and size targets not met	
Ground Cover (fine and coarse woody material/leaf litter)	Course woody debris on the ground in high density; some deciduous leaf litter present	Heavy wind-throw and ice storm damage in plantations, especially red pine.
Trails/Roads	Walking trails	Conservation commission expressed concern about inappropriate ATV use on and near the trails
Additional Significant Features		
Responsibility Bird Species Noted		

This habitat unit is currently providing habitat for responsibility birds of mixed forest. In the plantations, natural and human-induced canopy thinning has allowed light to reach the forest floor and an understory to re-initiate. A healthy mid-story of mixed species, dominated by hardwoods, indicates that the Norway spruce and red pine were planted on a hardwood site. A

northern hardwood natural community expected to return to the site over time. If another forest bird habitat assessment were conducted in 20 years, the plantation areas would likely fall into habitat unit 1, where target species are birds of hardwood forests. Currently, however, remaining coniferous over-story trees are providing habitat for canopy-nesting birds of coniferous and mixed forest, such as Blackburnian warbler. Mid-story nesters such as blue-headed vireo are expected to use this area as well, taking advantage of that canopy layer.

The lower-elevation, hemlock-hardwood stands are expected to support a similar bird species assemblage, and are expected to retain softwood species over a longer time period. The management goal for this area (stand 6) is to retain and encourage hemlock. Maintaining a softwood or mixed stand within a landscape dominated by hardwood forest is a good strategy for maintaining habitat diversity; this strategy is expected to have a positive impact on the bird diversity of the parcel. Pockets of low-quality timber offer opportunities for regenerating larger patches of forest. Larger (>2 tree heights in diameter) regeneration cuts would create early-successional habitat conditions suitable for nesting by chestnut-sided warbler and mourning warbler, while improving the growing stock. Patch cuts of up to 2 acres would be appropriate from a bird habitat perspective in western arm of the parcel.

Apple trees are present in the far eastern end of the habitat unit, near the boundary with the Cheney Farm field.

Desired Future Habitat Conditions

The management goal for this unit should be to encourage a structurally diverse forest and enhance diversity over time. As the forest ages, opportunities to maintain larger-sized trees, **snags** and **coarse woody material** on the ground will arise. Taking advantage of these opportunities would enhance forest bird habitat. Maintaining mixed tree species composition – including softwoods and hardwoods - will enhance bird diversity. Patches of up to 2-3 acres of early-successional habitat would be appropriate in the western arm of the property, while interior forest conditions in upland stands should be protected by limiting the size of canopy openings.

Target Responsibility Bird Species

- Wood thrush
- Ovenbird
- Veery
- Yellow-bellied sapsucker
- Eastern wood-pewee
- Scarlet tanager
- Northern parula
- American redstart
- Black-throated blue warbler
- Black-throated green warbler
- Blackburnian warbler
- Purple finch
- Blue-headed vireo
- Canada warbler

Management Options

- ✓ **Enhance structural complexity; maintain interior forest conditions in upland stands**

Responsibility bird benefit:

Bird species specialize in using different foliage strata for nesting and foraging. For example, black-throated blue warblers tend to nest low in the understory, but forage above 5' in height. Blue-headed vireos nest between 6' and 15' on average, scarlet tanagers tend to forage and nest

in the upper canopy. For this reason, maximizing the diversity of foliage height will maximize bird diversity in the forest. Non-living structures such as **snags** and **course and fine woody material** on the ground contribute to **structural diversity** as well.

Management strategy: For regeneration cuts, single-tree and group selection harvests that create canopy openings with a diameter < 2x the height of dominant canopy trees will help release advanced regeneration, promote shrub development, and enhance nesting site opportunities for black-throated blue warbler and wood thrush while maintaining forest interior conditions. Timber stand improvement treatments (e.g. canopy thinning, crop tree release) would likely have a similar effect, depending upon their intensity.

✓ **Create patches of early-successional habitat conditions**

Responsibility bird benefit: Population levels of birds associated with this habitat type are declining relative to 1960s levels, as their habitat becomes less abundant. Responsibility species that require this habitat type for all or a portion of their needs are chestnut-sided warbler, mourning warbler, white-throated sparrow, American woodcock, ruffed grouse, magnolia warbler, and Canada warbler. Areas that regenerate softwoods will be more suitable for magnolia warbler while hardwood regeneration will be utilized by chestnut-sided and mourning warblers. Early-successional habitat will likely be used by mature forest nesting bird species such as wood thrush and black-throated green warbler during the post-breeding season. The fruits of soft mast producing trees and shrubs that often grow in openings of these sizes are an important food service as the birds prepare for fall migration.

Management strategy: Limited use of larger group selections or patch cuts of 1 to 3 acres would temporarily create breeding habitat conditions for bird species of early-successional habitats. Openings of this size should be clustered as much as possible in order to reduce the amount of mature forest affected. Feasibility, location, and exact sizes of openings should be determined by the property's forester. When desired conditions result, they generally exist for 10-15 years after the harvest occurs.

✓ **Retain and release apple trees and hawthorne**

Responsibility bird benefit: The fruit, blossoms, seeds and sap are food sources for ruffed grouse, purple finch, and yellow-bellied sapsuckers. Additionally, the blossoms serve as a food source for ruby-throated hummingbirds, and Baltimore orioles, eastern bluebirds and other bird species nest in apple trees. These trees may also be providing a food source for black bear, bobcats, foxes, fishers, and porcupines.

Management strategy: Apple trees and hawthorns that are crowded by competing vegetation can be "released" by removing any trees that overtop them as well as any vegetation within their drip-line.

3. Early-successional habitat – approximately 3 acres

Area Description

This small habitat unit is located at the tip of Paine Mountain’s southern ridge, near the southeastern corner of the property. It contains a lean-to shelter and serves as a viewpoint, although it is not the highest point in the Village Forest. It can be accessed by hiking trails.

Assessment of Current Conditions

Habitat Unit Current Conditions		
<u>Variable</u>	<u>Condition/Amounts</u>	<u>Notes</u>
Cover Type	Early-successional habitat	
Dominant Canopy Trees	NA	
Dominant Understory Trees	Sugar maple, red maple, white ash, red osier dogwood	Blackberry/raspberry and honeysuckle present
Dominant Tree Size Class	Sapling	
Understory Development (woody-stemmed vegetation 1-20’ in height)	High density throughout the 0-20’ height range	
Snags (standing dead trees)	None	
Ground Cover (fine and coarse woody material/leaf litter)	Low amounts of coarse woody debris and leaf litter	
Trails/Roads	Trails are <20 ft wide	
Additional Significant Features	Lean-to shelter at edge of habitat unit	
Responsibility Bird Species Noted		Rain

This habitat unit is currently characterized by very dense woody growth between zero and ten feet from the ground. It is ideal early-successional habitat. The Conservation Commission would like to manage the area for such young forest conditions perennially, both for habitat and to maintain the view from the lean-to at the height of land.

Desired Future Habitat Conditions

This habitat unit is currently in a desirable condition. One challenge is that the trees will get more difficult to cut by hand as they get older. Employing a cutting rotation will ensure that that

habitat type is available perennially. Controlling invasive plant species, especially honeysuckle, should be a management priority in this unit.

Target Responsibility Bird Species

- Chestnut-sided warbler
- Mourning warbler
- Nashville warbler
- Ruffed grouse
- American woodcock

Management Options

✓ **Maintain early-successional habitat conditions**

Responsibility bird benefit: Population levels of birds associated with this habitat type are declining relative to 1960s levels, as their habitat becomes less abundant. Responsibility species that require this habitat type for all or a portion of their needs are chestnut-sided warbler, mourning warbler, white-throated sparrow, American woodcock, ruffed grouse, magnolia warbler, and Canada warbler. Areas that regenerate softwoods will be more suitable for magnolia warbler while hardwood regeneration will be utilized by chestnut-sided and mourning warblers. Early-successional habitat will likely be used by mature forest nesting bird species such as wood thrush and black-throated green warbler during the post-breeding season. The fruits of soft mast producing trees and shrubs that often grow in openings of these sizes are an important food service as the birds prepare for fall migration.

Management strategy: To maintain the best early-successional habitat, brush-hog (or otherwise cut) the area on a rotation designed to keep all sections of the unit between 0 and 15 years post-mowing at all times. For example, half the acreage could be cut every 7 years, or a quarter of the area could be cut every 4 years.

✓ **Monitor and control invasive plants.**

See general management guidelines

4. Wetland – approximately 4 acres

Area Description

This wetland area is kept open by beaver activity and appears to include multiple areas of open water, as well as shrubby growth surrounding it. A trail crosses the beaver flowage’s outlet stream.

Assessment of Current Conditions

Habitat Unit Current Conditions		
<u>Variable</u>	<u>Condition/Amounts</u>	<u>Notes</u>
Cover Type	Open wetland (beaver ponds) surrounded by shrubby growth	
Dominant Canopy Trees	Paper birch, white pine	
Dominant Understory Trees	Willow, alder, paper birch, white pine	
Dominant Tree Size Class	Sapling/shrub	
Understory Development (woody-stemmed vegetation 1-20’ in height)	High between 0 and 5’, low between 5 and 20’	
Snags (standing dead trees)	Snags are present, roughly in target numbers and sizes	
Ground Cover (fine and coarse woody material/leaf litter)	Moderate coarse woody debris; little deciduous leaf litter	
Trails/Roads	Narrow trail crosses along the edge of the habitat unit	
Additional Significant Features	stream	
Responsibility		
Bird Species Noted		

Although none were observed during the field visit, this habitat unit appears to be providing habitat well suited to wetland bird species alder flycatcher, olive-sided flycatcher, white-throated sparrow and Canada warbler.

The large snags within and at the margins of the wetland are an important feature for olive-sided flycatcher. White-throated sparrows often nest in shrubby growth on the margins of beaver ponds in our region. Forested wetlands with a complex structure of shrubs and upturned trees

and standing water and/or wet soils provide the breeding habitat conditions suitable for Canada warbler, a bird of special conservation concern due to dramatic population declines.

There is a stream flowing down from the beaver flowage area which may support nesting of the Louisiana waterthrush, a responsibility species whose nesting is strongly associated with fast moving streams with forested buffers. Protecting this riparian buffer will ensure it is available for Louisiana waterthrush nesting.

Desired Future Habitat Conditions

The primary objective in this area should be protection of the wetland and watercourses, and retention of **snags** and shrubby growth around the wetland. A forested buffer around the beaver flowage area and the stream is desirable; it may need to shift spatially over time, as the beaver system is dynamic.

Target Responsibility Bird Species

- Olive-sided flycatcher
- Canada warbler
- Alder flycatcher
- Louisiana waterthrush
- White-throated sparrow

Management Options

✓ **Protect wetlands and waterways**

Responsibility bird benefit: Buffering the brook and allowing in-stream structure to develop as trees die naturally would protect and enhance Louisiana waterthrush habitat. See “General Management Considerations” for more information. Protecting wetlands helps protect water quality and retain soils as well as habitat for responsibility species listed above.

Management strategy: Little to no management is recommended within these wet areas. Winter harvest is especially important if any management does take place.

✓ **Maintain and reate snags**

Responsibility bird benefit: Snags, or dead standing trees, benefit many species of wildlife (see General Management Guidelines). In this habitat unit specifically, olive-sided flycatcher, a responsibility species specializing in forest-edge habitat, particularly in coniferous forests along the edges of wetlands in our region, can use the open space in the wetland openings for foraging. Snags for perching and singing are important habitat attributes for this species.

Management strategy: Retain existing snags and create new snags by girdling trees on the edge of the wetland.

5. Open – approximately 16 acres

Area Description

This field at the far western edge of the parcel is known as the Cheney Farm. It is uphill from the reservoir that holds Northfield Village’s water supply.

Assessment of Current Conditions

Habitat Unit Current Conditions		
<u>Variable</u>	<u>Condition/Amounts</u>	<u>Notes</u>
Cover Type	Field	
Dominant Canopy Trees	NA	Herbaceous cover
Dominant Understory Trees	NA	
Dominant Tree Size Class	NA	
Understory Development (woody-stemmed vegetation 1-20’ in height)	NA	
Snags (standing dead trees)	NA	
Ground Cover (fine and coarse woody material/leaf litter)	NA	
Trails/Roads	NA	
Additional Significant Features		
Responsibility		
Bird Species Noted		

This field is not currently hayed or pastured.

Desired Future Habitat Conditions

There are two desirable outcomes for this area: 1) a field with a soft edge transitioning into the closed-canopy forest, or 2) a regenerating field, which would pass through a 10-20 year period of providing early-successional habitat.

Target Responsibility Bird Species

Currently, no responsibility species are expected to use the field for nesting. American woodcock may use the area for courtship display. The field could be providing habitat to grassland birds.

Management Options

✓ **Maintain/create soft edges between forest and field**

Responsibility bird benefit: A gradually increasing canopy height will help shield interior nesting birds from view by predators and parasites. Additionally, the brushy conditions that often develop in a soft edge may provide breeding habitat for early-successional bird species including chestnut-sided warbler and white-throated sparrow.

Management strategy: To create a soft edge, retain more trees closer to the forest and retain fewer trees as you move towards the open area. Let shrubby vegetation grow out into the field if compatible with landowner objectives. One alternative is to create shrubby conditions on the forest side of the edge by aggressively thinning out mature trees approximately 15-20 ft. into the forest. A second alternative is to girdle some of the trees along the edge of the forest. Girdled trees will eventually die, creating another important habitat feature – snags. In time, shrubby growth will establish itself due to the open canopy that develops as the trees die. In either scenario, trees of poor form and quality should be chosen for removal or girdling.

✓ **Retain and release apple trees and hawthorne**

Responsibility bird benefit: The fruit, blossoms, seeds and sap are food sources for ruffed grouse, purple finch, and yellow-bellied sapsuckers. Additionally, the blossoms serve as a food source for ruby-throated hummingbirds, and Baltimore orioles, eastern bluebirds and other bird species nest in apple trees. These trees may also be providing a food source for black bear, bobcats, foxes, fishers, and porcupines.

Management strategy: Apple trees and hawthorns that are crowded by competing vegetation can be “released” by removing any trees that overtop them as well as any vegetation within their drip-line.

Bird Monitoring

Understanding the response of bird communities to forest management is a critical aspect of conservation efforts. It is important for us to understand how our management activities impact bird populations over time, so that we can adapt practices accordingly. One method to collect this information is through a bird monitoring program. By periodically recording the bird species present at a given time and place on the property in question, we can see if and how the composition of the bird community is changing in response to management activity.

For assistance on getting started with monitoring on this property, please contact Audubon Vermont at 802-434-5827 or shagenbuch@audubon.org.

Appendix 1: Forest Bird Initiative Responsibility Species



Audubon VERMONT

Bicknell's Thrush
Wood Thrush
Canada Warbler
Bay-breasted Warbler
American Woodcock
Olive-sided Flycatcher
Rusty Blackbird
Cape May Warbler
Chestnut-sided Warbler
Veery
Eastern Wood-Pewee
Purple Finch
Yellow-bellied Sapsucker
American Redstart
Boreal Chickadee
Black-throated Blue Warbler
Chimney Swift
Ruffed Grouse
Blackpoll Warbler

Louisiana Waterthrush
Northern Parula
Blackburnian Warbler
Black-throated Green Warbler
Ovenbird
Yellow-bellied Flycatcher
Gray Jay
Palm Warbler
Northern Flicker
Black-backed Woodpecker
Tennessee Warbler
White-throated Sparrow
Mourning Warbler
Spruce Grouse
Magnolia Warbler
Alder Flycatcher
Nashville Warbler
Lincoln's Sparrow
Swamp Sparrow
Blue-headed Vireo
Scarlet Tanager

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APPENDIX 3. Town Forest PUBLIC SURVEY, SPRING 2015

Northfield Town Forest Public Survey, Spring 2015

The Northfield Conservation Commission (NCC) conducted a survey of Northfield residents and non-residents during March, 2015. The 10-question survey asked residents and non-residents about their knowledge and enjoyment of the Town Forest, as well their concerns about, and future priorities for the resource. Paper surveys were distributed at Town Meeting and completed by 120 residents. In addition, an online version of the survey was publicized via Front Porch Forum and the NCC's Facebook page. The online survey was completed by 57 self-reported Northfield residents and 36 non-residents. The results from this survey represent one of a number of different efforts the NCC has employed to solicit public input in preparation for drafting a proposed Town Forest management plan. Following is a summary of the survey results:

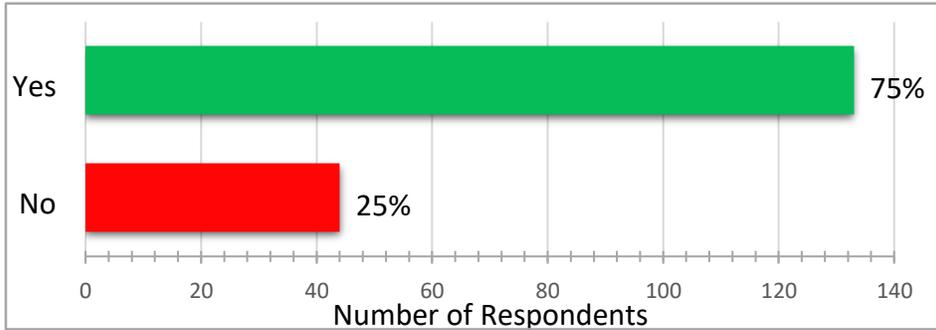
1. In which town are you currently a resident?

Town	Number of Respondents
Northfield*	178
Ashland, NH	1
Barre	2
Braintree	1
Burlington	4
Cambridge	1
Hanover	1
Elmore	1
Massachusetts	1
Montpelier	4
Montreal	3
Moretown	4
Morrisville	2
New Haven	1
Richmond	1
Roxbury	1
Vershire	1
Waterbury	1
Waterville	1
West Burke	1
Winooski	1
Woodstock	1

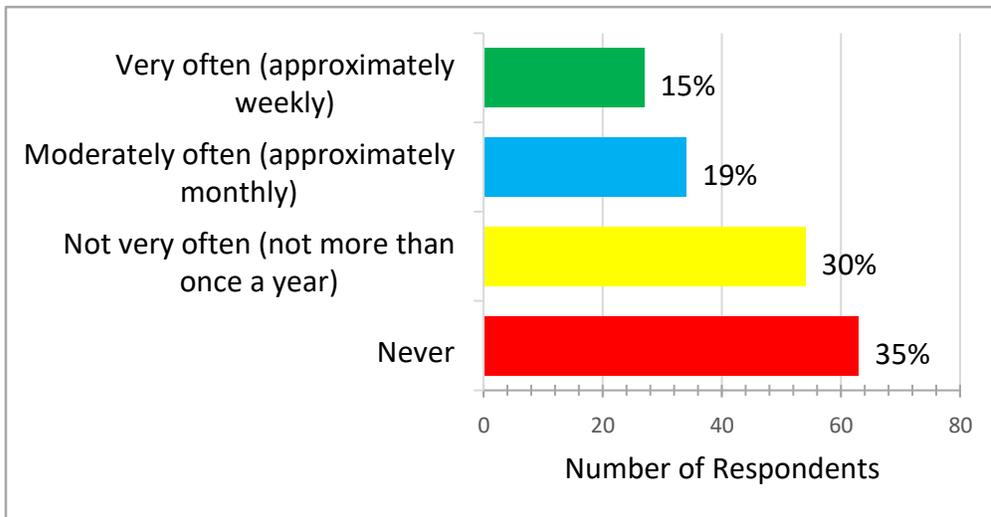
*The remainder of this report considers only the responses from self-identified

residents of Northfield.

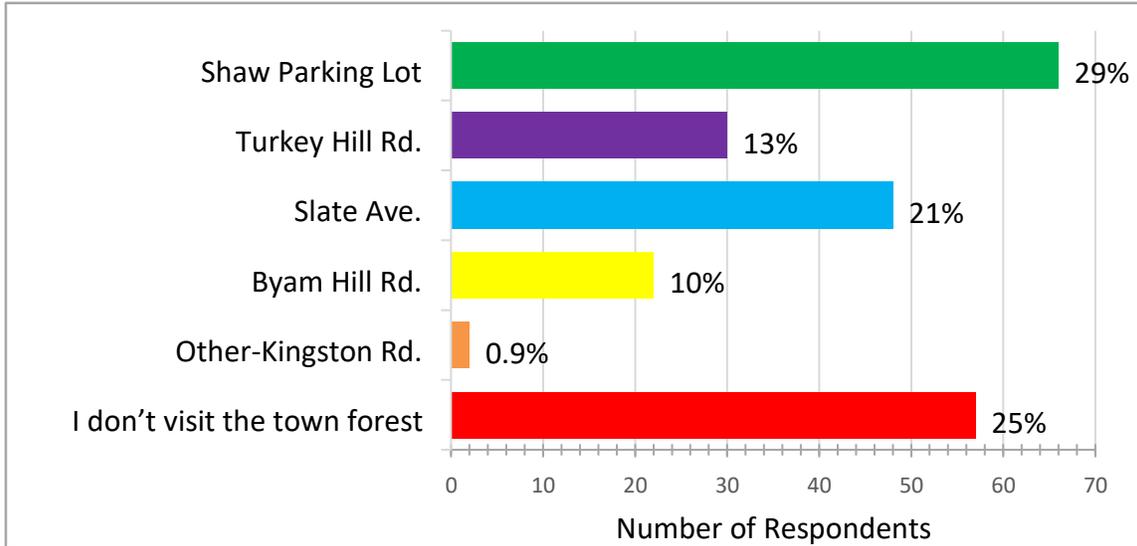
2. Are you aware that the Town of Northfield owns forest land designated as a “Town Forest”?



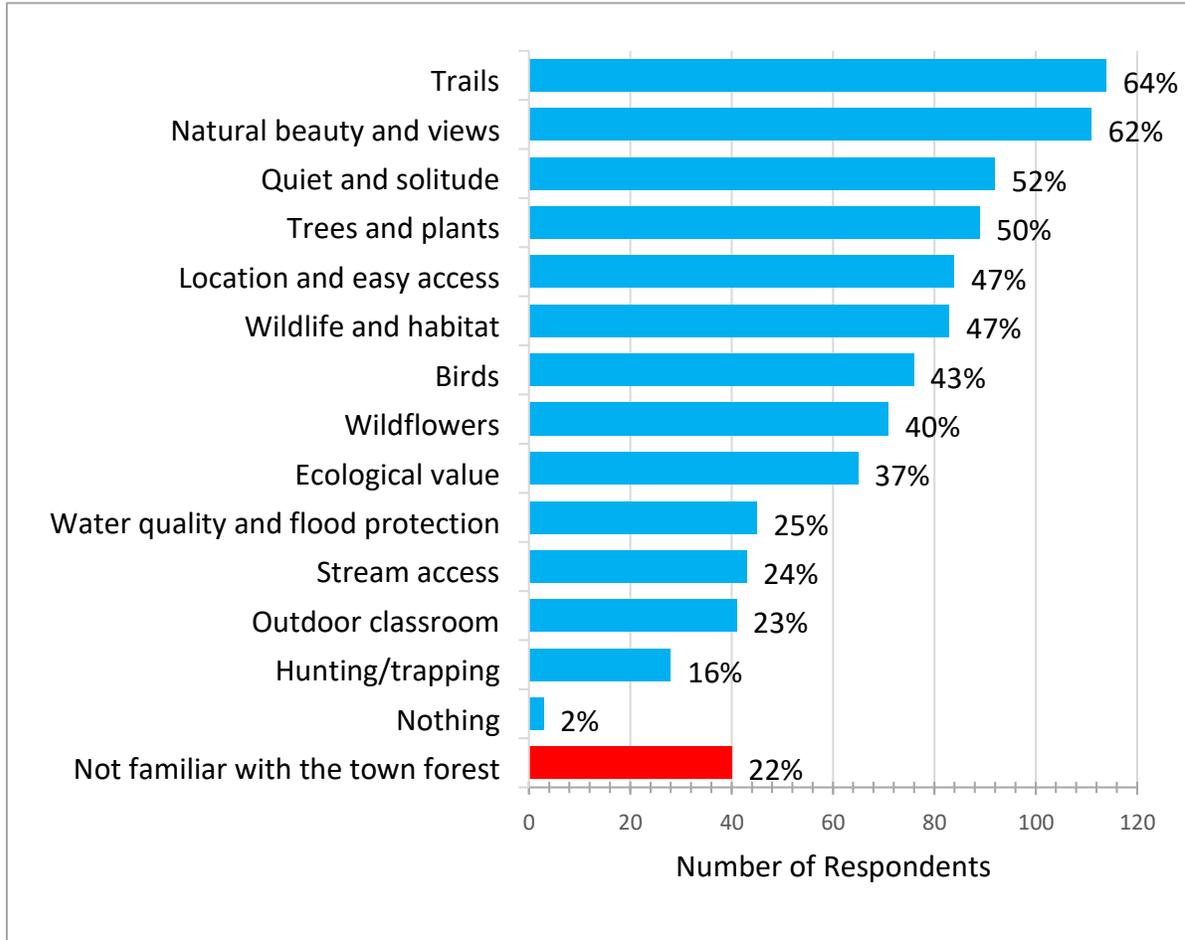
3. How often do you visit the Town Forest?



4. How do you access the Town Forest (check all that apply)?



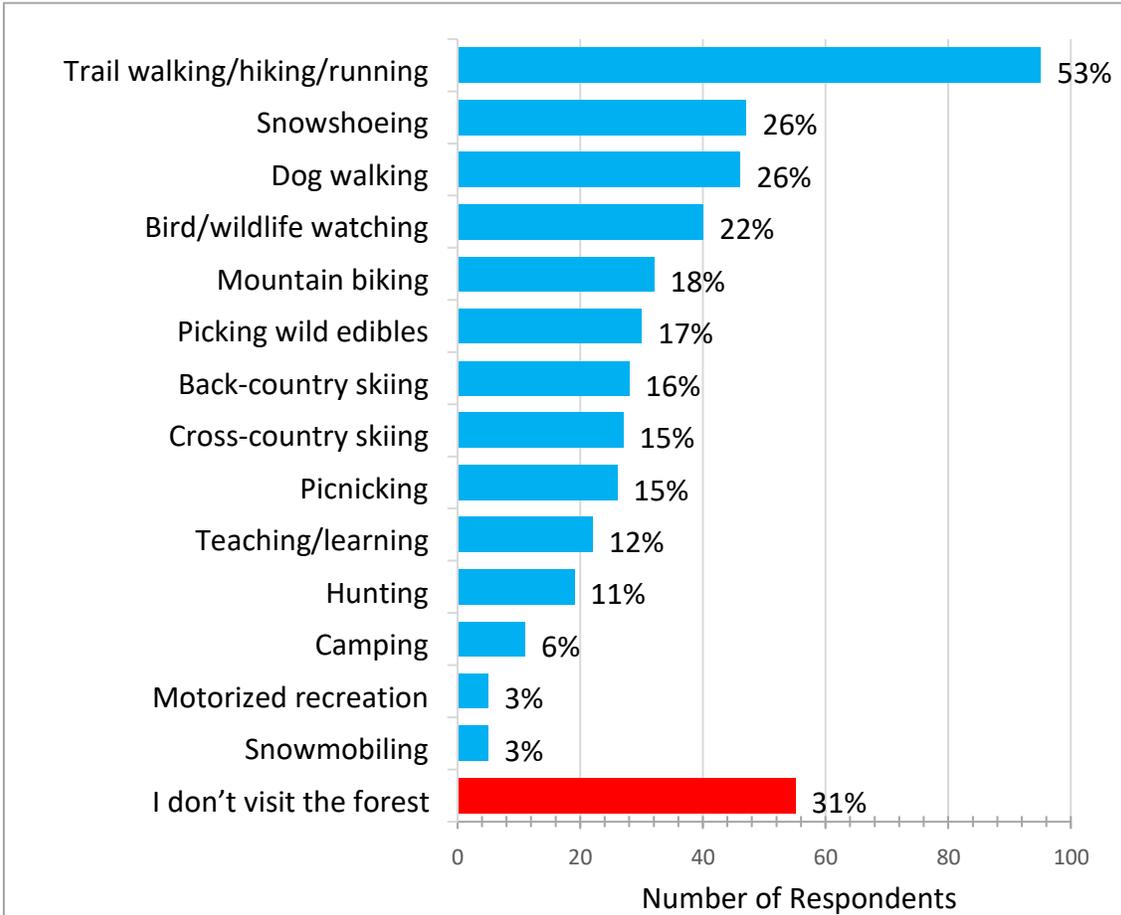
5. What do you value about the Town Forest (check all that apply)?



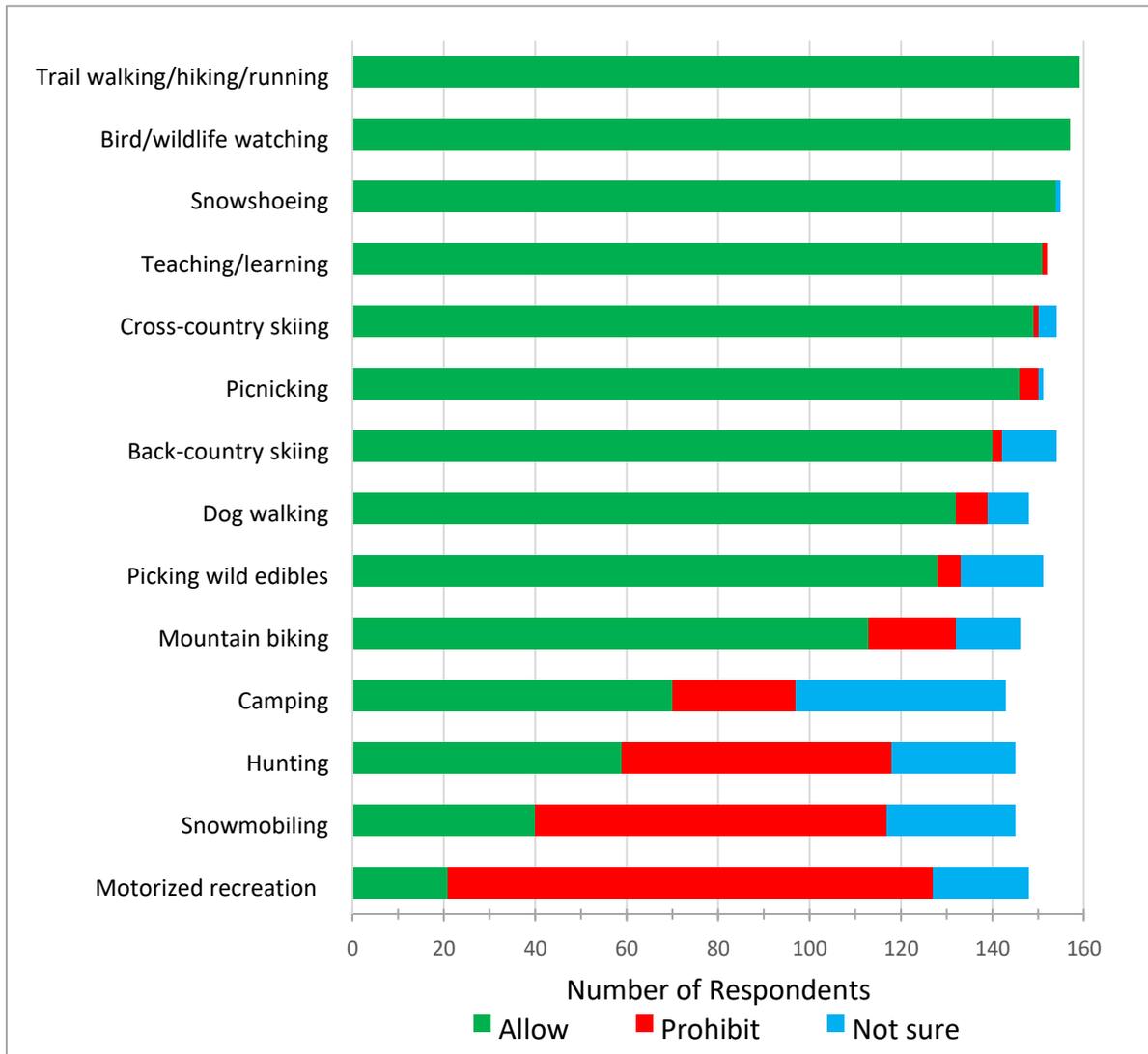
6. What do you like most about the Town Forest?

See Comments section at end of report.

7. What do you do when you visit the Town Forest (check all that apply)?



8. Which uses would you like to see allowed/prohibited in the future?



9. Comments

Question 6. What do you like most about the Town Forest?

- 7 respondents: Trails/hiking
- 5 respondents: It's easily accessed; public access
- 3 respondents: Beautiful trails; blackberries/raspberries ☒ 3 respondents: The beautiful views
- 3 respondents: The fact that it's a nature area from the center of an urban area ☒ 3 respondents: Skiing!
- 3 respondents: It's a place I can walk to get away from stress – walk my dog
- 2 respondents: It is nearby and is a natural beauty and nice views
- 2 respondents: Quietness; I enjoy the peace and quiet

- 2 respondents: Hiking and the views/nature
- 2 respondents: Wildlife
- It reminds me that we are part of the Natural world
- Old growth hardwoods
- Forest solitude
- I liked it that it was quiet. I loved watching dogs run in the field
- The outdoors are preserved well by the town
- Everything
- Its peaceful beauty
- Free access to all
- I think this is a marvelous resource and should be developed for use with trails, but other parts maintained as wild; a forestry plan should also be developed
- ...that we have one
- A vast natural resource. Free. ☑ Trees and plants
- Mostly natural setting. Quiet and not a lot of “traffic” on the trails
- Connection to Shaw Mountain
- Mountain biking
- The habitat/forest gives me an opportunity to remember what’s important on our planet ☑ Snowshoeing – having this so close to home ☑ Meeting up with friends to be outdoors!
- That we have the opportunity for local recreation and conservation education
- I like that the trails are established and my dogs and I can enjoy exercising in the outdoors
- Its natural beauty and importance as preserved forest in our town – we strongly agree with conservation and are glad the Commission is working – we will follow closely and be present at meetings
- Birds
- Elevation
- Snowshoeing
- Existence value
- It is good to know that some land is protected from development
- Working forest, managed for timber and wildlife
- The trails are a treasure for Northfield, providing residents and non-residents with excellent accessible recreation and access to nature

Question 9. What changes would most improve the Town Forest?

- 8 respondents: Public knowledge/information
- 7 respondents: Signage (trail, location, nature, distance)
- 4 respondents: Better parking/access
- 3 respondents: Comprehensive mapping service of the trail system
- 2 respondents: Additional trail development
- Maintaining trails
- Perhaps dog running and mt. biking could be restricted in some areas

- More ski options
- None
- Free access to all/motor-driven/horses/bikes
- Protection of important natural resources. No ATVs or uses that degrade the ecology
- Selective harvesting and forest management
- Designated “ecological” protection areas
- The Town Forest would be improved through clearer definition of use, when where, how, what, etc.
- Trash receptacles at beginning to encourage people to clean up after themselves
- Rebuild that shelter
- None. Leave it natural

Question 10. Additional comments/suggestions:

- 2 respondents: Better maintained and marked trails
- Dog park in Cheney Field, maybe? The wild domestic dogs are scary
- Combine Town Forest with forest land owned by Water Department
- Unable physically to visit the forest
- I love the Town Forest
- We the people own it, not corporate America
- Educate the public about the need for conservation and the importance of the forest to environmental sustainability
- Create a map with trails, points of interest, access/trailheads ☐ NAME the Town Forest
- Don’t spend money
- I would like to see the Town Forest remain as natural as possible
- How would you “police” activities/clean-up there?

CONTACT:

Northfield Conservation Commission

Web Page: <http://www.northfield-vt.gov/text/NCC.htm>

Facebook Page: <https://www.facebook.com/Northfield-Conservation-Commission-453509638086185/>

Email: northfieldconservation@gmail.com

APPENDIX 4. RULES, POLICIES AND MANAGEMENT DECISIONS TO BE ESTABLISHED AND IMPLEMENTED

The Northfield Town Forest [NTF] will be managed for the benefit of the local community under the concept of multiple-use management. The Forest is diverse and every site will not support every use. Allowed uses and management activities must be compatible with maintaining or enhancing water quality, wildlife habitat, and general ecosystem function and health over the long term. Permitted uses and management should be reviewed and modified as needed based on operational experience and the best information available from the scientific and land conservation communities. (Northfield Town Forest Stewardship Plan (NTFSP) at p. 3).

The TFSSC [Town Forest Stewardship Sub-Committee] will develop and help to implement management policies for the Town Forest, including use guidelines and restrictions, signage, trail maintenance, and user oversight. Applications for special uses or events will be made to the TFSSC, which will make recommendations to the town administration for a final decision. If and when matters of financial, legal, policy or controversial consequences arise, the subcommittee will make recommendations for action to the Conservation Commission who will then make recommendations for action to the Select Board for a final decision. (Northfield Town Forest Stewardship Plan at p.10-12).

Rules, Policies, and Management Decisions to be Established and Implemented:

1. Streams Management

- Except for necessary construction of stream crossings, a minimum undisturbed and vegetated buffer of 50 feet on both sides of streams shall be required. Any activity that encroaches on a stream or riparian area must be designed to minimize impacts and to maintain the natural condition of the stream. Vermont's Forestry Acceptable Management Practices (AMP's) shall be followed and the number of stream crossings shall be minimized.
- A crossing structure may be appropriate over the stream below the beaver wetland. Any crossing here should be sized so as to maintain natural flow and aquatic organism passage. A footbridge with abutments set well back from the stream bank would be most suitable.
- A crossing structure should be installed over the stream that crosses the Paine Mountain/Cheney Route Trail near the narrow point between the Cheney Farm and Paine Mountain portions of the Town Forest. The crossing structure should be designed to accommodate the trail traffic, natural stream flow and aquatic organism passage. An oversized culvert with a natural bottom could also function effectively here. Trail stabilization efforts should focus on minimizing trail erosion and keeping sediment from entering the stream channel.

- New trail crossings of streams elsewhere on the Town Forest should be avoided, especially in areas of steep slopes.
 - Trail design should include properly spaced waterbars and uninterrupted flowpaths as well as attempts to maintain sheet flow of surface water rather than channelization into ditches and encouraging reabsorption into the soil utilizing green infrastructure concepts. (see <http://dec.vermont.gov/watershed/cwi/green-infrastructure>).
2. Wetland Management
- Minimum of 50 ft. buffer is required for most wetlands
 - Within all buffers:
 - Logging activities should be excluded.
 - In areas that receive a great deal of recreation, or are important for wildlife habitat, larger buffers may be appropriate
 - If any logging or other motorized machinery is used near wetlands, soil disturbance or rutting must be prevented.
 - Seeps Wetlands require minimum of 100 ft. of forested buffers; any logging shall follow state guidelines; access roads, skidder trails, and harvesting operations must avoid these areas. Recreation trails must be kept out of these areas. If existing trails go through these wetlands, they must be re-routed, or proper trail crossings implemented.
 - Beaver Wetland requires a 100 ft. buffer to provide undisturbed cover for wildlife such as deer, bear, spotted salamanders and wood frogs. Recreation trails will be re-routed to avoid wetland impacts. Invasive species control should be implemented.
 - Alder Swamp requires a 50 ft. buffer from logging activities.
 - Vernal Pools require two buffer zones
 - 1) A 100 ft. buffer zone
 - A complete forested cover is required in this buffer zone.
 - If selective removal is undertaken, it should come no closer than 25 ft from the pool's edge. Logging should occur when soils are frozen and the ground is covered with snow. Ruts must be prevented. Development must be avoided in this buffer zone.
 - 2) A 600 ft. buffer zone (referred to as “amphibian life zone” or the “critical terrestrial habitat”)
 - At least a 50% forested cover is required within this zone when logging and forestry occur.
 - A minimum of 75% forested cover is required where development occurs. (Trails and other building is considered development).
 - Any logging in these areas should occur when the ground is frozen and there is adequate snow cover. Soil compaction and ruts should be prevented.
3. Upland Natural Communities Management
- Matrix Forests: Northern Hardwood Forests and Rich Northern Hardwood Forests

- Active forest management does not threaten the ecological integrity of these areas.
- Recreation can be part of management for these sites.
- Maintain integrity by maintaining unfragmented nature and limiting impacts to the interior of the sites.
- Patch Communities: Hemlock Types and Red Spruce-Northern Hardwood Forest
 - Active forest management can have great impacts on this community
 - If logging occurs, selective logging should be undertaken, rather than small clear-cuts.
 - Hemlock Forests along stream banks must be excluded from logging.
 - The steep slopes of the Red Spruce-Northern Hardwood Forest should be excluded from logging.
- 4. Rare & Uncommon Species
 - Protection of rare, threatened and endangered species is a priority.
 - The male fern and other uncommon species such as goldies fern and Braun's holly fern, must be protected
 - Re-routing of trails, signage or other means to exclude human activity from the locations of these species must be implemented.
- 5. Wildlife Habitat
 - Black Bear Habitat
 - Hard Mast Stands
 - Beech and Red Oak provide fat-rich nuts critical for black bear fall feeding
 - These trees occur infrequently and so future forest management should favor retention of these species – especially those showing signs of bear use.
 - Bear Wetlands and Other Areas
 - Bears use the beaver complex and may use the Alder Swamp.
 - Signs of bear are evident throughout the central portion of Paine Mountain parcel and most notably in the red pines within the former plantation area. Markings observed between the climbed beech trees and the beaver complex; concentrations of bear sign were noted where the trail density is the lowest and the farthest from the established trails. Trails should be excluded from areas with high concentrations of bear sign.
 - Deer Winter Habitat
 - The Hemlock and Hemlock-Northern Hardwood forest communities located in the Cheney parcel and along the western edge of the Paine Mountain parcel should be managed specifically to enhance the conifer overstory and hemlock regeneration which would serve to enhance the value of the habitat for wintering deer. Prohibit the introduction of new trails in these forest types to help deer using those habitats by reducing stress.
 - Songbird Habitat

- Focused bird monitoring as recommended by Audubon would provide additional information as well as an opportunity for additional exploration of the forest
 - Grasslands:
 - The Cheney meadow at the western end of the Cheney parcel may be just large enough to support nesting grassland birds such as bobolink and likely provides periodic habitat for other birds such as American woodcock who might conduct mating displays here, and for tree swallows and bluebirds feeding on insects over the open meadow
 - Conduct any mowing after August 1 of each year, and mow at least once every 3 years to maintain the best and most productive grassland habitat for these species.
 - Rotate schedule for mowing different sections in different years to help provide habitat diversity for wildlife.
 - Conduct an educational project to install nest boxes in the Cheney meadow to provide nesting areas for bluebirds, swallows and others.
 - Early Successional Habitat:
 - Cutting trees results in openings that will regenerate with shrubby young growth preferred by early succession species. As would be expected, the larger the clearing area, the more early succession habitat is created.
 - Any forest openings that are created through management activities need to be designed to discourage invasives and monitored, and controlled if necessary, to be sure they do not become established before the mature forest regrows.
 - Early succession openings should be located away from any existing populations of invasive species and kept relatively small (1-2x canopy tree height in diameter) to avoid new invasive species incursions.
 - Interior Forest:
 - Interior forest is usually considered any forestland that is 100 meters or more from human landscape activity such as residences, roads, agricultural land and maintained open land.
 - Interior forest habitats are best exemplified by uninterrupted canopy cover, varied tree species composition, a healthy and diverse understory, decomposing woody debris on the forest floor and standing dead trees, or snags throughout.
 - These provide important habitat for nesting birds and other wildlife, and should be left undisturbed.
 - Manage through silvicultural activities that focus on these features to benefit the interior nesting birds using the forest and to enhance the overall forest health.
6. General Wildlife Habitat
- The juxtaposition of healthy habitat types such as grassland, early succession and interior forest, combined with portions of the property

relatively undisturbed by regular human activity will continue to provide for a diverse suite of wildlife species.

- The Northfield Town Forest makes up but a portion of a larger habitat “block”- or large area of unfragmented forest. Maintain healthy forest ecosystems and wildlife habitats in the Northfield Town Forest to benefit wildlife that makes its home there.
- Apple Trees/Soft Mast:
 - Apples are eaten by a wide variety of wildlife species from black bears to ruffed grouse but will die off when shaded by surrounding canopy trees, and this is happening in some places. These trees should be “released” by removing nearby trees that are shadowing the apples and attempt to bring back to vigor through knowledgeable pruning.
 - Couple routine maintenance of apple trees and other soft mast with maintenance of small early succession forest patches wherever possible as they are quite compatible.

7. Forest Management & Silviculture

- Incorporate management recommendations contained in the 2000 Forest Stewardship Plan (by Rose Beatty) and in the 2010 Forest Bird Habitat Assessment of the Municipal Forest (Katie Manaras, Audubon VT) into silvicultural activities as they are planned and proposed.
- The NCC will coordinate with TFSSC on vegetative management (timber sales etc.) implementation as recommended in the forest management plan.
- Consider conducting silvicultural activities under a well thought out plan that provides an opportunity for outreach and education.

8. Recreational Activities- Trails

- ATV use is prohibited and will be addressed by the TFSSC
- Several trails will require maintenance and repair work
- Long term use resulted in “dugway” conditions that channel stormwater runoff down trails further eroding and exacerbating the washed out condition
- Conduct trail inventory and initiate work to improve stormwater runoff throughout the trail system. Use the guidelines laid out in the booklet “Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont” (see internet link in References) which provide a good baseline for installation of drainage structures.
- Basic recommended structure spacing is provided in NTF Stewardship Plan, Table 3: Trail Structure Spacing
- Policies will be established regarding user types allowed on each trail. Accompanying signage will make clear to all which trails are appropriate for which type of use.
- New trail installation, including changes to existing trails, will follow a strict and pre-determined process of approval. To be approved, new trails must avoid all wetland areas and ensure adequate buffers, minimize stream

crossings and use appropriate crossing structures, avoid steep slopes and be designed so as not to alter hydrology or cause soil erosion.

- Portions of the property will be maintained as trail free to allow for remote and less-frequently disturbed areas. No new trails or development will be sited in sensitive areas as mapped (Map 6) and/or described in the NTF management plan.
- New trails, or changes to existing trails, that cause new and long-term impacts require approval by the NCC and the Selectboard.
- The old trail through the Beaver Complex wetland is closed and will remain closed and allowed to revegetate.
- The portion of the route that crosses the stream below the beaver wetland area is within the wetland buffer and the trail must not be expanded, but is to remain only as a narrow path that maintains full canopy cover.
- Develop criteria and process of approval for new trails or changes to trails [see Management Guidelines in the NTFSP]
- Trail maintenance is by permission only and under the supervision and approval of the TFSSC.

9. Uses

- Some uses have more potential for adverse and lasting impacts than others, and certain areas of the forest are more sensitive to human activity. Careful planning is needed to balance the interests of recreationists with natural resource conservation imperatives.
- Table 4 of the NTF plan details allowed and prohibited use types as deemed appropriate by the Northfield Conservation Commission and shall be implemented and planned for accordingly.
- Off-trail use is discouraged; off-trail biking will be prohibited. Signage will reflect those policies.
- Cutting of understory vegetation is prohibited without the explicit permission of the TFSC.
- Cutting of trees is prohibited except under the oversight of a qualified forester and with an approved forest management plan

10. Invasive Species

- Non-native Invasive Species (NNIS) are scattered throughout the Northfield Town Forest. The main species of concern are honeysuckle (*Lonicera spp.*) and barberry (*Berberis spp.*), though buckthorn (*Rhamnus spp.*) is also occasional. In the cleared area around Hawk's Watch these NNIS have become dominant.
- If an effort to control NNIS on the forest is undertaken, the highest priority areas are the Hawk's Watch clearing and any occurrences within wetlands. The Beaver Wetland complex, in particular, has an infestation of honeysuckle that should be controlled.
- Many other small canopy openings have small populations of invasive species, notably the open area near Butternut Junction, and the smaller open

area near the homestead and stone barn foundation both in the northern part of the Paine Mountain parcel.

- Invasive plan management is to be conducted only by authorized and qualified individuals

Continuing Challenges:

- Public parking is not currently available on the Town Forest property. Exploration of available options and a plan to establish formal and acceptable parking in proximity to Town Forest access point(s) should be a priority.
- Hunters will be advised that hikers are likely to be present. Likewise, hikers will be advised during deer rifle season that hunters may be present. Both user groups will be encouraged to take appropriate precautions.
- Mountain bikers tend to travel faster than hikers and can create uncomfortable or even unsafe conditions for each other. Hikers will always have the right-of-way on multi-use trails. Biking is allowed on the Paine Mt. Trail as indicated on Map 2. Bikers will control their speed. If conflicts arise, policy may be established to more effectively manage the conflicts.
- Trail maps and signage are to be distributed to clarify allowable activities and rules for all users.
- Maple syrup production by a private party on the Town Forest is unlikely to be compatible with the other uses prioritized in this Stewardship Plan. Any leases or lease renewals to private parties for any use must be approved by the Selectboard.
- Some trails continue off property onto neighboring land that may or may not have the same use restrictions in place as the Northfield Town Forest. Coordinated management should be undertaken so that neighboring landowners understand the management and use objectives in the Forest and help to avoid future conflicts.
- Some camping has taken place in the Forest, sanctioned or not. There remains evidence of campsites, in some cases with a considerable amount of trash, and in others fire rings or cleared areas. Clear camping restrictions and guidelines shall be adopted. Leave No Trace principles shall be followed.

Recommendations:

Forest Management

- Update 2000 Forest Management Plan to incorporate natural resource inventory information and recommendations contained in this report and in the 2010 Audubon Vt. Forest Bird Habitat Assessment.
- Identify forestry management zones where more intensive timber harvesting and habitat management can occur and others that can be left to natural forest succession.

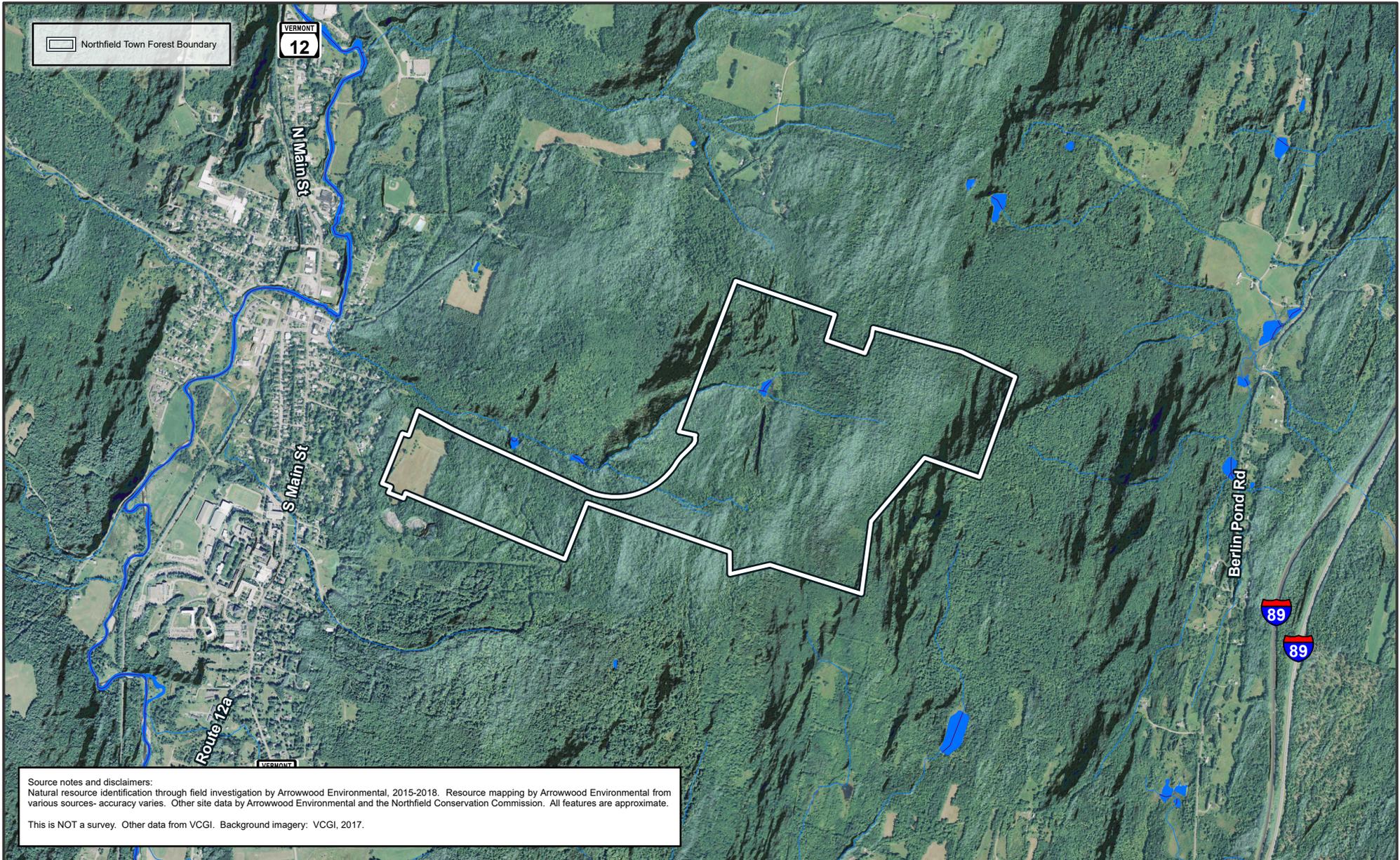
- Hold public educational sessions in concert with forest management activities to highlight responsible forest management and wildlife habitat improvement.
- Conduct invasive species management activities at Hawk Watch and other locations throughout the property.
- Release apple trees to provide soft mast for wildlife.
- Paint and blaze all Town Forest property boundaries.

Ecological

- Except for necessary construction of stream crossings, maintain 50 feet of undisturbed and vegetated buffer along all streams.
- Implement Vernal Pool protection zones where new trails and forestry activities are not permitted.
- Maintain buffers around all wetlands of at least 50' from all activities; in some cases larger buffers are required as described in the NTF Stewardship Plan.
- Designate “low-disturbance” areas where concentrated activity such as new trails will not be allowed. Initial designations are indicated as of December 31, 2016, in Map 6.
- Implement an invasive management plan to tackle the growing invasive plant populations throughout the property.

Trails/Uses

- Close and block trails in sensitive or unnecessary areas
- Provide signage detailing allowed/prohibited trail uses, rules for uses, and areas to be avoided, including those that provide habitat for rare, threatened, or endangered species.
- Install signage at the boundary with Norwich University Shaw Recreation Center and the NTF to provide information on the different management and usage policies. Uses at the Shaw Center are more intensive than those on the NTF; and the goal of management at the NTF is to balance recreation with conservation.
- Conduct a comprehensive trail inventory, mapping existing conditions.
- Plan and conduct trail maintenance to improve water drainage on trails. Aim to move water off trail surface in frequent small quantities or sheet flow.
- Consider documenting the various ecological and historic elements of the property by developing interpretive trail markers or a brochure and map.



Northfield Town Forest

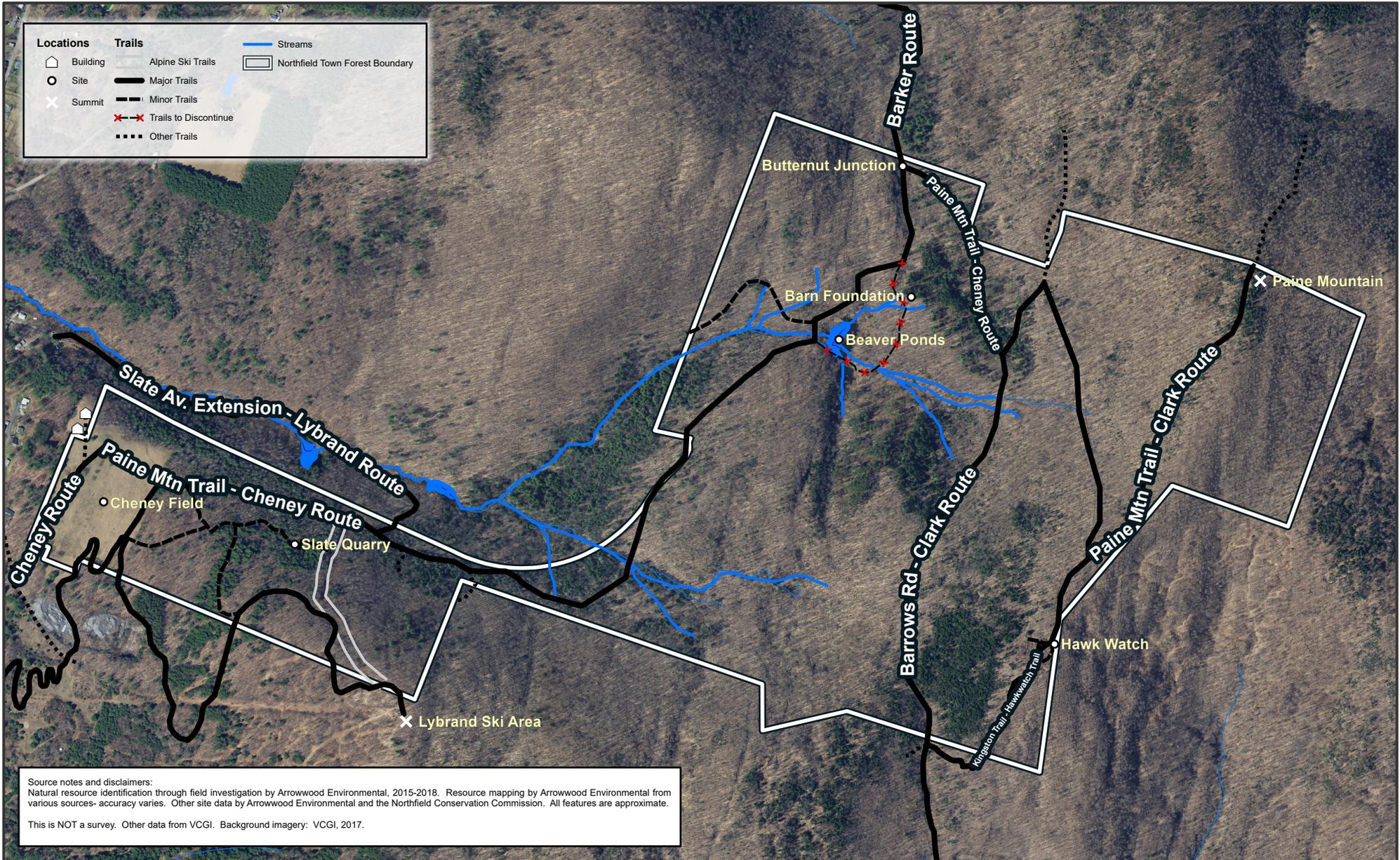
Wednesday, July 17, 2019

File: NorthfieldTF Prepared By: A Worthley NAD 83, Vt State Plane

Map 1: Location

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Source notes and disclaimers:
 Natural resource identification through field investigation by Arrowwood Environmental, 2015-2018. Resource mapping by Arrowwood Environmental from various sources- accuracy varies. Other site data by Arrowwood Environmental and the Northfield Conservation Commission. All features are approximate.
 This is NOT a survey. Other data from VCGI. Background imagery: VCGI, 2017.



Northfield Town Forest

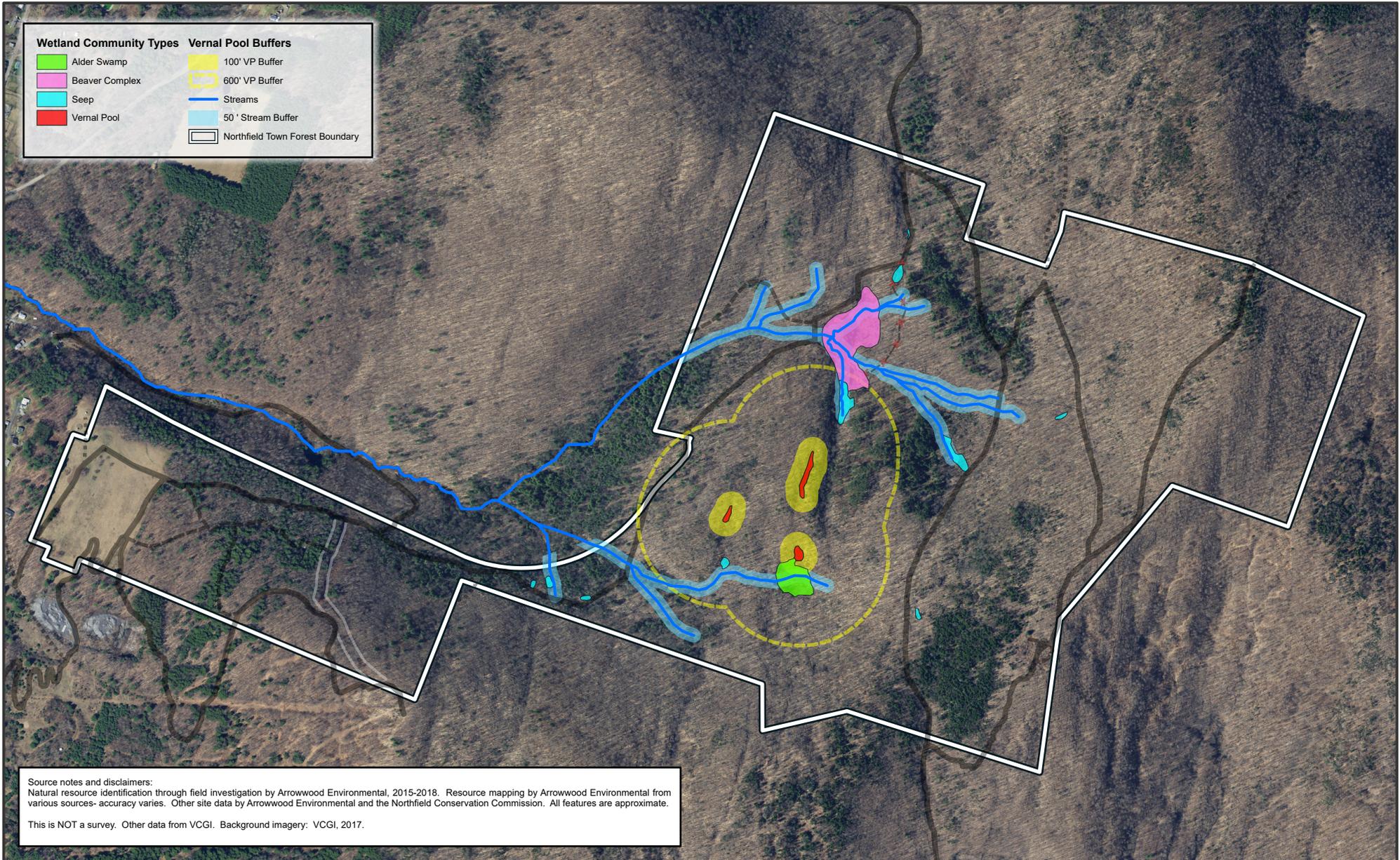
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File: NorthfieldTF Prepared By: A Worthley NAD 83, Vt State Plane

Map 2: Trails & Notable Features

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Wetland Community Types		Vernal Pool Buffers	
■	Alder Swamp	■	100' VP Buffer
■	Beaver Complex		600' VP Buffer
■	Seep	—	Streams
■	Vernal Pool		50' Stream Buffer
			Northfield Town Forest Boundary

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Northfield Town Forest

Wednesday, July 17, 2019

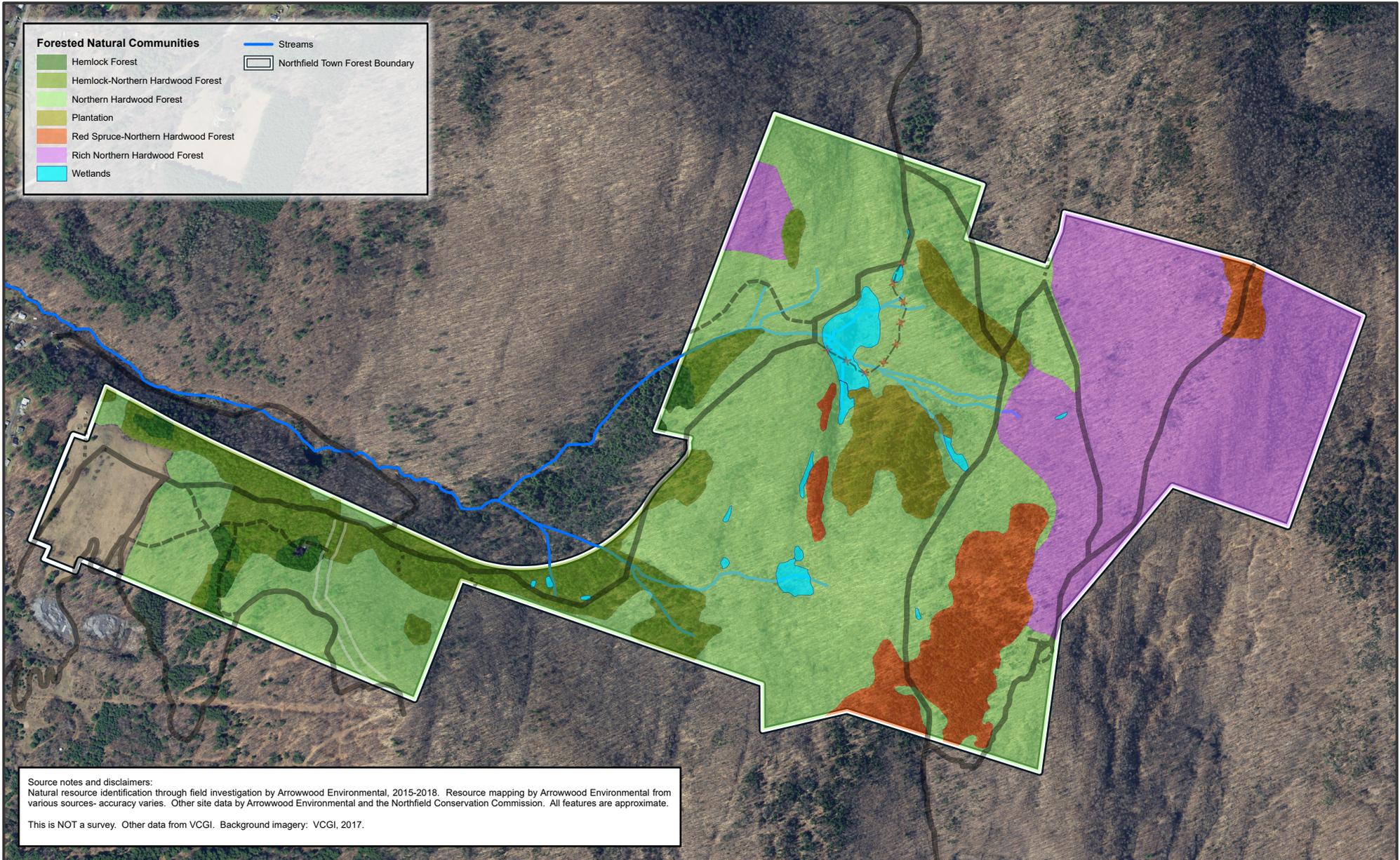
File: NorthfieldTF Prepared By: A Worthley NAD 83, Vt State Plane

Map 3: Wetlands & Vernal Pools

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Forested Natural Communities

- Streams
- Northfield Town Forest Boundary
- Hemlock Forest
- Hemlock-Northern Hardwood Forest
- Northern Hardwood Forest
- Plantation
- Red Spruce-Northern Hardwood Forest
- Rich Northern Hardwood Forest
- Wetlands

Source notes and disclaimers:
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Northfield Town Forest

Map 4: Forested Natural Communities

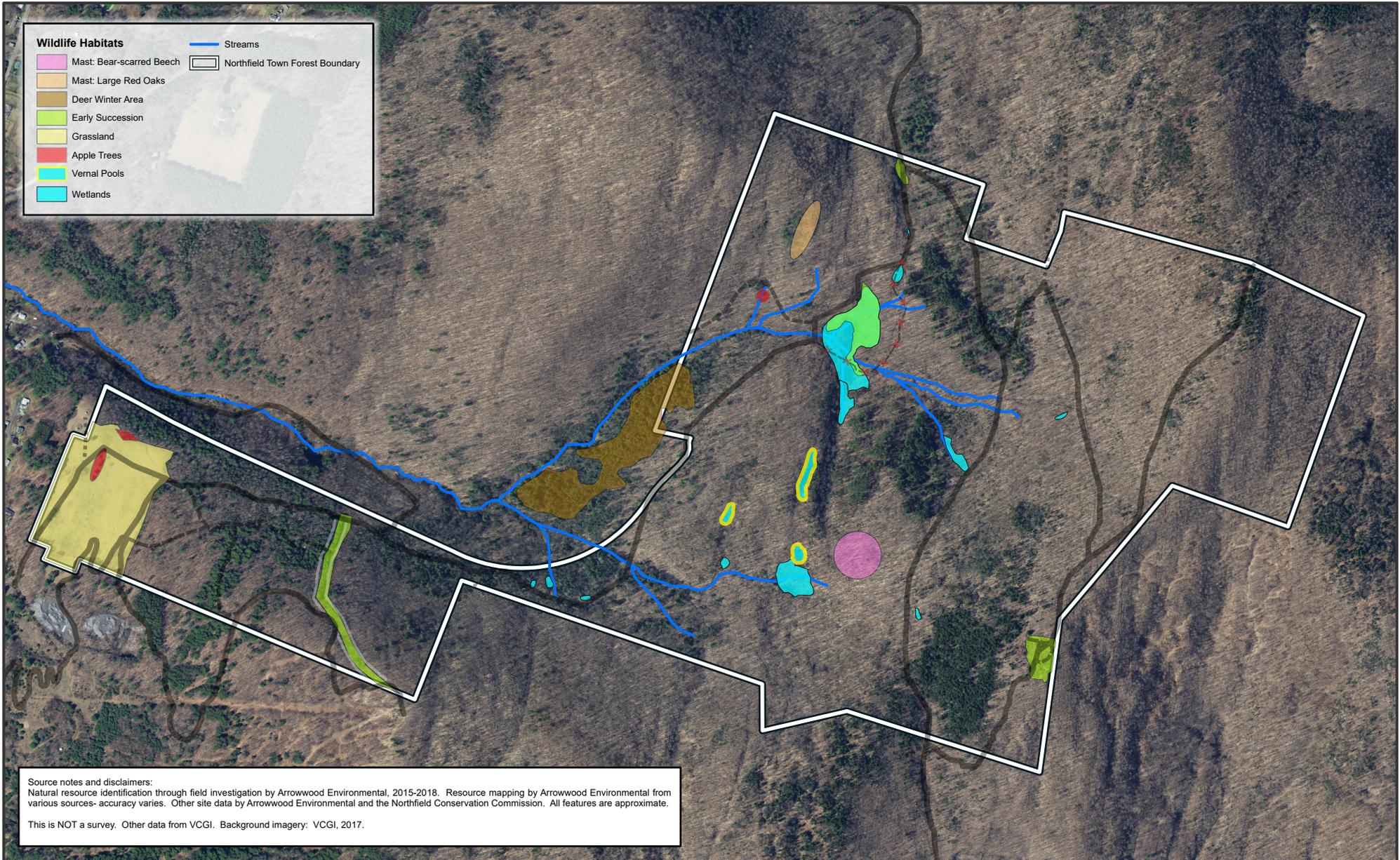
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Northfield Town Forest

Map 5: Wildlife Habitats

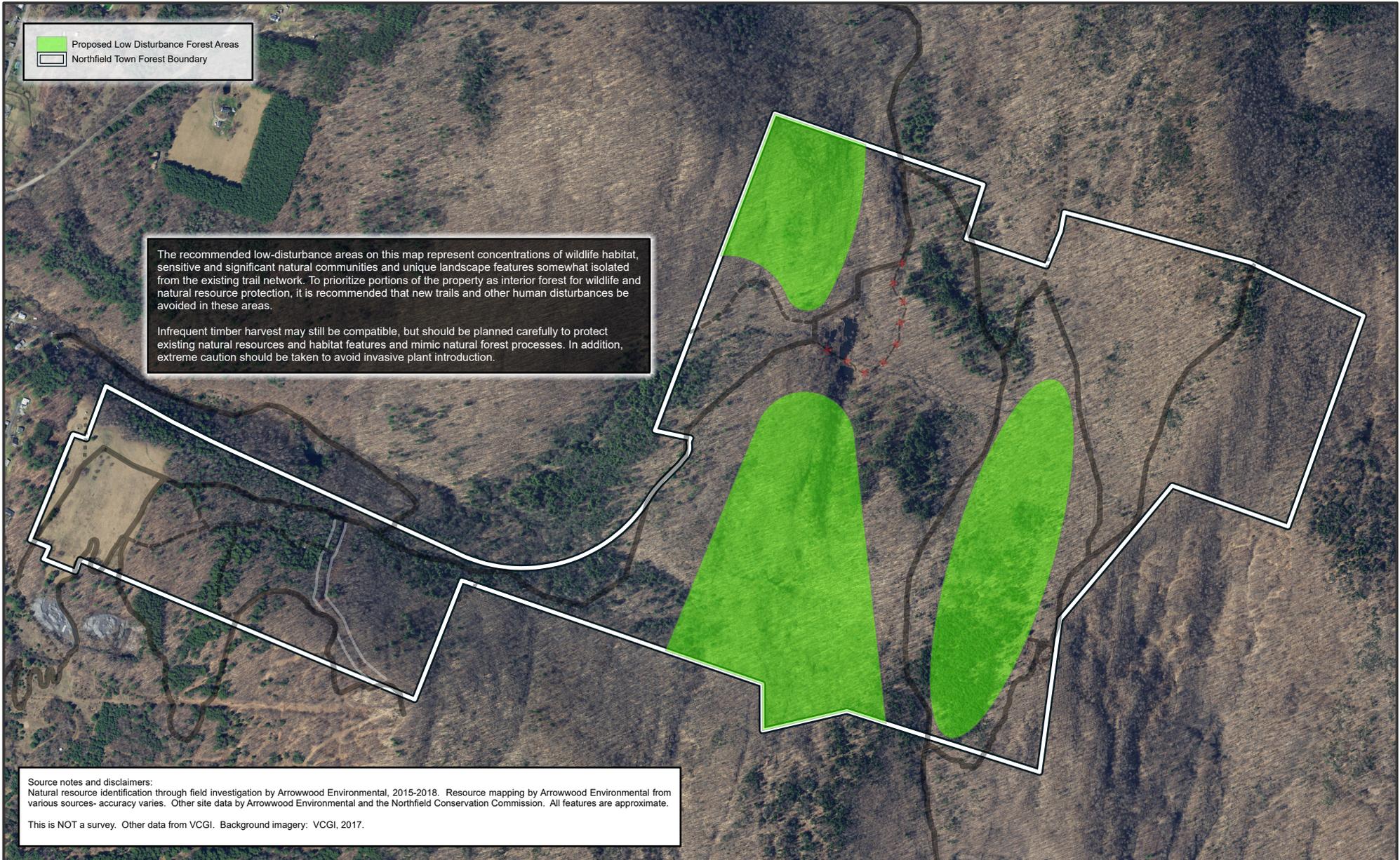
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Northfield Town Forest

Map 6: Proposed Low Disturbance Areas

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