

# **DRAFT INVENTORY AND ASSESSMENT**

**FOR THE**

***Hinesburg Town Forest***

***Hinesburg***

**For the 10 years beginning January 2018**

**Supplement to the Hinesburg Town Forest Management Plan**

**Adopted September 2012**

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# **CONTENTS**

I.	PROPERTY INFORMATION .....	3
II.	FOREST MANAGEMENT PLAN OVERVIEW .....	3
III.	SOIL AND WATER RESOURCES.....	4
IV.	MANAGEMENT INTENSITY ZONES .....	4
V.	TRAILS AND RECREATION.....	7
VI.	WILDLIFE HABITAT .....	8
VII.	BOUNDARY CONDITIONS .....	9
VIII.	PAST PRACTICES .....	11
X.	STAND DESCRIPTIONS AND MANAGEMENT RECOMMENDATIONS .....	13
	Stand : 1.....	14
	Stand : 2.....	18
	Stand : 3.....	22
	Stand : 4.....	26
	Stand : 5.....	28
	Stand : 6.....	29
	Stand : 7.....	32
	Stand : 8.....	36
	Stand : 9.....	38
	Stand : 10.....	42
	Stand : 11.....	44
	Stand : 12.....	46
	Stand : 13.....	48
	Stand : 14.....	51
	Stand : 15.....	54
	Stand : 16.....	57
	Stand : 17.....	59
	Stand : 18.....	61
XI.	MANAGEMENT SCHEDULE.....	63
XII.	REFERENCES .....	64
XIII.	DEFINITIONS.....	66
XIV.	VERNAL POOL TIMBER HARVESTING GUIDELINES.....	68

## **I. PROPERTY INFORMATION**

**Name:** Hinesburg Town Forest (HTF)

**Acreage / Grand List Description:** TOWN FOREST & (10-1-3) 864.5 acres

**School Property Account Number (SPAN):** 294-093-11677

**Biophysical Region:** Border of Champlain Valley and Northern Green Mountain

## **II. FOREST MANAGEMENT PLAN OVERVIEW**

The Hinesburg Town Forest (HTF) is an important local and regional natural resource. These forested hillsides have a diversity of terrestrial and aquatic habitats, 18 miles of well-maintained recreational trails, and contain a rich cultural history. The abandoned farms that formerly occupied this area are still very evident through stone walls and fence lines, abandoned cellar holes and barn foundations, old roads and deserted equipment. The current vegetative cover is as much a result of these past forest and farm practices as it is from natural processes.

This Forest Management Plan is being guided by management philosophy and goals enumerated in the Hinesburg Town Forest Management Plan, adopted September 2012. Management goals are:

- Use the forest as a model and example of the value of forests to the community, including promotion of educational and community uses that are compatible with other management goals.
- Protect water quality.
- Maintain and enhance ecological connections between the HTF and the larger landscape.
- Monitor and respond to changes.
- Allow natural processes to govern the HTF ecosystems and model any active management on these processes to the extent possible.
- Maintain the forest in at least its present parcel size and configuration.
- Demonstrate sustainable forestry practices that protect and enhance the ecosystem function and health.
- Protect and promote the natural and human made elements of historic and environmental significance for educational and cultural purposes.
- Protect and/or enhance habitat for native species, including game and non-game wildlife.
- Manage the allowed uses of the forest in such a way that they appropriately minimize the adverse effect on the rural residential nature of the neighborhood.
- Manage non-commercial, recreational opportunities that are not incompatible with the other management plan goals.

The inventory for this plan was conducted in the spring and summer of 2017. Boundaries were walked to evaluate any issues, and flagged with blue ribbon. Corner monumentation was flagged with pink ribbon, as was barbed wire when found. Trails were walked to determine their condition and to call attention to any issues. In order to investigate the entire property regardless of accessibility, 154 plots were taken using a 500' x 500' grid spacing. Each plot gathered data on trees, shrubs, herbaceous plants, wildlife and ground conditions. Point samples using a 10 BAF prism were used for tree data, and mil-acre plots were used for shrubs, seedlings and saplings. Data was analyzed using US Forest Service NED-3 software. Assistance was provided by UVM interns Karina Morales and Blake Thomas.

There has been a wealth of useful environmental and cultural information gathered about the HTF. Of note is the *Landscape Inventory and Assessment, Hinesburg Town Forest*, conducted by the University of Vermont and Vermont Law School Field Naturalist Program in 2006. Another valuable assessment is the *Forest Bird Habitat Assessment and Management Recommendations* conducted by Audubon Vermont in 2009. Other related reports are listed in the References section at the end of this plan.

Proper forestry is a long-term undertaking, so it is important to understand management prescriptions that have been conducted in the past. The goal of this plan is not to start from scratch, but to build on past management practices that have been conducted on the HTF. Therefore, forest management plans written in 1986, 2005, and 2006 were integrated into this plan where appropriate. In other cases, management prescriptions have been modified. There are also large areas of the property where management has occurred, but not under the guise of a written management plan.

### **III. SOIL AND WATER RESOURCES**

Virtually all the soils on the HTF are spodosols derived from glacial tills (see Soils Map). Lyman-Marlow very rock loams generally follow the ridgelines. Marlow fine sand loams, and Peru fine sandy loams, occupy the midslopes and low-lying areas. Cabot soils are found in a small wet area near Hayden Hill Road. A very good analysis of HTF soils can be found in the 2006 *Landscape Inventory and Assessment* on pages 15-21.

The HTF contains a variety of wetland features, including brooks, seeps, vernal pools, alder swamp, red maple swamp, and possibly seepage forest. The brooks generally drain to the east toward the Huntington River, with a small portion draining west to the La Platte River. The entire property is in the Lake Champlain watershed.

### **IV. MANAGEMENT INTENSITY ZONES**

The Management Zones described in the HTF Management Plan (September 2012) are a valuable tool to create a balance of uses for the local community. They also promote a diversity of ecological management practices.

After careful examination of the HTF, it is recommended that the Management Intensity Zones be adjusted. It is believed that the zones can be better aligned with conditions on the ground, while still meeting the goal of having both large preserved areas, and areas of active management. The map on Page 6 shows the adjustments.

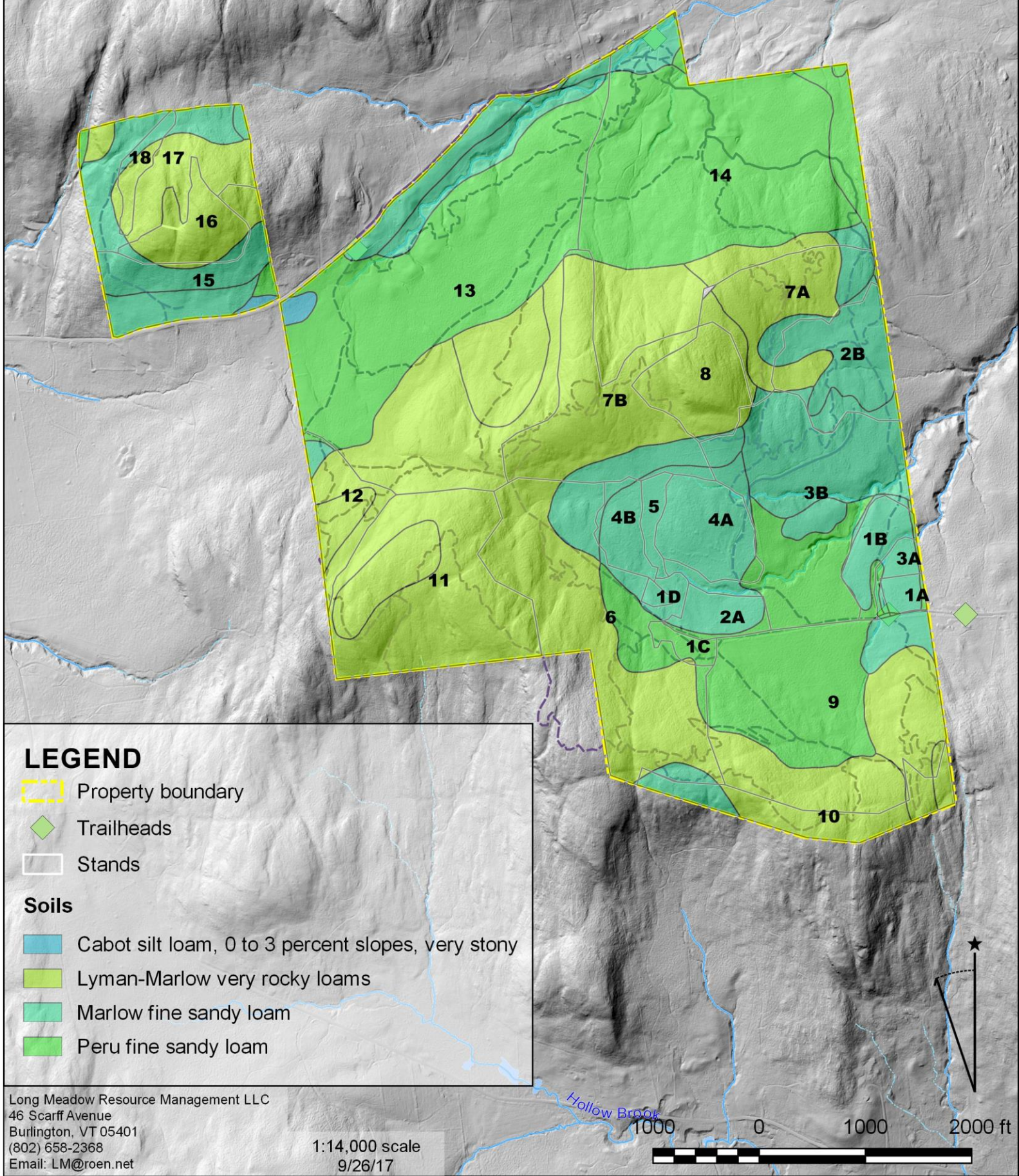
Here a summary of the changes:

- Enlarge the Intense Zone around Stand 1A and 1B to better correspond to plantation stand boundaries.
- Slightly enlarge the Intense zone around Stand 1C and 2A to correspond to the plantations
- Reduce the Intense Zone out of Stand 4A, replace with Moderate Zone
- Move the Reserve Zone to cover Stand 4B and Stand 5.
- Expanded Reserve Zone to follow ridge in Stand 7B.



# HINESBURG TOWN FOREST

## Soils Map



### LEGEND

Property boundary

Trailheads

Stands

### Soils

Cabot silt loam, 0 to 3 percent slopes, very stony

Lyman-Marlow very rocky loams

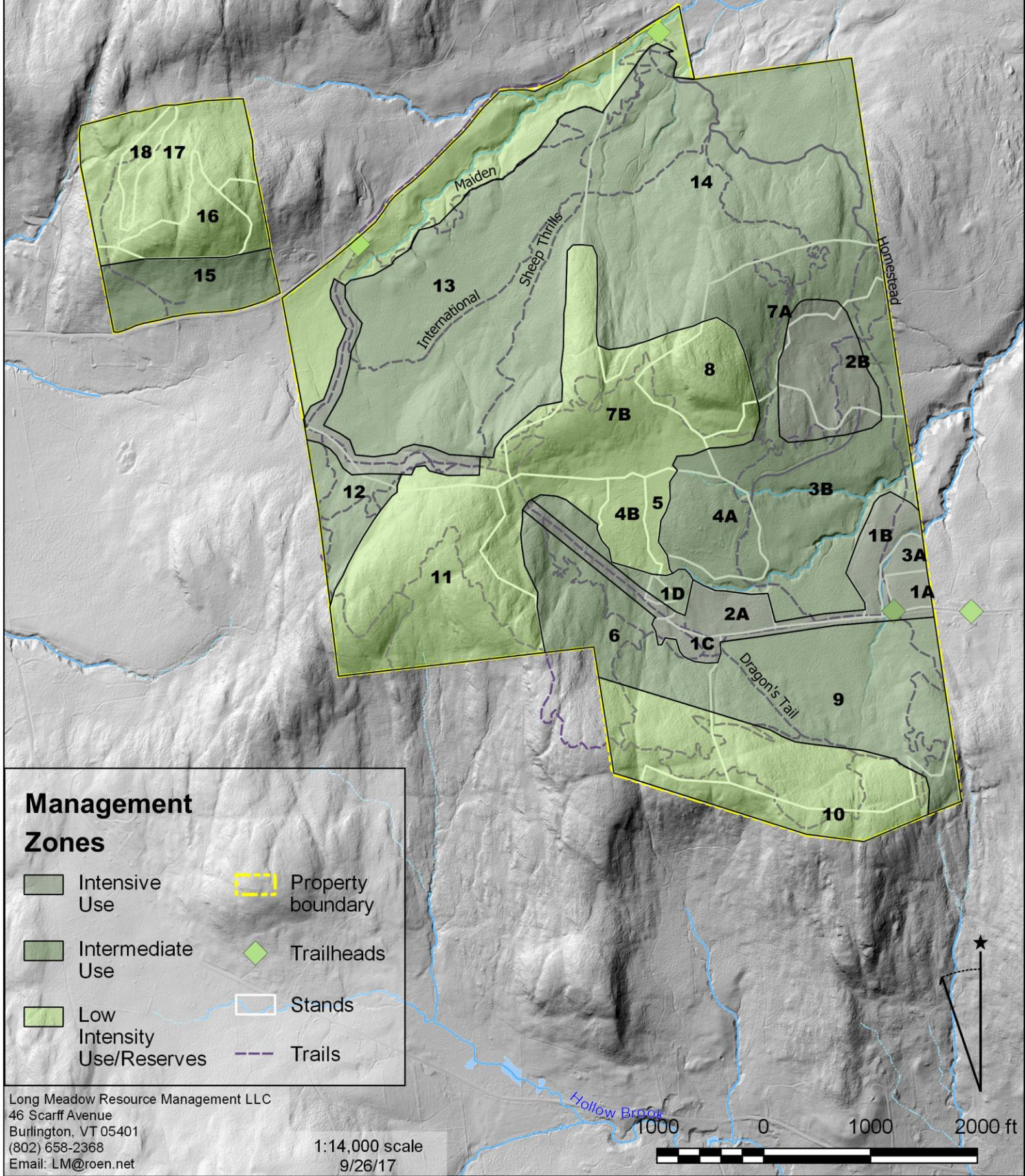
Marlow fine sandy loam

Peru fine sandy loam



# HINESBURG TOWN FOREST

## Management Intensity Zones



### Management Zones

- Intensive Use
- Intermediate Use
- Low Intensity Use/Reserves
- Property boundary
- Trailheads
- Stands
- Trails



## V. TRAILS AND RECREATION

The Hinesburg Town Forest is an important local and regional recreational resource. There are estimated to be over 16 miles of trails. Trails are used primarily by bikers, but are also enjoyed by hikers, dog walkers, joggers, birders, etc. ATVs and horseback riders use the main access roads, which have been improved with gravel. Each day of the inventory pedestrian, mount bike, and/or ATVs were observed, whether cold and rainy or hot and buggy.

This extensive network of trails is managed by the Fellowship of the Wheel (FOTW), a Williston-based non-profit that “builds and maintains responsibly-built sustainable multi-use singletrack for human powered recreation in Chittenden County, Vermont” ([www.fotwheel.org](http://www.fotwheel.org)).

Most all the trails are being well managed by FOTW. Field investigations showed that trail structures such as water bars, bridges, and hardened surfaces are doing much to check erosion and other impacts (Figure 1).

There were a few muddy spots observed on the Sheep Thrills, Maiden and Passing the Horizon that would benefit from improved drainage or hardening. It should be noted, though, that it is very difficult to completely avoid muddy zones during a high-water year such as we had this past season.

There are some intersections where signage is confusing, with multiple signage types and hard to understand wayfinding. There are also some drainage issues on the woods road that goes north into the Hollis parcel from Hayden Hill Road. Runoff from that trail was entering the town road after some heavy spring rains.

One other issue is that a view spot on Passing the Horizon Trail is becoming overgrown (Figure 2).

### **Management Recommendations:**

- Continue to monitor condition of recreational trails, giving on-site feedback to FOTW where necessary.
- Create signage standards for a consistent and effective wayfinding experience.
- Install two or three waterbars on the woods road in the Hollis parcel.
- Designate and map a limited number of key viewpoints in the HTF. Prune designated overlooks, with the goal of maintaining vistas while retaining a naturalized feel.



*Figure 1. Hardened trail reinforced with rock*



*Figure 2. Overgrown view point on Passing the Horizon trail*



## VI. WILDLIFE HABITAT

The physiographic regions defined in the Forest Bird Habitat Assessment (Audubon Vermont) are used in wildlife evaluation for this plan (Figure 3). These wildlife management zones reflect differing habitat types on a landscape level.

Zone 1 is comprised of a variety of types of hardwood forest that tend to be younger than other areas. In the eastern part of Area 1, the brooks have carved out some steep banks with exposed dirt faces, creating potential kingfisher habitat. Birds in Area 1 include black-throated blue warbler, hermit thrush, red-eyed vireo, blue jay, starling, cedar waxwing, mourning dove, roughed grouse, ovenbird, and woodpecker. Bear scat was seen in the east-central part of Zone 1.

Zone 2 encompasses the lowland plantations on the property, including the large blowdown. Avian species in Zone 2 heard or seen include winter wren, cedar waxwing, red eyed vireo, black capped chickadee, hairy woodpecker, hermit thrush, white breasted nuthatch, blue jay, red tailed hawk, ovenbird and black-throated-blue warbler. Bear scat was also seen in this area.

Zone 3 is made up of more mature hardwoods. Bird species found include Swainson's thrush, veery, pileated woodpecker, red-eyed vireo, ovenbird, white breasted nuthatch, tufted titmouse, house sparrow, cedar waxwing, black-throated blue warbler, yellow warbler and American robin.

Zone 4 contains the higher ridges of the property. There are many rock outcrops and associated crags in this area, which creates potentially denning areas. Birds seen or heard include black-throated blue warbler, hermit thrush, hairy woodpecker, ovenbird, red-eyed vireo, black-caped chickadee, brown creeper, white-breasted nuthatch and cedar waxwing.

Zone 5 is norther part of the Hollis Parcel, which has a wide diversity of site conditions in a relative small area. These include a dry, acidic hilltop, a large vernal pool, a red maple swamp (possible a Northern Hardwood Seepage Forest natural community), and rich hardwood forests on the north facing slope. Bird species heard or seen in the area include barred owl, winter wren, oven bird, blue jay and hermit thrush.

Deer activity is evident throughout the property, with deer scat common in many areas.

Vernal pools should continue to be mapped and verified in the HTF wherever they are found. Forest Management around vernal pools should seek to follow the attached "Suggested Guidelines for Timber Harvesting Around Vernal Pools." Areas of road and trail ditches with vernal pool-like attributes should be exempted from this rule.

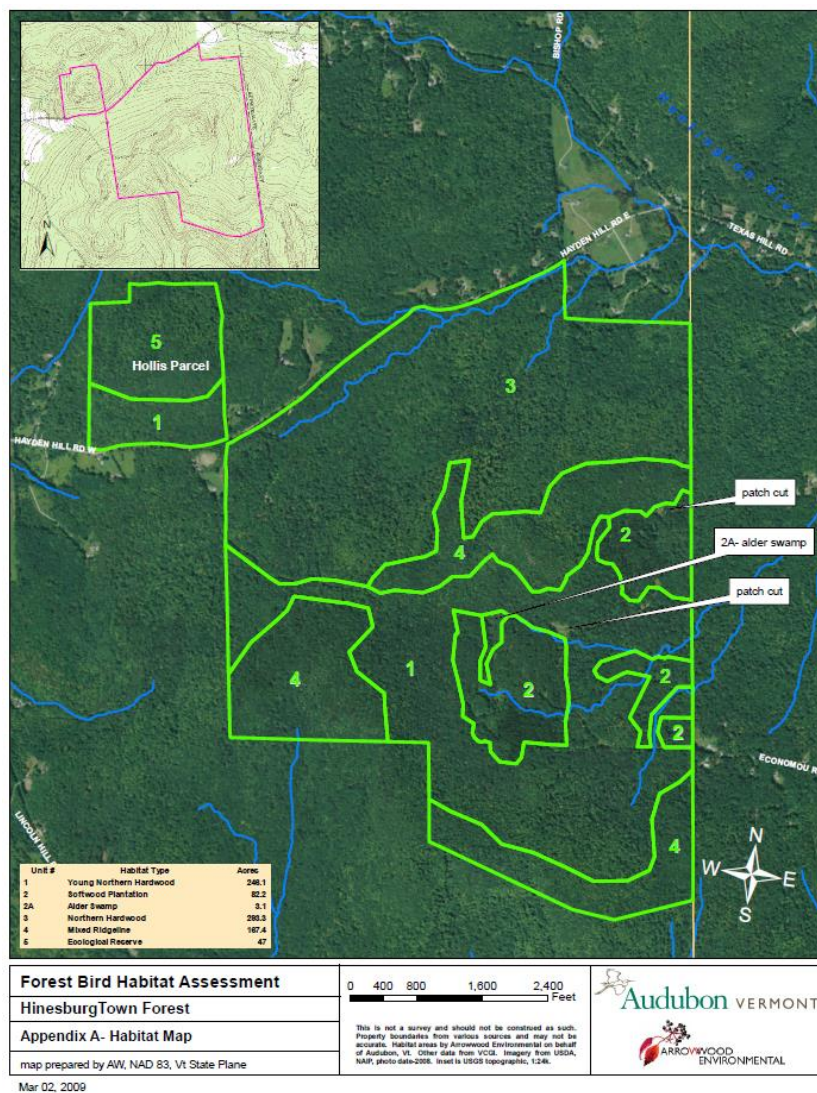


Figure 3. Forest Bird Habitat Assessment Management Zones



Figure 4. Bear scat.



## VII. BOUNDARY CONDITIONS

The entire boundary was walked as a part of the field work for this plan. Blue flagging was used to indicate boundary trees. Pink flagging was used for corner pins and barbed wire. Many of the corners were found and boundaries are evident, though many of the blazes are old and fading (Figure 6).

There are two main boundary issues on the HTF. One is in the northwest corner of the Hollis parcel, and the other is along the southwestern boundary.

**Hollis Parcel:** The HTF committee noted that there are questions around how the northwest corner of the Hollis parcel was laid out. This area is quite confusing on the ground, as there is an old fence line that seems to be the logical location of the boundary. Town property records have a survey on file for this area from Nolen and Pamela Frances (Grantee), Plat 170-B recorded 4/29/2008 (Figure 5). Further field work located the corner pins and fence line as indicated in the survey, which were flagged on the ground. This changes the shape of that corner from previous HTF maps.

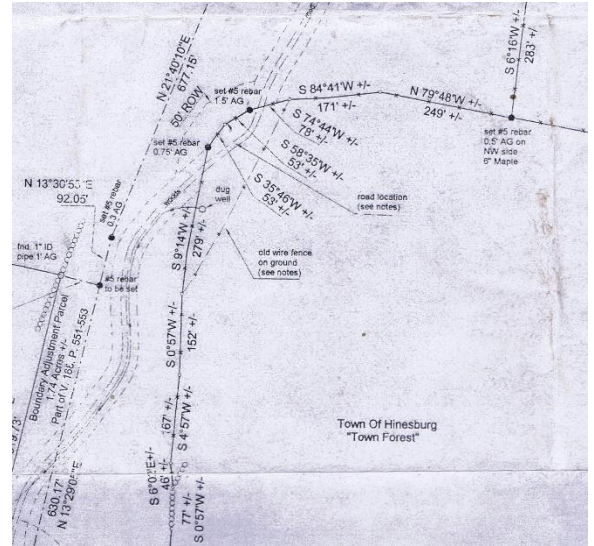


Figure 5. Detail of Plat 170-B

Because the survey is recorded in the town records, with corresponding evidence found on the ground, this would be considered the legal boundary. Having said that, there is a concern that the boundary was surveyed incorrectly. This is attested to the fact that part of the private road, and a private well, are both contained within the HTF. Also, there is another fence line that could have served as an older boundary. This possible discrepancy would take more deed research to resolve.

**Southwestern Boundary:** There are several discrepancies along the western side of the southern boundary of the HTF. This boundary was walked with Tom Sweet, forester for the Carse Land Company LLC, who shares the boundary. The maps on the next page can be used to follow the discussion.

Corner A is undisputed and well established (Figure 7). It was found exactly as indicated on the tax map, and monumented by a somewhat obscured quartz stone pile where the north/south and east/west line meet. The only problem is no witness blazes were found facing the stone pile. There is also a wood tree stand at this location.

The line between A and B follows scant evidence of old barbed wire, blazes and red paint. Following these indicators when they were found shows a line that runs in variable directions. There was no monumentation found at Corner B, though there is a bunch of barbed wire and old paint.

The line between B and C is also evidenced by scant old barbed wire, blazes and red paint. There was no monumentation found at Corner C, though its location was estimated in the field where the two lines come together. The boundary line as indicated on the tax map and Carse map (yellow) was followed between these two points, but no evidence was found. It is interesting to note that maps in the 1986 Brynn HTF Land Management Plan show the boundary matching what was found in the field, though no reference was given on where that boundary information was obtained (Figure 8).

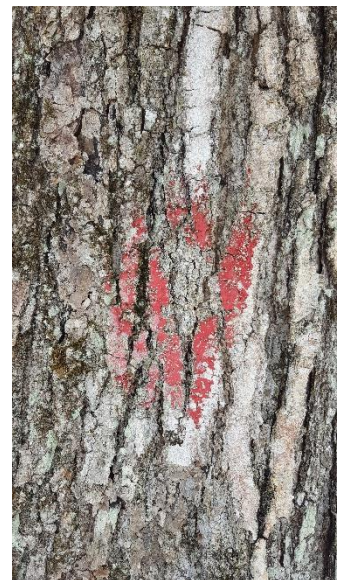


Figure 6. Old boundary point becoming obscured

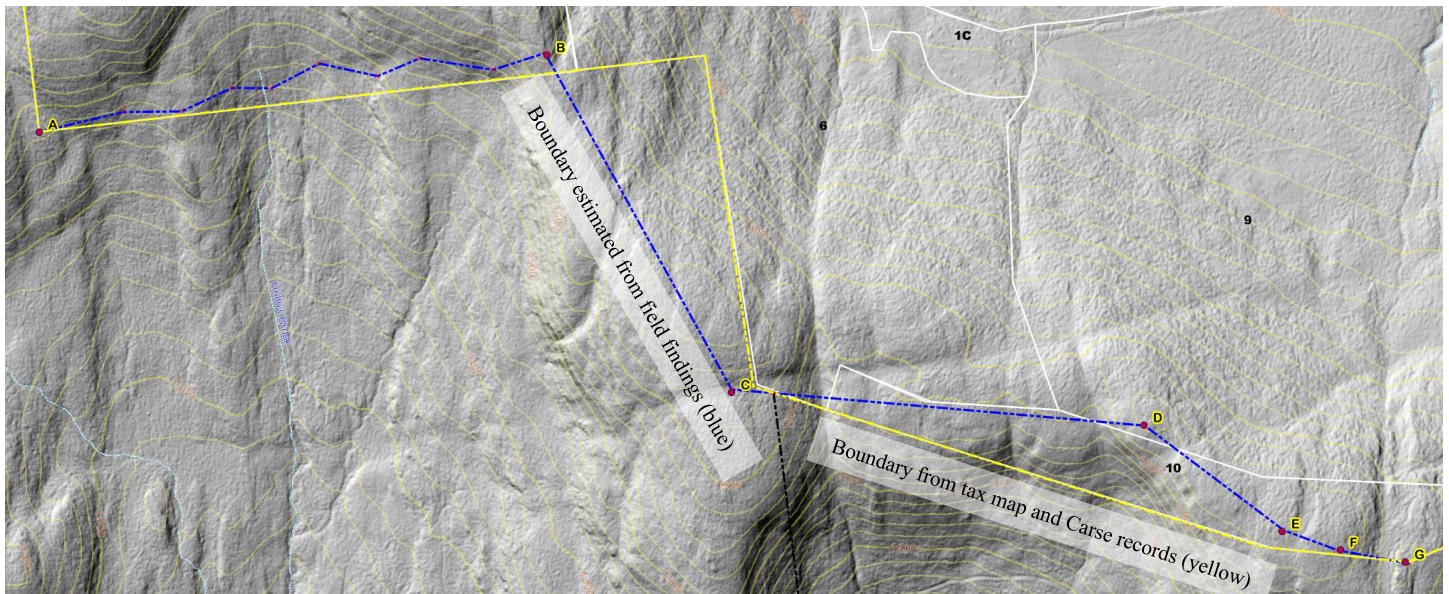


Figure 7. Southwest boundary

Not much boundary evidence was found between C, D, and E, except for very scant barbed wire. An old blaze was found at D. An iron pin was found at Corner E.

Scant evidence of old barbed wire, blazes and red paint were found between E, F, and G. Boundary paint was found at F. An iron pin was found at Corner G.

The black boundary line in figure 8 is an extension of the Carse line that goes up the hill from Lincoln Hill Road. This line is not hard to find in its lower portion, but evidence runs out as it approaches the HTF boundary.

### Management Recommendations:

- Perform further deed research to confirm the possible discrepancy in the northwest corner of the Hollis parcel.
- Continue to paint boundaries so that they do not become obscured. Implement a regular boundary maintenance schedule, either painting the entire boundary every 10 years, or cycling through individual boundary lines every few years so that all boundaries are covered at least once every 10 years.
- Enter into an agreement with the Carse Land Company to share the cost of surveying the southwest boundary.

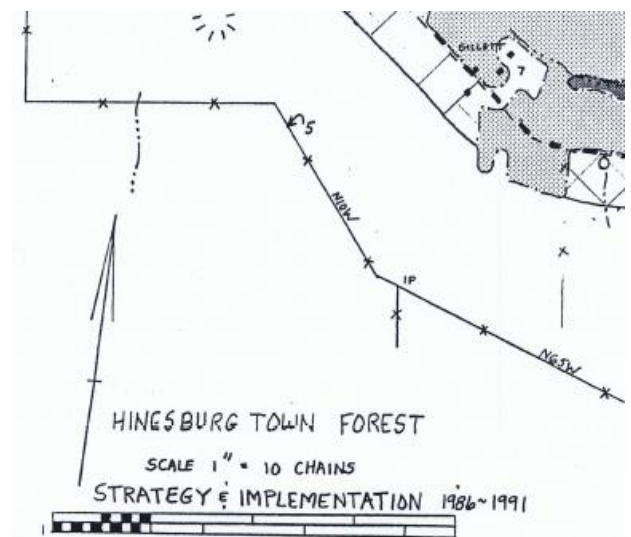


Figure 8. Map detail from 1986 Land Management Plan



## **VIII. PAST PRACTICES**

There is a long and rich history of forest management in the Hinesburg Town Forest. In the 1940's the State of Vermont assisted the Town of Hinesburg in planting Norway Spruce and White Pine on abandoned farm fields to create productive forestland (records show that the state assisted in planting 81,700 trees since 1909).

The first record of harvesting under the management of a forester was in 1958. 50.3 MBF of sugar maple sawlogs (and a small amount of beech), and 22.3 cords of white birch were harvested. Before that time logging had occurred, but often lacked oversight. Comments from the state forester state "This has always been a troublesome Town Forest. Selectmen often choose to sell timber without the use of a contract of a forester's guidance. Many log roads have not been water barred and are in bad shape."

It is good to see that management of the HTF has improved markedly over the years. Since the 1950's, there are records of 547.5 MBF and 457.2 cords harvested under direction of State and/or County Foresters. Many of the cuts in the 1980's and 1990's have greatly improved stand conditions.

There is an abundance of old logging roads still evident throughout the HTF. Some are being utilized as recreational trails, but many are off in the woods.

## **IX. CLIMATE CHANGE AND INVASIVE SPECIES**

While it is alluded to in many locations in this Forest Management Plan, it is worth stating explicitly how the recommendations proposed here interact with the challenges posed by climate change and invasive exotic species. These factors increasingly interfere with the health and function of our forested ecosystems; in our stated goals to manage this forest responsibly and sustainably over the long term, it is incumbent upon us to employ management strategies that account for these factors.

It is impossible to know exactly how climate change will express itself in our forested ecosystems. The best defense that we have at our disposal is the tremendous diversity offered by our forested ecosystems -- many tree species capable of growing in many different ways, filling many different niches. Species diversity (many different tree species) and structural diversity (many different ages and sizes of trees), coupled with the protection of unique species, natural communities and sites not only provides the best possible wildlife habitat, it also increases the *resilience* of the forest: its ability to remain healthy and productive in the face of disturbance. Managing for diversity helps to ensure that the forests in the HTF are able to respond and adapt with vigor, no matter what types of disturbances we face in the future.

All of the management proposed in this plan seeks to increase species and structural diversity in the HTF, converting all managed areas to a structurally diverse condition over time. Each of these prescriptions seeks to increase "irregularity," and create conditions that favor the widest mix of site-appropriate native vegetation possible, growing in a complex structure. Our management strategies also seek to model natural disturbances: studies of natural forest disturbance regimes and stand dynamics have verified that unmanaged forests assume a structurally diverse condition over time through disturbances of a scale and quality similar to those proposed in this Forest Management Plan.

Another critical aspect of managing for a resilient forest is controlling the introduction and spread of invasive species. Invasive exotic insects and diseases, such as the Emerald Ash Borer (EAB), Dutch elm's disease, butternut canker, and beach bark disease, are difficult or impossible to control. Our best defense against these invasives is, as in the case of climate change, to manage for a diverse forest, stocked with species that are capable of stepping into the niche vacated by effected species. That said, there are some invasive species, such as the Asian Long-horned beetle (ALB) that can be controlled. Should we become aware of any such infestation that may affect the HTF, a plan should be made for how to minimize the spread of these species and their effect on the HTF.

The invasive exotic species that we are able to control most effectively are plants. These invasive exotic plants are present at a low density in some areas of the HTF, and are extremely abundant throughout Chittenden County, especially in the Champlain Valley. These plants threaten the long-term viability of forests at the HTF by out-competing native species, interfering with the natural regeneration that forests rely on to be healthy. They lower diversity in the forest, replacing an array of native species with one or a few invasives, and decrease the quality of wildlife habitat.

It is likely that these invasive exotic plants will benefit from the effects of climate change, and so become more of a problem in the future. Eradication of these species from the landscape is unrealistic, so we now talk about the management of these species in terms of “control.” Any landowner in Vermont should be continually monitoring their land for the presence of these plants and removing them as soon as they are established. Early removal decreases the chance that these species will be able to reproduce and spread, lowers the cost of removal and mitigates the need for the use of herbicide. A reasonable level of control of these species is a level at which the HTF is continually monitored, and invasives are hand-pulled as soon as they are found.

The management strategies proposed in this Forest Management Plan, while they will increase the health and resilience of the HTF, will also potentially create opportunities for invasives to become established in new areas. Harvest areas should be well-mapped and monitored for invasives following activity. Any invasives found should be immediately removed.

Finally, while we can make a thoughtful, intelligent plan based on the best information available, the effects of climate change and invasive species will ultimately be unpredictable. As changes visit the HTF, it is important that we are flexible in our management strategies, and are responding robustly as new information, both in the form of research and conditions in the HTF, presents itself. If needed, we should amend this Forest Management Plan to address these issues when they surface.



## **X. STAND DESCRIPTIONS AND MANAGEMENT RECOMMENDATIONS**

Management recommendations are presented at the stand level. This allows town officials, with the help of professional resource managers, to best organize and plan for successful forest management.

Overall the HTF is well stocked with a variety of tree species and forest types. The list below shows trees and shrubs that were tallied. Other tree and plant species were picked up in reconnaissance assessment.

Species	Latin name	Overstory	Understory
American basswood	Tilia americana	X	
American beech	Fagus grandifolia	X	X
American elm	Ulmus americana	X	X
American hornbeam	Carpinus caroliniana		X
American witchhazel	Hamamelis virginiana		X
Balsam fir	Abies balsamea		X
Bitternut hickory	Carya cordiformis	X	
Black cherry	Prunus serotina	X	X
Chokecherry	Prunus virginiana	X	X
Eastern white pine	Pinus strobus	X	X
Gray birch	Betula populifolia	X	
Hophornbeam	Ostrya virginiana	X	X
Mountain ash	Sorbus		X
Mountain maple	Acer spicatum		X
Northern red oak	Quercus rubra	X	X
Norway spruce	Picea abies	X	X
Paper birch	Betula papyrifera	X	X
Quaking aspen	Populus tremuloides	X	X
Red maple	Acer rubrum	X	X
Red pine	Pinus resinosa	X	X
Red spruce	Picea rubens	X	X
Speckled alder	Alnus incana ssp. rugosa		X
Striped maple	Acer pensylvanicum	X	X
Sugar maple	Acer saccharum	X	X
White ash	Fraxinus americana	X	X
Yellow birch	Betula alleghaniensis	X	X
Hardwood snag (HW)		X	X
Softwood snag (SW)		X	X
Counts		22	24

Estimated income from timber sales have been provided for each stand. These estimates are for planning purposes only. Actual revenues can vary significantly due to fluctuations in market dynamics, timber quality, mill prices, trucking costs, weather conditions and other factors. Dollar estimates are stumpage value to the Town, net of any management costs or fees

**Stand Cover Type:** White pine plantation, Norway spruce component

**Natural Community:** Beech-Red Maple-Hemlock Northern Hardwood Forest

**Forest Management Zone:** Intensive Use

**Age Class Structure:** Even

**Site Class:** I

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam

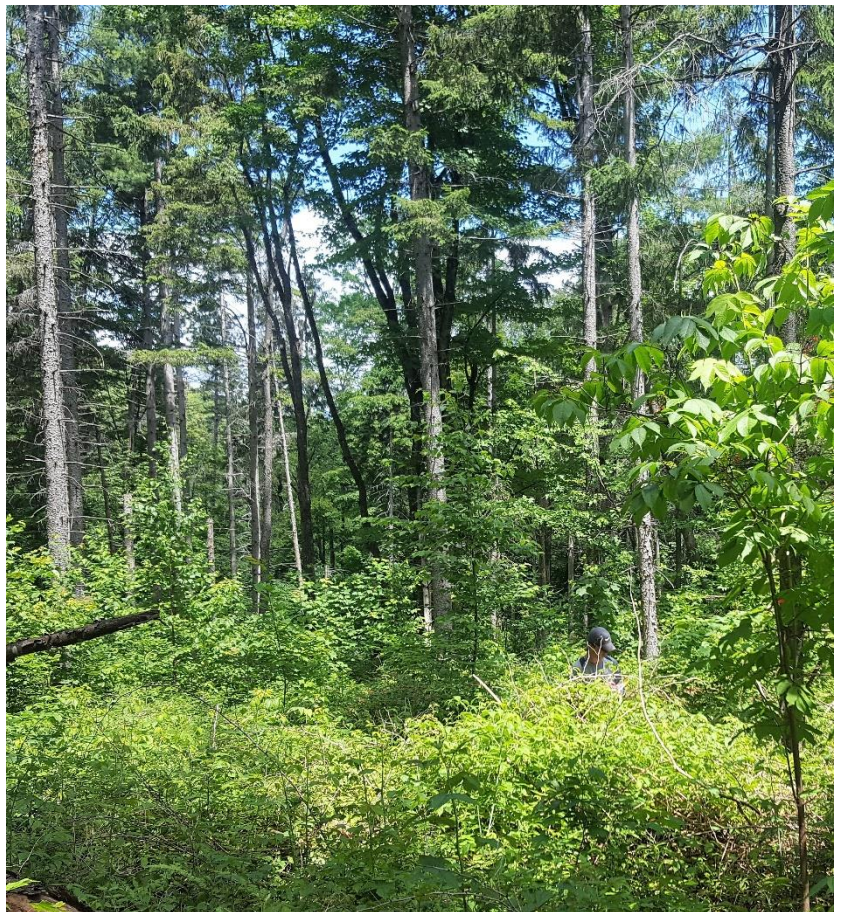
**Prime Ag Soils:** Statewide significant

**Stand Description:** Stand one is comprised of four areas of the plantations that were established in the 1940's. This stand is relatively even-aged, with the dominant age-class comprised of mainly field-origin and planted white pine, with a Norway spruce component. This stand was damaged by the 2010 wind storm, which removed a portion of the overstory and, in so doing, caused the establishment of new regeneration in some areas of the stand. Soils are fertile in this area, as evidenced by abundance of rich site indicator plants such as blue cohosh and maidenhair fern.

Work has been done over the years to improve the timber value of this stand, which has been greatly beneficial. Areas of the stand were pruned around 1960, some trees to 8' and some to 12'. Row thinnings were performed in 2002/2003, and 2010.

White pine makes up over half of the stand by density, and Norway spruce about 15%. Hardwood tree species comprise 15% of the basal area in the overstory, and include black cherry, red maple, striped maple, sugar maple and white ash. There is also a small amount of red spruce in the stand. Because of previous thinnings, these plantations are relatively open, with canopy closures ranging from 30% to 70% averaging out just over 50%. There is a band of blowdown in the western portion of Area 1D.

Regeneration is excellent in this stand, owing to the relatively open canopy and high-quality soils (Figure 9). This makes for a relatively dense midstory, creating excellent structural diversity for avian habitat. Areas are adequately to full stocked, primarily with hardwood seedlings and saplings. Some softwood regeneration is mixed in as well. Sugar maple makes up over half of the seedlings and saplings present. There is also an abundance of first-year ash seedlings coming up. This is due to a good seed year in 2016, combined with a moist spring and summer this year. Other regen species



*Figure 9. Hardwood regeneration*



include white birch, white pine, red oak, Norway spruce, red maple, black cherry, American beech, striped maple and yellow birch. Some of the more open areas are coming in to raspberries and blackberries.

Invasive species, specifically honeysuckle and buckthorn were found, but in small quantities. There is a small amount of inhibiting ferns present, making up about 10% of the ground cover.

There are an estimated 25 standing dead trees, or snags, per acre in the stand (Table 2). Most are in the 6" to 12" diameter size class, with a large amount the 12" to 18" size class as well. There are few greater than 18" d.b.h.

Timber volumes are high in this stand, at about 109 MBF/acre (Table 3). About three-quarters of the volume is in trees 12" to 20" diameter.

## Stand Data

**Sampling Date:** 7/31/2017

**Number Points/Plots:** 7

**Quadratic Mean Stand Diameter (inches):** 13.6

**Stems/acre:** 142.8

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 118.6

**Acceptable Growing Stock:** 92.9

**Unacceptable Growing Stock:** 25.7

**Stocking level:** B on White pine Stocking Guide

**Canopy Closure:** 53%

**Midstory Closure:** 74%

**Snag Trees/acre:** 24.9

dbh	black cherry	Norway spruce	red maple	red spruce	striped maple	sugar maple	white ash	white pine	sum	%
<4										
4 - 6					1.4				1.4	1%
6 - 8						1.4			1.4	1%
8 - 10		1.4		1.4					2.9	2%
10 - 12			1.4	1.4		1.4	1.4	1.4	7.1	6%
12 - 14		5.7	1.4	2.9		1.4		10.0	21.4	18%
14 - 16	1.4	4.3		1.4				11.4	18.6	16%
16 - 18		7.1	1.4	1.4			1.4	10.0	21.4	18%
18 - 20		4.3					1.4	10.0	15.7	13%
20 - 22								14.3	14.3	12%
22 - 24								7.1	7.1	6%
24 - 26		1.4					1.4	2.9	5.7	5%
26 - 28										
28 - 30								1.4	1.4	1%
sum	1.4	24.3	4.3	8.6	1.4	4.3	5.7	68.6	118.6	100%
%	1%	20%	4%	7%	1%	4%	5%	58%	100%	

**Table 1. Basal area per acre by 2-inch diameter class – Stand 1**

dbh	SW snag
<= 1	
1 - 6	
6 - 12	13.2
12 - 18	9.8
18 - 24	1.9
>= 24	
<b>TOTAL</b>	<b>24.9</b>
Table 2. Snags/acre, Stand 1	

### Timber Table:

dbh	black cherry	Norway spruce	red maple	red spruce	white ash	white pine	TOTAL
<=8							
8 - 10						65	65
10 - 12		158	68	337		429	992
12 - 14	117	349		117		998	1,583
14 - 16		607	111		163	608	1,489
16 - 18		791		122		1,122	2,034
18 - 20		216			170	1,389	1,775
20 - 22						1,658	1,658
22 - 24					94	711	804
24 - 26		178				383	561
<b>TOTAL</b>	<b>117</b>	<b>2,299</b>	<b>179</b>	<b>577</b>	<b>427</b>	<b>7,362</b>	<b>10,961</b>
Table 3. Board feet per acre by 2-inch diameter class – Stand 1							

## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Even-age Management

**Present Stand Age:** 75

**Rotation Age:** Areas 1A and 1B, 80-100 years. Areas 1C and 1D, 120 years.

**Treatment Year:** 2018 for Areas 1A and 1B.

**Treatment:** Irregular shelterwood

**Residual Basal Area:** 50

**Species favored for retention and regeneration:** White pine, black cherry.

**Estimated income from timber sale:** \$4,000

**Recommendations:** Management practices should be split between Areas 1A and 1B, and Areas 1C and 1D. The goal is to help to diversify stand conditions, vary rotation age, and spread out economic returns.

In areas 1A and 1B, an irregular group shelterwood is recommended and prescribed for year 2018. This treatment will gradually regenerate this stand by removing overstory trees in groups up to 2 acres in size on a progressive basis. In this initial round of cutting, the primary goal will be to remove groups of trees which are at risk of windthrow or mortality due to stand damage from 2010. Harvesting these groups will also serve to release regeneration established in 2010, and so the utmost care will be taken to protect



regeneration during the course of the harvest. Groups may also be created which expand gaps created in 2010, releasing established regeneration and establishing new pockets of regeneration.

Within groups, windfirm trees of all species may be retained as dispersed individuals and/or as small groups of stems. These inclusions will be retained indefinitely within these groups, functioning as structural diversity, wildlife habitat and seed sources. Snags and cavity trees should also be retained for wildlife wherever they are found. This treatment will remove the overstory in a total of approximately 5 acres throughout Stand 1.

Overall, this treatment will capture value in standing overstory stems, while releasing established regeneration and establishing new regeneration. The goal for this stand will be to regenerate 30% of the stand area every 10 years, so that the stand has been 90% regenerated in 30 years, with 10% of the stand kept as reserves indefinitely. The goal will be to create a young stand with a somewhat patchy structure, comprised of a diversity of healthy, native tree species.

Between groups, a light thinning should occur. This treatment will seek to release high-quality stems of all species, and to capture value in damaged, defective and poor-quality trees between groups. This treatment may also have the added benefit of establishing areas of shade tolerant regeneration, which will be released in subsequent entries. This treatment will be light, lowering the basal area between groups to approximately 100 ft<sup>2</sup>/acre.

This treatment should occur in the winter and will likely utilize a whole-tree logging crew, although other equipment mixes should be considered. The established landing on Economou Road should be utilized, though it may need to be expanded somewhat to accommodate a whole-tree crew. This treatment should be done in conjunction with scheduled treatments in Stands 2 and 3.

Consider temporarily relocating or detouring Eagle's Trail to the west (into stand 3B) to minimize conflict with logging operations.

Although the character of this area would visually change after an intensive harvest, there are several reasons that removing much of the overstory is recommended. First, the site is successfully reverting to northern hardwoods with a softwood component, which likely resembles the natural state of this area before settlement. This native cover is preferable to the planted softwood overstory that currently exists. Second, the recent large-scale blowdown that occurred near by indicates the vulnerability of the remaining plantations to a similar event. Such an incident would create another largely unusable area for recreation, and a loss of timber value to the town.

Reassess conditions in 2027. If there are no great departures from the current assessment, harvest areas 1C and 1D in the same manner as recommended above.

**Stand Cover Type:** Norway spruce plantation, white pine component

**Natural Community:** Beech-Red Maple-Hemlock Northern Hardwood Forest

**Forest Management Zone:** Intensive Use, Moderate Use

**Age Class Structure:** Even

**Site Class:** I

**Soil Series:** Peru fine sandy loam, Marlow fine sandy loam

**Prime Ag Soils:** Statewide significant

**Stand Description:** As with Stand 1, Stand 2 is comprised of areas that were former farm fields planted to softwoods. This stand is relatively even-aged, with the dominant age-class comprised of mainly planted Norway spruce, which makes up over two-thirds of the basal area. There is a small component of white pine and red spruce, and other hardwoods such as red maple, sugar maple, white ash, black cherry and quaking aspen. This stand was damaged by the 2010 wind storm, which removed a portion of the overstory and, in doing so, caused the establishment of new regeneration in some areas of the stand.

Stand 2 is broken down in to two components: Area 2A, which is a 7.3 acre stand north of the main access road extending from Economeau Road; and Area 2B, a 23.4 acre area adjacent to the eastern boundary along its center portion. Both areas have a relatively gentle slope, with an east to northeast aspect.

Crown openings vary depending on past management, but the canopy is relatively open overall, averaging 59% closure. The midstory is also not very dense, averaging 36%, so the stand overall has low structural diversity. Some of the more open areas of the stand are dominated by raspberries, blackberries and thimbleberries. There are a large number of snag trees per acre, particularly in the smaller size classes.

Regeneration is variable in this stand. Most areas are somewhat understocked, and what regeneration is there is mostly in the seedling size class with a small number of saplings. Regeneration is primarily white pine, sugar maple and red maple. Other species include white ash, Norway spruce, black cherry, choke cherry, beech, white birch, yellow birch, red pine and red oak. A small amount of invasive honeysuckle was found in the understory of Area 2A.

Sawlog volumes are very good, though less than in Stand 1, estimated at 8.9MBF/acre (Table 6). Three quarters of the sawlog volume is in Norway spruce, two-thirds of which is in the 14" to 18" size class. Tree quality is good, with about three-quarters of trees being acceptable growing stock.

There has been management performed in both areas of the stand, but better documentation exists for the cutting performed in Area 2B. In 2005, an intermediate thinning was conducted in Area 2B to bring it to the B line, (bring it down from an overstocked condition to an adequate stocking level). At the same time, three acres of red pine were removed to stimulate regeneration.



## Stand Data

**Sampling Date:** 7/3/2017

**Number Points/Plots:** 7

**Quadratic Mean Stand Diameter (inches):** 12.3

**Stems/acre:** 178.9

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 124.3

**Acceptable Growing Stock:** 94.3

**Unacceptable Growing Stock:** 30.0

**Stocking level:** B-C on Norway spruce Stocking Guide

**Canopy Closure:** 59%

**Midstory Closure:** 36%

**Snag Trees/acre:** 27.5

dbh	SW snag	HW snag	TOTAL
<= 1			
1 - 6	10.5		10.5
6 - 12	11.6	2.2	13.8
12 - 18	1.8		1.8
18 - 24	0.7	0.7	1.4
>= 24			
<b>TOTAL</b>	24.6	2.9	27.5
<b>Table 4. Snags/acre, Stand 2</b>			

dbh	black cherry	Norway spruce	quaking aspen	red maple	red spruce	sugar maple	white ash	white pine	sum	%
<=4										
4 - 6		1.4			1.4	1.4			4.3	5%
6 - 8		2.9			1.4		1.4		5.7	6%
8 - 10		4.3				1.4			5.7	6%
10 - 12		7.1			1.4				8.6	9%
12 - 14	2.9	8.6		1.4	1.4				14.3	15%
14 - 16		20		1.4	1.4			1.4	24.3	26%
16 - 18		12.9	1.4				1.4	1.4	17.1	18%
18 - 20		4.3						4.3	8.6	9%
20 - 22		2.9						1.4	4.3	5%
22 - 24										
24 - 26										
26 - 28								1.4	1.4	1%
<b>sum</b>	2.9	64.3	1.4	2.9	7.1	2.9	2.9	10	94.3	100%
<b>%</b>	3%	68%	1%	3%	8%	3%	3%	11%	100%	
<b>Table 5. Basal area per acre by 2-inch diameter class – Stand 2</b>										

**Timber Table:**

dbh	black cherry	Norway spruce	quaking aspen	red maple	red spruce	sugar maple	white pine	TOTAL
<=8								
8 - 10		137						137
10 - 12		707			113			820
12 - 14	152	858		70	136			1,216
14 - 16		2,530		72	163	71	153	2,989
16 - 18		1,747	79				116	1,942
18 - 20		387					570	957
20 - 22		520					210	729
22 - 24								
24 - 26								
26 - 28							122	122
TOTAL	152	6,886	79	143	412	71	1,171	8,914
Table 6. Board feet per acre by 2-inch diameter class – Stand 2								

**MANAGEMENT RECOMMENDATIONS****Long Range Silvicultural Objectives:** Even-age Management**Present Stand Age:** 75**Rotation Age:** Area 2A, 80-100 years; Area 2B, 120 years**Treatment Year:** 2018**Treatment:** Irregular shelterwood**Residual Basal Area:** 50**Species favored for retention and regeneration:** Sugar maple, white pine, black cherry**Estimated income from timber sale:** \$1,800

**Recommendations:** The long-term goal for this stand is to revert the forest to a diverse composition of natural, native species, growing in a complex structure. In 2018, trees in Stand 2A at risk of windthrow and mortality as a result of the 2010 wind storm should be removed. This harvest is essentially a salvage, and so its main purpose is to capture value, but it will also serve to release regeneration that was established in 2010. This portion of the harvest will remove the overstory in approximately 30-50% of the stand.

In areas of Stand 2A which still feature well-stocked, windfirm plantation trees, a light thinning should occur. While Norway spruce is a non-native species, these trees are valuable and immature, and would benefit greatly from being thinned. This will be a thinning “from below”, removing poor quality trees in suppressed and intermediate canopy positions to concentrate growth on high-quality dominant and co-dominant stems. This treatment will be light, reducing stocking in areas of the stand treated to approximately 100-110 ft<sup>2</sup>/acre.

This stand should be reassessed at the time of the next Forest Management Plan update. The long-term goal for Stand 2A will be to regenerate this area and establish a stand of native tree species with a high degree of species and structural diversity.

This treatment should occur in the winter and will likely utilize a whole-tree logging crew, although other equipment mixes should be considered. The established landing on Economou Road should be utilized, though it may need to be expanded somewhat to accommodate a whole-tree crew. This treatment should be done in conjunction with scheduled treatments in Stands 1 and 3.

Reassess conditions in 2027. If there are no great departures from the current assessment, harvest area 2B in the same manner as recommended above.



**Stand Cover Type:** Intermediate northern hardwoods

**Natural Community:** Northern Hardwood Forest

**Forest Management Zone:** Moderate Use

**Age Class Structure:** Even

**Site Class:** I

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam, Marlow fine sandy loam

**Prime Ag Soils:** Statewide significant in Area 3A, and in the center of Area 3B.

**Stand Description:** Stand 3 is made up of two areas in the eastern part of the property. Area 3A is 3.3 acres of hardwoods between plantations 1A and 1B. Area 3B is 60.6 acres of hardwoods bound by plantations (and former plantations in the blowdown area). The middle of Area 3B had a 3 acre white spruce/red pine plantation, established in 1939, that has been harvested.

The bulk of the stand is in a convex east-facing bowl, bisected by several streams. The stand is on the midslope of the hill, and has a gentle 15% gradient. Area 3A has wet soils, particularly in the south section. Area 3b has some seeps in the northeast section. Gully erosion was observed on one of the streams, occurring after an intense downpour in early July.

Some important recreation trails go through this stand, including Eagle's Trail and Homestead Trail. There is some cultural debris that has been left in the stand, including some old rusted truck parts, and an abandoned hunting stand in the southern part of Stand 3B (Figure 10).

This is a diverse stand of mostly hardwoods. Sugar maple makes up the largest component, about a third of the basal area. Red maple and white ash are the next most abundant species, combined they make up about a third of the basal area. Paper birch, American beech, red pine, yellow birch, red spruce, eastern white pine, black cherry, hophornbeam, American elm and quaking aspen are also in the overstory. There are some rich site plant indicator species in the center of Area 3B, coinciding with the Marlow fine sandy loam soils.

Trees vary in size ranging up to 36" d.b.h. About half the trees are between 10" and 18" d.b.h. There is a small patch of red pine still standing, located in the western arm of Area 3B, just south of the large blowdown. Most of the snag trees are in the 6" to 12" and 12" to 18" size classes (Table 7).

Regeneration is adequate to fully stocked with high-quality hardwood species. Sugar maple is predominant, present in large numbers throughout the stand, and in advanced stages in some areas. Other species include paper birch, northern red oak, red maple, white pine, white ash, black



Figure 10. Abandoned hunting stand

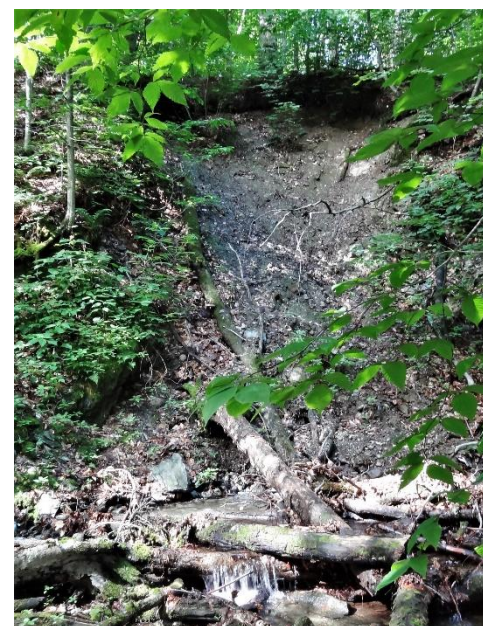


Figure 11. Gully erosion.

cherry, American beech, striped maple, chokecherry, and in wet areas speckled alder.

Some of the large white ash have thinning crowns, a potential sign of poor health and/or decline. Also, there is a heavy incidence of white pine blister rust on a few of the pines in the center of the stand. Overall, about two-thirds of trees are acceptable growing stock. There is some old blowdown in the western part of Area 3B.

Per acre timber volumes are moderate for this stand, at 4.3 MBF/acre (Table 9). Most of the value is in sugar maple and white ash.

#### Stand Data

**Sampling Date:** 7/3/2017

**Number Points/Plots:** 10

**Quadratic Mean Stand Diameter (inches):** 10.0

**Stems/acre:** 225.8

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 107.0

**Acceptable Growing Stock:** 71.0

**Unacceptable Growing Stock:** 36.0

**Stocking level:** A-B on Northern hardwoods Stocking Guide

**Canopy Closure:** 73%

**Midstory Closure:** 65%

**Snag trees/acre:** 34.6

dbh	HW snag	SW snag	TOTAL
<= 1	5.3		5.3
1 - 6			
6 - 12	13.2	5.1	18.3
12 - 18	7.2	3.3	10.5
18 - 24	0.5		0.5
>= 24			
TOTAL	26.2	8.4	34.6

Table 7. Snags/acre, Stand 3

dbh	beech	elm	black cherry	hophorn beam	paper birch	quaking aspen	red maple	red pine	red spruce	sugar maple	white ash	white pine	yellow birch	sum	%
<4															
4 - 6	2.0								1.0	2.0				5.0	5%
6 - 8	2.0	1.0		1.0	1.0		2.0			3.0	1.0			11.0	10%
8 - 10	1.0				2.0		1.0			1.0	1.0	2.0	1.0	9.0	8%
10 - 12					1.0		5.0			8.0	1.0			15.0	14%
12 - 14	1.0		1.0		1.0		4.0	3.0		6.0	2.0		1.0	19.0	18%
14 - 16					3.0		4.0	3.0		2.0	1.0		1.0	14.0	13%
16 - 18					1.0		3.0		1.0	6.0			1.0	12.0	11%
18 - 20			1.0			1.0	2.0			3.0	1.0			8.0	7%
20 - 22	1.0									1.0				2.0	2%
22 - 24										1.0				1.0	1%
24 - 26							1.0				3.0			4.0	4%
26 - 28											2.0			2.0	2%
28 - 30										1.0				1.0	1%
30 - 32										1.0				1.0	1%
32 - 34										1.0	1.0			2.0	2%
34 - 36											1.0			1.0	1%
sum	7.0	1.0	2.0	1.0	9.0	1.0	22.0	6.0	2.0	36.0	14.0	2.0	4.0	107.0	100%
%	7%	1%	2%	1%	8%	1%	21%	6%	2%	34%	13%	2%	4%	100%	

Table 8. Basal area per acre by 2-inch diameter class – Stand 3

### Timber Tables:

dbh	black cherry	paper birch	quaking aspen	red maple	red pine	red spruce	sugar maple	white ash	white pine	yellow birch	TOTAL
<=8											
8 - 10		43							59		102
10 - 12				95	317		142	133			688
12 - 14	53	121		201	222		124	111			831
14 - 16		104		232	113	84	183			150	867
16 - 18			149				293				442
18 - 20	103			161			314	151			729
20 - 22											
22 - 24							82	66			148
24 - 26								57			57
26 - 28								260			260
28 - 30											
30 - 32								57			57
32 - 34								129			129
TOTAL	155	268	149	689	653	84	1,139	964	59	150	4,309

Table 9. Board feet per acre by 2-inch diameter class – Stand 3



## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Even-age Management

**Present Stand Age:** 75

**Rotation Age:** 100-120

**Treatment Year:** 2018

**Treatment:** Small group and single tree selection

**Residual Basal Area:** 75

**Species favored for retention and regeneration:** Sugar maple, yellow birch, red oak

**Estimated income from timber sale:** \$9,000

**Recommendations:** This stand should be treated with a single tree/group selection treatment in 2018. The primary purpose of this treatment will be to increase structural diversity in the stand, establishing a new age class of trees while capturing value in low quality and declining stems.

Groups up to 1 acre in size will be established in areas with a high proportion of poor-quality stocking, especially in areas of declining white ash and white birch, and unhealthy red maple. Within these groups all stems should be severed, except for occasional high-quality individual trees, any snags or cavity trees present, and any pockets of established high-quality regeneration. These groups will be somewhat evenly distributed throughout the stand, but should be placed wherever stocking is the poorest in quality and/or desirable advance regeneration is present. A total of approximately 20% of the stand, or 13 acres, will be regenerated in the course of this treatment.

Between groups, a single tree selection treatment will occur. This portion of the harvest will remove trees from all age classes which are poor in quality and health and/or which are crowding trees of superior quality. This treatment will particularly focus on the removal of declining white birch and white ash, and unhealthy red maple. Residual basal area between groups will be lowered to approximately 75 ft<sup>2</sup>/acre.

The long-term goal for this stand will be to maintain a diverse healthy forest with a high degree of structural and species diversity, while producing a sustained flow of high-quality forest products from periodic timber harvesting. Single tree and group selection are used to maintain a somewhat balanced array of age classes in the forest by regenerating a proportion of the stand on a set “cutting cycle.” In this case, the goal will be to regenerate 20% of the stand every 20 years, which will result in all areas having been regenerated after 100 years. In reality, this level of regulation over a time period of this length is unlikely to occur, but setting this goal for our forest encourages the establishment of new age classes and the recruitment of structural diversity in the forest, in addition to laying the groundwork for a sustained flow of forest products from the forest over the long term.

This treatment should occur in the winter and will likely utilize a whole-tree chip crew, although other equipment mixes should be considered. The established landing on Economou Road should be utilized, though it may need to be expanded somewhat to accommodate a whole-tree crew. This treatment should be done in conjunction with scheduled treatments in Stands 1 and 2. Buffer any brooks with a 50' no cut zone, and a 100' low cut zone, to retain canopy cover and minimize any water quality impediments. Also create a low-cut buffer along Eagle's Trail.

**Stand Cover Type:** Early successional hardwoods (blowdown)

**Natural Community:** Beech-Red Maple-Hemlock Northern Hardwood Forest, Northern Hardwood Forest

**Forest Management Zone:** Intensive Use, Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** I

**Soil Series:** Marlow fine sandy loam, Peru fine sandy loam

**Prime Ag Soils:** Statewide significant

**Stand Description:** Stand 4 encompasses the large blowdown that occurred in 2010. The stand is bisected by an alder swamp (Stand 5), so is divided into two areas. Area 4A is to the east of the alder swamp, and area 4B is to the west. This allows for two management zones, outlined in the section below.

This area was mostly farm fields that were planted to white pine and red pine. The plantation reportedly dominoed over, pushed by strong sustained winds, as opposed to being blown over all at once by a violent microburst. There was a limited salvage operation in the eastern part of the stand, but most of the area is covered with downed trees attached to their tipped up root masses. The forest floor is dense with early successional vegetation. Very few overstory trees remain, though there is a small number of what must be very root-strong survivors.

The density and variety of forest tree species that have become established is extremely promising. Early successional species such as quaking aspen, willow, choke cherry, white pine, white birch and grey birch dominate much of the stand. There is also a cohort of later successional seedlings and saplings present in many areas, including beech, sugar maple, red oak, black cherry, white ash, striped maple, balsam fir and red spruce.

The shrub and ground layer is dominated by dense rubus patches, such as blackberry, raspberry and thimbleberry. Otherwise there is a healthy mix of herbaceous and woody plants, including red sumac, elderberry, alternate leaf dogwood, sensitive fern, interrupted fern, New York fern, Jack-in-the-pulpit, Christmas fern, wild oats, goldenrod, rudbeckia, bedstraw, wild strawberry, wood sorrel, witch hazel, bracken fern and club mosses. No invasive plants were found, so if there are any the incidence is low.



*Figure 12. Saplings emerging through blowdown.*

## Stand Data

dbh	black cherry	paper birch	red maple	sugar maple	white pine	sum	%
<=4	0	0	2.5	0	0	2.5	22%
4 - 6	0	1.3	0	0	0	1.3	12%
6 - 8	0	0	0	1.3	0	1.3	12%
8 - 10	1.3	0	0	0	0	1.3	12%
10 - 12	0	0	0	1.3	0	1.3	12%
12 - 14	0	0	0	1.3	0	1.3	12%
14 - 16	0	0	0	1.3	0	1.3	12%
16 - 18	0	0	0	0	0	0	0%
18 - 20	0	0	0	0	0	0	0%
20 - 22	0	0	0	0	0	0	0%
22 - 24	0	0	0	0	1.3	1.3	12%
sum	1.3	1.3	2.5	5	1.3	11.3	100%
%	12%	12%	22%	44%	12%	100%	

Table 10. Basal area per acre by 2-inch diameter class – Stand 4

**Sampling Date:** 6/7/2017

**Number Points/Plots:** 8

**Quadratic Mean Stand Diameter (inches):** 6.9

**Stems/acre:** 95.6

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 21.3

**Acceptable Growing Stock:** 11.3

**Unacceptable Growing Stock:** 10.1

**Stocking level:** D on Northern hardwoods Stocking Guide

**Canopy Closure:** 9%

**Midstory Closure:** 71%

## MANAGEMENT RECOMMENDATIONS

**Recommendations:** If possible, desirable forest tree species should be released in Area 4A as regeneration moves into more advanced stages. In dense clusters of saplings 1" diameter and larger, use a brush cutting tool to clear about 3' of vegetation around best stems. Spacing between selected stems should be about 10'. This treatment should be carried out progressively as this stand develops over the next 50-60 years.

Area 4B is to be kept as a reserve, allowing natural processes to occur as the forest slowly becomes reestablished.

Both areas should be monitored for invasive species every year to ensure early detection, which will aid greatly in removal.



**Stand Cover Type:** Alder swamp

**Natural Community:** Alder Swamp

**Forest Management Zone:** Low Intensity  
Use/Reserves

**Age Class Structure:** Even

**Site Class:** III

**Soil Series:** Marlow fine sandy loam

**Prime Ag Soils:** Statewide significant

**Stand Description:** This alder swamp is located in the lower middle portion of the property. It is characterized by shallowly rooted trees due to the presence of groundwater near the surface. Speckled alder and red maple dominate the site.

This area was affected by the large blowdown event of 2010. Most of the alder cover remains intact, but downed stems from the plantation are present throughout (Figure 13).

**Management Recommendations:** Allow wetland functions to occur undisturbed. This stand should be buffered if any management occurs in adjacent stands.



*Figure 13. Downed trees in alder swamp*

**Stand Cover Type:** Early northern hardwood**Natural Community:** Northern Hardwood Forest**Forest Management Zone:** Moderate Use, Low Intensity Use/Reserves**Age Class Structure:** Uneven**Site Class:** II**Soil Series:** Lyman-Marlow very rocky loams

**Stand Description:** Stand 6 is located along the mid to upper slope of the hills in the southwestern part of the property. Slopes are moderate, between 10% and 20%, with a north to northeast aspect. Trees are younger on this part of the property, as these pastures were more recently abandoned than other areas of the property.

The stand is dominated by maples, with sugar maple making up 39% of the basal area, and red maple 27% (Table 12). Trees are generally small, about half the basal area is in trees 12" d.b.h. and less. About a third of trees are unacceptable growing stock. Other overstory species include paper birch, northern red oak, white pine, white ash, black cherry, American beech, red spruce, hophornbeam, yellow birch, striped maple, American basswood and gray birch. There are some enriched areas of the stand in the upper western section, as evidenced by the presence of blue cohosh and wild leeks. There are 33.6 snag trees per acre on average, mostly in the 6" to 12" size class.

Regeneration is good throughout the stand varying from adequately to fully stocked. Sugar maple is predominant, especially in upper elevations. Beech regeneration is more abundant in the lower areas. Other species include white ash, black cherry, red spruce, quaking aspen, red oak, striped maple, speckled alder and hophornbeam.

Hardwood snags are well represented, especially in the 6" to 12" size class. Timber volumes are relative low, at 3.1 MBF/acre. Sugar maple and red maple make up over half the timber volume.

Some common buckthorn was found in the northwestern part of the stand.

### Stand Data

**Sampling Date:** 6/1/2017**Number Points/Plots:** 13**Quadratic Mean Stand Diameter (inches):** 9.9**Stems/acre:** 203.2**Basal Area (ft<sup>2</sup>/acre):****Total:** 93.8      **Acceptable Growing Stock:** 60.0**Unacceptable Growing Stock:** 33.8**Stocking level:** A-B on Northern hardwoods Stocking Guide

dbh	HW snag
<= 1	
1 - 6	5.5
6 - 12	17.6
12 - 18	9.0
18 - 24	1.5
>= 24	
<b>TOTAL</b>	33.6
<b>Table 11. Snags/acre, Stand 6</b>	

**Canopy Closure: 70%**

**Midstory Closure: 57%**

**Snag trees/acre: 33.6**

dbh	Beech	black cherry	gray birch	hophorn beam	red oak	paper birch	red maple	sugar maple	white ash	white pine	yellow birch	TOTAL	%
<4													
4 - 6								2.3	1.5			3.8	4%
6 - 8	0.8	0.8		0.8		0.8	3.1	3.1	0.8			10	11%
8 - 10			2.3		0.8	0.8	3.1	6.2	0.8			13.8	15%
10 - 12						0.8	4.6	6.2	2.3			13.8	15%
12 - 14					0.8	0.8	3.1	3.8	0.8			9.2	10%
14 - 16		0.8			0.8	3.1	5.4	6.2		0.8		16.9	18%
16 - 18		0.8				3.1	1.5	1.5	0.8			7.7	8%
18 - 20						0.8	0.8	2.3	1.5		1.5	6.9	7%
20 - 22		0.8					1.5	3.8				6.2	7%
22 - 24							1.5		0.8			2.3	2%
24 - 26							0.8	1.5				2.3	2%
26 - 28													
28 - 30													
30 - 32					0.8							0.8	1%
TOTAL	0.8	3.1	2.3	0.8	3.1	10	25.4	36.9	9.2	0.8	1.5	93.8	100%
%	1%	3%	2%	1%	3%	11%	27%	39%	10%	1%	2%	100%	

Table 12. Basal area (sq.ft./acre) by 2-inch diameter class – Stand 6

### Timber Tables:

dbh	black cherry	red oak	paper birch	red maple	sugar maple	white ash	white pine	yellow birch	TOTAL
<=8									
8 - 10				37					37
10 - 12				146	73				219
12 - 14	85	139	149	270	249		60		953
14 - 16			221	104	324				649
16 - 18	43		203			204		59	509
18 - 20	43			185	101	67		38	435
20 - 22					86				86
22 - 24						121			121
24 - 26					47				47
26 - 28									
28 - 30									
TOTAL	171	139	574	742	879	391	60	98	3,055

Table 13. Board feet per acre by 2-inch diameter class – Stand 6



## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Even-age Management

**Present Stand Age:** 85

**Rotation Age:** 120

**Treatment Year:** 2026

**Treatment:** Small group and single tree selection

**Residual Basal Area:** 70

**Species favored for retention and regeneration:** Sugar maple, red oak, black cherry.

**Estimated income from timber sale:** \$4,500

**Recommendations:** Areas of this stand designated at moderate intensity, generally below 1,500 feet in elevation, are to be treated using single tree/group selection in 2018. The primary purpose of this treatment will be to increase structural diversity, establishing a new age class of trees while capturing value in low quality and declining stems, and to encourage the growth of the highest-quality stems in the stand.

Groups up to 1 acre in size will be established in areas with a high proportion of poor-quality stocking, especially in areas of declining white ash and white birch, and unhealthy red maple. Within these groups all stems should be severed, except for occasional high-quality individual trees, any snags or cavity trees present, and any pockets of established high-quality regeneration. These groups will be somewhat evenly distributed throughout the stand, but should be placed wherever stocking is the poorest in quality and/or desirable advance regeneration is present. A total of approximately 20% of the stand, or 15 acres, will be regenerated in the course of this treatment.

Between groups, a single tree selection treatment will occur. This portion of the harvest will remove trees from all age classes which are poor in quality and health and/or which are crowding trees of superior quality. This treatment will particularly focus on the removal of declining white birch and white ash, and unhealthy red maple. Residual basal area between groups will be lowered to approximately 70 ft<sup>2</sup>/acre.

The long-term goal for this stand will be to maintain a diverse healthy forest with a high degree of structural and species diversity, while producing a sustained flow of high-quality forest products from periodic timber harvesting. Single tree and group selection are used to maintain a somewhat balanced array of age classes in the forest by regenerating a proportion of the stand on a set “cutting cycle.” In this case, the goal will be to regenerate 20% of the stand every 20 years, which will result in all areas having been regenerated in 100 years. In reality, this level of regulation over this long of a time period is unlikely to occur, but setting this goal for our forest encourages the establishment of new age classes and the recruitment of structural diversity in the forest, in addition to laying the groundwork for a sustained flow of forest products from the forest over the long term.

This harvest should be conducted in the winter, and should utilize cable skidders or comparable low-impact logging equipment. The existing landing off of Economou Road should be used. This harvest should be conducted in conjunction with harvesting in Stand 9. The harvest of these two stands will likely occur over the course of two winters.

**Stand Cover Type:** Mixed northern hardwoods

**Natural Community:** Beech-Red Maple-Hemlock Northern Hardwood Forest; Northern Hardwood Forest Mesic Maple-Ash-Hickory-Oak Forest

**Forest Management Zone:** Area 7A - Moderate Use; Area 7B - Low Intensity Use/Reserves

**Age Class Structure:** Uneven

**Site Class:** II

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam

**Stand Description:** Stand 7 consists of two areas in the center of the property. Area 7A is a convex, east facing slope that contains sections of Passing the Horizon and Homestead trails. Area 7B is made up of a southeast facing linear slope, as well as the top of a north/south ridge. There is a bench at a view point at the top of the ridge on Passing the Horizon Trail. Unfortunately, vegetation has grown in and the view has is mostly obscured.



*Figure 14. Cut and shredded vegetation*

Overall the stand is well stocked, mid-way between the A and B line on the northern hardwood stocking guide. Red maple dominates the stand, making up 44% of the basal area. Other main species in the stand are American beech (20%), sugar maple (17%) and red spruce (7%). Species that make up 3% or less of trees include black cherry, white ash, paper birch, quaking aspen, hophornbeam and northern red oak. Trees are generally small, with two-thirds of stems being 14" d.b.h. or less (Table 15). Trees are lower quality overall, with about half the stems unacceptable growing stock. Timber levels are low, at only 2.2 MBF/acre. Snag trees are lacking in the larger size classes (Table 16).

Regeneration is adequate to fully stocked throughout the stand, mostly in the sapling size class. Beech is by far the predominant species, making up three quarters of the seedlings and saplings. Other species include white pine, red spruce, striped maple, yellow birch, white ash, and a small amount of sugar maple. Some areas are dense with hobblebush.

On the south end of the north/south ridge in Area 7B, near Passing the Horizon Trail, some small saplings have been cut. This is presumably an unauthorized backcountry ski trail that has been developed, as evidenced by small vegetation nearby that has apparently been shredded by skis (Figure 14). This cutting is located in the Reserve Zone.

## Stand Data

**Sampling Date:** 6/1/2017

**Number Points/Plots:** 11

**Quadratic Mean Stand Diameter (inches):** 8.5

**Stems/acre:** 278.2

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 99.1

**Acceptable Growing Stock:** 54.5

**Unacceptable Growing Stock:** 44.5

**Stocking level:** A-B on Northern hardwoods Stocking Guide

**Canopy Closure:** 76%

**Midstory Closure:** 71%

**Snag trees/acre:** 20.6

dbh	HW snag
<= 1	
1 - 6	2.0
6 - 12	14.4
12 - 18	3.8
18 - 24	0.4
>= 24	
<b>TOTAL</b>	<b>20.6</b>
<b>Table 14. Snags/acre, Stand 7</b>	

dbh	American beech	black cherry	hophorn beam	red oak	paper birch	quaking aspen	red maple	red spruce	sugar maple	white ash	TOTAL	%
4 - 6	2.7						0.9	3.6	1.8		9.1	9%
6 - 8	4.5	0.9	0.9				6.4	2.7	1.8		17.3	17%
8 - 10	3.6						4.5		1.8		10.0	10%
10 - 12	4.5						2.7	0.9	6.4		14.5	15%
12 - 14	0.9			0.9	1.8		10		1.8		15.5	16%
14 - 16	1.8	0.9					8.2			0.9	11.8	12%
16 - 18	1.8	0.9					3.6		0.9		7.3	7%
18 - 20						0.9	4.5		0.9	1.8	8.2	8%
20 - 22						0.9	1.8				2.7	3%
22 - 24									0.9		0.9	1%
24 - 26												
26 - 28									0.9		0.9	1%
28 - 30							0.9				0.9	1%
<b>TOTAL</b>	<b>20.0</b>	<b>2.7</b>	<b>0.9</b>	<b>0.9</b>	<b>1.8</b>	<b>1.8</b>	<b>43.6</b>	<b>7.3</b>	<b>17.3</b>	<b>2.7</b>	<b>99.1</b>	<b>100%</b>
<b>%</b>	<b>20%</b>	<b>3%</b>	<b>1%</b>	<b>1%</b>	<b>2%</b>	<b>2%</b>	<b>44%</b>	<b>7%</b>	<b>17%</b>	<b>3%</b>	<b>100%</b>	

**Table 15. Basal area (sq.ft./acre) by 2-inch diameter class – Stand 7**



dbh	black cherry	northern red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	sum	%
<=8									
8 - 10									
10 - 12			129		194			323	15%
12 - 14	49	70			491		75	684	31%
14 - 16	77				115			192	9%
16 - 18				51	320		157	527	24%
18 - 20				109	173	73		354	16%
20 - 22						47		47	2%
22 - 24									
24 - 26									
26 - 28					76			76	3%
sum	125	70	129	159	1,369	120	232	2,204	100%
%	6%	3%	6%	7%	62%	5%	11%	100%	

Table 16. Basal area per acre by 2-inch diameter class – Stand 7

## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Even-age Management

**Present Stand Age:** 90

**Rotation Age:** 120

**Treatment Year:** 2018

**Treatment:** Small group and single tree selection

**Residual Basal Area:** 70

**Species favored for retention and regeneration:** Sugar maple, black cherry, red spruce

**Estimated income from timber sale:** \$1,500

**Recommendations:** In Stand 7A, light harvesting may be conducted opportunistically, in conjunction with harvesting in Stand 3. Harvesting should only occur if access to the stand can be achieved without risking damage to soil conditions in this area. The primary purpose of this treatment will be to increase structural diversity in the stand, establishing a new age class of trees while capturing value in low quality and declining stems, and to encourage the growth of the highest-quality stems in the stand. Harvesting in this stand would have the added benefit of creating pockets of young forest near “reserve” zones, which will benefit wildlife greatly.

Groups up to 1/4 acre in size may be established in areas with a high proportion of poor-quality stocking, especially in areas of declining, damaged, and unhealthy stems. Within these groups all stems should be severed, except for occasional high-quality individual trees, any snags or cavity trees present, and any pockets of established high-quality regeneration. These groups will be placed where stocking is poor in quality and/or desirable advance regeneration is present. A total of up to 10% of the stand, or 7 acres, may be regenerated in the course of this treatment.

Single trees from all age classes which are poor in quality and health and/or which are crowding trees of superior quality may also be removed in the course of this treatment. This portion of the harvest will focus on the removal of declining, damaged, and unhealthy stems of all species. Residual basal area between groups will be lowered to approximately 80 ft<sup>2</sup>/acre in treated areas.

The long-term goal for this stand will be to maintain a diverse healthy forest with a high degree of structural and species diversity, while producing a sustained flow of high-quality forest products from periodic timber harvesting.

Prune overlook area at bench to open up the view, with the goal of retaining a naturalized feel. Encourage ferns and low shrubs to vegetate the area. Leave some of the taller trees where stems branch out above the level of the vista, pruning them up as necessary to enhance the view.

Monitor unauthorized cut area to limit any potential expansion. If the problem persists, distribute information and create signage to discourage unauthorized cuts. Follow guidelines currently under development at Vermont Forest, Parks and Recreation in conjunction with Backcountry Ski and Ride Partners (contact Jessica Savage, [Jessica.Savage@vermont.gov](mailto:Jessica.Savage@vermont.gov)).

**Stand Cover Type:** Mixedwood ridge

**Natural Community:** Red Spruce-Northern Hardwood Forest

**Forest Management Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** III

**Soil Series:** Lyman-Marlow very rocky loams

**Stand Description:** This area encompasses the top of the hill in the center of the property, up to 1,558' elevation. This ridgetop has slower growing vegetation and shorter trees due to thin soils and steep slopes. There is a nice view of Camels Hump through the trees from the hilltop.

It is a mixedwood stand dominated by sugar maple and red maple, which together comprise 60% of the basal area. Other species include paper birch, northern red oak, eastern white pine, white ash, American beech, hophornbeam, quaking aspen and striped maple.

Regeneration species include red spruce, paper birch, striped maple. Areas with more open crowns are being colonized with raspberries. A few patches on the eastern-facing slope have an abundant fern cover.

White birch decline is evident on this hilltop. This has created a large number of hardwood snags. There are about 26 hardwood snags per acre between 6" and 12" d.b.h. (Table 17).



Figure 15. View of Camels Hump from Stand 8.

### Stand Data

**Sampling Date:** 6/26/2017

**Number Points/Plots:** 4

**Quadratic Mean Stand Diameter (inches):** 9.0

**Stems/acre:** 290.9

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 85.0

**Acceptable Growing Stock:** 62.5

**Unacceptable Growing Stock:** 22.5

**Stocking level:** B-C on Mixedwood Stocking Guide

**Canopy Closure:** 80%

**Midstory Closure:** 58%

**Snag trees/acre:** 40.3

**Recommendations:** Allow natural processes to occur undisturbed in Low Intensity Use/Reserves Zone.

dbh	HW snag	SW snag	TOTAL
<= 1		5.0	5.0
1 - 6		2.9	2.9
6 - 12	26.0		26.0
12 - 18	6.4		6.4
18 - 24			
>= 24			
<b>TOTAL</b>	32.4	7.9	40.3

Table 17. Snags/acre, Stand 8

dbh	American beech	hophorn beam	northern red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	white pine	sum	%
<4											
4 - 6				2.5						2.5	3%
6 - 8	2.5	2.5		2.5		12.5				20.0	24%
8 - 10						2.5	7.5			10.0	12%
10 - 12	2.5						12.5			15.0	18%
12 - 14			2.5			2.5		2.5		7.5	9%
14 - 16							2.5	2.5	2.5	7.5	9%
16 - 18							5.0			5.0	6%
18 - 20											
20 - 22											
22 - 24							5.0	2.5	2.5	10.0	12%
24 - 26											
26 - 28					2.5				2.5	5.0	6%
28 - 30											
30 - 32											
32 - 34									2.5	2.5	3%
sum	5.0	2.5	2.5	5.0	2.5	17.5	32.5	7.5	10.0	85.0	100%
%	6%	3%	3%	6%	3%	21%	38%	9%	12%	100%	

Table 18. Basal area per acre by 2-inch diameter class – Stand 8



**Stand Cover Type:** Mixed northern hardwoods

**Natural Community:** Northern Hardwood Forest, Red Spruce-Northern Hardwood Forest

**Forest Management Zone:** Lower area - Moderate Use; Upper area - Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** II

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam

**Stand Description:** Stand 9, located in the southeast corner of the property, is comprised of a long north-facing slope that goes to the top of a ridge. The lower parts of the stand have mostly wet soils due to the presence of seeps. The stand gets drier to the south as it goes uphill. Much of the uphill section has rocky outcrops.

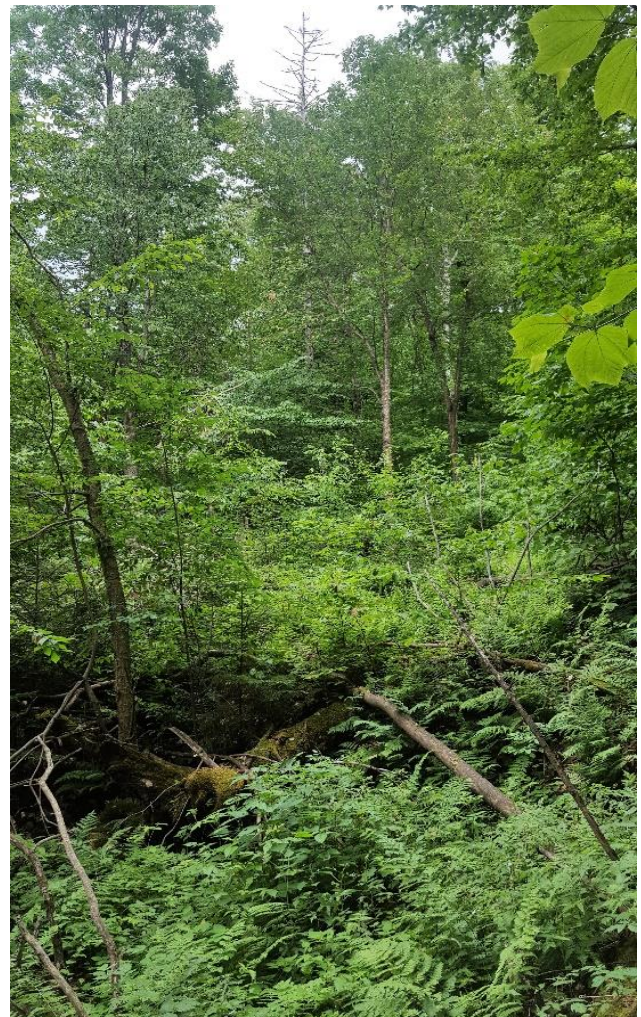
This is primarily a deciduous stand, with hardwoods making up 96% of the relative density. Half the trees are sugar maples, followed by red maple, white ash, paper birch, red spruce, hophornbeam, quaking aspen, American beech, bitternut hickory, black cherry, gray birch and northern red oak. Trees range in size up to 32" d.b.h., with the majority between 10" and 18". Much of the lower- and mid-slopes have enriched soils, as evidenced by the blue cohosh and maidenhair fern. There are 30 snag trees per acre, mostly hardwood (Table 19).

Regeneration is generally well established in the seedling to sapling size classes. The only exception is an area in the southern section of the stand where inhibiting ferns have taken over, preventing seedling establishment. Sugar maple is dominant in the under story, followed by beech. Other regen species include white ash, red spruce, striped maple, balsam fir and black cherry. Some of the sugar maple regen is in advanced stages. Common barberry, an invasive plant, was also found in the understory in the north end of the stand near the main access road.

The stand has several natural openings, which has created excellent vertical structure, beneficial for songbird habitat (Figure 16). There is a particularly large amount of deer scat in this area.

Timber values are moderate, at 3.8 MBF/acre (Table 21). About half the volume is in high-value hardwoods such as sugar maple, white ash and black cherry. Sawlogs range up to 28" d.b.h., but two-thirds are 16" d.b.h. and smaller.

Some of the white ash in the upper part of the stand have thin looking crowns. This may be because they were late leafing out, or could be early symptoms of decline. There is a low incidence of butt rot on the red spruce in the east side of the stand. Also, a small amount of Eutypella canker was found on sugar maples.



*Figure 16. Excellent vertical vegetative structure.*

## Stand Data

Sampling Date: 6/21/2017

Number Points/Plots: 12

Quadratic Mean Stand Diameter (inches): 10.3

Stems/acre: 193.5

Basal Area (ft<sup>2</sup>/acre):

Total: 95.8

Acceptable Growing Stock: 69.2

Unacceptable Growing Stock: 26.6

Stocking level: B-A on Northern hardwoods Stocking Guide

Canopy Closure: 76%

Midstory Closure: 68%

Snag trees/acre: 29.9

dbh	HW snag	SW snag	TOTAL
<= 1			
1 - 6	9.5		9.5
6 - 12	10.9		10.9
12 - 18	6.7	1.1	7.8
18 - 24	1.7		1.7
>= 24			
TOTAL		1.1	29.9

Table 19. Snags/acre, Stand 9

dbh	American beech	bitternut hickory	black cherry	gray birch	hophorn beam	northern red oak	paper birch	quaking aspen	red maple	red spruce	sugar maple	white ash	sum	%
<4														
4 - 6	0.8				0.8						2.5		4.2	4%
6 - 8	0.8				2.5				0.8		3.3	1.7	9.2	10%
8 - 10		0.8			0.8				0.8		3.3		5.8	6%
10 - 12							0.8	0.8	1.7	1.7	6.7	2.5	14.2	15%
12 - 14							0.8	0.8	3.3	3.3	6.7	0.8	15.8	17%
14 - 16								1.7	2.5	0.8	5.8		10.8	11%
16 - 18				0.8			4.2	0.8	2.5	0.8	6.7	0.8	16.7	18%
18 - 20						0.8					3.3		4.2	4%
20 - 22							0.8				2.5	0.8	4.2	4%
22 - 24			0.8								0.8	1.7	3.3	3%
24 - 26									0.8		2.5	0.8	4.2	4%
26 - 28									0.8				0.8	1%
28 - 30												0.8	0.8	1%
30 - 32											0.8		0.8	1%
sum	1.7	0.8	0.8	0.8	4.2	0.8	6.7	4.2	13.3	6.7	45.0	10.0	95.0	100%
%	2%	1%	1%	1%	4%	1%	7%	4%	14%	7%	47%	11%	100%	

Table 20. Basal area per acre by 2-inch diameter class – Stand 9

## Timber Tables:

dbh	black cherry	red oak	paper birch	quaking aspen	red maple	red spruce	sugar maple	white ash	TOTAL
10 - 12			59		79	285	40		463
12 - 14				67	250	91	351		760
14 - 16			230	235	42	119	362	95	1,083
16 - 18		80			178		197		455
18 - 20							158		158
20 - 22			66				186	304	555
22 - 24	88				69		43	55	255
24 - 26					44				44
26 - 28								47	47
<b>TOTAL</b>	<b>88</b>	<b>80</b>	<b>354</b>	<b>302</b>	<b>661</b>	<b>495</b>	<b>1,337</b>	<b>501</b>	<b>3,820</b>

Table 21. Board feet per acre by 2-inch diameter class – Stand 9

## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Uneven-age Management

**Present Stand Age:** 75

**Rotation Age:** 120

**Treatment Year:** 2026

**Treatment:** Small group and single tree selection

**Residual Basal Area:** 75

**Species favored for retention and regeneration:** Sugar maple, red oak, black cherry

**Recommendations:** Areas of this stand designated at moderate intensity, generally below 1,500 feet in elevation, are to be treated using single tree/group selection in 2026. The primary purpose of this treatment will be to increase structural diversity in the stand, establishing a new age class of trees while capturing value in low quality and declining stems.

Groups up to 1/2 acre in size will be established in areas with a high proportion of poor-quality stocking, especially in areas of declining white ash and white birch, and unhealthy red maple. Within these groups all stems should be severed, except for occasional high-quality individual trees, any snags or cavity trees present, and any pockets of established high-quality regeneration. These groups will be somewhat evenly distributed throughout the stand, but should be placed wherever stocking is the poorest in quality and/or desirable advance regeneration is present. A total of approximately 20% of the stand, or 16 acres, will be regenerated in the course of this treatment.

Between groups, a single tree selection treatment will occur. This portion of the harvest will remove trees from all age classes which are poor in quality and health and/or which are crowding trees of superior quality. This treatment will particularly focus on the removal of declining white birch and white ash, and unhealthy red maple. Residual basal area between groups will be lowered to approximately 80 ft<sup>2</sup>/acre.

The long-term goal for this stand will be to maintain a diverse, healthy forest with a high degree of structural and species diversity, while producing a sustained flow of high-quality forest products from periodic timber harvesting. Single tree and group selection are used to maintain a somewhat balanced array of age classes in the forest by regenerating a proportion of the stand on a set “cutting cycle.” In this

case, the goal will be to regenerate 20% of the stand every 20 years, which will result in all areas having been regenerated in 100 years. In reality, this level of regulation over this long of a time period is unlikely to occur, but setting this goal for our forest encourages the establishment of new age classes and the recruitment of structural diversity in the forest, in addition to laying the groundwork for a sustained flow of forest products from the forest over the long term.

This harvest should be conducted in the winter, and should utilize cable skidders or comparable low-impact logging equipment. The existing landing off of Economou Road should be used. This harvest should be conducted in conjunction with harvesting in Stand 6. This treatment will likely occur over the course of two winters.



**Stand Cover Type:** Mixed northern hardwood ridge

**Natural Community:** Northern Hardwood Forest

**Forest Management Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Uneven

**Site Class:** III

**Soil Series:** Lyman-Marlow very rocky loams

**Stand Description:** This stand spans the top of the ridge on the south boundary of the property, going up to 1,657 feet elevation. Soils are thinner on the ridge, with areas of rock outcrop. Virtually the entire stand is in the Reserve management zone.

Northern red oak is prevalent, making up over half the tree density. There is also red maple, sugar maple, black cherry and white ash in the overstory. Understory species include beech, black cherry, red spruce striped maple, red oak, sugar maple red maple. Hog peanut forms a vine in parts of the ground layer. Other ground layer species include interrupted fern, Christmas fern, wild sarsaparilla, bracken fern, New York fern and red raspberry. A vernal pool was found in the eastern part of the stand. Most of the snag trees are hardwoods, 12" d.b.h. and smaller.



Figure 17. Eastern tent caterpillar.

Block-knot fungus is common on the black cherry. Some blowdown has occurred in the eastern area. There is also a small incidence of eastern tent caterpillar (Figure 17)

### Stand Data

dbh	black cherry	northern red oak	red maple	sugar maple	white ash	sum	%
<4							
4 - 6		2.5		2.5		5.0	6%
6 - 8	2.5				2.5	5.0	6%
8 - 10					2.5	2.5	3%
10 - 12		7.5	2.5			10.0	13%
12 - 14	2.5	2.5	5.0		2.5	12.5	16%
14 - 16	2.5	5.0	2.5	2.5		12.5	16%
16 - 18	2.5	5.0		2.5		10.0	13%
18 - 20		7.5			2.5	10.0	13%
20 - 22		2.5				2.5	3%
22 - 24		2.5				2.5	3%
24 - 26				2.5		2.5	3%
26 - 28			2.5			2.5	3%
sum	10.0	35.0	12.5	10.0	10.0	77.5	100%
%	13%	45%	16%	13%	13%	100%	

Table 22. Basal area per acre by 2-inch diameter class – Stand 10

**Sampling Date:** 6/21/2017

**Number Points/Plots:** 5

**Quadratic Mean Stand Diameter (inches):** 10.2

**Stems/acre:** 190.6

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 77.5

**Acceptable Growing Stock:** 65.0

**Unacceptable Growing Stock:** 12.5

**Stocking level:** B on Northern hardwoods Stocking Guide

**Canopy Closure:** 63%

**Midstory Closure:** 45%

**Snag trees/acre:** 25.1

**Management Recommendations:** Allow natural processes to occur undisturbed in Low Intensity Use/Reserves Zone.

**Stand Cover Type:** Spruce hardwoods

**Natural Community:** Red Spruce-Northern Hardwood Forest, Northern Hardwood Forest

**Forest Management Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** III

**Soil Series:** Lyman-Marlow very rocky loams

**Stand Description:** This rugged stand covers the hilltop in the southwest part of the property. Steep terrain, numerous rock outcroppings and stunted vegetation characterize this stand. Dragon Tail trail brings bikers and hikers to the highest point of the HTF, at 1,677 feet. There is a benchmark about 1,000 feet west of the hilltop, stamped Hines No 2 1943 (PID - PG1932).

Red spruce is the predominant tree, making up about a third of basal area. Other species include red maple, sugar maple, paper birch, black cherry, northern red oak, white ash, yellow birch, American beech, hophornbeam and striped maple. No bear signs were seen on the beech.

There is a 2½ acre blowdown near the top of the hill in the west central part of the stand (Figure 18). This is the same event as the 2010 blowdown in Stand 4. Otherwise, the canopy is relatively open overall, averaging 60%. There is a low to moderate incidence of butt rot on some of the larger red spruce trees.



*Figure 18. Blowdown area.*

The understory is dominated by beech and striped maple, with a lesser amount of red spruce. Other species include sugar maple, red oak and white ash. Blackberries and hayscented fern are prevalent in the blowdown area, though some yellow birch is becoming established. Ericaceous species such as blueberry and partridgeberry cover some of the areas under the spruce, indicating acidic soils.

## Stand Data

dbh	American beech	black cherry	northern red oak	paper birch	red maple	red spruce	sugar maple	white ash	yellow birch	sum	%
<=4					1.1	2.2	1.1			4.4	8%
4 - 6					1.1	1.1				2.2	4%
6 - 8				1.1	5.6		1.1	1.1		8.9	16%
8 - 10						2.2		1.1		3.3	6%
10 - 12				1.1	1.1	1.1				3.3	6%
12 - 14	1.1		1.1	1.1		3.3	3.3		1.1	11.1	20%
14 - 16			1.1			3.3	3.3		1.1	8.9	16%
16 - 18		1.1			2.2	3.3	3.3			10.0	18%
18 - 20					1.1					1.1	2%
20 - 22		1.1								1.1	2%
22 - 24											
24 - 26						1.1				1.1	2%
sum	1.1	2.2	2.2	3.3	12.2	17.6	12.1	2.2	2.2	55.4	100%
%	2%	4%	4%	6%	22%	32%	22%	4%	4%	100%	

Table 23. Basal area per acre by 2-inch diameter class – Stand 11

**Sampling Date:** 5/24/2017

**Number Points/Plots:** 9

**Quadratic Mean Stand Diameter (inches):** 8.4

**Stems/acre:** 267.9

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 91.1

**Acceptable Growing Stock:** 54.4

**Unacceptable Growing Stock:** 36.7

**Stocking level:** B on Mixedwood Stocking Guide

**Canopy Closure:** 60%

**Midstory Closure:** 68%

**Snag trees/acre:** 25.8

**Management Recommendations:** The dry conditions at the top of the ridge, combined with the recent blowdown, puts this area at risk of fire. The area should be monitored during particularly dry conditions to minimize fire risk. Otherwise, allow natural processes to occur undisturbed in Low Intensity Use/Reserves Zone.



**Stand Cover Type:** Early spruce hardwood

**Natural Community:** Beech-Red Maple-Hemlock Northern Hardwood Forest

**Forest Management Zone:** Moderate Use

**Age Class Structure:** Even

**Site Class:** II

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam

**Stand Description:** Stand 12 is a small area of relatively young hardwoods along the western boundary, about half way up the hill. It has a northwest facing aspect with a consistent 12% slope. It contains Missing Link and Back Door trails.

Soils in many areas of the stand are thin, wet and slippery (it should be noted that the stand was inventoried in late spring of a very wet season). Though thin, the soils can be rich, as evidenced by blue cohosh.

The canopy is fairly closed in this area, about 90% on average. Sugar maple makes up 40% of the basal area, followed by hophornbeam, paper birch, white ash, red spruce and black cherry. Trees are generally small, with half the basal area less than 12" d.b.h. Despite this, a 39" d.b.h. white ash was measured directly adjacent to the Back Door trail. This open-grown form ash was likely a shade tree when this area was pastured over a century ago.

Regeneration is variable but mostly well established in the seedling and sapling size class. Sugar maple dominates the regeneration, followed by beech, striped maple, yellow birch and white ash. There are about 19 snags per acre, most of which are hardwoods between 10" and 12" d.b.h.

A small amount of young buckthorn was found, and removed. There is a heavy incidence of butt rot on some of the larger red spruce.

## Stand Data

dbh	black cherry	hophorn beam	paper birch	red spruce	sugar maple	white ash	sum	%
<4								
4 - 6		2.5			2.5		5.0	5%
6 - 8		15.0					15.0	15%
8 - 10		5.0	2.5		5.0		12.5	13%
10 - 12			5.0	2.5	5.0		12.5	13%
12 - 14			5.0		5.0		10.0	10%
14 - 16					7.5		7.5	8%
16 - 18			2.5		7.5		10.0	10%
18 - 20				2.5	2.5		5.0	5%
20 - 22				2.5	2.5	2.5	7.5	8%
22 - 24	2.5					2.5	5.0	5%
24 - 26								
26 - 28								
28 - 30						2.5	2.5	3%
30 - 32					2.5		2.5	3%
32 - 34								
34 - 36						2.5	2.5	3%
36 - 38								
38 - 40						2.5	2.5	3%
sum	2.5	22.5	15.0	7.5	40.0	12.5	100.0	100%
%	3%	23%	15%	8%	40%	13%	100%	0.01

Table 24. Basal area per acre by 2-inch diameter class – Stand 11

**Sampling Date:** 5/24/2017

**Number Points/Plots:** 4

**Quadratic Mean Stand Diameter (inches):** 9.5

**Stems/acre:** 220.5

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 100.0

**Acceptable Growing Stock:** 45.0

**Unacceptable Growing Stock:** 55.0

**Stocking level:** B on Mixedwood Stocking Guide

**Canopy Closure:** 89%

**Midstory Closure:** 61%

**Snag trees/acre:** 18.9

**Management Recommendations:** None at this time. Allow stand to grow, reevaluate during next management cycle.

**Stand Cover Type:** Northern hardwoods

**Natural Community:** Rich Northern Hardwood Forest, Beech-Red Maple-Hemlock Northern Hardwood Forest

**Forest Management Zone:** Moderate Use

**Age Class Structure:** Uneven

**Site Class:** II

**Soil Series:** Lyman-Marlow very rocky loams, Peru fine sandy loam

**Stand Description:** Stand 13 is a large hardwood stand in the northwest part of the HTF, south of Hayed Hill Road. It has a northwest aspect, and varies from almost level at the bottom of the hill, to over 50% slopes in the upper areas of the stand. Stumps were seen throughout the stand from prior management.

Sugar maple is by far the most common overstory tree, making up over 40% of the relative density. Species that follow by density are white ash, red maple, yellow birch, quaking aspen, paper birch, hophornbeam, white pine, black cherry, American beech, American basswood, bitternut hickory, northern red oak and red spruce. Pockets of enriched soils were found throughout the stand. Snag trees are low in number, mostly hardwoods averaging about 9 per acre.

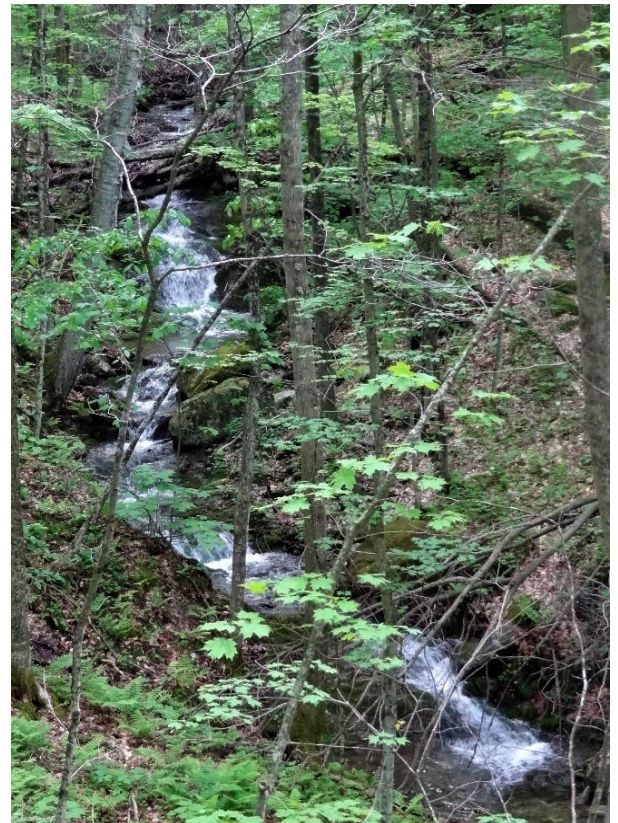
Regeneration is well established with few exceptions. Most are in sapling stage, though there are seedlings growing as well. Sugar maple and beech are the dominant regeneration species. Other understory woody plants include striped maple, basswood, red oak, white ash, white birch, yellow birch, alternate leaf dogwood, red spruce and quaking aspen. There are also areas of hobblebush.

There was a moderate amount of common buckthorn found that is starting to get established, particularly in the west side of the stand. Common barberry was found as well. Eutypella canker has infected a few of the maples. Stem scarring from logging damage was also found.

There are high exposed mud banks along the river at the bottom of the stand, attributed to a storm event in 2013. While this can cause soils to slough off into the brook, it also creates opportunities for kingfisher nesting sites (Figure 19). There is also a pretty waterfall in this area (Figure 20).



*Figure 19, Potential kingfisher nesting habitat along riverbank.*



*Figure 20. Waterfall off the trail*

## Stand Data

Sampling Date: 5/24/2017

Number Points/Plots: 26

Quadratic Mean Stand Diameter (inches): 11.4

Stems/acre: 123.9

Basal Area (ft<sup>2</sup>/acre):

Total: 96.7

Acceptable Growing Stock: 67.4

Unacceptable Growing Stock: 29.3

Stocking level: High B level on Northern hardwoods Stocking Guide

Canopy Closure: 71%

Midstory Closure: 52%

Snag trees/acre: 8.9

dbh	Bass wood	beech	bitt. hickory	black cherry	Hophor nbeam	red oak	paper birch	quak aspen	red maple	red spruce	sugar maple	white ash	white pine	yellow birch	sum	&
4 - 6					0.7		0.4				1.9				3	3%
6 - 8		0.4			0.4		0.4		1.1	0.4	1.1			0.7	4.4	5%
8 - 10					1.5				0.7		4.1	1.1		0.7	8.1	8%
10 - 12				0.7				1.1	3.0		4.4	3.0		2.2	14.4	15%
12 - 14		0.4		0.7			1.1	0.4	2.2		4.1	2.6	0.7	1.9	14.1	15%
14 - 16	0.4						0.4	1.1	1.5		4.1	1.9		0.7	10	10%
16 - 18			0.4				1.1	1.5	1.5		3.3	2.6		1.5	11.9	12%
18 - 20		0.4					0.4	0.4	1.1		4.4	4.1		2.6	13.3	14%
20 - 22	0.4						0.7	1.9	0.7		1.9	1.5		0.4	7.4	8%
22 - 24						0.4		0.4	0.4		2.2	1.5	0.7		5.6	6%
24 - 26											0.4	0.7	0.4		1.5	2%
26 - 28											0.4				0.4	0%
28 - 30								0.4							0.4	0%
30 - 32								0.4			0.7				1.1	1%
32 - 34											1.1				1.1	1%
TOTAL	0.7	1.1	0.4	1.5	2.6	0.4	4.4	7.4	12.2	0.4	34.1	18.9	1.9	10.7	96.7	100%
%	1%	1%	0%	2%	3%	0%	5%	8%	13%	0%	35%	20%	2%	11%	100%	

Table 25. Basal area per acre by 2-inch diameter class – Stand 13



## Timber Tables:

dbh	Bass wood	bitternut hickory	black cherry	red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	white pine	yellow birch	TOTAL
8 - 10			16			56						72
10 - 12					43		61	69	223		43	440
12 - 14	43					75	120	259	193		53	742
14 - 16		28			18	135	57	309	372		66	986
16 - 18					29	32	64	242	403		55	824
18 - 20	42				40	135	40	128	141		92	618
20 - 22				43		122		220	122			508
22 - 24								30	119	110		259
24 - 26									33	23		56
26 - 28						21						21
28 - 30						21		31				52
TOTAL	85	28	16	43	130	597	342	1,289	1,607	133	309	4,578
Table 26. Board feet per acre by 2-inch diameter class – Stand 13												

## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Uneven-age Management

**Present Stand Age:** 90

**Rotation Age:** 120

**Recommendations:** Allow this stand to grow to a more fully stocked condition. If desired, girdle two trees per acre greater than 16” diameter to create snag trees. Otherwise, no treatment is recommended for this 10-year management cycle.

**Stand Cover Type:** Northern hardwoods

**Natural Community:** Rich Northern Hardwood Forest, Beech-Red Maple-Hemlock  
Northern Hardwood Forest

**Forest Management Zone:** Moderate Use (Reserve Zone surrounding Hayden Hill East trailhead)

**Age Class Structure:** Uneven

**Site Class:** II

**Soil Series:** Peru fine sandy loam, Lyman-Marlow very rocky loams

**Stand Description:** Stand 14 is a large, high-quality hardwood stand in the northeast corner of the property. It has a general north aspect, with both convex and concave slopes. Some small brooks flow north through the east side of the stand, converging into the larger brook at the bottom. Slopes are gentle in the lower part of the stand, but get steep as you go up the hill to the south, where there are some exposed cliffs.

As with the rest of the property, there is a rich human history in this area. Many cultural remnants from Stevens farm and Place farm are still evident. Especially interesting were two stone dams found along the brooks (5).

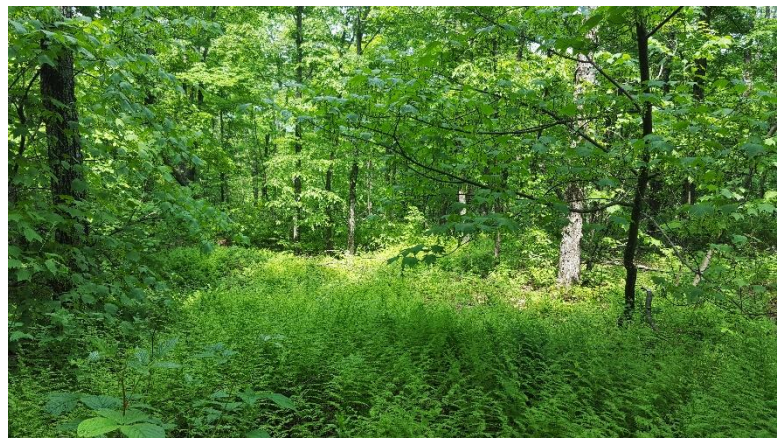


*Figure 21. One of the remnant stone dam.*

Many areas of the stand show enriched site indicators such as blue cohosh and maidenhair fern. Though much of the stand has a dense overstory, there are also many crown openings that have been formed from past treatments and natural blowdown. This has created many areas of excellent vertical structure, which greatly benefits avian habitat. Some of the more open areas are coming up to raspberries. Hawthorn is also in the midstory in the lower part of the stand.

There is a big seep in this stand, northeast of the intersection of Passing the Horizon and Homestead trails. There are also other smaller seeps scattered throughout. There is an average of only 10 standing dead trees per acre.

Sugar maples are by far the largest component of the overstory, comprising 70% of the relative density. Other overstory species by prevalence include white ash, red maple, yellow birch, quaking aspen, American beech, hophornbeam, striped maple, black cherry, northern red oak, paper birch, bitternut hickory and red spruce. Trees are generally large, with two-thirds of basal area 16" d.b.h. or larger.



*Figure 22. Inhibiting fern.*

Sawtimber volumes are very good for hardwoods, at 5.1 MBF/acre. Many of the trees exhibit high-quality stems. Over 60% of the sawlog volume is in the 16" to 24" size class. Two-thirds of sawtimber volume is in sugar maple.

Regeneration is well established throughout the stand in the seedling to sapling size classes. Many areas are thick with beech regeneration, which is not the most desirable condition. While beech is an excellent wildlife tree, owing to its highly caloric mast production, it is also disease prone and has lower commercial value than other northern hardwoods. Additional regeneration species include sugar maple, striped maple, white ash, red spruce, black cherry, white birch and white oak. The shrub layer also contains witch hazel and hophornbeam.

Logging damage was noted in the western side of the stand. Some areas in the eastern part of the stand have thick patches of inhibiting ferns, which are hindering seedling establishment (Figure 22). A small amount of Eutypella canker exists on some of the sugar maples. There is also some buckthorn present.

#### Stand Data

dbh	beech	bitt. hickory	black cherry	hophor nbeam	northern red oak	paper birch	quake aspen	red maple	red spruce	striped maple	sugar maple	white ash	yellow birch	sum	%
<4															
4 - 6	0.5									1.4	1.4		0.5	3.8	4%
6 - 8	0.5			1.4				0.5	0.5	0.5	3.3			6.7	7%
8 - 10				0.5		0.5		1.0			2.9	1.0	0.5	6.2	6%
10 - 12	0.5							1.0			6.7		1.9	10.0	10%
12 - 14			0.5		0.5		0.5	0.5			5.7	0.5	0.5	8.6	9%
14 - 16		0.5					0.5	1.0			7.6	0.5	1.0	11.0	11%
16 - 18			0.5			0.5	0.5	0.5			10.5	0.5		12.9	13%
18 - 20	0.5		0.5		0.5		0.5	1.0			11.4	2.9		17.1	18%
20 - 22					0.5		0.5				4.8	3.3		9.0	9%
22 - 24							0.5				4.8	1.9		7.1	7%
24 - 26							0.5				0.5			1.0	1%
26 - 28											0.5	0.5		1.0	1%
28 - 30											0.5			0.5	1%
30 - 32											0.5	0.5		1.0	1%
32 - 34															
sum	1.9	0.5	1.4	1.9	1.4	1.0	3.3	5.2	0.5	1.9	61.0	11.4	4.3	95.7	100%
%	2%	1%	1%	2%	1%	1%	3%	5%	1%	2%	64%	12%	4%	100%	

Table 27. Basal area per acre by 2-inch diameter class – Stand 14

Sampling Date: 6/7/2017      Number Points/Plots: 21

Quadratic Mean Stand Diameter (inches): 10.9      Stems/acre: 169.4

Basal Area (ft<sup>2</sup>/acre):

Total: 96.2      Acceptable Growing Stock: 76.7      Unacceptable Growing Stock: 19.5

Stocking level: B-A on Northern hardwoods Stocking Guide

Canopy Closure: 72%      Midstory Closure: 62%      Snag trees/acre: 10.0

## Timber Tables:

dbh	bitternut hickory	black cherry	red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	yellow birch	TOTAL
10 - 12			36			23	80	25		163
12 - 14		52			64	36	384	26	35	597
14 - 16	48	54			26	37	690	65	36	956
16 - 18			46	36			941	82		1,105
18 - 20		72			27		727	326		1,152
20 - 22			55				191	263		509
22 - 24					42		319	58		420
24 - 26							29			29
26 - 28							48	60		107
<b>TOTAL</b>	<b>48</b>	<b>178</b>	<b>136</b>	<b>36</b>	<b>160</b>	<b>96</b>	<b>3,408</b>	<b>905</b>	<b>71</b>	<b>5,037</b>

Table 28. Board Feet per acre by 2-inch diameter class – Stand 14

## MANAGEMENT RECOMMENDATIONS

**Long Range Silvicultural Objectives:** Uneven-age Management

**Present Stand Age:** 90

**Rotation Age:** 120

**Treatment Year:** 2020

**Treatment:** Intermediate thinning

**Residual Basal Area:** 75

**Species favored for retention and regeneration:** Sugar maple, red oak, black cherry

**Recommendations:** This stand should be treated with an intermediate thinning in 2020. The primary purpose of this treatment will be to concentrate growth on the highest quality stems in the stand, while capturing value in low quality and declining stems.

Poor quality and declining stems, or those crowding stems of superior form and condition, should be removed. This treatment will target unhealthy individuals of all species for harvest, but will generally focus on removing declining ash and white birch and poor-quality red maple. This harvest will lower stocking in this stand to approximately 75 ft<sup>2</sup>/acre, stand-wide.

In some areas, declining white birch, white ash, and red maple comprise the majority or entirety of the stocking in a small group. In these areas, groups up to 1/2 acre in size may be cut. Within these groups all stems should be severed, except for occasional high-quality individual trees, any snags or cavity trees present, and any pockets of established high-quality regeneration. These groups will not be evenly distributed throughout the stand, but should be placed only where pockets of pure or nearly pure poor-quality stocking exist. The purpose of these groups is to capture the value in declining trees, but they will likely have the added benefit of creating structural diversity in this stand, establishing regeneration or releasing existing regeneration. A total of up to 10% of the stand, or 13 acres, may be regenerated in the course of this treatment.

This treatment will occur in winter, utilizing the established landing off of Hayden Hill East Road. The harvest should utilize a cable skidder or other comparable, low-impact logging equipment. It is likely that this harvest will take place over the course of two winters.



**Stand Cover Type:** Early northern hardwood

**Natural Community:** Northern Hardwood Forest

**Forest Zone:** Moderate Use and Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** II

**Soil Series:** Peru and Marlow fine sandy loams

**Stand Description:** Stand 15 is in the southern section of the Hollis Parcel, just north of Hayden Hill Road. Slopes are gentler in the south part of the stand, and get steeper up the hill, averaging out to 20% slope. The stand has a south facing aspect. Most of the southern part of the stand is in the Moderate management zone.

There are technically a series of vernal pools that have been created in the ditch in areas along the north side of Hayden Hill Road, especially toward the east. Frog egg masses were abundant in these small ponding areas.



*Figure 23. Grassy ground layer in northwest part of stand*

Regeneration is good in most of the stand, adequately stocked in the seedling to sapling size class. Sugar maple is the primary regeneration species in the lower part of the stand, and beech is more predominant higher on the slope. Other species include striped maple, white birch, witch hazel, quaking aspen, red maple, hophornbeam, white ash and white pine. There are also red oak and red spruce seedlings coming in. The northwest part of the stand has a grassy ground layer that lacks regeneration. It is possible that this is due to earthworm action in the soil, but this would require further investigation (Figure 23).

Trees range widely in size, with many pole and small sawtimber size stems and large legacy trees mixed in. About two-thirds of basal area is in the 6 to 14" size classes (Table 29), but four of the red oak inventoried were larger than 30" d.b.h. One red oak measured 38".

Timber volumes are low to moderate, at 2.6 MBF/acre (Table 30). Most of the timber value is in red oak, white ash and white pine. Trees are especially nice and straight in the northwest part of the stand. Access to this stand is very good, with over 1,500 feet of level access from Hayden Hill Road.

This stand has some important cultural features, including preserved stone walls and a cellar hole. Many of the stone walls are well preserved and fully evident, but the cellar hole is becoming naturalized and is easy to miss (Figure 24).



*Figure 24. Cellar hole becoming naturalized*

## Stand Data

dbh	American beech	northern red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	white pine	sum	%
<4										
4 - 6	1.4				2.9				4.3	4%
6 - 8	7.1				2.9	1.4	5.7	2.9	20.0	20%
8 - 10	2.9				5.7			1.4	10.0	10%
10 - 12	2.9	1.4	1.4		1.4	5.7		1.4	14.3	14%
12 - 14		7.1	4.3		2.9	4.3	1.4		20.0	20%
14 - 16	1.4	2.9	1.4		1.4			1.4	8.6	8%
16 - 18		2.9	1.4		4.3				8.6	8%
18 - 20		1.4		1.4		1.4	1.4		5.7	6%
20 - 22										
22 - 24		1.4						1.4	2.9	3%
24 - 26						1.4			1.4	1%
26 - 28										
28 - 30										
30 - 32		2.9							2.9	3%
32 - 34										
34 - 36		1.4							1.4	1%
36 - 38										
38 - 40		1.4							1.4	1%
sum	15.7	22.9	8.6	1.4	21.4	14.3	8.6	8.6	101.4	100%
%	15%	23%	8%	1%	21%	14%	8%	8%	100%	

Table 29. Basal area per acre by 2-inch diameter class – Stand 15

dbh	American beech	northern red oak	paper birch	quaking aspen	red maple	sugar maple	white ash	white pine	sum	%
<=8										
8 - 10								101	101	4%
10 - 12		266	130		136				532	21%
12 - 14	124	219				79	75	73	570	22%
14 - 16		541							541	21%
16 - 18		157				73	201		431	17%
18 - 20		161							161	6%
20 - 22								120	120	5%
22 - 24		120							120	5%
sum	124	1,463	130		136	152	277	294	2,575	100%
%	5%	57%	5%		5%	6%	11%	11%	100%	

Table 30. Board feet area per acre by 2-inch diameter class – Stand 15

**Sampling Date:** 7/31/2017

**Number Points/Plots:** 7

**BAF/Plot Size:** 10

**Quadratic Mean Stand Diameter (inches):** 9.2

**Stems/acre:** 217.5

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 101.4

**Acceptable Growing Stock:** 58.6

**Unacceptable Growing Stock:** 42.8

**Stocking level:** B-A on Northern hardwoods Stocking Guide

**Canopy Closure:** 89%

**Midstory Closure:** 64%

**Snag trees/acre:** 27.3

### **MANAGEMENT RECOMMENDATIONS**

**Long Range Silvicultural Objectives:** Even-age Management

**Present Stand Age:** 75

**Rotation Age:** 120

**Treatment Year:** 2024

**Treatment:** Small group and single tree selection

**Residual Basal Area:** 80

**Species favored for retention and regeneration:** Red oak, sugar maple

**Recommendations:** Lightly thin this stand, focusing on releasing good maple and oak growing stock in the smaller size classes. Utilize the woods road that enters the stand about 500' east of the southwest corner. Care should be taken so as not to disturb vernal pools that have formed along the north edge of Hayden Hill Road. Also, avoid using machinery in or around the cellar hole.

**Stand Cover Type:** Oak hardwoods

**Natural Community:** Mesic Red Oak-Northern Hardwood Forest, Dry Oak-Hophornbeam Forest

**Forest Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** III

**Soil Series:** Marlow fine sandy loam, Lyman-Marlow very rocky loams

**Stand Description:** Stand 16 covers much of the hilltop of the Hollis parcel. It encompasses the south facing side of the hill, and includes the hills highest point at 1,512'. This dry hilltop is characterized by thin, acidic soils.

Red oak makes up a third of the basal area, followed by sugar maple, white pine and red maple. Trees are generally small, with half the basal area less than 12" d.b.h. The thin acidic soils have caused the trees to grow more slowly on this hilltop, and have allowed a moderate amount of blowdown to occur.

Regeneration is sparse in this stand. Beech predominates the regeneration. There is also striped maple, hophornbeam, paper birch, red maple, red spruce and white pine. Shrub species include blueberry, which are associated with acidic soils.

#### Stand Data

dbh	American beech	black cherry	choke cherry	northern red oak	red maple	red spruce	sugar maple	white pine	sum	%
<4										
4 - 6							3.3		3.3	3%
6 - 8	3.3		3.3	3.3	6.7				16.7	17%
8 - 10					3.3			3.3	6.7	7%
10 - 12				10.0			10.0		20.0	21%
12 - 14				3.3	3.3	3.3	3.3		13.3	14%
14 - 16							3.3		3.3	3%
16 - 18		3.3		3.3			3.3		10.0	10%
18 - 20								3.3	3.3	3%
20 - 22				6.7				6.7	13.3	14%
22 - 24										
24 - 26							3.3		3.3	3%
26 - 28				3.3					3.3	3%
sum	3.3	3.3	3.3	30.0	13.3	3.3	26.7	13.3	96.7	100%
%	3%	3%	3%	31%	14%	3%	28%	14%	100%	

Table 31. Basal area per acre by 2-inch diameter class – Stand 16



**Sampling Date:** 5/22/2017

**Number Points/Plots:** 2

**BAF/Plot Size:** 10

**Quadratic Mean Stand Diameter (inches):** 9.8

**Stems/acre:** 183.7

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 96.7

**Acceptable Growing Stock:** 60.0

**Unacceptable Growing Stock:** 36.7

**Stocking level:** B on Northern hardwoods Stocking Guide

**Canopy Closure:** 72%

**Midstory Closure:** 52%

**Snag trees/acre:** 13.4

**Management Recommendations:** Allow natural processes to occur undisturbed in Low Intensity Use/Reserves Zone.

**Stand Cover Type:** Mixed northern hardwoods

**Natural Community:** Northern Hardwood Forest/Rich Northern Hardwood Forest

**Forest Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** II

**Soil Series:** Lyman-Marlow very rocky loams, Marlow fine sandy loam

**Stand Description:** Stand 17 is located in the north end of the Hollis parcel. The stand covers most of the north side of the hill. The very northeast corner also contains a small section of an improved private road. This area also contains a private domestic well dug in 1986, owned by George Walton (VT DEC WellReportID #27662).

There is a high-quality vernal pool located in a depression in the south-central part of the stand (Figure 25). There is also a brook flowing through well-defined ravine in the northwest part of the stand.

This diverse hardwood stand is made up of about half sugar maples through a range of size classes. Other predominant species are red oak, red maple, red spruce and white ash, with a smaller component of basswood, beech and yellow birch. Old stumps are scattered throughout the stand, indicating past management activities.

Some areas of the stand have enriched soils and good site indicators such as maidenhair fern, wild leeks and blue cohosh. Accordingly, there are some high-quality sugar maples growing in the stand that have good timber value, particularly northeast corner.

Regeneration is variable but generally adequately stocked, in the seedling to sapling size class. Beech and striped maple are abundant, other species include sugar maple, red spruce, white ash and paper birch.



*Figure 25. Vernal pool*

### Stand Data

**Sampling Date:** 5/22/2017

**Number Points/Plots:** 6

**BAF/Plot Size:** 10

**Quadratic Mean Stand Diameter (inches):** 9.9

**Stems/acre:** 191.9

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 102.0

**Acceptable Growing Stock:** 60.0

**Unacceptable Growing Stock:** 42.0

**Stocking level:** B-A on Northern hardwoods Stocking Guide

**Canopy Closure:** 78%

**Midstory Closure:** 67%

**Snag trees/acre:** 5.7

dbh	American basswood	American beech	northern red oak	paper birch	red maple	red spruce	sugar maple	white ash	yellow birch	sum	%
<=4							2.0			2.0	3%
4 - 6						2.0				2.0	3%
6 - 8				4.0		2.0				6.0	10%
8 - 10											
10 - 12				2.0	4.0					6.0	10%
12 - 14	2.0	2.0								4.0	7%
14 - 16							4.0	2.0		6.0	10%
16 - 18			4.0				6.0			10.0	17%
18 - 20			4.0				4.0	2.0	2.0	12.0	20%
20 - 22							4.0			4.0	7%
22 - 24							2.0			2.0	3%
24 - 26							2.0			2.0	3%
26 - 28							4.0			4.0	7%
28 - 30											
30 - 32											
sum	2.0	2.0	8.0	6.0	4.0	4.0	28.0	4.0	2.0	60.0	100%
%	3%	3%	13%	10%	7%	7%	47%	7%	3%	100%	

Table 32. Basal area per acre by 2-inch diameter class – Stand 17

dbh	American basswood	American beech	northern red oak	paper birch	red maple	red spruce	sugar maple	white ash	yellow birch	sum	%
<=8						81				81	2%
8 - 10											
10 - 12		146		89	146					381	8%
12 - 14	116	230								347	7%
14 - 16							519	273		792	16%
16 - 18			162				858			1,020	21%
18 - 20			389				322	112	156	979	20%
20 - 22							552			552	11%
22 - 24							164			164	3%
24 - 26							294			294	6%
26 - 28							289			289	6%
28 - 30											
30 - 32											
sum	116	377	551	89	146	81	2,999	385	156	4,899	100%
%	2%	8%	11%	2%	3%	2%	61%	8%	3%	100%	

Table 33. Board feet per acre by 2-inch diameter class – Stand 17

**Management Recommendations:** Since Stand 17 is in the Low Intensity Use/Reserves Zone, harvesting is not proposed at this time. In the future, however, the Town may want to consider managing certain parts of the stand for high-quality hardwood sawlogs and veneer.

**Stand Cover Type:** Red maple swamp

**Natural Community:** Northern Hardwood Seepage Forest

**Forest Zone:** Low Intensity Use/Reserves

**Age Class Structure:** Even

**Site Class:** II

**Soil Series:** Peru fine sandy loam, Lyman-Marlow very rocky loams

**Stand Description:** Stand 18 is a wet forested area in the northern part of the Hollis Parcel. Though it has been defined as a red maple swamp in the 2006 assessment, this is most likely a Northern Hardwood Seepage Forest. A Seepage Forest is a group of community types not yet formally recognized in Vermont. It is, however, recognized in New Hampshire, listed as uncommon but not rare (S3). The Vermont Natural Heritage Inventory is working on including the classification. A seepage forest overstory is typically a mix of sugar maple, yellow birch, white ash, and black ash. Soils are typically wetland, with shallow surface organics and high organic content A-horizon. False hellebore, jewelweed, and other seepage indicator wetland herbs are common.

In this stand, the overstory is predominantly sugar maple, and includes red maple, beech, red spruce and hophornbeam. The understory is dominated by beech, and also includes striped maple, hobblebush and witch-hazel. Ground species include trout lily, Indian cucumber, cinnamon fern, and mosses.

## Stand Data

dbh	American beech	hophor nbeam	red maple	red spruce	sugar maple	sum	%
<4							
4 - 6	5	15				20	15%
6 - 8	10				5	15	11%
8 - 10					10	10	7%
10 - 12	5			10	10	25	19%
12 - 14				5	5	10	7%
14 - 16	5		5		5	15	11%
16 - 18			15		20	35	26%
18 - 20							
20 - 22							
22 - 24			5			5	4%
sum	25	15	25	15	55	135	100%
%	19%	11%	19%	11%	41%	100%	

Table 34. Basal area per acre by 2-inch diameter class – Stand 18



**Sampling Date:** 5/22/2017

**Number Points/Plots:** 2

**BAF/Plot Size:** 10

**Quadratic Mean Stand Diameter (inches):** 8.1

**Stems/acre:** 379.2

**Basal Area (ft<sup>2</sup>/acre):**

**Total:** 110.0

**Acceptable Growing Stock:** 70.0

**Unacceptable Growing Stock:** 40.0

**Stocking level:** B-A on Northern hardwoods Stocking Guide

**Canopy Closure:** 78%

**Midstory Closure:** 70%

**Snag trees/acre:** 5.4

**Management Recommendations:** Allow wetland functions to occur undisturbed. This stand should be buffered if any management occurs in adjacent stands.

## **XI. MANAGEMENT SCHEDULE**

*Treatment year should be flexible to account for market changes, weather and ground conditions, and other factors.*

<b>Treatment Year</b>	<b>Stand #</b>	<b>Management Activity</b>
2018	1A, 1B	Irregular shelterwood
2018	2A	Irregular shelterwood
2018	3	Small group and single tree selection
2018	7	Small group and single tree selection
2020	14	Intermediate thinning
2024	15	Small group and single tree selection
2026	6	Small group and single tree selection
2026	9	Small group and single tree selection

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### **XIII. DEFINITIONS**

**Acceptable growing stock** A growing tree capable of producing at least one 8-foot log in the butt or bottom section of the bole.

**Basal area** The cross-sectional area of the base of any object. In forestry it means the cross-sectional area of a tree at a point 4.5 feet above the ground line expressed in square feet. The sum of all basal areas of all the trees on an acre is a measure of the density of the population of trees growing on the acre and is useful for making forest management decisions.

A helpful way to think of basal area is to imagine all the trees on an acre cut off with 4.5 foot stumps. Basal area on the acre could then be measured by measuring and totaling the cross sectional area of all the stumps.

**Board foot** A unit of measure of wood 1 inch thick, and 1 foot on each side.

**Bole** The stem or trunk of a tree, usually thought of as being that part without limbs, the merchantable part of the stem, the bottom part of the stem.

**Canker** An imperfection on the trunk, limb or twig of a tree caused by an organism that kills a part of the tree's tissue. Canker-causing organisms sometimes exist in some sort of a balance with the host, never killing enough tissue to cause death. Cankers tend to weaken trees at the points where they are growing, causing the tree to eventually break.

**Cord** A unit of measure of wood that is equivalent to a pile of round wood 4 feet wide, 8 feet long and 4 feet high. Contains 128 cubic feet of wood and space.

**Crown** Refers to that part of the tree consisting of limbs, branches, twigs and leaves. In other words, the top of the tree.

**Cull** Refers to a tree having no commercial value, usually from having rot, holes, large knots or from being crooked rather than from being too small or of an unmerchantable species. It is important to note that a cull, though having no commercial value may have wildlife, aesthetic or other value.

**d.b.h.** stands for diameter breast high. Always taken as 4.5 feet above the ground.

**Defect** An imperfection in a tree making it less desirable for some purpose. The term is commonly used to refer to some imperfection that will reduce the value of a tree or log for a product, resulting in reduced monetary value.

**Den tree** A tree that has a hole in its stem that can be used as shelter by wildlife such as birds and small mammals.

**Mast tree** Mast = nut. A mast tree is a nut-bearing tree such as oak, beech, etc.

**MBF** One-thousand board feet.

**Natural Community** An interacting assemblage of organisms, their physical environment, and the natural processes that affect them.

**Pole or poletimber** A young tree or stand of young trees between 3.5 inches and 10 inches in diameter at a point 4.5 feet above the ground.

**Q value** The quotient between numbers of trees in successively smaller d.b.h. classes.

**Relative density** A measure of tree crowding that accounts both for the size of each tree and the amount of space typically occupied by a tree of that size and species. A relative density of 100 percent implies that the growing space is fully occupied

**Sapling** A young tree that has grown beyond the seedling stage. When a tree has grown to a diameter of 3.5 inches in diameter at a point 4.5 feet above the ground it is no longer a sapling, having become a small pole.

**Seedling** A baby plant. In forestry the term usually used to refer to young trees that have grown beyond the stage where they have just emerged from the soil up to the point that they become saplings. See sapling.

**Selection harvest** A method of harvesting whereby individual trees are selected for harvest. A characteristic is that the form and appearance of the forest is maintained and the site is not exposed to sunlight and weathering. This scheme favors tree species which tolerate shading such as maple and basswood. It also benefits certain wildlife species.

**Silviculture** Stands for forest (silva) + culture = forest culture. Defined by Webster as the art of producing and caring for a forest.

**Site index** A measure of the productive quality of an area where trees grow. Site index is based on the height of dominant and co-dominant trees at age 50. That is to say, if the average height of dominant and co-dominant trees on a site was 70 feet at age 50, 70 would be the site index. Graphs are developed to enable determination of site index over a range of tree ages.

**Snag** A snag is a dead tree, commonly a tall, limbless tree left after a logging operation. Though of little or no commercial value, they can be very valuable wildlife resources.

**Stand** A group of standing trees is referred to as a stand. One stand will usually have characteristics that will distinguish it from other stands. Differences could be species, average diameter, density and location.

**Stumpage** The value of standing timber. Also, the timber itself or the right to cut it.

**Unacceptable growing stock** A growing tree not capable of producing at least an 8 foot sawlog in the butt or bottom section of the bole.

**TSI** stands for timber stand improvement. It is any cultural practice carried out on a tree or group of trees that is designed to improve them for any purpose. The term is commonly used to refer to practices designed to help trees grow faster and develop more valuable products than if left alone.

**Volume** Refers to the amount of wood in a tree or log. Expressed as board feet, cubic feet, cords or other measure.

## XIV. VERNAL POOL TIMBER HARVESTING GUIDELINES

### SUGGESTED GUIDELINES FOR TIMBER HARVESTING AROUND VERNAL POOLS

Forest management practices may directly affect vernal pools and adjacent habitat used by amphibians outside of the breeding season. In general, silvicultural practices are compatible with conservation of pools and breeding populations of amphibians, especially if these general guidelines are followed. Remember, amphibians that breed in vernal pools spend most of the year (11½ months) in the surrounding upland forest—an area whose integrity must be maintained in order to support viable populations of amphibians.



**THE VERNAL POOL BASIN** – This includes the vernal pool depression (at spring high water) which may or may not be wet during the period when timber is being harvested.

**Management Goal:** To maintain the vernal pool depression in an undisturbed state.

1. Heavy equipment should not be permitted in pool depressions at any time of the year;
2. Avoid locating landings, skid roads, or haul roads through or near these depressions. Rutting, siltation, or compaction in the pool depression can alter the pool's water-holding capacity, disturb eggs or larvae buried in the organic layer and alter the environment in which organisms live;



3. Avoid harvesting operations in the pool depression, even during the winter. This can disturb woody vegetation that may serve as egg attachment sites or that may provide shading;
4. Avoid leaving slash and tree tops from forestry operations in the pool as they can hinder amphibian movement and alter water chemistry. If slash or other woody debris accidentally fall into the pool during the breeding season (April to June), it is best to leave it in place to avoid disturbing egg masses or other breeding activity.

**THE AMPHIBIAN "LIFE ZONE"** – This includes the forested habitat within 400 feet of the vernal pool depression. This area is used as a minimum and is based on the average migration distance for spotted and Jefferson salamanders (400 feet)<sup>1</sup> and wood frogs (633 feet)<sup>2</sup>. Since females are known to move further from pools than males, expanding the life zone to 500 feet or more will do more to preserve the ecological integrity of vernal pools and their associated wildlife.

**Management Goal:** To provide quality non-breeding habitat for amphibian populations.

To support amphibian populations, uplands adjacent to vernal pools should be dominated by areas of uncompacted leaf litter, coarse-woody debris, and closed canopies for maintaining a suitable forest floor microclimate. These microhabitat components are most likely to be maintained during light to moderate partial cuts within this management zone. Foresters who incorporate the following harvest guidelines in the landscape immediately surrounding breeding pools will greatly help to conserve local biodiversity and wildlife values associated with the vernal pool.

1. Maintain or encourage a closed canopy stand in a mature state that will provide shade, deep litter, and woody debris around the pool. This will ensure that the temperature and relative humidity at the soil surface be maintained in the cool, moist condition necessary for amphibians;

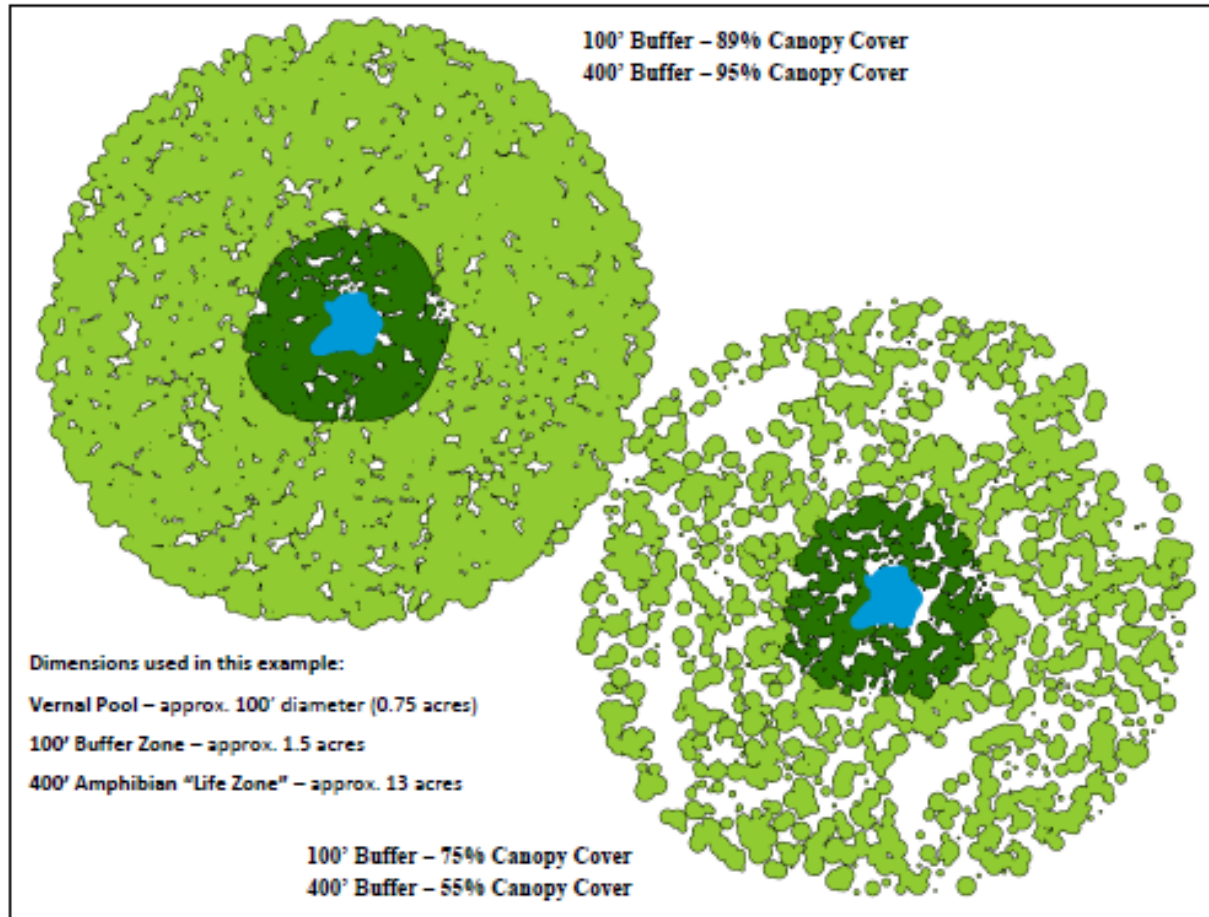
*Photos: Discussing management options with landowners at vernal pool in Hartford, VT (top); Jefferson Salamander, Sharon, VT. Both © Steve Faccio*

2. Limit harvesting to uniformly distributed light to moderate partial cutting, leaving a minimum of 75% canopy cover within 100 feet of the pool, and 55% canopy cover between 100 and 400 feet of the pool;
3. Maintain a shaded forest floor without ruts, bare soil, or sources of sedimentation/erosion. Ruts deeper than 4 inches can disrupt migration routes of salamanders. If ruts fill with water, amphibians may deposit eggs in ruts that do not hold water long enough to produce juveniles.
4. Harvesting operations should occur only on frozen ground and outside of the season when juveniles and adults are active on the forest floor.

<sup>1</sup> Faccio, S.D. 2003. Post-breeding emigration and habitat use by Jefferson and spotted salamanders in Vermont. *Journal of Herpetology* 37:479-489.

<sup>2</sup> Baldwin, R.F., A.J.K. Colhoun, and P.G. deMaynadier. 2006. Conservation Planning for Amphibian Species with Complex Habitat Requirements: A Case Study Using Movements and Habitat Selection of the Wood Frog. *Journal of Herpetology* 40:443-454.

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