Forest Management Plan
Town Forest
Hanover, New Hampshire

Prepared by Butternut Hollow Forestry
Ecosystems Management Consultants
and
Hanover Conservation Commission

2020

Table of Contents

List of Tables and Maps

Forest Management Plan
Town Forest
+/- 629 acres Hanover, New Hampshire

PLAN PURPOSE

This plan's purpose is to provide the Hanover Conservation Commission with a comprehensive description of the property's natural resource attributes and to propose management activities. This plan is meant to provide practical information and recommendations for practices that consider the Town's objectives, given the character of the land and the surrounding landscape. The plan is meant to allow for flexibility as the forest conditions change or as the objectives for the property change over time. This plan sets forth activities in the form of silvicultural prescriptions where managing for timber products is appropriate. The plan also makes suggestions and recommendations for other goals such as water quality, wildlife habitat, ecology and recreation.

This is the second management plan for the property in its current configuration. The first plan was written by Harwood Forestry in 1994. In 1980, a forest management plan for the Town Forest (then 98 acres) was developed by Ehrhard Frost.

BRIEF PROPERTY DESCRIPTION

Identified in the Hanover tax records as Map 14, lots 8, 9 and 12, the 629-acre (as estimated by the Town GIS, actual acreage unknown at this time) tract is located in the northeastern part of Hanover with quite a bit of road frontage along Goose Pond (Class V) and Tunis (Class VI) Roads. E-911 managers have re-named Tunis Road, so it is shown on recent maps as Adams Road. The original town forest was 98 acres, with the Goodwin property added later. Entirely forested, the most common tree is red maple, while white ash makes up an estimated 22% of the total sawlog volume. The terrain is steep and ledgy, limiting the areas where commercial forestry can be practiced.

The property is located in the Monadnock Sunapee Highlands ecoregion.

This part of New Hampshire is generally cooler and wetter than the nearby Connecticut River Valley ecoregions. The soils are mostly glacial till which can be enriched where there is calcium-rich bedrock. This region is generally productive for tree growth, especially white pine and northern red oak, but also northern hardwoods.

Mixed hardwoods are common

Along Tunis Road

BRIEF PROPERTY HISTORY

Prior to European settlement, the property was probably entirely forested, likely consisting of a mixture of shade-tolerant hemlock, red spruce, sugar maple and beech, along with smaller amounts of medium shade-tolerant yellow birch and white pine. Areas of older trees including small canopy gaps created by mortality or blowdowns and with limited human intervention are commonly referred to as a climax forest. In reality, forests are never truly at climax; succession is continuous with fire, hurricane, ice storm, insect infestation, disease, and/or human intervention, producing disturbances and causing the forest to revert to an earlier stage of succession.

While no additional historical research was conducted for this plan, much of the land-use history can be gleaned from on-ground evidence. In the early 1800s, settlement expanded from the valleys into the hills. Most of the more moderate terrain was likely cleared for agricultural use - either as crop land or pasture. In the Town Forest, stone walls and the remains of building foundations are a testament to this past land use.

The original 98- acre Town Forest was granted to Hanover by Florence Whipple in 1941. In 1965, the Town Forest Committee was formed. It is not known when this

Committee disbanded. The property was surveyed in 1979 to facilitate the development of the1980 Continuous Forest Management management plan. Erhardt Frost oversaw a logging project in 1984 with an estimated harvest of 72,000 board feet and 500 cords of hardwood pulp. In 1987, the Town purchased the adjacent Dorothy Goodwin property with the help of Land and Water Conservation funds. In 1994, Harwood Forestry developed the first forest management plan for the expanded property. In 1998, upper elevation parts of the property were impacted by an ice storm that damaged many trees and delayed the proposed harvest schedule. In 2005-2007, a timber harvest was conducted in the property's northwestern corner. The yield from this harvest included: 570,755 board feet, 140 cords of pulp, 297.37-ton volume of chips, 42 cords of firewood and 49.57 cords of hardwood pulp and chips. In 2012, the Upper Valley Mountain Bike Association was given permission to expand recreational use of the property by building a mountain bike trail. A Recreational Trails Program grant funded the installation of a parking area at a former log landing on Goose Pond Road in 2013. Soon after, a gate across the north end of Tunis Road was installed by the Town. The culvert across Tunis Road at its intersection with Goose Pond Road was replaced in 2019.

GOALS AND OBJECTIVES GUIDING TOWN FOREST MANAGEMENT

The Town of Hanover has been a steward of this property for nearly 80 years. Every property owned by the Town contributes to the Town system of open spaces which supplements the overarching Town goal of creating a sustainable community.

Sustainability is most often defined as meeting the needs of the present without compromising the ability of future generations to meet theirs. It has three main pillars: environmental, economic, and social. The goals for this property reinforce the Town's environmental goals and are developed to let natural systems function, remain diverse, and produce everything they need for the ecology to remain in balance.

The Town's environmental goals, taken from its draft update of the *Open Space Priorities Plan* are as follows:

Open Space Lands:

To protect rural and urban open space land to preserve the character and important natural resources of Hanover; to promote the development of a greenbelt

around the urban area.

Water Resources:

To safeguard surface waters, wetlands, and groundwater resources, and to protect water supplies and existing aquifers and groundwater recharge areas.

Forests and Fields:

To maintain productive forested and agricultural lands; to protect unfragmented forest lands; and to preserve open fields.

Wildlife and Biodiversity:

To protect and foster the ecological integrity of the town's diverse natural communities and wildlife habitats; and to develop a robust connected system of a variety of habitats.

Recreation:

To maintain and expand landscape-based recreational opportunities; and to develop an interconnected system of open spaces.

Historic and Cultural:

To protect Hanover's historic sites and Class VI highways; to provide cultural and educational opportunities; and to promote social interaction using open spaces.

Scenic Quality:

To sustain the scenic quality and visual character of the town.

Climate Change:

To provide climate change resilience through landscape diversity with a variety of soils and terrain, and locally and regionally effective connectivity; to protect the town's infrastructure from the impacts of climate change.

Objectives for the Town Forest are listed below in an unprioritized order:

- Maintain the ecological integrity and health of the forest system.
- Maintain or enhance the water quality of streams and wetlands.
- Maintain or enhance wildlife habitat by creating a diversity of habitat conditions.
- Protect rare or endangered species and natural communities.
- Provide a place of refuge for a variety of wildlife as climate changes.
- Grow and harvest trees in a sustainable manner where terrain and access are

suitable; capitalize on unsuitable areas as places to sequester carbon.

- Develop opportunities (trails) for recreational pursuits including cross country skiing, mountain biking, and nature walks.
- Protect all cultural, historic, and special ecological areas.

It is not always possible, nor practical, to achieve every objective on each acre of land. Some objectives such as "*preserve the character of important natural resources"* for example, by their nature are practiced on the entire parcel. But often, the more specific objectives are better applied to sections of the land best suited to meet those objectives.

PROCEDURES

A forest inventory was conducted in April and May of 2017 to evaluate the timber types, wildlife habitats, and other natural features on the property. The forest inventory was conducted to evaluate the stocking and composition of the forest and the volume of the merchantable timber on the woodlot. A cruise grid of 134 sample plots was used spacing points 400 x 400 feet apart, providing approximately one point for every 3.5 acres of commercial forestland. A 20-BAF prism was used to sample trees six inches and larger at each point. The trees which fell within the sample at each point were recorded by species, diameters tallied to the nearest inch, growing stock status and crown position. The trees were also tallied as sawlogs, veneer, and pulpwood**,** or a combination of the three. Trees that have characteristics valuable for wildlife habitat and/or trees that have the potential to be good snags or downed woody debris were tallied as legacy trees. The sampling also included estimating the number, size and decay class of snags, downed logs, and cavity trees. Wildlife habitat, indicator plants, and regeneration characteristics were noted but not measured. Photographs were taken at points of interest.

Merchantable products estimated in tallied trees greater than six inches in diameter were graded in multiples of eight feet. Hardwood sawlogs were estimated to a ten-inch small-end diameter, while softwood logs were estimated to an eight-inch small-end diameter. Pulpwood was estimated in eight-foot lengths up to a four-inch top.

In order to more accurately estimate volume and species composition and to make specific forest management and wildlife habitat recommendations, the property was broken down into five stands. The stands are not all contiguous and those areas designated as A, B, or C are considered similar enough to be lumped together into one stand. In addition to the numbered stands, there are non-commercial areas. These areas either have terrain that is unsuitable for logging or are ecologically sensitive. The computer program Forest Metrix was used to process the data collected at the sample points. This was then extrapolated to the entire forest. The highlights and pertinent data are found in this plan. Additional computer program output is not included as part of this plan but is available if needed from Butternut Hollow Forestry.

The table below summarizes some of the broad characteristics of each of the mapped areas. Silvicultural treatments are proposed for the areas suited to forest management. A more detailed description and the results of the forest inventory can be found in the forest data section of this plan.

		SUMMARY CHART		
		HANOVER TOWN FOREST		
		BRIEF STAND DESCRIPTIONS		
STAND #	**EXISTING CONDITIONS**	**PROPOSED MANAGEMENT ACTIVITIES**	**NOTES**	**ACRES**
0A	Mixed wood talus	None	Steep with large rocks	3.9
0B	Hdwd talus even-aged w/ gaps	None	Ledgy steep - big trees	5.6
0C	Hdwd boulder field	None	Medium-sized trees	4.4
0D	Hdwd boulders and ledge	Possible hiking trail	Large interesting trees	27.9
0E	Hdwd steep to vertical ledge	None	Pocket of high elevation spruce forest	33.8
0F	Hdwd on steep ledgy sidehill	None	Some red mixed in here - mast area	6.5
0G	Black spruce red maple swamp	Try to restore or re-route road bed	Unusual ecological community	1
1A	Hdwd on moderate to steep slopes	Intermediate thinning 2019 -2022	Large ash at risk for EAB	63.9
1B	Southern part of 1	Intermediate thinning 2020 -2022	A bit more oak in the mix here	120.3
2	Mixed wood moderately steep	Thinning,patch cut invasive control 2019-2022	Create some canopy gaps for diversity	61.5
3A	Hdwd on moderate ground	Thinning and patch clear-cut 2019-2022	A bit of pine mixed in here	16.1
3B	Hdwd moderate and flat ground	Thinning and patch clear-cut 2019-2022	Oak here a good regional mast area	79.8
3C	Hdwd steeper slopes	Intermediate thinning 2019-2022	Quite a bit of red oak here too	15.5
4	Mixedwood moderate to steep	Intermediate thinning 2019-2022	Stand provide cover - bike trail	93.4
5	Sftwd flat and moderate slopes	Irregular shelterwood 2019-2022	Advance regen in canopy gaps	34.4

A rapid ecological assessment was undertaken by Ecosystem Management Consultants between May 2019 and May 2020. This is included in Appendix H. Significant ecological areas and rare, endangered or threatened species were identified. Proposed timber management sites were evaluated for ecological condition and

sensitivity. Finally, landscape level biodiversity was assessed for consideration in this plan and the Town *Open Space Priorities Plan*.

Fourteen significant ecological areas were identified that correspond roughly to the NC(non-commercial) areas designated in the Forest Type Map in Appendix D.

Significant Ecological Areas in the Hanover Town Forest

Id	Name	Description	Acres
1	Black ash conifer swamp	Old growth seepage/basin swamp	.7097
2	Y-B MM w dd talus buffer	Old growth talus slope/ledge	1.0866
3	Riparian zones/seepage	Lower stream braid & seepage area, cellar hole	7.6435
4	Talus slope & cascades	Small talus boulder extending to stream	.87
5	Semi-rich old talus slope RO-NH	Steep talus, rocky ledge, inoperable	9.36
6	Semi-rich NH-RO forest	Late successional, old growth, steep talus common	19.522
7	Semi-rich OG forest w dd talus	Late successional -old growth semi-rich woods	37.957
8	Semi-rich talus forest Wdld	YB-SM-RO-AB, some openings	6.6429
9	Semi-rich YB-MM Wdd talus	Inoperable, some enriched colluvium	7.6802
10	High elevation spruce-fir forest	Thin soils, some pine, uncut area	7.7263
11	Semi-rich RO-SM forest	Steep, many ledges & talus area	14.429
12	High elevation spruce-fir forest	Late successional forest/woodland	1.6971
13	Semi-rich wooded talus	Old growth trees, steep talus	2.1215
14	Rich mesic forest	Rare plants, old growth, steep talus	15.176
TOTAL			132

Public engagement has occurred a number of times during the management planning for this property. Neighbors and conservation organizations with an interest in

the east side of Moose Mountain were invited to gatherings on:

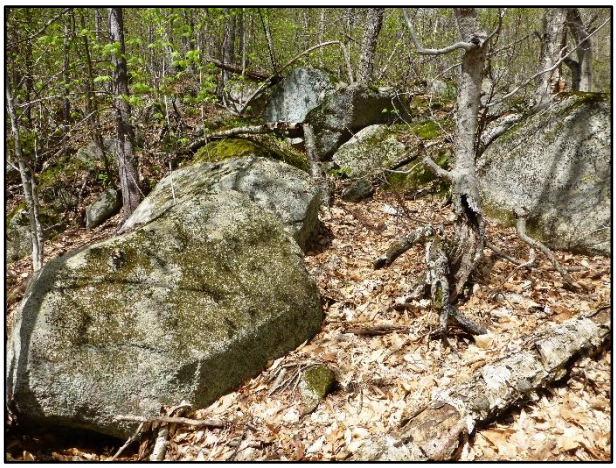
- **November 16, 2016** First gathering with neighbors, Town Forester, Hanover Conservancy
- **June 14, 2017** Town Forester reports on his preliminary results after his winter field work
- **August 7, 2017** Neighborhood ramble with Town Forester
- **October 24, 2018** Conservation Commission, Biodiversity Committee members and Town Forester tour site with UNH Extension Biologist, Grafton Country Forester, and representatives from the Upper Valley Land Trust, and NH Fish and Game.
- **July 10, 2019** Ecosystems Management Consultants reports on the first draft of the rapid ecological assessment.
- **August 13, 2020** Ecosystems Management Consultants reports on the final draft of the rapid ecological assessment.
- **January 13, 2021** Final draft of the Forest Management Plan is discussed.

In addition, the Commission received comments and reports that have been incorporated into this Plan.

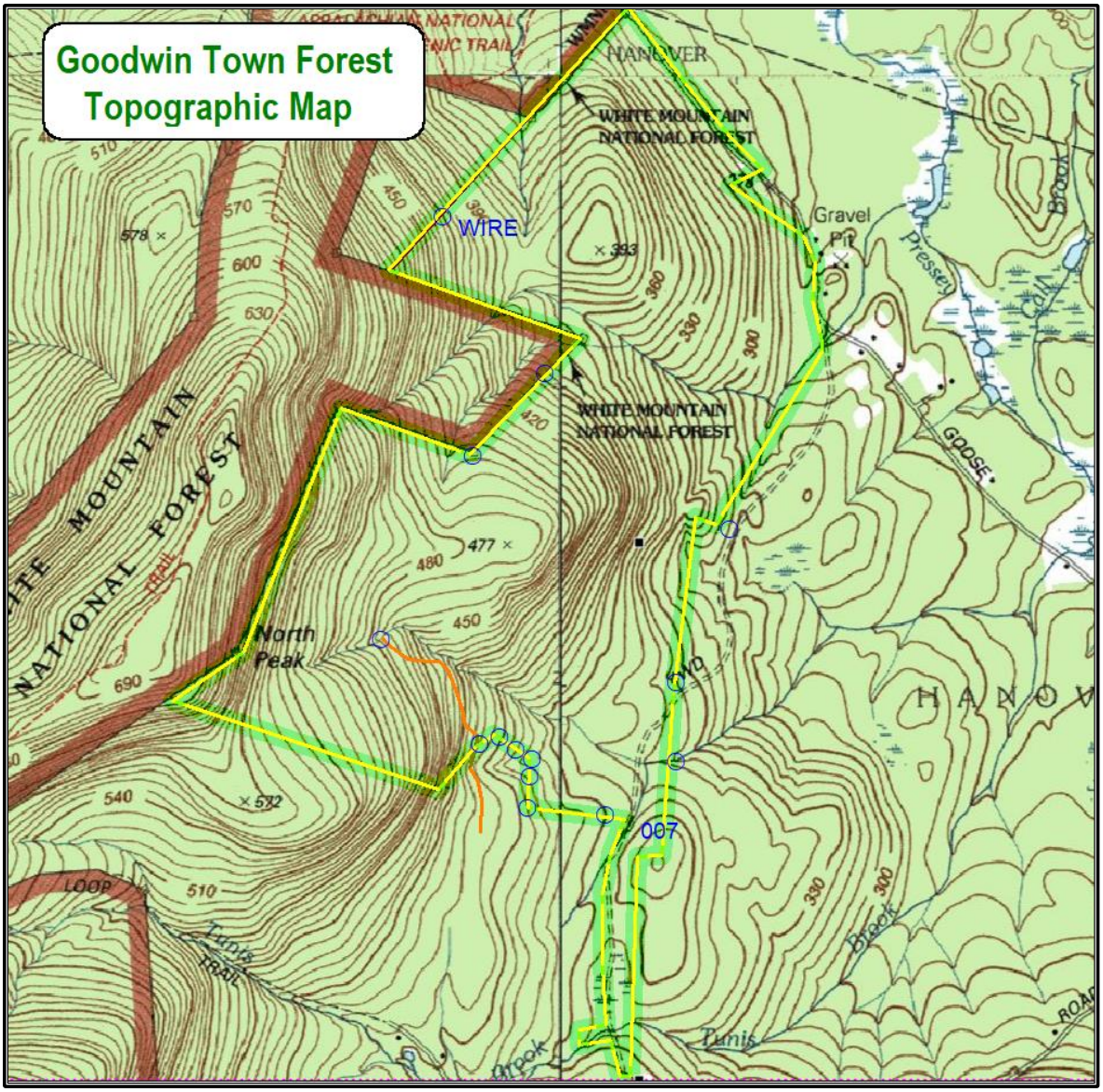
TOPOGRAPHY & TERRAIN

Lying on the eastern slopes of Moose Mountain, the topography of the Hanover Town Forest varies from flat to precipitously steep with elevations ranging from 850’ to 2,215’. Most of the topography consists of moderate to steep slopes. The terrain ranges from quite gentle to very rocky and includes places with ledge outcrops. Due to the challenging terrain and topography, approximately 95 acres are considered unsuitable for logging operations. There are additional areas that may be inoperable that do not appear on the forest type map.

A rocky side hill



Glacial erratics



ASPECT

If there is a dominant aspect it is easterly, but northeast and southeastern slopes are present as well.

BROOKS, WETLANDS & PONDS

As part of the larger Connecticut River watershed, water from the Town Forest flows into the third order Pressey Brook, and then into Goose Pond and the Mascoma River. The property has numerous water features, including 4.8 miles of perennial stream and 2.5 miles of intermittent streams. Riparian zones deserve special

consideration in the management process. They are valuable from a wildlife habitat standpoint and are a high priority for protection or restoration to maintain water quality. With the highest elevations reaching nearly to the Moose Mountain ridge, there are several headwater streams. Headwater streams typically have springs or seeps as their origin and they grow larger as they flow downhill. Often ephemeral in nature, they can be heavily flowing in the spring - only to dry up in late summer.

The most southerly and largest stream is Tunis Brook. Homestead Brook is encountered as one reaches the main part of the property near the cellar hole. The last perennial stream along Tunis Road is Moose Brook which flows off the north shoulder of Moose Mountain and descends along an old skid road before exiting the property near the north gate on Goose Pond Road.

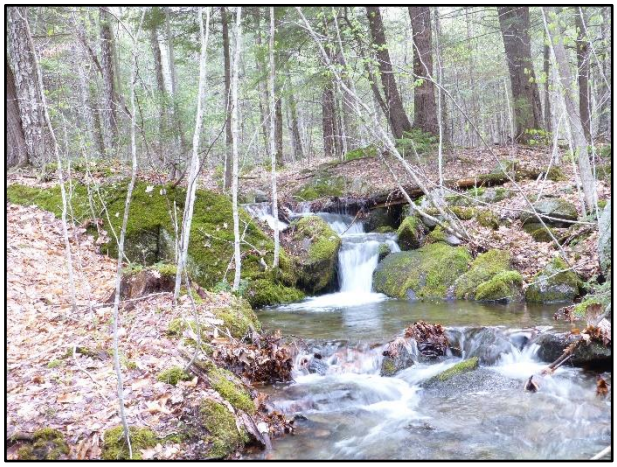
In addition to these streams, there are significant but small forested wetlands associated with flat ground and poorly drained soils, roughly 2.3% of the Forest. Each of the six wetland complexes have good value for wildlife but are not comparable with regard to flood storage or wildlife habitat, to the larger wetlands associated with Pressey Brook. The largest is slightly over three acres and is bisected by Tunis Road. This Red Maple-Sphagnum Basin swamp features deep organic soils. The next largest wetland, about 2.5 acres, is just north. It contains a fair amount of groundwater discharge that provides a steady supply of water and nutrients to the basin. A number of seepage-associated plants occur in this basin including enough Black ash to designate this as a Northern Hardwood Black-Ash Conifer Swamp. This natural community is rare in the State and it is the only one in the Town Forest. These sensitive areas have been compromised as Tunis Road passes through both wetland areas.

The ruts associated with Tunis Road have created impounded areas that serve as “pseudo” vernal pools. They contain ample amounts of water and obligate breeding amphibians, but are unnatural, and should not be treated as jurisdictional vernal pools.

A spring is the start of a stream

A headwater stream

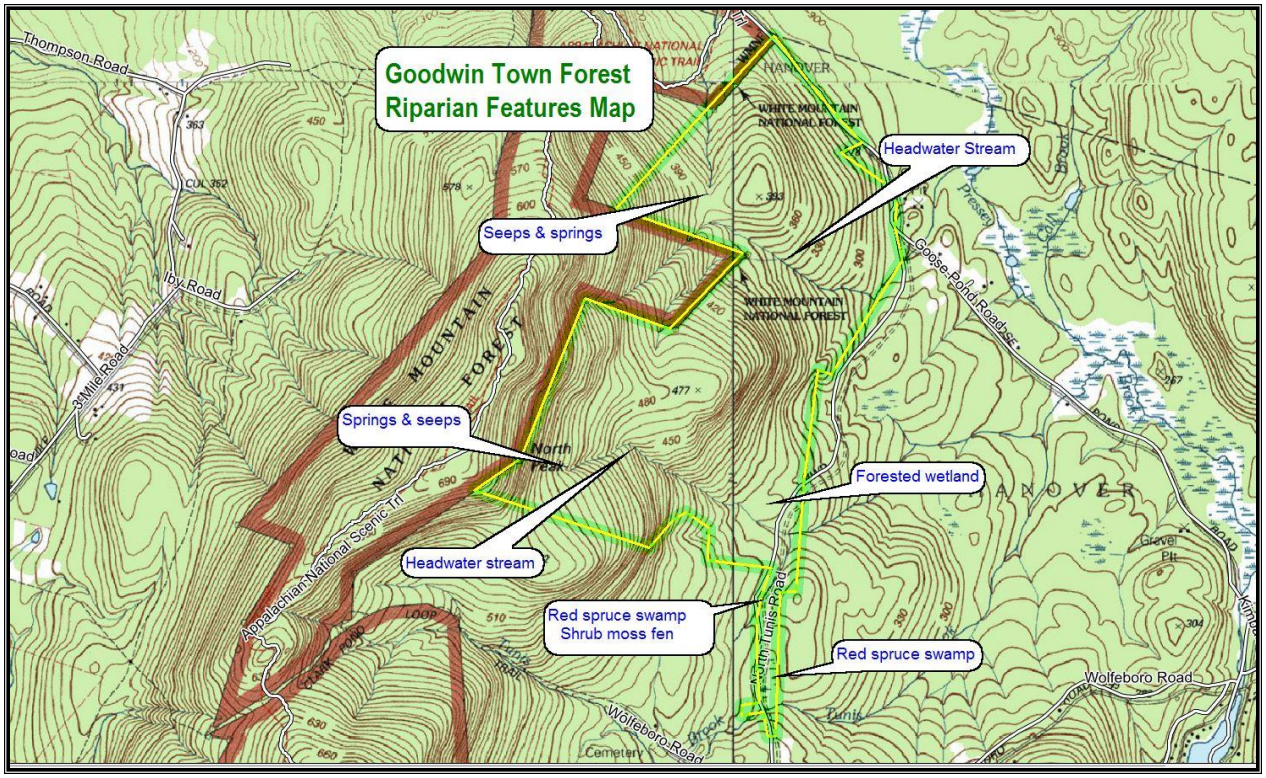
A forested wetland



A nicely flowing stream

Overland flow

More spring runoff



Some of the major riparian features on the Hanover Town Forest

GEOLOGY & SOILS

The Town Forest is underlain by a series of bedrock types that date back to the time of the first fish species, roughly 440-465 million years ago. The Ordovician time was when thousands of feet of sediment built up in the shallow seas off the then coast of North America and were subsequently compressed and metamorphosed during a continental collision tens of millions of years later.

The uppermost formation on the western edge of the property, the Ammonoosuc Volcanics, have interbedded layers of volcanic lava and ash materials. The result of upwelling magma during the continental collision, Granodiorite/Tonalite form the shoulders of Moose Mountain and the very large talus boulders, and comprise most of the central part of the property The eastern part of the property is the product of a late Ordovician magmatic upwelling and the bedrock here is known as Oliverian Biotite Granite.

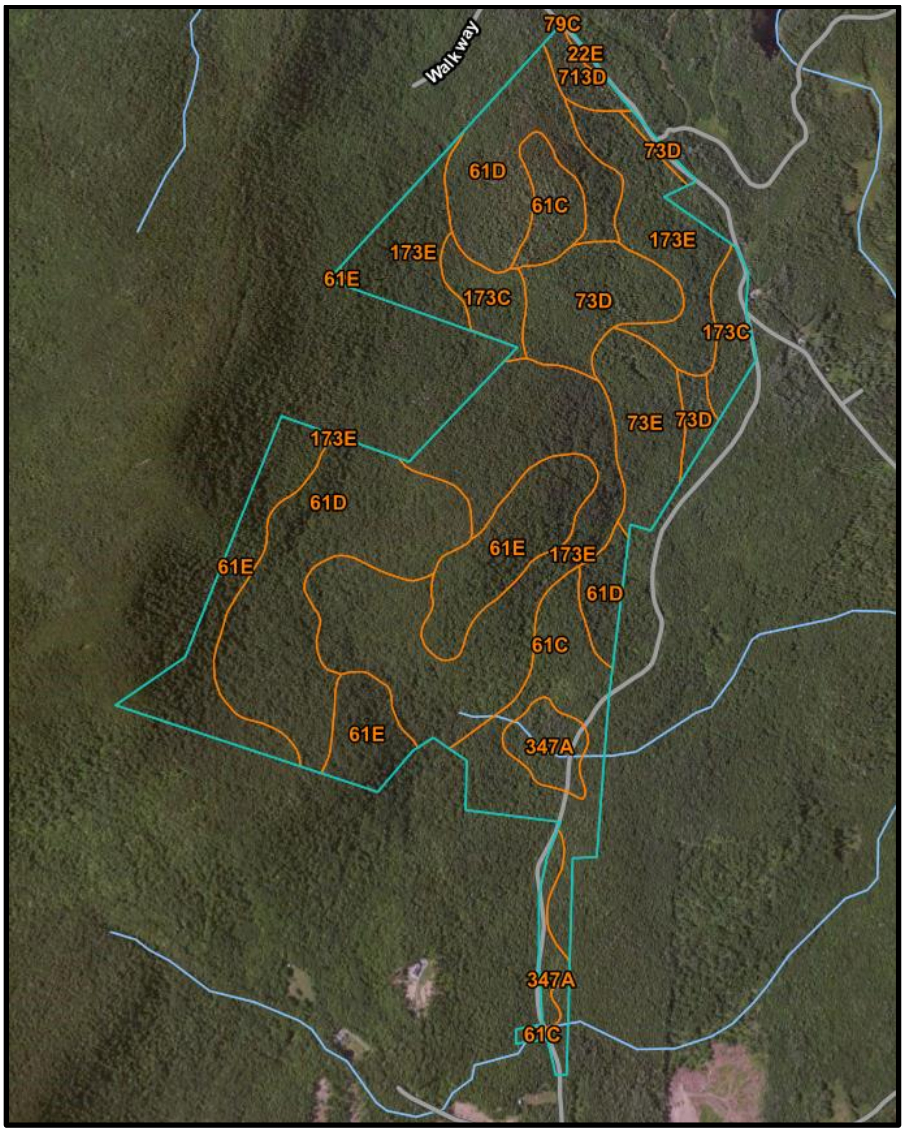
Soils that formed over this bedrock have been influenced by the physical and chemical properties of the rock, especially as it pertains to water and nutrients. The

horizontal bedding of the Ammonoosuc Formation mica schists dip easterly, enabling calcium-rich groundwater to enrich the soils on the eastern face of Moose Mountain while increasing surface weathering. This weathering contributes to the slow accumulation of colluvium, deep pockets of organic-rich soil, that is deposited between rock fragments. Thus, the rich soils of the eastern, lower edge of the Ammonoosuc Volcanics favor lush vegetation growing in a high pH humus.

In contrast, the talus and ledge on the northern part of the property have only thin soils and bare ledge with little colluvium and much less plant diversity. Counter-intuitively, soils in the lowest slopes are even less rich and favor softwoods that tend to further acidify the surface soil layers. The enriched seeps along Tunis Road are an exception.

Overall, the soils on the property are thin, moderate in terms of growth potential for vegetation, and very stony. Stones cover more than 15% of the landscape in most parts of the property, and upwards of 75 % of the surface in the talus boulder fields. Both slope and rock fragments are therefore a limiting factor for most land uses.

From a NH forester's perspective, the soils are productive for tree growth even where ledge outcrops are common. Six soil series are mapped on the parcel as shown on the NRCS Soil Map. Wetland soils and areas with a highwater table cover only about 3% of the area, more or less. The Natural Resources Conservation Service (NRCS) *Soil Resource Report* is included in Appendix C.



NRCS Soil Map

FOREST CONDITIONS

Forest Stands

Based on past management plan mapping, information collected during the timber cruise, aerial photos, and topographic interpretation, the forest was divided into five stands. Stands are aggregates of trees which have similar characteristics and they are the basic units of forest management. Stands differ from one another in species composition, density, and often age. Stand differences occur due to soil conditions, aspect, and most commonly, past or current land use. A forest stand may differ from its natural community type due to changes brought about by human activities.

Stand 1 is northern hardwoods

Stand 4 contains dense hemlock

Forest Types

The following forest type designations are used to describe stands in a broad sense:

COVER TYPES
H ≥ 50% dominant & co-dominant trees are hardwood
S ≥ 50% dominant & co-dominant trees are softwood
HS = Mixed species but dominated by hardwood
SH = Mixed species but dominated by softwood

SIZE CLASS
1 = Seedlings or regeneration - 90% of stems < 3" DBH
2 = Saplings or small poles 3" - 8" DBH
3 = Large poles and/or small sawtimber 9" - 12" DBH
4 = Sawtimber 13" and larger

CROWN CLOSURE/DENSITY
A = 75-100% crown closure of co-dominant or dominant trees
B = 50-74% crown closure of co-dominant or dominant trees
C = 0-49% crown closure of co-dominant or dominant trees

A description of each stand and a chart defining other characteristics can be found in the Forest Data section at the end of this plan. The location of each stand can be quickly identified by looking at the Forest Type Map in Appendix D.

Non-commercial Forested Areas

Approximately 95 acres of the property are mapped as non-commercial. No

inventory points were taken but all the areas were visited and evaluated. Here, the terrain is not suitable for conventional logging equipment. Mapped in six different blocks, these areas are forested and some of the trees are large and impressive. Most of the blocks have a species composition that is similar to the surrounding stand types, but the trees are often larger. This is mostly because the areas have not been harvested, or if they have been, it was limited. The exception to this is a high-elevation red spruce forest community which is different ecologically than other parts of the forest. Since these areas cannot be harvested, they will develop as a “natural” forest might. This means there may be a forest of giant trees someday, if the trees are not impacted by a heavy wind storm, or a significant ice storm like the one in 1998.

Ledgy and stony

A large yellow birch finds a place to grow

Age and Size Class Distribution

The juxtaposition of trees of different age classes has important implications for long-term forest and wildlife management. Forest managers generally divide a well-balanced (uneven-aged) forest into four different size classes: seedlings, saplings, pole timber and sawtimber. A balance of age classes is desirable for a diverse forest structure and the sustained yield of forest products. A mixture of age classes is also important for providing a variety and richness of wildlife habitats and an overall increase in ecological diversity.

While there was some timber harvesting in 2007, in most areas it has been much longer since any trees were cut. Canopy gaps that were created when trees lost their crowns in the 1998 ice storm, do have pockets of younger growth-as do parts of the most recently cut areas. Other than these areas, places with younger growth are lacking. There are no early successional areas. Almost all of the forest is characterized by middle-aged, medium to large diameter, sawtimber-sized trees. What is unusual for this region is that there are places with trees that are on the larger and older side. This is especially true on the non-commercial areas that are difficult or impossible to log. Also, these areas were never cleared for agricultural use. Once a major part of the landscape, older forests are regionally diminished - reducing the overall biological diversity of the forest ecosystem. It is nice to see some larger trees in the mix.

A large white ash

A 48” red oak

Growth Rates

An in-depth study of tree growth is beyond the scope of this plan. While not statistically sound, growth observations can be made by counting tree rings on old stumps and taking increment cores of some live trees. Although volume growth is very difficult and expensive to accurately calculate, a few basic rules-of-thumb do apply. A tree’s growth is directly related to the substrate (soil) on which it is located. Wet, ledgy or dry areas do not promote rapid growth of trees. Lower elevation and cool, moist but well-drained areas support better tree growth as the soils are deeper and more fertile. Younger trees and trees with adequate growing space generally grow at a fast rate -

faster than older trees. Trees in the average managed woodlot in New Hampshire grow two to four percent per year. This corresponds to volume increases of approximately 0.4 cords or 200 board feet per acre per year. The soils on Hanover Town Forest are somewhat better than average for tree growth, especially at lower elevations. These are fertile soils which are productive and are capable of growing quality hardwood trees to a large diameter.

Based on a growth rate of 2%, and given the current estimated volumes, annual growth on the commercial acreage is estimated to be 45,000 board feet of sawtimber and 175 cords of pulpwood.

Tree Quality

As with most properties in the area, tree quality and health are quite variable. Quality, for the purpose of this discussion, is primarily a timber-related consideration. It should be understood that a tree that is of poor quality for timber may be exceptional from a wildlife standpoint. The timber quality on the Hanover Town Forest is good to excellent - especially for hardwoods. Particularly impressive are the white ash. There are a lot of large, vigorous trees. Most of the softwoods are of average quality including the typically low-value hemlock.

As was mentioned earlier, large trees of poor quality are often valuable for wildlife. Cavities used by many birds and mammals are often present in these trees. They should be left as legacy trees which, once they die, will fall to the forest floor, becoming “retained organic matter” which provides important soil nutrients.

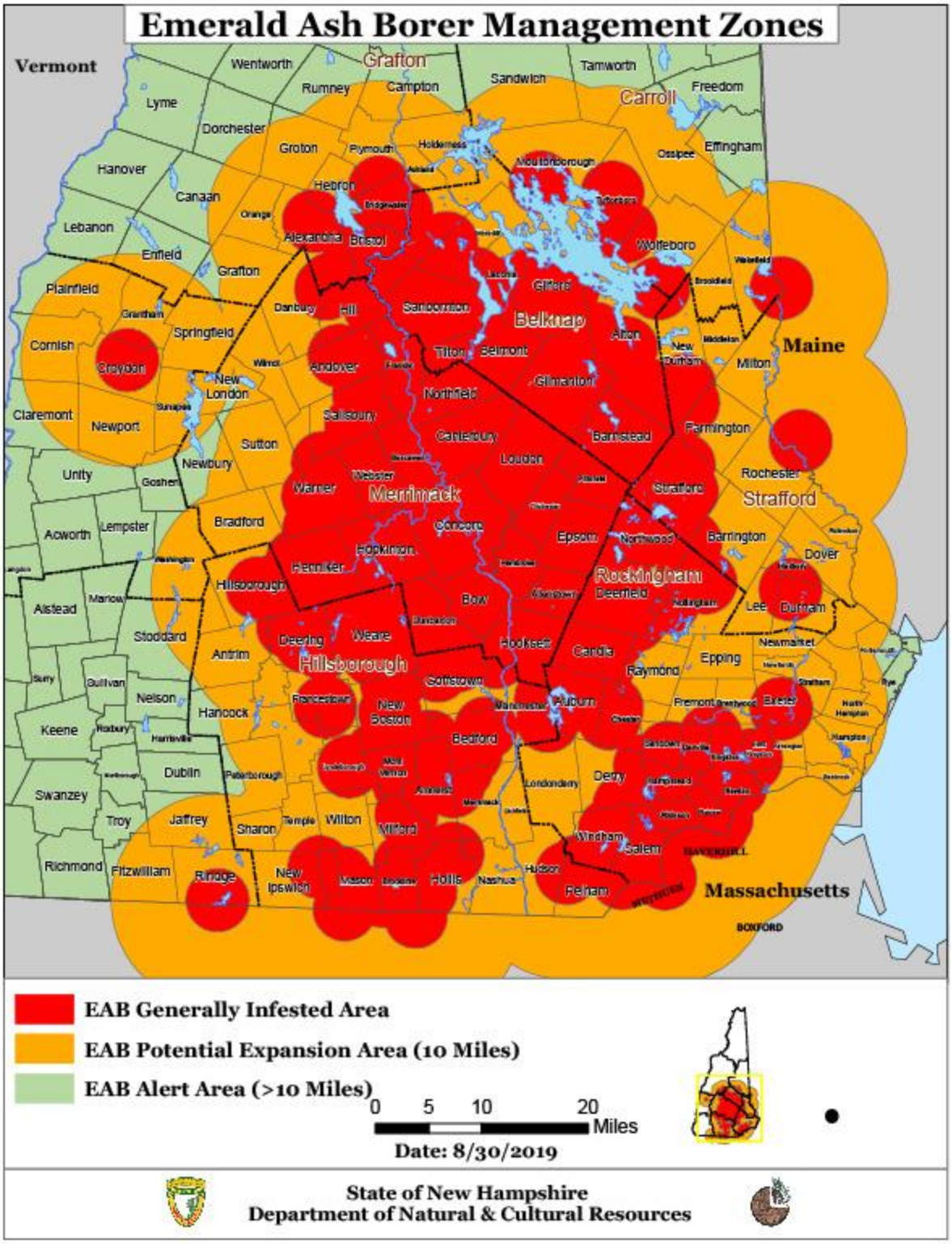
Forest Health

Generally speaking, the forest is free of widespread disease. The diseases found here are not unusual, and they are an integral part of a naturally functioning forest ecosystem. Common problems such as white pine blister rust, sugar maple borer, and beech bark disease are present, but they are no worse here than in other places. Of particular concern is the emerald ash borer. This insect has the potential to alter forest composition and decrease diversity by all but eliminating white, black and green ash trees. The maps below show the known infestation areas in New Hampshire as of 2019

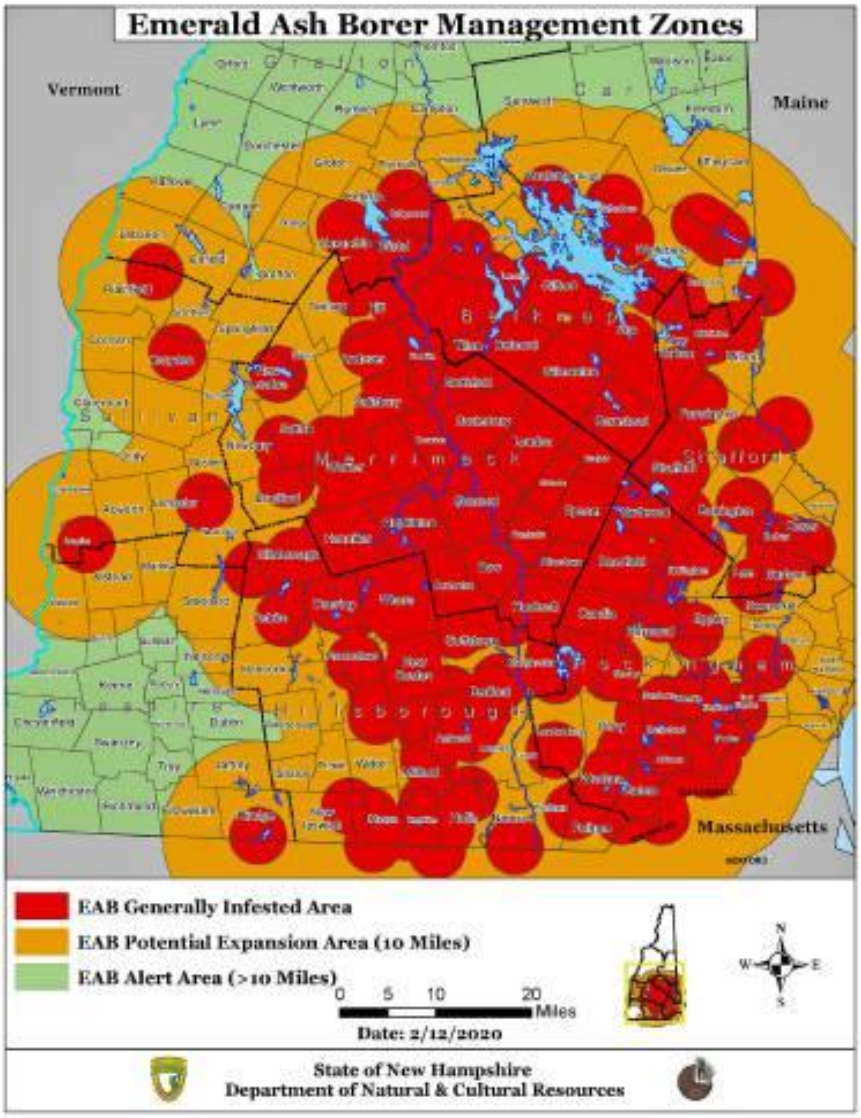
and 2020 and give a sense about the expansion of the infestation.

The insect has been found in the province of Quebec and all the surrounding states except Maine. A relatively large infestation was recently found in Vermont not that far from Hanover. It is estimated that the infestation has been there for at least several years. It is anyone's guess when it will show up in Hanover and perhaps it is already here.

The emerald ash borer has a history of altering forest ecology by killing a high proportion of the ash trees. In Wisconsin and Michigan where the insect was first identified in 2002, most of the ash trees are gone. Entomologists predict that once present in an area, both white and black ash will be targeted. The trees are killed by girdling when the borer is in its larval stage. White ash makes up 8% of the tree species on the commercial parts (and many of the large trees in the non-commercial portion) of Hanover Town Forest. Due to their relatively large diameter and good form, white ash makes up 22% of the sawlog volume (more than any other species) on the property. The current market value of these trees is high.

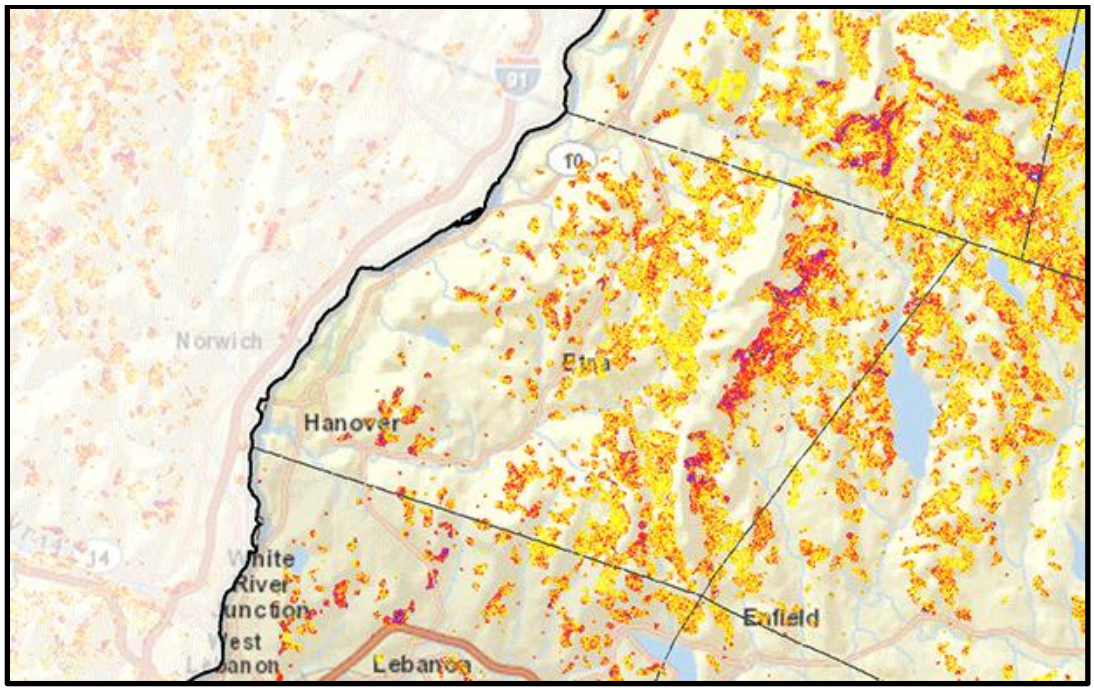


Map showing Emerald Ash Borer Management Zones in August 2019



Map showing Emerald Ash Borer Management Zones in February 2020
(Note spread to Plainfield putting Hanover in the potential expansion area in less than one year)

The map below shows the distribution of white ash in the Town of Hanover. The reds and purples show the highest concentrations of ash which are located on mid-slope, east - facing aspects on Moose Mountain, right where the Town Forest is located.



Invasive plants are one of the biggest threats to overall forest health and biodiversity. In many areas of the Connecticut River Valley, invasive plants are a real problem. Luckily, the Hanover Town Forest is far enough from the river valley that invasives are less abundant. Colt's foot has established at the north end of the property along Tunis and Goose Pond Roads. A small concentration of plants including barberry and honeysuckle are found near an old homestead. Common and glossy buckthorn may also be present although they were not found. It is best to remove these plants before they spread further. Chemical or mechanical removal can both be effective. With a small number of plants, mechanical removeable may be a viable alternative to chemical control and a valuable approach should there be an objection to using herbicides.

It should be noted that invasive plants are opportunists and they become established and spread when there is a disturbance. A bit of light and some exposed mineral soil are all most plants need to get a foothold. Buckthorn, honeysuckle, and barberry can be spread by birds and when the berries are ingested their seeds may be dropped many miles from the mother plant. Disturbances can be human caused (logging, mechanical control, emerald ash borer) or natural (large and small-scale wind throw, ice storms, fire etc.). Regardless of the cause, invasive plants will take advantage given the opportunity.

Periodic monitoring is a crucial step in controlling the spread of invasive plants. Early detection will make it easier to control the plants giving native plants a chance to grow and thrive. It is also crucial to control or remove invasive plants before any planned disturbance and to monitor the sites afterwards.

Japanese barberry

Honeysuckle

Colts foot, while not an exotic plant, can be invasive and it will take over sites often forming somewhat of a monoculture. It seems to thrive on gravelly disturbed sites. One such area is around the relatively new parking spot created when the mountain bike trail was built. Here, hand pulling and planting other native plants may be effective in reducing its spread.


There is a relatively large monoculture of Colts Foot here

An overabundance of white-tailed deer can often have detrimental effects on forest health. Deer browse on succulent and woody vegetation. They have their favorite foods and when those are depleted they move to less palatable options. While they have been known to browse on glossy buckthorn, they are rarely interested in invasive plants preferring sugar and red maple, white ash, and hemlock. This preference makes regenerating these and other native species difficult to impossible when deer populations are high.

Hanover is known for its high deer density, especially at lower elevations in the Connecticut River Valley. On the higher elevation Goodwin Town Forest, the deer population is lower than in the more developed parts of town. This does not mean that deer browse is not an issue as it is occurring. Parts of Stand 4 have relatively dense softwood cover. While it is not a preferred location for a deer yard, there is evidence that it is used especially in years when snowfall is abundant. There is also evidence of moose browse, but most if not all of that is five years old or older. Moose populations have plummeted in the last five years or so and they are not currently having a detrimental effect on successful native plant regeneration. Appendix G contains suggestions for management of invasive plants and deer.

In all of the stands except 5, beech is the most common tree in the understory. Beech is one of the most shade tolerant trees in the forest and it is also low on the list of preferences for deer browse. While deer are negatively impacting the establishment of other trees, the closed canopy found on much of the forest is the main reason other

species are not able to get a foothold. Past records show that over the last 30 years there have been only two relatively small timber harvests. The prior discussion about age and size class note that the forest is relatively uniform; there are few areas with seedling or sapling growth. In contrast, Stand 5 has developed adequate regeneration (dominated by red spruce and white pine) in many of the canopy gaps created in the last timber harvest. This indicates that it should be possible to secure tree regeneration in other areas if enough canopy gaps and openings are created. Regeneration success would likely be improved if the work were done over a relatively short time frame, thereby creating an abundance of young trees. Securing suitable regeneration is more likely if a disturbance is made during or immediately after an abundant seed year and the soil is scarified. Also, with higher the elevation, browse pressure decreases.

Stocking and Volumes

Stocking is a term used by foresters to describe the relative density of the trees in a stand. Stands may be under-stocked, over-stocked, or fully-stocked. Stands which are fully-stocked have trees which are wholly utilizing the growing space available to them. Due to limited past harvesting, most of the stands are fully- to over-stocked with medium to large trees. Some of the ash, oak, and yellow birch are quite large, reaching over 30 inches in diameter.

Volume refers to the quantity of merchantable timber found on the property. Having accurate timber data helps in planning for future harvesting and in managing sustainably.

The current forest inventory data estimates that the total volume in cords is 78% hardwood. The most common trees are red and sugar maple. The average sawtimber volume is 5,000 board feet per acre. Also, 18 cords of pulpwood per acre is part of the overall volume estimated to be on the property.

OTHER CONSIDERATIONS

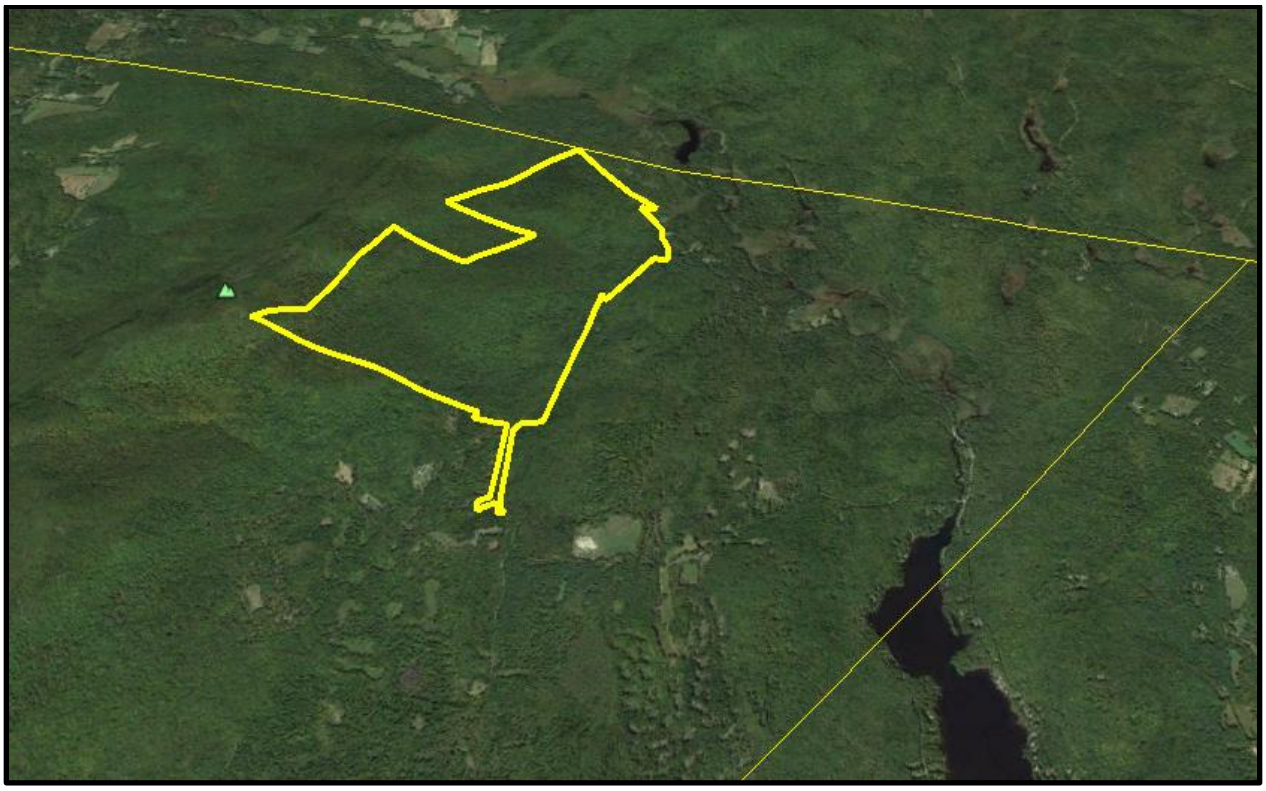
Landscape Context

From an ecological perspective, property boundaries mean little. The same can be said for wildlife and plant distributions. However, differing landowner practices have

a localized impact on landscape-scale processes. The broad patterns of landscape cover and fragmentation should be considered when making management decisions for a particular property. For example, the Appalachian Trail corridor to the west of the property is owned by the federal government. It will never be harvested providing an opportunity for the trees to grow larger over time.

Forest fragmentation is the breaking apart of intact landscapes by roads and other unnatural features. Parcelization is the division of land into smaller blocks. Both happen over time, eroding wildlife habitat and isolating plant communities. Both are occurring locally and regionally. Fragmentation is a wildlife habitat consideration; in general, the less fragmentation there is, the richer the wildlife habitat.

An in-depth study of landscape patterns around the Hanover Town Forest is beyond the scope of this management plan, but a lot of information can be gleaned from looking at aerial photography and topographic maps. This parcel is located in a rural part of Grafton County. Located in the “forestry district” of Hanover, the parcel size is relatively large and the development pattern is less dense than in other parts of Town. As mentioned, the property abuts the Appalachian Trail Corridor to the west. More active forest management has taken place on some of the properties to the south. To the north and east there is a large block of unfragmented land in an area bounded by Route 25A to the north, Route 25 to the east and Route 118 to the southeast. In general, there is ample unfragmented habitat in this block to attract many species that depend on forested landscapes.



The general landscape around the Hanover Town Forest is dominated by forest

Natural Communities

Another way of looking at and describing the Town Forest is by natural community. Natural communities are naturally occurring aggregations of plants, animals, and other organisms in their physical environment. Common to nearly all the natural communities in the Town Forest is that they are forested. A closed canopy covers roughly 95% of the Forest's land area. The State of New Hampshire is even more forested with 97% of the land occupied by trees. Distinctive at the Town Forest is the age of the trees. Given the rugged terrain, stoniness and shallow soils, this area did not lend itself to easy conversion to pasture or logging when the area was first settled. Tree ages of all dominant species regularly exceed 350 years. This lack of disturbance yields highly intact natural communities and underscores the Town Forester's characterization of this Forest as a High Conservation Value Forest.

Moreover, with the nutrient enrichment from the parent bedrock, the growth potential and occurrence of rare plants is enhanced. Several rare plants were found and more are likely to be found in the upper reaches of the Forest with further

investigation.

A total of sixteen natural community types were identified. These are described in more detail in the *Rapid Ecological Assessment* in Appendix H.

Wildlife Habitat

One objective is to maintain or enhance wildlife habitat. Habitat can be retained by maintaining open space and enhanced by increasing diversity which is most economically accomplished through timber harvesting. Most often, good forest management considers multiple benefits. Red oak, a hard mast food source for many wildlife species such as white-tailed deer, bears, and turkeys, is also a good tree to grow for timber. The opening of the forest canopy during timber harvesting also allows more sunlight to hit the forest floor. The size and shape of forest openings has an important role in determining the type and intensity of regeneration. Openings of a variety of sizes promotes the growth of herbaceous vegetation, trees, and shrubs which provide browse, shelter, structural complexities, and diversity.

For wildlife species that require dense undisturbed mature forest, timber harvesting may not be compatible. The non-commercial areas can supply this habitat type. The inverse is true as well; the access roads, log landings, and areas on the edges of open areas not yet reforested are excellent places to manage shrubby, open wildlife habitat with a lot of edge and shrub “islands” as well as grasses and other herbs. Periodic brush-hogging or brontosaurus work can keep these areas open. Dynamic planning that allows for islands of shrubby vegetation often harbors soft mast species, thereby increasing diversity. These openings can be created through timber harvesting and access development.

Other wildlife objectives could be met through forest management but not in combination with a specific timber objective. For example, some forest stands could be improved based on the wildlife habitat they provide. Snag trees, downed logs and living cavity trees could be protected for wildlife by retaining them. Large trees that have potential to become snags and downed woody debris (DWD) should be left as legacy trees, never to be cut or removed as they add to the ecological integrity of the forest. Perch trees could be released or intentionally left to meet specific habitat requirements.

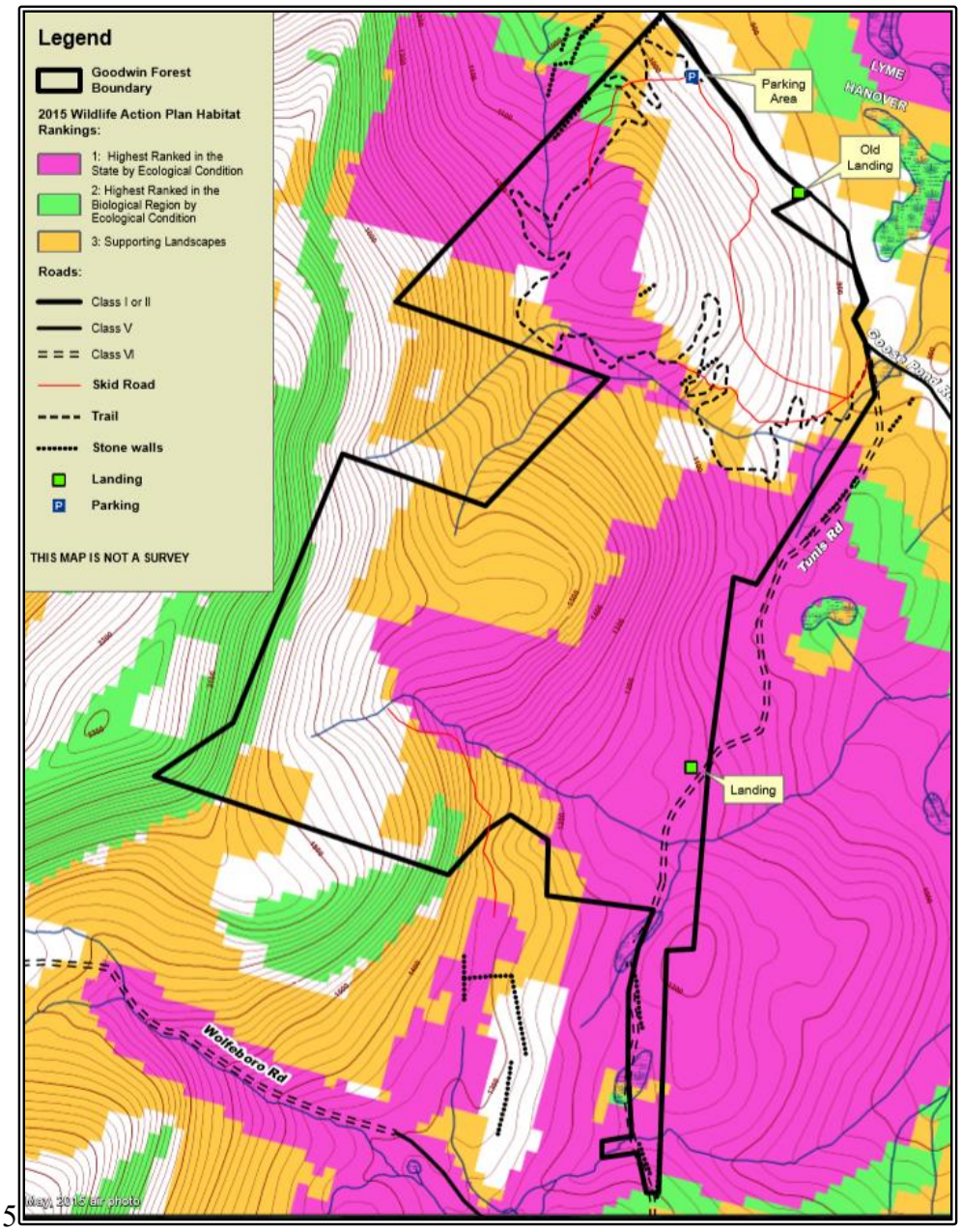
Forest species diversity could be increased through selective thinning. Forest structure can also be manipulated to provide habitat in different layers of the forest.

Fallen trees provide important habitat

Snags often contain cavities

Parts of the Hanover Town Forest are important local sources of mast, adding to the already excellent habitat in the vicinity. Also, with other large ownerships committed to wildlife habitat management nearby, the general area will provide good habitat for many years. The landscape is diverse with open, forested, and wetland habitats.

The New Hampshire Fish & Game's 2010 *Wildlife Action Plan* ranks the property as a supporting landscape, with the headwater stream areas ranked high in overall wildlife habitat value, based on ecological condition as shown on the following map.



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The Wildlife Action Plan maps habitats in a broad-brush approach when considering an area's overall wildlife habitat value. Here, the lands to the north of the property rank high as well, indicating this as an important region for wildlife.

Rare Species & Unique Natural Communities

An in-depth flora and fauna survey is not within the scope of this plan. However, the *Rapid Ecological Assessment* (REA) is included in Appendix H. No rare threatened

or endangered plants or animals were encountered while collecting the forest data for this plan. An inventory of plants was conducted by Alice Schori in the vicinity of the proposed bike trail in May 2011 and is included in Appendix F. The REA notes areas of semi-rich mesic forest. A more thorough survey could be undertaken to create baseline information to aid in determining changes in diversity over time.

The natural communities found on this property are fairly common for this region, but rare communities can be quite small. All of the forested natural communities are considered to be secure and common with S4 and S5 rankings except for the pockets of rich mesic forest which are considered vulnerable in New Hampshire with an S3 ranking. Wetlands, seeps, and steep areas at the toe of steep slopes would be the most likely place to find rare plants. The red spruce swamp along Tunis Road has an S3 ranking. The New Hampshire Natural Heritage Bureau within the Department of Resources and Economic Development maintains a database of known locations of rare plants. Data check, NHB – 2795 indicates that there are no known occurrences of rare or endangered species or natural communities on the property.

Blue cohosh - a rich site indicator

Trout Lily is a treat to see

High Conservation Value Forests (HCVF)

Both the Forest Stewardship Council and the American Tree Farm System recognize the importance of forests with high conservation values. Both certification systems require that, where HCVF exist, they be considered as part of the overall

management process. According to the definition, HCVF possess one or more of the following attributes:

(A) - "Forest areas containing globally, regionally or nationally significant: concentrations of biodiversity values (e.g. endemism, endangered species, refugia); and/or large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

(B) - Forest areas that are in or contain rare, threatened or endangered ecosystems.

(C) - Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).

*(D) - Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and/or critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities)." **

**from Forest Stewardship Council FSC-STD-01-001 (April 2004)*

It does not seem like any of the above conditions exist on the Hanover Town Forest.

Recreation

After walking, hunting is likely the most commonly pursued recreational activity that takes place on the Hanover Town Forest. The property is not posted and as a large un-fragmented block of land, it is desirable for hunting. Much of the additional recreational use is by the local neighbors. Walking, snowshoeing, and cross-country skiing on Tunis Road were mentioned at several informational meetings. In 2010 a proposed mountain bike trail system was drawn up by Morton Trails. Some of the locations may not have been "ground-truthed", as part of the route goes through some extremely stony areas, especially in the southern part of the property. In 2010, a bike trail was constructed in the northern part of the property by the Upper Valley Mountain Bike Association. At the same time, a parking area was created at the trail head using an old log landing. At this point, the trail is lightly used - probably more for hiking than

bike riding. It appears that there has been little maintenance of the trail and one bridge was left incomplete though materials are at the installation site.

Often forest access roads and skid trails can be utilized for recreational activities. This is especially true for hiking as foot trails can be built in much more rugged terrain than trails for skiing or biking. The Access Map on page 42 provides a conceptual layout of trails for logging that could be used recreationally. It takes a bit of planning and perhaps some additional work to turn a skid trail into a recreation trail following a logging operation, but if new trails are desired, this is a good place to start. While the property has limitations because of its terrain, there is an interest in expanding the recreational opportunities on the property by those who live nearby. Tunis Road is often used as a trail by neighboring landowners, providing a way to get from Goose Pond Road to Wolfeboro Road. Unfortunately, it is flooded in several places and during most of the year parts of the road are impassable. Work will need to be done to re-locate a trail that avoids these wet spots or to perhaps build a boardwalk- type trail in the wet areas. The actual design of a trail expansion network is beyond the scope of this plan.

Signage at the trailhead

A very nice bridge built for mountain biking

The parking area on Goose Pond Road

Tunis road is used for walking and skiing

Cultural Features & Special Places

Cultural features and special places encompass many things and what may be a valued part of the landscape to one person may be seen as a liability to another. There are several homesteads along Tunis Road that are historic and are likely former hill farms. Cultural features on the Hanover Town Forest include several foundations, at least one well, an old stone ford, and numerous stone walls. All cultural features and historic artifacts should be protected from logging and other ground-disturbing activities.

A hand dug well

An old stonewall

A building foundation

Remnants from the past

OPERATIONAL CONSIDERATIONS

Access

One of the biggest challenges to forest management on this property is access. For a large property, there is very little infrastructure in place and the terrain limits the options. Additionally, the landing used for a recent timber harvest has been turned into the Goose Pond parking area, so it has little to no utility now for logging.

In the southern portion of the property, there is an older log landing off Tunis Road. It was last used in the late 1980s and is now overgrown. This landing is located in the only feasible spot to access this portion of the forest for timber harvesting due to surrounding terrain and constraints that wetlands and streams present. It makes sense to re-use it. To reach this area with the large trucks used to haul forest products, Tunis Road will have to be improved from Goose Pond Road to the landing. This will include widening the road in places, ditching, culvert replacement, adding some material in low or wet spots, and a new permanent or temporary bridge to be able to reach the landing with large trucks. It may be necessary to access some of the southern part of the property through land of an abutting landowner. An old skid trail runs from the upper western part of this area onto land currently owned by Tunis Timber. If permission can be obtained to use their property for access and a log landing, it may be preferable. This will need to be investigated further to determine the most feasible option.

Access to the northern part of the Hanover Town Forest is quite limited at this point as well. There are three old landing areas; two are extremely small and unworkable

for modern logging operations and the other has been turned into a parking area. Ideally, a new access road and landing could be built off Goose Pond Road. The all-season road would be approximately 2,000 feet in length with a landing about one-half an acre in size. It would allow management activities to take place on a good portion of this part of the Town Forest.

To access the various forest stands, a skid trail network will have to be created to efficiently and safely accommodate today's forestry equipment. Many of the older trails are narrow and stony, and some may need to be upgraded or relocated. The map below shows in concept how the network might look, but the exact trail locations will need to be determined on site. Several old trails run onto abutting properties indicating that earlier logging projects likely utilized neighboring lands for access.

The cost and design of the above described road improvements will need to be determined when and if a particular project is undertaken. There are different standards that could be applied to road construction. Some questions need to be asked and answered. Are the improvements designed for temporary or permeant access or is there a future recreational component to considered? Following any logging, are some of the skid trails to be left free of brush for future recreational use, and if so which ones? Are the road improvements to be done by logging contractors as part of a timber harvest or is the road work to be done by a separate contractor prior to the bidding of a timber sale?

Improving access infrastructure usually involves some amount of excavation and the moving or re-shaping of material. Often, as in the case on the Town Forest there are wetlands and stream crossings to consider. It is important that any work that is done in and around these areas is conducted in a way that minimizes impacts to water quality. Temporary structures and culverts may have more short-term impacts but less long-term impacts to water quality. An unmaintained culvert can easily clog and wash out a road. A temporary bridge is less expensive, but it may not serve recreation as well.

Permits for working in and around riparian areas are required in New Hampshire. Also, the Town Zoning may require permits for water crossings and Town Ordinance #4 does require permits for work in Class VI roads.

Best management practices (BMPs) should be followed during any logging or road building/maintenance projects. Typical job closure should include landing clean-up

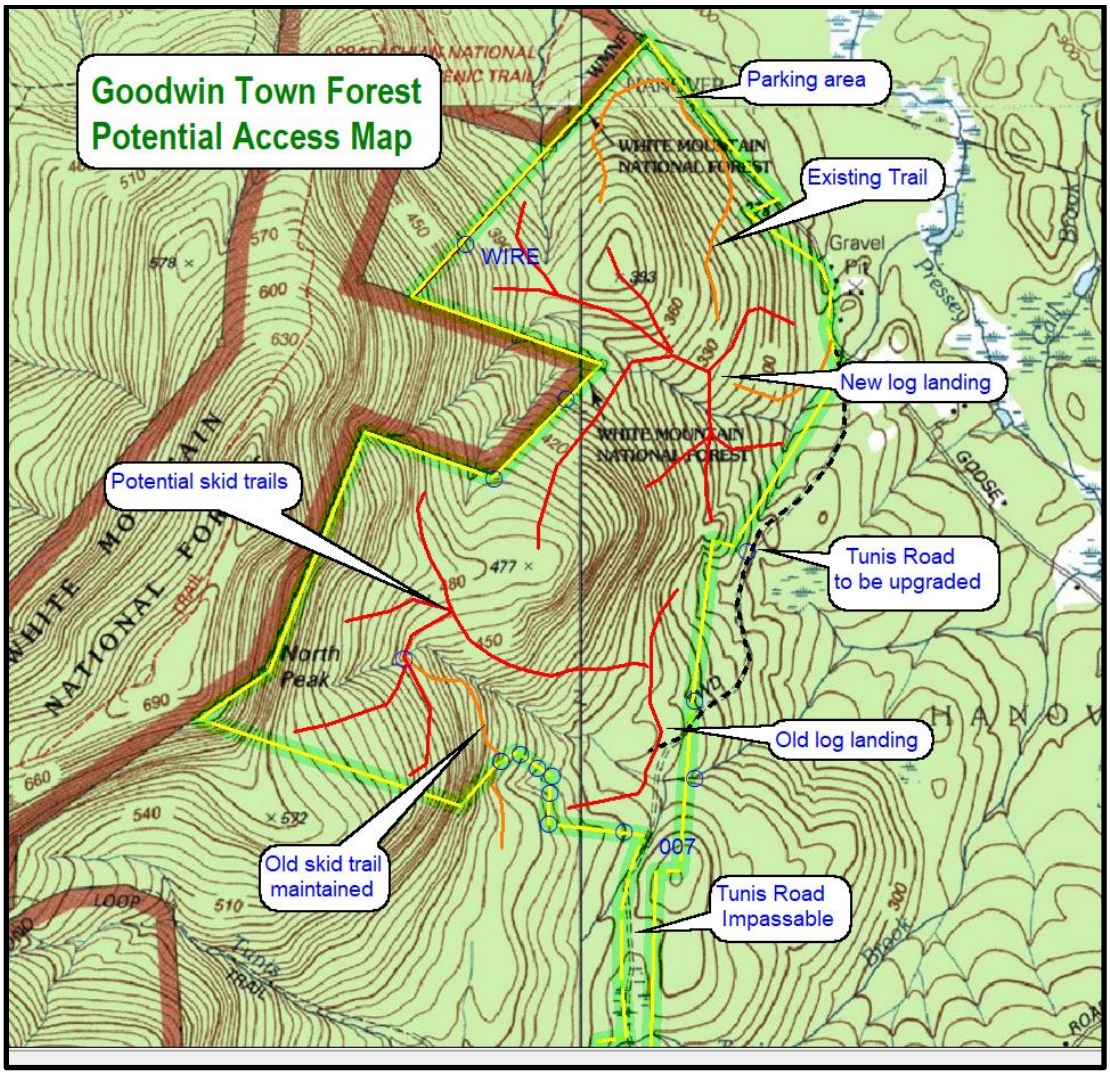
(and seeding if necessary), smoothing of any ruts, installation of water bars, the cutting of leaning or “hung up” trees, and the cutting of any slash above three feet.

A old log landing

Stones removed from an improved skid trail

A bridge on Tunis Road that needs replacement

Tunis Road is impassable from the south



Operability

Based on terrain and with improvements to access, parts of the property are well-suited to forest management while others are not. As was mentioned earlier, there are approximately 95 acres that are mapped as inoperable for timber harvesting. There are other smaller, unmapped sections of the property that are also inoperable. Currently, the biggest challenge for timber management is access and the lack of suitable infrastructure as discussed above. To economically harvest timber, at least two new landings will need to be established. To reach the landing spots, access roads will need to be created or improved (see map above). Within the areas that are suited to management there are some limitations but most of the areas can be reached with equipment as long as common sense is applied and the logging contractors are

conscientious. Sensitive areas include steep slopes, wetland and riparian buffers, and any areas where cultural or special sites are present.

There are several options when considering the type of logging equipment to use Appendix A includes a discussion of these options. The more traditional “conventional logging” involves using small to medium-sized cable skidders and hand (chainsaw) cutting. Mechanized logging systems utilize either whole-tree logging equipment or cut-to-length equipment. Whole-tree logging utilizes feller-bunchers to cut the trees and grapple skidders to pull the trees to the landing where a slasher-loader cuts up the trees into various products. Cut-to-length operations typically involve a harvester which cuts the tree, limbs it and cuts it into products. The various products are then picked up and brought to the landing by a forwarder.

Determining the best logging system to use involves many variables and each involves trade-offs. Whole-tree systems typically are the most cost effective and lead to the highest monetary return. There are also more contractors to choose from as it is the most common system in use today. Bigger openings and wider trails can be expected as the entire tree is removed. Whole-tree logging also results in less woody debris left in the woods. Cut-to- length logging is more expensive, but it often has a lighter footprint than whole-tree logging requiring smaller landing areas. The trails are usually brush covered which is often unacceptable if the trails are to be used for recreation following logging. With conventional systems the machines used are typically smaller and may have somewhat lower impact, including narrower trails. They do have their limitations, especially when skidding distances are long and/or when the wood is of low quality.

A grapple skidder

A forwarder

Boundaries

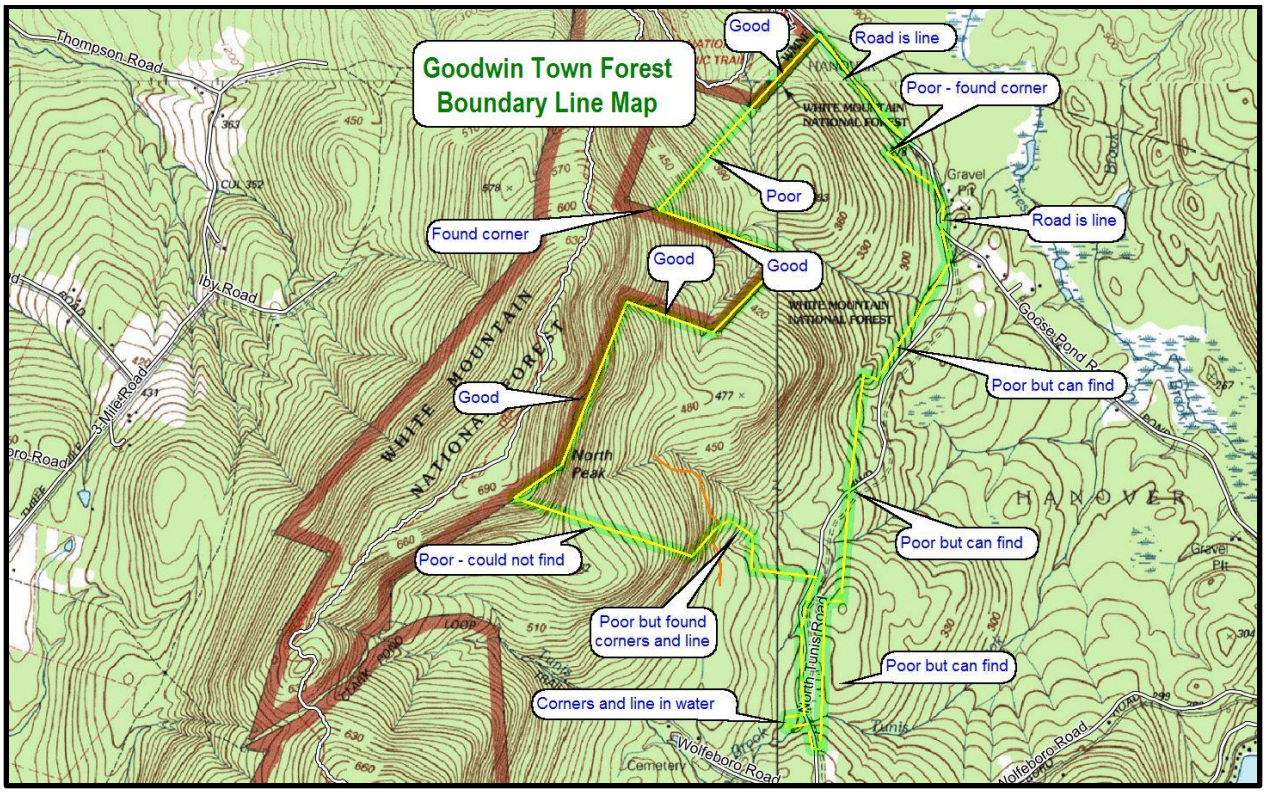
There is no survey of the entire property. A survey of the original town forest (Whipple Lot 97.5 acres) was completed in 1979 by Thomas Dombroski. Along the western boundary, the lines along the Appalachian Trail Corridor have been surveyed and are clearly marked. Other lines are marked with a mix of old blazed and painted lines, stone walls, and/or barbed-wire fences. Several property lines were not evident and more work will be needed to locate the lines as shown on the Boundary Line Map. Many of the corner points were located and marked using a Garmin 62s GPS unit.

A corner marker

An old blaze on a beech tree

This line is under water

Very old blaze on a hemlock tree



It is good practice to keep property lines blazed and painted to prevent problems or questions in the future. In general, boundary lines should be re-painted every ten to twelve years and re-blazed every twenty years. A season or two should pass after the trees have been blazed so the paint will adhere well.

HANOVER TOWN FOREST- FOREST DATA

Stand 1 Northern Hardwood – H3A 184.4 acres – 55 points

General Attributes

Natural community type:	Sugar maple-beech-yellow birch forest Pockets of semi rich mesic forest
Past management history:	Little evidence of recent harvesting in most places
Approximate age of dominant trees:	Variable but generally 80 -110 years with scattered older trees
Stand health:	Generally good to excellent
Insects/damage/disease:	Nothing alarming – beech bark disease, maple borer Be on the lookout for emerald ash borer
Timber quality:	Good to excellent

Site Conditions

Soil rating:	IA &IIA, NH forest soil groups
Determined by:	Soils map and field observation
Tree vigor:	Medium to high vigor
Soils:	Tunbridge-Lyman & Berkshire
Parent material:	Glacial till
Soil texture:	Fine sandy loam
Drainage:	Well drained
Terrain:	Gentle, moderate and steep slopes
Aspect:	East & northeast
Elevation:	1,150’-1,800’

Cultural Attributes

Archeological features present:	A few stone walls
Past land use:	Parts may have been pasture land Other places always wooded

Wildlife Attributes and Objectives

Forest type:	Upland hardwood
Vertical diversity:	Low-mostly with some beech in the understory
Vegetative diversity:	Moderate– a nice diversity of species here
Beneficial shrubs and trees:	Basswood & hophornbeam add diversity
Hard mast:	Hophornbeam, beech and red oak
Soft mast:	A few black cherry
Dead and decaying structure:	A moderate amount
Special habitat features:	The stand has some large to very large trees
Wildlife protection zones:	Near wet areas, drainages and seeps
Special wildlife practices:	Develop a more complex structure with canopy gaps, Retain some large crowned oaks

Wetland and Water Features

Wetland type:	Forest seeps, wet areas along streams
Streams:	Several headwater streams
Ponds or standing water:	Nothing encountered

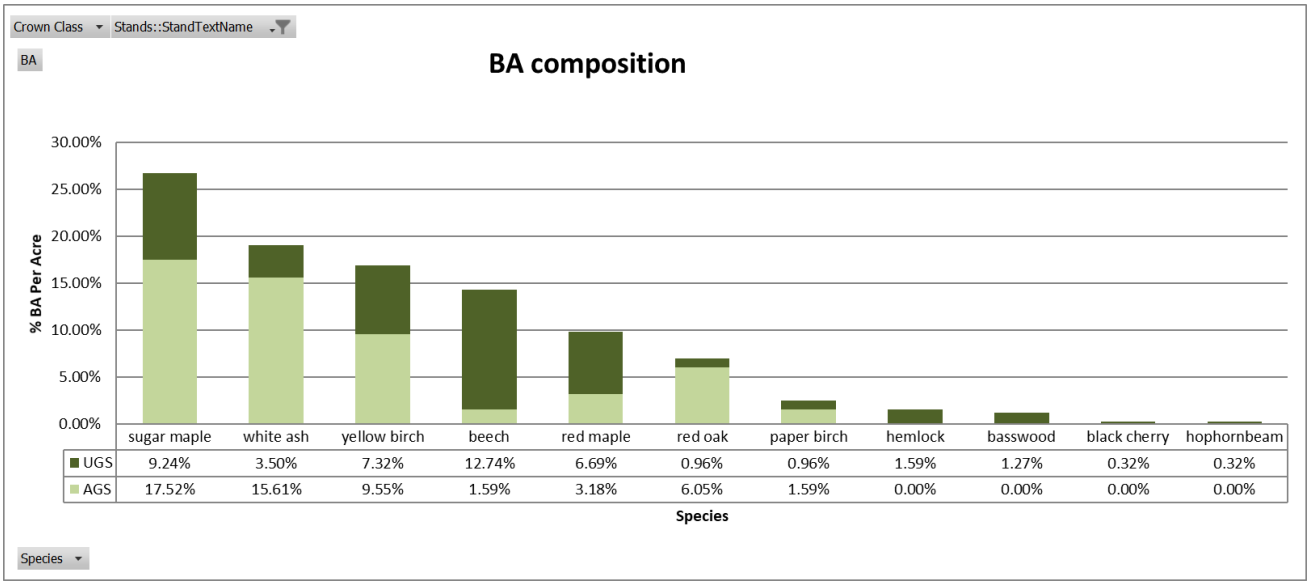
Structural and Silvicultural Attributes

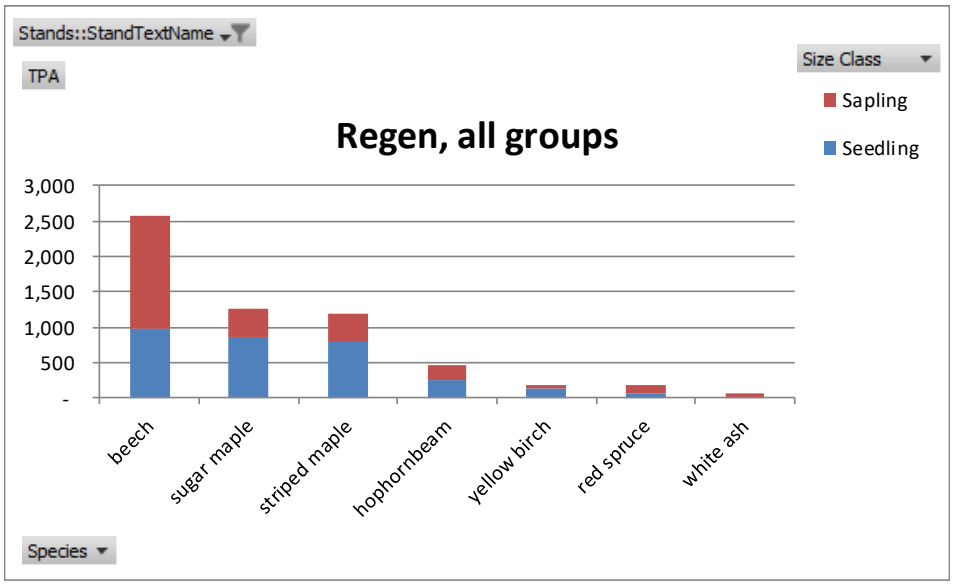
Broad forest type:	H3A
Size class:	Medium and large sawtimber
Stand structure:	Even-aged
Crown closure:	80-100%
Total basal area	114
Total acceptable basal area	62
Trees per acre:	136
Quadratic mean stand diameter:	12.4”

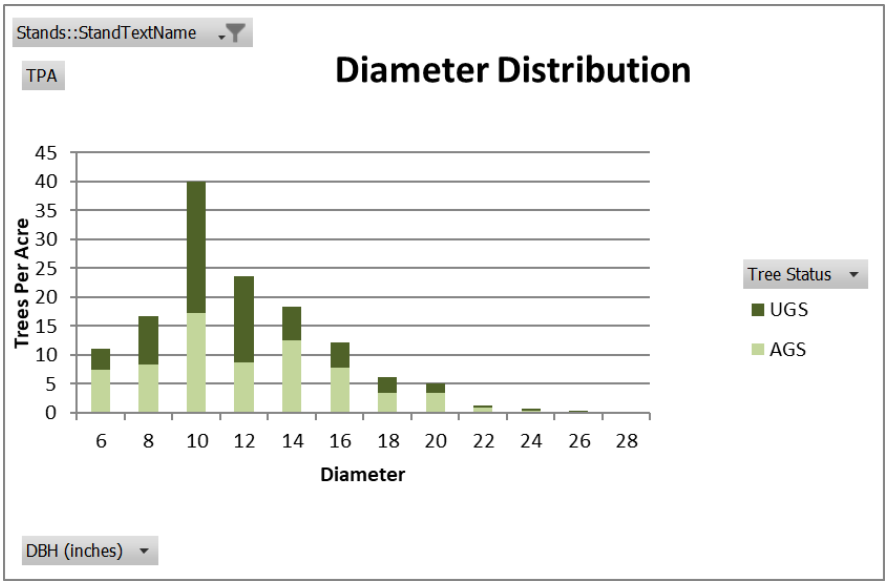
Forest Composition and Volume

Type	Species	Data %TPA	%BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Growing Stock (Cords)	Topwood (Tons)	Total Cords
HW	sugar maple	29%	27%	-	1,221.1	3.2	298.2	0.3	0.9	1.3	8.7
	white ash	14%	19%	9.8	1,968.7	2.5	-	-	0.2	0.0	7.8
	yellow birch	17%	17%	-	570.0	2.3	-	0.4	0.5	0.9	4.9
	beech	17%	14%	10.7	91.1	2.6	-	0.6	-	1.0	3.8
	red maple	11%	10%	-	159.7	2.0	-	0.1	0.3	0.5	3.0
	red oak	7%	7%	68.9	505.5	0.6	45.6	0.1	0.3	0.6	2.8
	paper birch	2%	3%	-	147.6	0.4	-	-	0.1	0.1	0.9
	basswood	1%	1%	-	18.0	0.1	-	0.2	-	0.2	0.4
	hophornbeam	1%	0%	-	-	0.0	-	-	-	0.0	0.0
	black cherry	0%	0%	-	-	0.1	-	-	-	-	0.1
HW Total		**99%**	**98%**	**89.5**	**4,681.7**	**13.8**	**343.8**	**1.7**	**2.2**	**4.8**	**32.4**
SW	hemlock	1%	2%	-	-	0.4	-	-	-	0.2	0.5
SW Total		**1%**	**2%**	**-**	**-**	**0.4**	**-**	**-**	**-**	**0.2**	**0.5**
Stand Total		**100%**	**100%**	**89.5**	**4,681.7**	**14.1**	**343.8**	**1.7**	**2.2**	**5.0**	**32.9**

Table 1.1: Stand volume, basal area and trees per acre by species and product.







Silvicultural Objectives

Management system:	Uneven-aged management
Harvest entry:	Variable but 15 to 20 year cutting cycle likely
Products:	Mixed species hardwood and softwood
Desired composition:	Maintain a diversity of site suited species
Crop tree target diameter:	Sugar maple 20-24” White ash 18-22”

Operational Considerations

Operability:	All operable except steep slopes and near forest seeps and wet areas
Seasonal limitations:	Any wet period – operate in the late summer or early fall to get good soil scarification – or winter
Terrain:	Variable but generally steep to very steep Stony and ledgy
Access and landing area:	Need to build two landings and related access improvements One area might flow better onto an abutting owners land
Skidding distance:	Both short and long
General maintenance:	Boundary line work
Brook-wetland crossings:	There would be several

Stand 1 Description & 10 Year Management Schedule

Stand 1 is a middle to older-aged sugar maple-beech-yellow birch forest community. There are two distinct areas that make up this stand: one on the northern part and one on the southern part of the property. There has not been any tree cutting in either area in many years. The most recent entry was in the southern part of the stand more than 30 years ago. Some of the largest trees are found on the steep, rocky slopes where it was difficult to log. In a few places, but not many, there are canopy gaps created by individual or groups of trees blown down. The white ash and sugar maple are generally of good to excellent quality. There are quite a few large to very large (36”+) trees associated with steep or very stony areas which are difficult to access. Regeneration is estimated to be 5,800 seedlings and saplings per acre, dominated by beech which easily survives under a full canopy of overstory trees. Deer browse is present, but quite low, especially as the elevation increases.

Hardwoods, dominated by sugar maple, make up an estimated 99% of the trees. Hemlock makes up the small softwood portion of the composition. The stand is estimated to have nearly 5,000 board feet of sawtimber and 18 cords of pulpwood per acre.

Stand objectives: Begin the process of developing an uneven-aged structure. Make some small to medium-sized group openings creating canopy gaps. With some luck, hopefully the resulting regeneration will consist of a mix of site-suited species including sugar maple, yellow birch, and red oak. Locate gaps near areas of existing favorable regeneration where

possible and in areas where the overstory is predominately of poor quality (beech dominated) or mature. Harvest most, but not all of the white ash as the emerald ash borer is predicted to spread through the region. Harvest some of the larger trees with quality, while retaining a good portion of the large and very large trees as legacies. Leave retained organic matter, and try to increase the overall structure and complexity of the forest with each successive cutting.

Silviculture: 2019 - 2020 Create canopy gaps, reduce overall basal area to approximately 80 square feet through:

- **Individual Tree Selection:** In between groups, release trees (either softwood or hardwood) of high quality and vigor. Release selected crop trees on at least two but preferably three sides. Leave the larger trees, especially low quality trees and ones with defects, for legacies.

- **Group Selection:** Focus on creating openings of from five to ten trees to perhaps slightly larger. Also, groups should be located in such a way as to release any pockets of acceptable advanced regeneration.

Wildlife: This area provides interior forest conditions for species which utilize forests with uniform dense hardwood over story. What little vertical diversity there is consists mostly of scattered beech up to 25 feet tall. The gap openings prescribed should help to diversify the habitat-allowing new growth which will increase the complexity of the forest. Larger mammals such as the moose and black bear likely frequent the property. There are many beech trees that have been climbed by bears searching for beechnuts. Birds that utilize interior hardwood forests such as the scarlet tanager, the black-throated blue warbler, and the hermit thrush as well as several species of woodpeckers, should do well here.

Stand 2 Hemlock/ Mixed Hardwood HS3A 60 acres – 14 points

General Attributes

Natural Community Type:	Hemlock-oak-northern hardwood forest
Past Management History:	Last harvesting in 1983 – low grade and white birch
Approximate Age of Dominant Trees:	80 – 110 years with scattered older trees
Stand Health:	Good, light invasives present near homesteads
Insects/Damage/Disease:	Nothing unusual – beech bark disease Sugar maple borer
Timber quality:	Mostly good – some really nice oaks Hemlock is fair

Site Conditions

Site rating:	IIA & IIB - NH forest soil group
Determined by:	Soil map and field observation
Tree vigor:	Medium to high except in wet areas
Soils:	Tunbridge-Lyman and Lyme-Moosilauke
Parent material:	Glacial till
Soil texture:	Fine sandy loam
Drainage:	Tunbridge well-drained –Lyme poorly drained
Terrain:	Moderate to steep - stony
Aspect:	East, southeast and northeast
Elevation:	1,100’ to 1,200’

Cultural Attributes

Archeological features present:	Old stone walls, several old home sites, barns etc..
Past land use:	Old pasture land, likely some crop land too

Wildlife Attributes and Objectives

Forest type:	Upland mixed wood forest
Vertical diversity:	Moderate in scattered canopy gaps
Vegetative diversity:	Moderate to high
Beneficial shrubs and trees:	Yellow birch for gleaning birds Softwood adds diversity

Hard mast:	Oak and beech plus some hophornbeam
Soft mast:	Little to none
Dead and decaying structure:	Moderate to high with quite a few snags
Special habitat features:	Stand does have some structural diversity
Wildlife protection zones:	Riparian zones
Special wildlife practices:	Retain large legacy trees, Increase DWD over time

Wetland and Water Features

Wetland type:	Interesting semi forested wetland, red spruce swamp Shrub moss fen & hemlock swamp
Streams:	Headwaters of Tunis Brook
Ponds or Standing Water	In wetlands

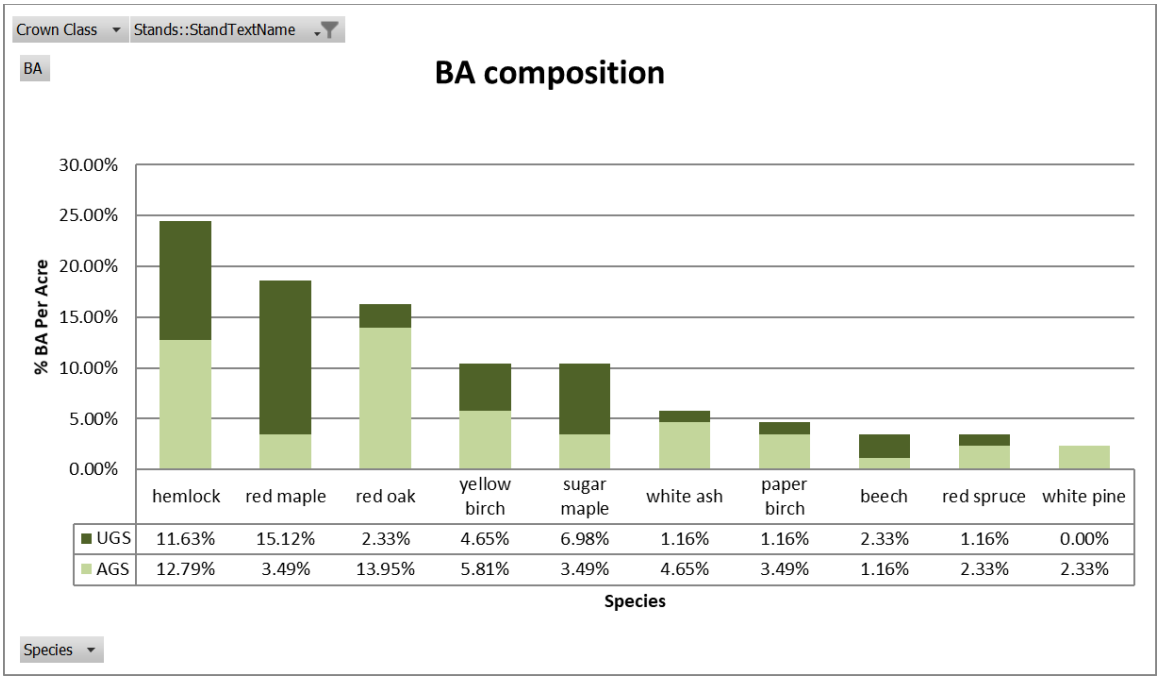
Structural and Silvicultural Attributes

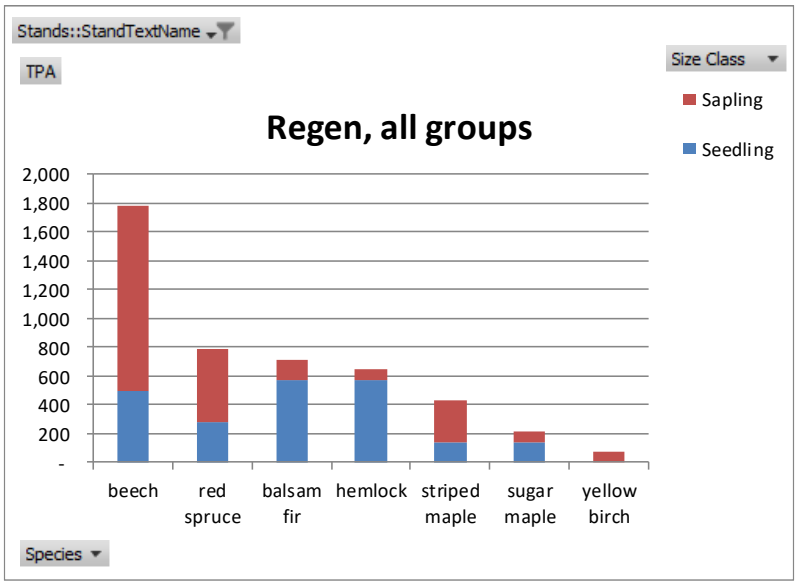
Broad Forest Type:	HS3A
Size Class:	Medium to large sized sawtimber
Stand Structure:	Even-aged – two-aged in a few areas
Crown Closure:	Generally, 85-100%
Total Basal Area:	123
Total Acceptable Basal Area:	66
Trees Per Acre:	149
Quadratic Mean Stand Diameter:	12.3

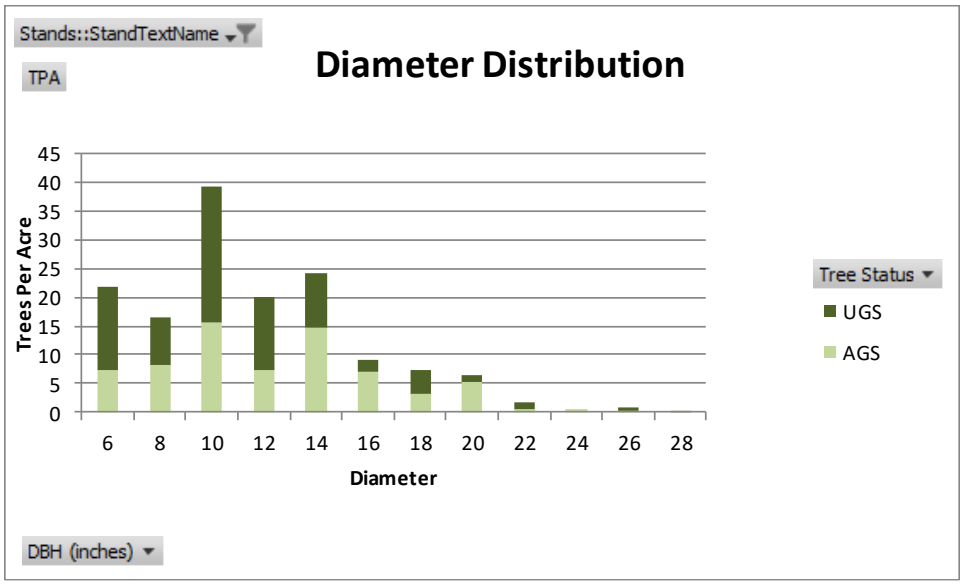
Forest Composition and Volume

Type	Species	Data % TPA	% BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Stock (Cords)	Topwood (Tons)	Total Cords
HW	red maple	20%	19%	-	142.0	3.6	-	0.3	0.4	1.8	5.2
	red oak	15%	16%	114.1	1,208.7	1.2	326.7	0.4	0.4	2.0	6.8
	yellow birch	9%	10%	-	382.4	1.0	69.4	0.8	0.3	0.6	3.5
	sugar maple	12%	10%	-	338.4	1.6	196.3	0.4	0.1	0.6	3.7
	white ash	5%	6%	-	566.1	0.9	-	-	-	-	2.3
	paper birch	4%	5%	-	434.0	0.7	-	-	-	0.3	1.9
	beech	6%	3%	-	-	0.8	-	-	-	0.2	0.8
HW Total		**72%**	**70%**	**114.1**	**3,071.6**	**9.6**	**592.4**	**1.8**	**1.2**	**5.5**	**24.2**
SW	hemlock	24%	24%	-	823.4	4.1	-	0.4	0.7	2.8	8.4
	red spruce	3%	3%	-	419.0	0.4	-	-	-	0.0	1.5
	white pine	1%	2%	-	321.5	0.2	73.7	-	-	-	1.2
SW Total		**28%**	**30%**	**-**	**1,563.9**	**4.7**	**73.7**	**0.4**	**0.7**	**2.8**	**11.1**
Stand Total		**100%**	**100%**	**114.1**	**4,635.5**	**14.3**	**666.2**	**2.3**	**2.0**	**8.3**	**35.3**

Table 2.1: Stand volume and trees per acre by species and product.







Silvicultural Objectives

Management system:	Uneven-aged management
Harvest Entry:	15 to 20 year cutting cycle
Products:	Mixed sawtimber and pulpwood
Desired Composition:	Maintain a diverse species mix
Crop tree target diameter:	Hemlock 18-20” Red oak 20--26”
	White ash 18-20” Red maple 16-18

Operational Considerations

Operability:	All operable except buffers near wetlands & streams
Seasonal limitations:	Any wet period – likely this is winter ground
Terrain:	Variable – relatively flat and steep and stony
Access and landing area:	Old landing area needs to be re-established
Skidding distance:	Short to moderate lengths
General maintenance:	Rebuild Tunis Road
Brook-wetland crossings:	There would be several

Stand 2 Description & 10 Year Management Schedule

Stand 2 is a variable hemlock-oak-northern hardwood forest community. The last harvest here was in 1983 administered by forester Ehrhard Frost. After 35 years, the forest has developed nicely. Quality trees were left and they have grown well. The old landing is dominated by white and yellow birch saplings. There are an estimated 4,600 seedlings and saplings per acre dominated by beech and red spruce. Much of the regeneration located under a dense canopy and is not free to grow.

Hardwoods dominated by red maple and red oak make up an estimated 72% of the trees while hemlock is the most common tree at 24%. The stand is estimated to have 4,600 board feet of sawtimber (mostly white pine) and 19 cords of pulpwood per acre.

Stand objectives: Create canopy gaps to begin the process of creating an uneven-aged stand. As always, try to leave trees that are healthy and vigorous as well as legacy trees. The goal is to regenerate the stand to site-suited species including yellow birch, red oak, and white pine in several stages over a period of years.

Silviculture: 2019 - 2020 Reduce the basal area to approximately 100 square feet via:

- **Group Selection:** Focus on creating openings of five to eight trees. Groups should be located in such a way as to release any pockets of acceptable advanced regeneration where they exist. Cut tree groups should focus on declining or high risk trees rather than trees which will improve with time.

- **Individual Tree Selection:** In between groups, release trees (either softwood or hardwood) of high quality and vigor. Release selected crop trees on at least two but preferably three sides. Leave the larger trees, especially low quality trees and ones with

defects, for legacies.

- **Patch cut:** Find two places where a patch cut of one and a half to two acres can be made. The goal is to create an opening large enough to regenerate some shade-intolerant species.

- **Invasive control:** Try to eradicate invasive barberry and honeysuckle plants.

Wildlife: The forest currently has moderate to high utility for most species of wildlife. The area along Tunis Road is likely used as a travel corridor, as it is relatively low elevation and it is protected. There is variety of structure in the form of down trees and snags. Missing are younger cohorts of trees. The wetland areas add diversity and are used by many species - including bears and turkey in the spring. Protect these areas by leaving riparian buffers where appropriate.

Song birds such as the blackburnian warbler and black-throated green warbler might be found in the areas dominated by softwood. Canada warblers often frequent softwood areas with wetlands. Year-round residents would certainly include chickadees, nuthatches, and a variety of woodpeckers.

Stand 3A-C Mixed hardwood with spruce H2/3A 111.4 acres – 33 points

General Attributes

Natural Community Type:	Hemlock-oak-northern hardwood forest
Past Management History:	Evidence of some logging 25 + years ago in southern part
Approximate Age of Dominant Trees:	75-90 years with scattered older trees
Stand Health:	Good generally
Insects/Damage/Disease:	Beech bark disease
Timber quality:	Variable with poor beech and red maple Some nice oak

Site Conditions

Soil rating:	IIA NH forest soil rating
Determined by:	Soils maps & field observation
Tree vigor:	Mostly high vigor
Soils:	Tunbridge-Lyman
Parent material:	Glacial Till
Soil texture:	Fine sandy loam
Drainage:	Well-drained
Terrain:	Moderate to steep slopes – ledgy in places
Aspect:	South, north & east
Elevation:	1,250 to 1,500’

Cultural Attributes

Archeological features present:	Stone walls near northern part of the stand
Past land use:	Old pasture in flatter areas

Wildlife Attributes and Objectives

Forest type:	Upland hardwood forest
Vertical diversity:	Low to moderate

Vegetative diversity:	Moderate
Beneficial shrubs and trees:	Scattered softwoods add diversity
Hard mast:	Oaks, some with large crowns, some beech
Soft mast:	Little to none
Dead and decaying structure:	Moderate amount
Special habitat features:	There are some steep ledgy areas, a few rich sites
Wildlife protection zones:	None in particular
Special wildlife practices:	Leave legacy trees as a way to build up forest structure: retain large red oak trees for mast

.

Wetland and Water Features

Wetland type:	Forest seeps
Streams:	Perhaps seasonally during spring runoff
Ponds or Standing Water:	Nothing encountered

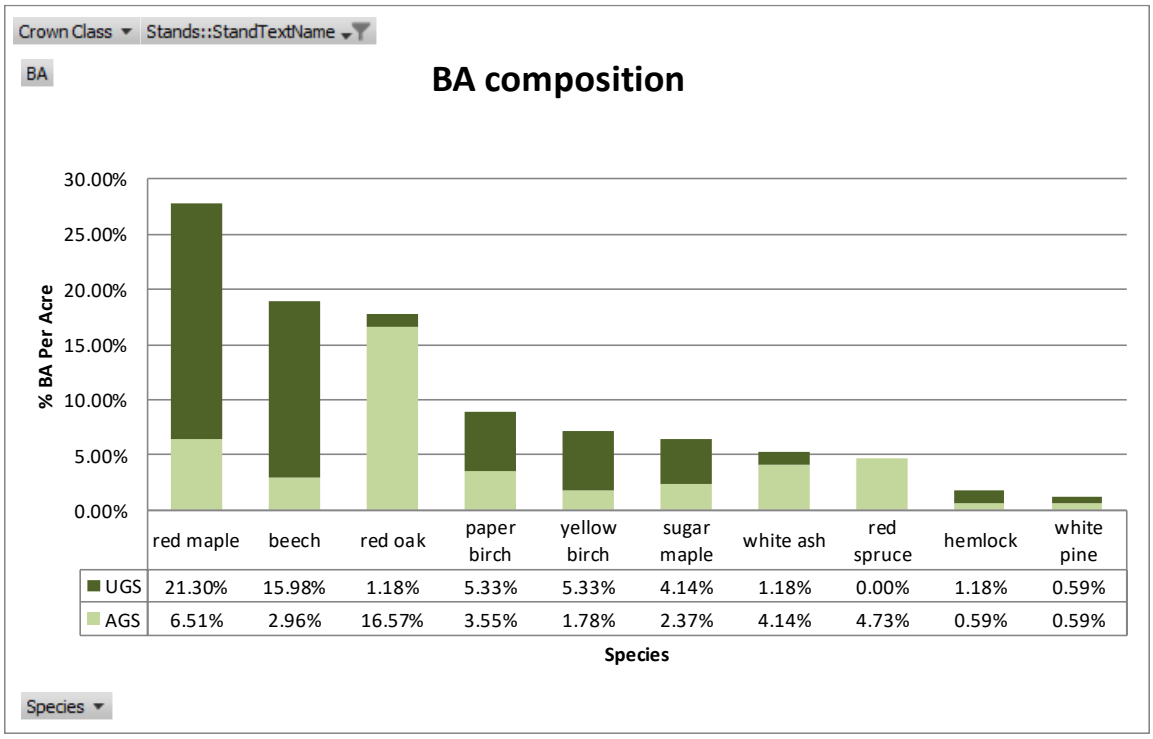
Structural and Silvicultural Attributes

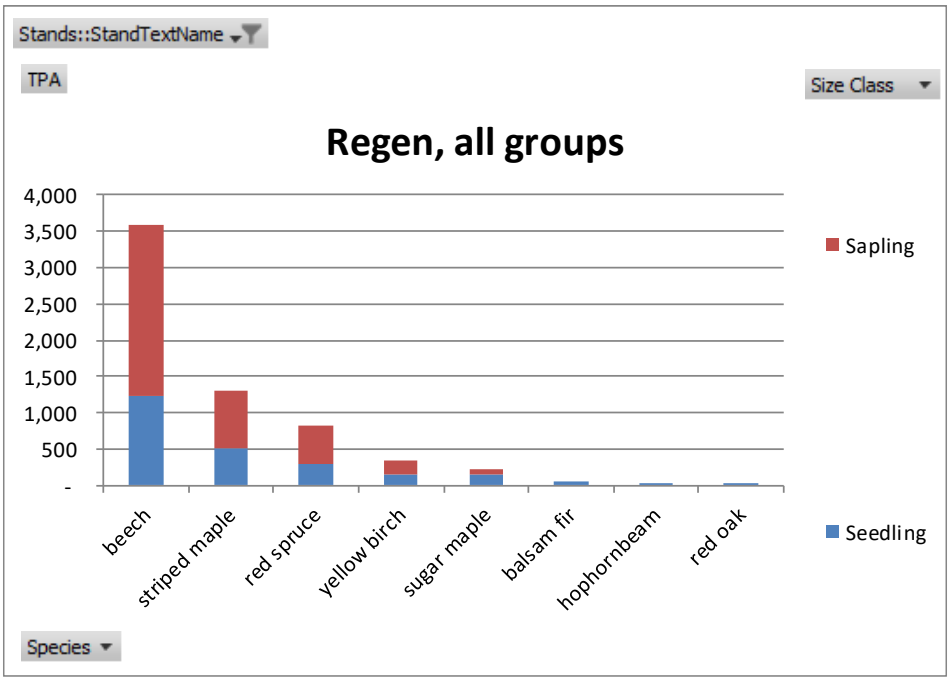
Broad Forest Type:	H2/3A
Size Class:	Medium-sized sawtimber
Stand Structure:	Mostly even-aged
Crown Closure:	Nearly 100%
Basal Area Per Acre:	102
Acceptable Basal Area Per Acre:	49
Trees Per Acre:	139
Quadratic Mean Stand Diameter:	11.6”

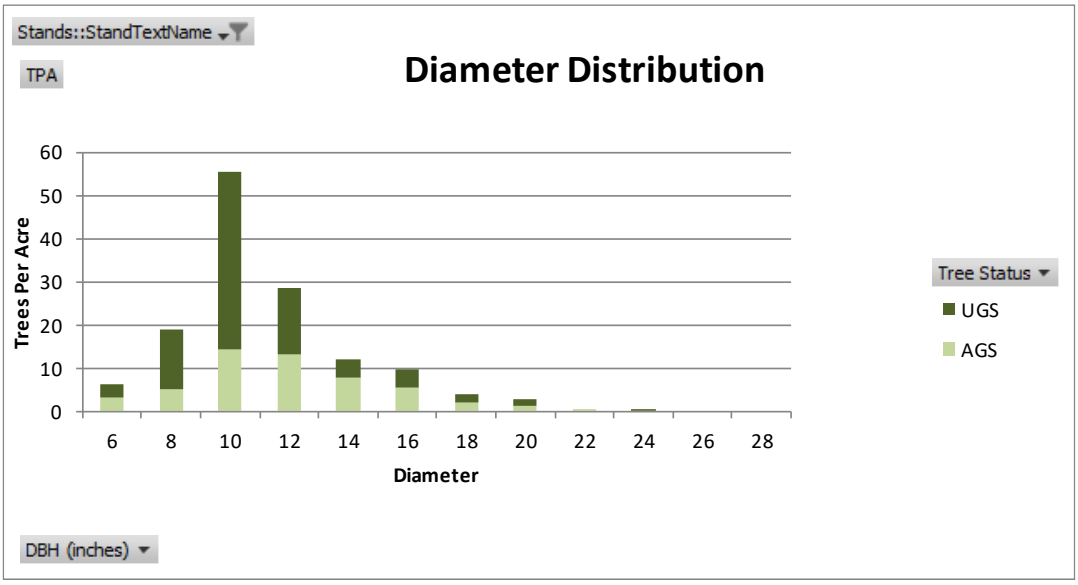
Forest Composition and Volume

Type	Species	Data % TPA	% BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Growing Stock (Cords)	Topwood (Tons)	Total Cords
HW	red maple	28%	28%	-	412.8	5.0	-	0.2	0.3	1.5	7.0
	beech	19%	19%	-	196.1	3.5	20.0	0.2	0.1	1.1	4.6
	red oak	16%	18%	30.1	1,235.0	1.3	116.2	-	0.6	1.5	5.9
	paper birch	10%	9%	-	209.2	1.2	-	-	0.2	0.6	2.2
	yellow birch	7%	7%	-	47.7	1.0	-	0.3	0.2	0.3	1.7
	sugar maple	8%	7%	-	97.3	0.8	44.4	0.2	0.2	0.4	1.6
	white ash	4%	5%	-	420.3	0.6	-	-	0.1	-	1.7
HW Total		**92%**	**92%**	**30.1**	**2,618.3**	**13.4**	**180.7**	**0.8**	**1.7**	**5.4**	**24.8**
SW	red spruce	5%	5%	-	428.9	0.4	-	-	0.1	0.0	1.6
	hemlock	2%	2%	-	-	0.2	-	-	0.1	0.2	0.3
	white pine	1%	1%	-	91.0	0.2	10.6	-	-	0.0	0.4
SW Total		**8%**	**8%**	**-**	**519.9**	**0.7**	**10.6**	**-**	**0.2**	**0.2**	**2.3**
Stand Total		**100%**	**100%**	**30.1**	**3,138.2**	**14.0**	**191.3**	**0.8**	**1.9**	**5.6**	**27.2**

Table 3.1: Stand volume per acre and composition by species and product.







Silvicultural Objectives

Management system:	Part uneven-aged part even-aged management
Harvest Entry:	15-20 year cutting cycle for uneven-aged part
Products:	Mixed species sawtimber & pulpwood
Desired Composition:	Maintain the diversify species composition

Crop tree target diameter:	Red maple	18-20”	Red oak 20-24”

Operational Considerations

Operability:	Good, no real difficulties
Seasonal limitations:	Any wet period – could operate in a dry mid-summer
Terrain:	Moderate slopes with a few very steep areas
Access and landing area:	Two different landings
Skid distance:	Moderate to long
General maintenance:	Construct landings
Brook-wetland crossings:	There would be several depending on the time of year

Stand 3 Description & 10 Year Management Schedule

Stand 3 is variable hemlock-oak-northern hardwood forest which has seen some harvesting over the years, especially on the gentle terrain. The dryer and warmer (south facing) areas have a good proportion of red oak in the mix. In addition, this stand contains some large red oak legacy trees which produce lots of acorns during a good year. Ledge outcrops and rocky terrain are common, but the growing sites are quite fertile and trees certainly grow well in much of the stand. Regeneration, dominated by beech and striped maple, is estimated at 6,400 seedlings and saplings per acre, but much of this is over-topped and likely will not survive.

Hardwoods, dominated by red oak and red maple, make up an estimated 92% of the trees. White pine and hemlock populate the softwood portion of the forest. The stand is estimated to have 3,200 board feet of sawtimber and 17 cords of pulpwood per acre.

Stand objectives: Manage most of this stand on uneven-aged system. In two spots, one on the northern part and one on the southern part, make gaps large enough to create young forest conditions. Encourage a diverse mix of site-suited regeneration. In the partially cut areas release quality trees with potential for value growth. Reserve some of the red oak trees for mast production-including larger legacies.

Silviculture: 2019 – 2020 Reduce the basal area to approximately 85 square feet via:

- **Group Selection:** Focus on creating openings of from five to ten trees and perhaps slightly larger in a few spots. Groups should be located in such a way as to release any pockets of acceptable advanced regeneration, where they exist. Cut tree groups should

focus on declining or high risk trees rather than trees which will improve with time.

- **Individual Tree Selection:** In between groups, release trees of high quality and vigor. The species to leave is not as important as leaving quality trees. Release selected crop trees on at least two, but preferably three sides. Leave some larger low quality trees and ones with cavities for legacies.

- **Patch clear-cuts:** In the northern part of the stand make an approximately three acre patch opening. In the southern part, a larger opening of up to about 5 acres is appropriate. Within the openings, leave legacy trees if they exist as well as any snags that are not a danger to loggers. Larger bear scarred beech should also be reserved from cutting.

Wildlife: This stand should continue to provide abundant acorns during good years. Large legacy beech and oaks will add to the diversity of this area as will the establishment of younger cohorts. The proposed patch cuts should allow for the development of a younger forest age-class. Here birds and animals that utilize young forests for part or all of their habitat needs should be on the increase. Ledge outcrops provide a different habitat type, one often preferred by bobcats and porcupines. In more densely forested areas, there is ample habitat for birds that use interior hardwood forests such as the wood thrush, scarlet tanager, and black-throated blue warbler. Also, there is habitat for woodpeckers, hawks, and resident birds.

Stand 4 Hemlock-yellow birch mixed hardwood HS3A/B 93.3 acres – 23 points

General Attributes

Natural Community Type:	Hemlock-spruce-northern hardwood forest
Past Management History:	Parts of the stand harvested in 2006-2007
Approximate Age of Dominant Trees:	70 to 85 years with scattered older trees
Stand Health:	Some but not all of the pine is in decline
Insects/Damage/Disease:	Brown spot needle cast in pine
Timber quality:	Variable, there is some nice pine and oak

Site Conditions

Soil group:	IA - NH forest soil group
Determined by:	Soils map & field observation
Tree vigor:	Medium to high vigor
Soils:	Berkshire
Parent material:	Glacial Till
Soil texture:	Fine sandy loam
Drainage:	Well-drained
Terrain:	Moderate to steep slopes places are very rocky
Aspect:	East and northeast
Elevation:	925’ to 1,150’

Cultural Attributes

Archeological features present:	Old stone walls
Past land use:	Old pasture land

Wildlife Attributes and Objectives

Forest type:	Upland mixed wood forest
Vertical diversity:	Moderate with some understory development in gaps
Vegetative diversity:	Moderate

Beneficial shrubs and trees:	Hemlock provides cover and some diversity
Hard mast:	Oak and beech make up about 15% of stand
Soft mast:	Little to none
Dead and decaying structure:	Low to moderate
Special habitat features:	Stand does provide some thermal cover
Wildlife protection zones:	Along riparian areas
Special wildlife practices:	Promote a more complex structure over time

Wetland and Water Features

Wetland type:	Stand borders significant red maple, black ash swamp
Streams:	None
Ponds or Standing Water:	In the wetland area

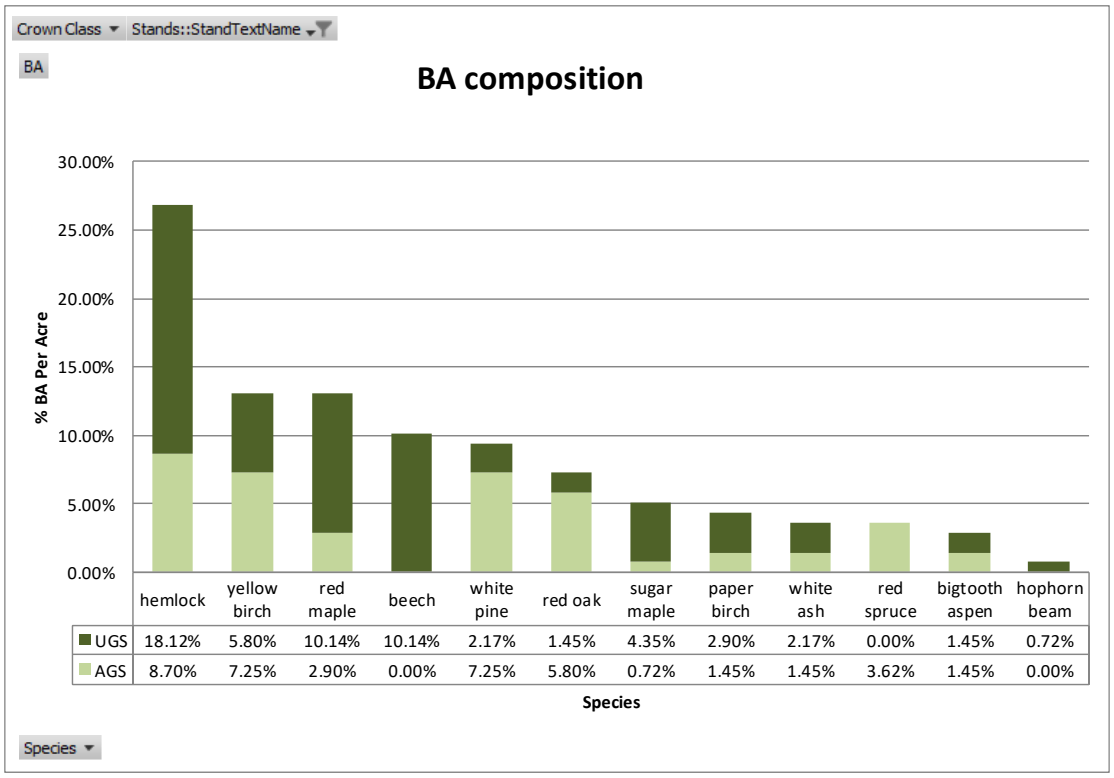
Structural and Silvicultural Attributes

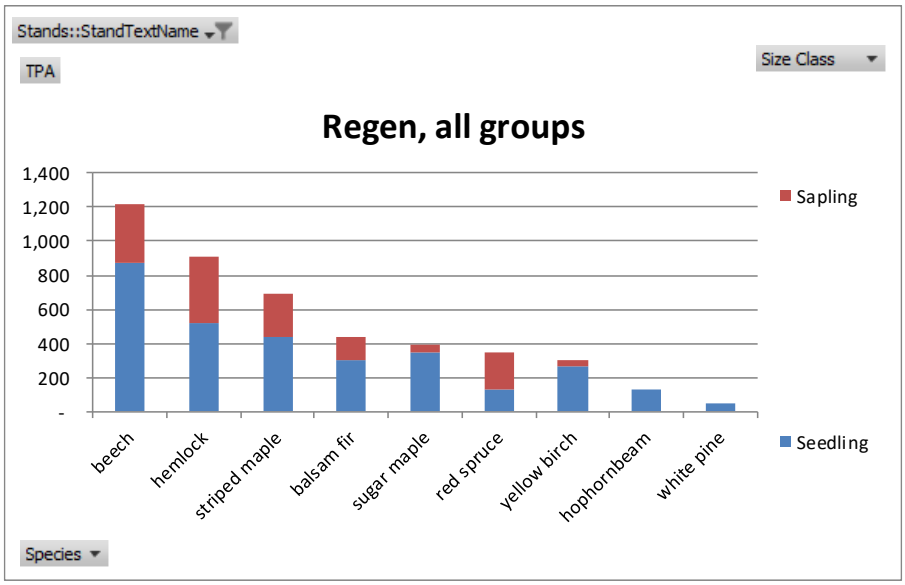
Broad Forest Type:	HS3A/B
Size Class:	Medium-sized sawtimber
Stand Structure:	Even-aged with development in canopy gaps
Crown Closure:	Nearly 100%
Basal Area Per Acre:	120
Acceptable Basal Area Per Acre:	49
Trees Per Acre:	147
Quadratic Mean Stand Diameter:	12.3”

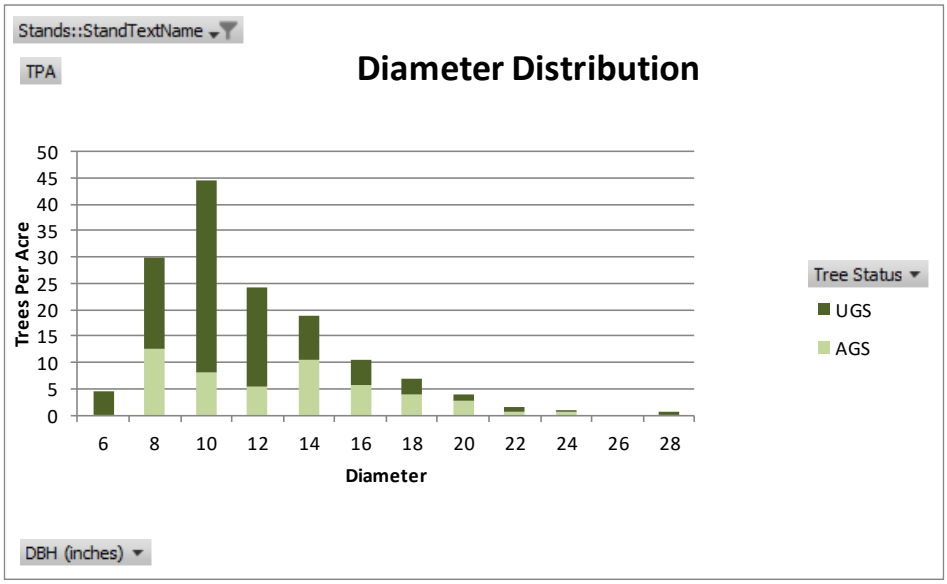
Forest Composition and Volume

Type	Species	Data % TPA	% BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Stock (Cords)	Topwood (Tons)	Total Cords
HW	red maple	20%	19%	-	142.0	3.6	-	0.3	0.4	1.8	5.2
	red oak	15%	16%	114.1	1,208.7	1.2	326.7	0.4	0.4	2.0	6.8
	yellow birch	9%	10%	-	382.4	1.0	69.4	0.8	0.3	0.6	3.5
	sugar maple	12%	10%	-	338.4	1.6	196.3	0.4	0.1	0.6	3.7
	white ash	5%	6%	-	566.1	0.9	-	-	-	-	2.3
	paper birch	4%	5%	-	434.0	0.7	-	-	-	0.3	1.9
	beech	6%	3%	-	-	0.8	-	-	-	0.2	0.8
HW Total		**72%**	**70%**	**114.1**	**3,071.6**	**9.6**	**592.4**	**1.8**	**1.2**	**5.5**	**24.2**
SW	hemlock	24%	24%	-	823.4	4.1	-	0.4	0.7	2.8	8.4
	red spruce	3%	3%	-	419.0	0.4	-	-	-	0.0	1.5
	white pine	1%	2%	-	321.5	0.2	73.7	-	-	-	1.2
SW Total		**28%**	**30%**	**-**	**1,563.9**	**4.7**	**73.7**	**0.4**	**0.7**	**2.8**	**11.1**
Stand Total		**100%**	**100%**	**114.1**	**4,635.5**	**14.3**	**666.2**	**2.3**	**2.0**	**8.3**	**35.3**

Table 4.1: Stand volume and basal area per acre and composition by species and product.







Silvicultural Objectives

Management system:	Uneven-aged with even-aged patched
Harvest Entry:	15 – 20 year cutting cycle
Products:	Mixed hardwood & pine sawtimber and pulpwood
Desired Composition:	Promote a diversity of species Maintain some softwood component
Crop tree target diameter:	Red maple 18-20” Red oak 22-24”

Operational Considerations

Operability:	Good operability
Seasonal limitations:	Much of the area is dry – good fall ground
Terrain:	Moderate to steep/rocky slopes
Access and landing area:	Both proposed landings would be utilized
Access distance:	Short, moderate & long
General maintenance:	Build 2 landing areas
Brook-wetland crossings:	There would be several

Stand 4 Description & 10 Year Management Schedule

Stand 4 is a relatively uniform, middle-aged hemlock-spruce-northern hardwood forest community. Parts of the stand were treated in the most recent round of harvesting in 2006 while other parts have not seen any activity in many years. Similar to other part of the property, much of the terrain is challenging as it is very stony. Overall, the trees are of good quality with some nice pine and oak trees growing here. Yellow birch also grows well here. The mountain biking trail meanders through the area. As a result, care will need to be taken to minimize damage when undertaking forestry operations. There is some patchy regeneration (pine, hemlock, and mixed hardwoods) in some of the small gaps created in the last logging operation. Beech, hemlock and striped maple dominate the estimated 4,500 seedlings and saplings per acre.

Hardwoods are estimated to make up 72% of the trees. Hemlock is the most common tree making up 24% of the trees. The stand is estimated to have 4,600 board feet of sawtimber (all white pine) and 19 cords of pulpwood per acre.

Stand objectives: As in other parts of the forest, manage this area on an uneven-aged basis. At this point, it would be wise to treat the areas that were not entered in 2006. Recreational and aesthetics should be considered when doing any work (including road building) near recreational the trails.

Silviculture: 2019 - 202 Reduce overall basal area to approximately 95 square feet through:

- **Group Selection:** Focus on creating openings of from five to ten trees. Groups should be located in such a way as to release any pockets of acceptable advanced regeneration, where they exist. Cut tree groups should focus on declining or high risk

trees rather than trees which will improve with time.

- **Individual Tree Selection:** In between groups, release trees of high quality and vigor. The species to leave is not as important as leaving quality trees. Release selected crop trees on at least two but preferably three sides. Leave some larger low quality trees and ones with cavities for legacies.

Wildlife: This stand provides cover. A headwater stream with several nice cascades is an important riparian area. The proposed log landing area can be mowed periodically to keep it open-providing a different habitat type. Large mammals such as black bear and white-tailed deer would move through this area. Certainly, there is ample habitat for birds that use interior softwood forests such as the blackburnian warbler, black-throated green warbler, and the purple finch.

Stand 5 White pine/spruce & mixed hardwood S3A/B 34.4 acres – 9 points

General Attributes

Natural Community Type:	Hemlock-spruce-northern hardwood forest
Past Management History:	Much of the area harvested in 2006
Approximate Age of Dominant Trees:	70-80 years with scattered older trees
Stand Health:	Good
Insects/Damage/Disease:	Some pine decline, spruce decline as well but not bad
Timber quality:	Good, some of the worst pine was cut Spruce is average

Site Conditions

Soil Rating:	IIA NH forest soil group
Determined by:	Soils map & field observation
Tree vigor:	Mostly medium to high vigor
Soils:	Tunbridge-Lyman
Parent material:	Glacial Till
Soil texture:	Fine sandy loam
Drainage:	Well-drained – a few small poorly drained areas
Terrain:	Flat to moderate slopes
Aspect:	North & northwest
Elevation:	1,150 to 1,300’

Cultural Attributes

Archeological features present:	Old stone walls
Past land use:	Likely old pasture land

Wildlife Attributes and Objectives

Forest type:	Upland mixed wood forest
Vertical diversity:	Moderate to high

Vegetative diversity:	Low to moderate
Beneficial shrubs and trees:	Spruce adds diversity
Hard mast:	Some beech
Soft mast:	*Rubus sp.* ins some openings
Dead and decaying structure:	Low to moderate amounts
Special habitat features:	Stand located on small ridge top
Wildlife protection zones:	Nothing specifically
Special wildlife practices:	Try to maintain the softwood dominated composition

Wetland and Water Features

Wetland type:	None
Streams:	Perhaps ephemeral streams in the spring
Ponds or Standing Water:	None

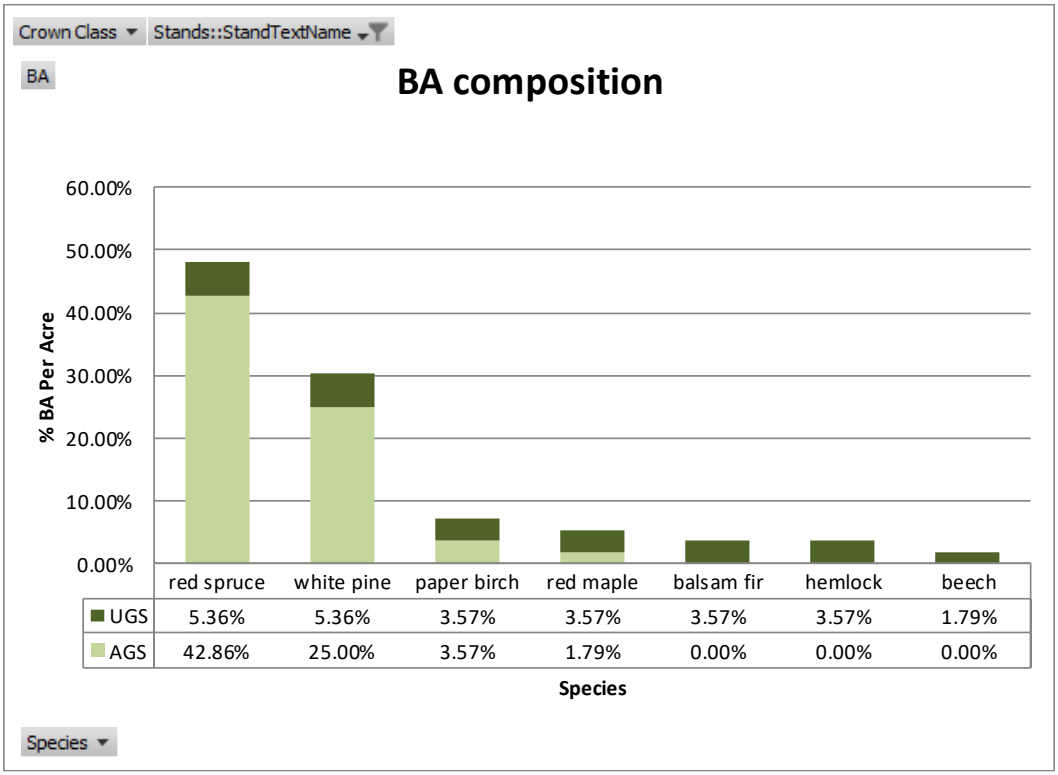
Structural and Silvicultural Attributes

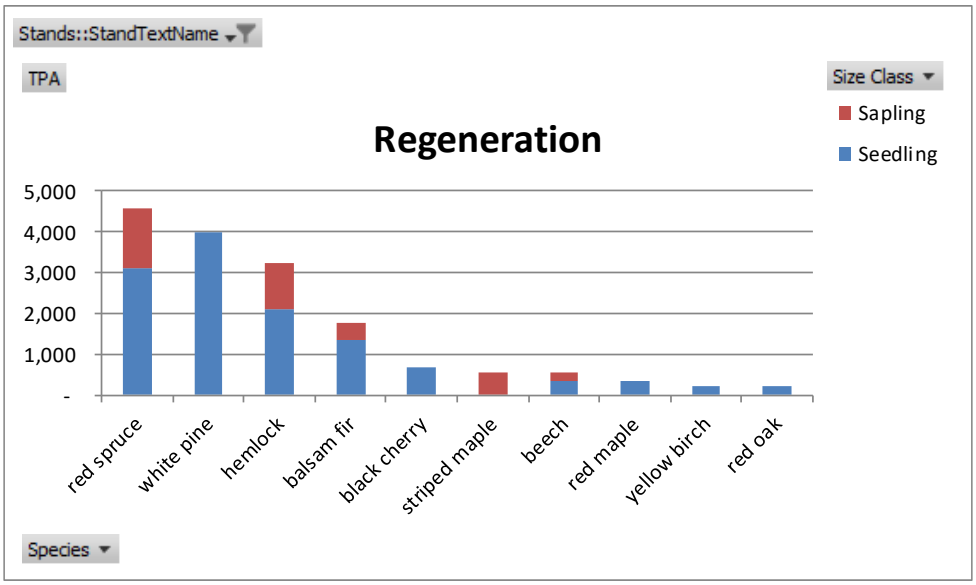
Broad Forest Type:	S3A
Size Class:	Medium sized sawtimber
Stand Structure:	Two-aged in a lot of places
Crown Closure:	70-90%
Basal Area Per Acre:	124
Acceptable Basal Area Per Acre:	91
Trees Per Acre:	187
Quadratic Mean Stand Diameter:	11.1”

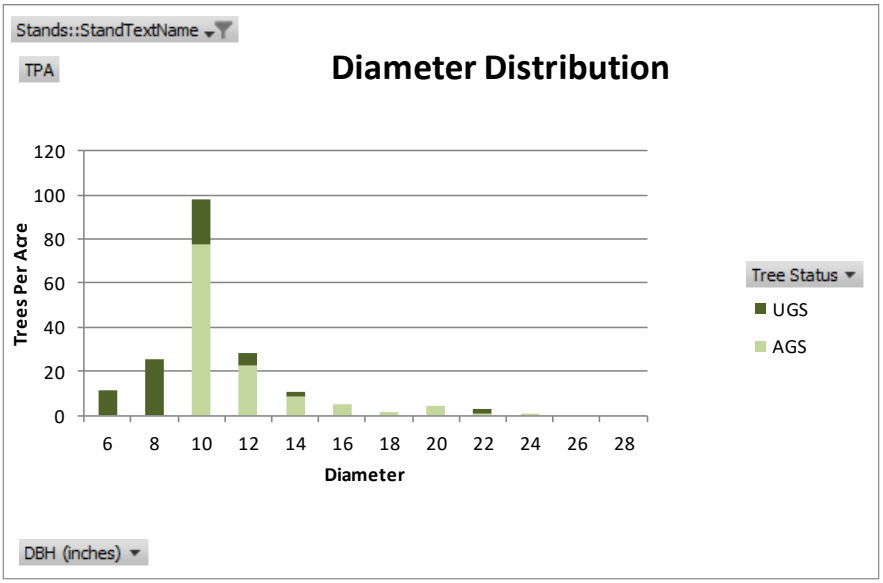
Forest Composition and Volume

Type	Species	Data % TPA	% BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Growing Stock (Cords)	Topwood (Tons)	Total Cords
HW	paper birch	11%	7%	-	255.4	1.0	-	-	0.2	0.5	2.0
	red maple	7%	5%	-	-	1.0	-	-	0.3	0.3	1.4
	beech	6%	2%	-	-	0.4	-	-	-	-	0.4
HW Total		**23%**	**14%**	**-**	**255.4**	**2.4**	**-**	**-**	**0.5**	**0.8**	**3.8**
SW	red spruce	51%	48%	57.1	4,357.3	4.5	255.9	-	0.4	0.1	17.1
	white pine	16%	30%	-	3,069.6	2.5	531.9	1.2	0.3	0.2	13.4
	balsam fir	7%	4%	-	-	0.8	-	-	-	0.3	0.9
	hemlock	3%	4%	-	-	0.8	-	-	-	0.5	1.0
SW Total		**77%**	**86%**	**57.1**	**7,426.9**	**8.7**	**787.8**	**1.2**	**0.7**	**1.1**	**32.5**
Stand Total		**100%**	**100%**	**57.1**	**7,682.3**	**11.0**	**787.8**	**1.2**	**1.2**	**2.0**	**36.3**

Table 5.1: Stand volume and basal area per acre and composition by species and product.







Silvicultural Objectives

Management system:	Uneven-aged management
Harvest Entry:	10 to 15 year cutting cycle
Products:	Mixed wood sawtimber & pulpwood
Desired Composition:	Maintain softwood dominance
Crop tree target diameter:	Red spruce 12 - 14” White pine 20 - 24”

Operational Considerations

Operability:	Difficult in places with uphill pulls required
Seasonal limitations:	Wet periods – could work during a dry summer/fall
Terrain:	Moderate to steep slopes – some flat
Access and landing area:	Old landing now a parking area Use proposed new landing
Access distance:	Moderate to long skidding length
General maintenance:	Construct new landing area
Brook-wetland crossings:	Might be several depending on time of year

Stand 5 Description & 10 Year Management Schedule

Stand 5 is a relatively uniform middle-aged hemlock-spruce-northern hardwood forest community. The white pine in the stand is likely due to the area's past use as pasture. This stand occupies a ridgetop where the ledge is not very far from the surface. This stand adds some diversity to predominantly hardwood in surrounding areas. Also, there are some canopy gaps with younger trees developing-representing a new age class. Regeneration is prolific, and estimated to be approximately 16,000 seedlings and saplings per acre, dominated by red spruce and white pine.

Softwoods, dominated by white pine and red spruce, make up an estimated 77% of the trees. White birch and red maple make up a large part of the hardwood portion of the composition. This stand is estimated to have 7,600 board feet of sawtimber and 14 cords of pulpwood per acre.

Stand objectives: Long-term, the stand should be managed on an uneven-aged basis. Rather than having many ages on one acre, this stand will likely be a mosaic of small even-aged groups. While treating any adjacent stands, it would be appropriate to open up some space for the established regeneration as the trees could use more sunlight. This will promote both softwoods and hardwoods that are of high vigor and quality. Any of the blown down trees should be left. In the long term, with each successive cutting, the overall structure of the forest should be increased.

Silviculture: 2019 - 2022 Reduce the basal area to about 90 square feet via:

- **Irregular shelterwood:** In much of the area, expand the canopy gaps created following the 2006 harvest. Find pockets of high quality and vigorous regeneration to release. Remove pine and spruce that are in decline. The species to leave is not as important as leaving quality trees and releasing existing regeneration. Where appropriate leave dense softwood cover in some spots.

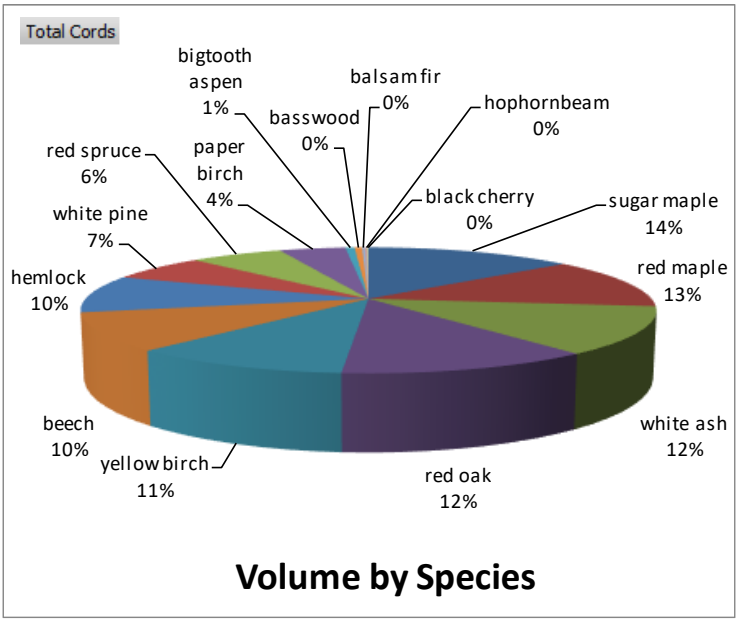
Wildlife: This area provides moderate high cover for some species. The dense softwood regeneration may attract snowshoe hare. This could benefit bobcats which are likely to be around due to the dens available in the steep and rocky surrounding areas.

Birds that utilize interior forests such as the blackburnian warbler, purple finch, and several species of woodpeckers should do well here.

ESTIMATED TOTAL FOREST STOCKING
Hanover Town Forest
April 2017
482 commercial wooded acres

Type	Species	Data % TPA	% BA	Veneer (BF)	Sawlog (BF)	Pulp (Cords)	Pallet (BF)	Legacy (Cords)	Stock (Cords)	Topwood (Tons)	Total Cords
HW	red maple	16%	15%	-	96,665.6	1,441.6	-	58.7	146.0	478.6	2,040.7
	sugar maple	15%	14%	-	273,948.1	855.7	80,438.4	110.8	208.7	359.7	2,204.0
	beech	14%	12%	2,047.2	39,175.5	1,157.7	5,978.8	131.4	8.9	397.5	1,539.6
	yellow birch	13%	12%	-	168,405.0	771.2	4,374.7	156.1	201.0	286.2	1,663.0
	white ash	8%	10%	1,871.5	469,740.8	652.2	-	-	47.9	3.7	1,927.5
	red oak	9%	10%	23,693.8	366,850.7	378.5	54,771.1	81.7	148.1	491.2	1,913.0
	paper birch	6%	5%	-	93,328.8	350.9	-	-	57.8	160.4	699.4
	bigtooth aspen	0%	1%	-	16,545.8	48.1	1,022.9	-	-	11.1	97.1
	basswood	0%	0%	-	3,446.9	12.4	-	43.7	-	45.2	78.6
	hophornbeam	1%	0%	-	-	22.7	-	-	-	0.8	22.9
	black cherry	0%	0%	-	-	15.2	-	-	-	-	15.2
HW Total		**81%**	**79%**	**27,612.4**	**1,528,107.3**	**5,706.1**	**146,585.9**	**582.4**	**818.6**	**2,234.4**	**12,200.8**
SW	hemlock	8%	10%	2,305.3	129,949.5	874.3	-	67.3	54.1	472.3	1,512.5
	red spruce	7%	6%	1,998.8	257,965.8	260.4	8,956.1	-	24.6	6.9	986.7
	white pine	2%	5%	-	244,491.1	186.0	57,503.0	61.1	10.3	8.4	1,045.6
	balsam fir	1%	0%	-	-	27.7	-	-	-	9.9	31.3
SW Total		**19%**	**21%**	**4,304.0**	**632,406.4**	**1,348.4**	**66,459.1**	**128.4**	**89.0**	**497.5**	**3,576.2**
Stand Total		**100%**	**100%**	**31,916.5**	**2,160,513.7**	**7,054.5**	**213,045.0**	**710.7**	**907.5**	**2,731.9**	**15,776.9**

Total cords (sawtimber and pulpwood) by species



Hanover Town Forest

MANAGEMENT ACTIVITY AND SILVICULTURAL TREATMENT SCHEDULE

This schedule is only meant to be a guide to prioritize treatment areas. All treatments may be rescheduled due to variable weather and market conditions.

Stand #	Type	Acres	Treatment	Year
1	**H3A**	**184**	Individual tree/group selection	**2019-2020**
2	**HS3A**	**60**	Patch-cut/group selection Individual tree selection	**2019-2020**
3	**H2/3A**	**111**	Individual tree/group selection Patch clearcut	**2019-2020**
4	**HS3A/B**	**93**	Individual tree/group selection	**2018-2020**
5	**S3A/B**	**34**	Irregular Shelterwood	**2018-2020**
2			Invasive control	**On going as needed**
2 & 4			Build landing and access road	**2018-2020**
All			Monitor Red Trillium area and invasive plant spread	**Every 3 years**
Where needed			Upgrade access roads and trails for recreational use	**As desired**
Where needed			Boundary line maintenance	**2018-2020**
All			Survey of flora	**2019-2021**
All			Update this plan if needed	**2028**

ACCOMPLISHING TREATMENTS AND OTHER MANAGEMENT ACTIVITIES

There are treatments scheduled over the next five years or so. These treatments are based on a combination of the Town's objectives and the forest condition. There are many components of a timber harvesting operation that need to fall into place if a treatment is to be successful. Weather and markets are both unpredictable. The prescribed timber harvesting can be conducted in a series of smaller jobs or the projects can be combined to make larger jobs. Often there are economies of scale with larger operations, especially when mills really need wood. Smaller jobs can be timed to the markets to some degree, but when it comes to regenerating pine and oak, a good seed year and soil scarification are important as well. The most crucial part of good forest management takes place on the ground, not in this document. The science of forest management is still in its infancy, and the intuition of the person on the ground is crucial to success.

If an agreement can be made between the Town and a potential buyer, it is consummated with a timber sale contract. There are many logistics of the operation that need to be fully understood and spelled out in the contract. Suitable access and landing areas need to be located; the type of equipment, the timing of the operation, payment schedules, and other issues need to be addressed. Patience and flexibility are usually required. Market and weather conditions will play an important role; rarely are all conditions in alignment. The scheduling of the various treatments can be difficult to time, but in most cases, there are opportunities to implement a successful timber harvest.

The schedule on page 77 summarizes the management activities that could be undertaken based on the landowner objectives and the forest conditions.