FOREST MANAGEMENT PLAN
for the
NH 42 Morgan Hill Forest
Plainfield and Lebanon, New Hampshire

Mapped Acres: 649.3
Tax Maps and Acres:
Plainfield: Map 207, Lot 1 (495.0 acres); Map 213, Lot 10 (64.7 acres)
Lebanon: Map 211, Lot 1 (111.2 acres)

Plan Prepared: March, 2015
Next Update due: 2025

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Landowner Date

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TSP Provider Date

Table of Contents

Morgan Hill NH42

Forest Management Plan

Plainfield and Lebanon, New Hampshire

FOREST INFORMATION SUMMARY

Tract Name: NH42 Morgan Hill

Acres: 649.3 mapped acres; 670.9 acres according to tax maps

Located in: Plainfield and Lebanon, New Hampshire

Tax Map and Lot: Plainfield: Map 207, Lot 1 (495.0 acres); Map 213, Lot 10 (64.7 acres)
Lebanon: Map 211, Lot 1 (111.2 acres)

Deed Book and Page: Easement: Book 947, Page 582

Survey: Three surveys: 111.2 acres in Lebanon- S. N. Stevens in 1933; original core acreage under conservation easement - Jim Neil compass and tape survey in 1990; and 64.7 "Mulherin Lot" surveyed by Wayne McCutcheon in 1991

Conserved Status: 515 acres under conservation easement held by the town of Plainfield

Current Use Status: Stewardship category of NH current use

Tree Farm Status: Part of MTL NH, #001350. Reinspection due: 2018

Cost Share Status: 2015 plan prepared with EQIP cost share funds

ROW: Legal gated access off state Route 120

Deed Restrictions: Conservation Easement on 515 acres has minor use limitations for forest management including a pedestrian ROW buffer limited to " salvage cuts; trail maintenance; logging road use, construction, and maintenance; vista clearing; or removal or diseased or hazardous trees" and protection of scenic quality viewed from public roads or public trails

Local/Zoning Restrictions: No special zoning: Tract lies within Rural conservation II in Plainfield and within Rural Lands III in Lebanon

PLAN PURPOSE

This plan's purpose is to provide the landowner, Meadowsend Timberlands Limited (MTL) with a comprehensive description of the property's make-up and proposed management activities. It is meant to be a "User's Guide" that reflects the landowner's objectives and will remain flexible as changes in the property condition or objectives change through time.

This plan meets and exceeds the requirements of the American Tree Farm program, the state Forest Stewardship Program, Conservation Easement held by the town of Plainfield , and has been prepared with funding from NRCS EQIP.

PROPERTY LOCATION AND BRIEF DESCRIPTION

Morgan Hill Forest is a contiguous ownership located in the towns of Plainfield and Lebanon, New Hampshire. According to town tax maps it totals 670.9 acres, with 606.2 acres in Plainfield, and 64.7 acres in and in Lebanon. As mapped, it totals 649.3 acres according to GPS data collected at boundary corners.

Morgan Hill Forest sits on the Lebanon-Plainfield town line, about 3.3 miles from the Connecticut River and the same distance from the City of Lebanon. This large, unfragmented forest plays an important role in this relatively heavily populated area of the Upper Valley, joined by the 700+ acre Farnum Hill Reserve about 1 mile to the north, and the several thousand-acre Enfield Wildlife Management Area about 3.7 miles to the east. About 80% (515 acres) of Morgan Hill is protected with a conservation easement, which is held and monitored by the town of Plainfield.

Though not the most numerous, red oak is the prominent tree species on Morgan Hill. Large, legacy oaks are common throughout the many heights of land. The terrain is variable, with gentle lower slopes that get steeper as you climb in elevation. The only open land on the tract is associated with active forest management, inclusive of truck roads and log landings. Wetlands associated with drainage systems occupy the lowers elevations, and include everything from open water, shrub dominated to fully forested. Other common tree species include red and sugar maple, yellow and white birch, white ash, hemlock, and white pine.

Morgan Hill has historically been a valuable asset to Meadowsend land holdings. Unfortunately, the long-term sustainability of this asset is seriously threatened by two landscape level threats. This first is an exploding population of invasive exotic shrubs, primarily glossy buckthorn. This prolific fruiting shrub is spread far and wide by birds and is showing up in all areas of the forest, but most heavily in the recently treated areas. Though management of this problematic shrub will be an important focus of this plan, once established at this level it is impossible to eradicate. The second threat is the pending arrival of emerald ash borer, affecting white ash-- the second greatest sawlog volume on the property. This exotic insect pest is the most damaging and prolific pest to ever introduced to our forests. Once symptoms appear the host tree can be expected to die in 3 to 5 years. The insect is spreading at an incredible rate, already well established in the counties of Merrimack, Hillsborough, and Rockingham County. It will reach Morgan Hill Forest in a matter of time, and will result in a drastic change in forest structure and composition. The long term effects are still being studied, but undoubtedly will impact forest diversity on all levels.

WOODLOT HISTORY

Morgan Hill has a rich land use history, with 3 homesteads located here at the peak of agricultural expansion in the early 1800's. Stonewalls, wire fence and agricultural artifacts can be found throughout the property. The height of Morgan Hill still hosts several wild apple orchards. Apples remain the most prominent agricultural product in the surrounding area today, with three commercial orchards, Poverty Lane, Plainfield Cider, and Walhowdon, all located within 3 miles of Morgan Hill. As agriculture use was abandoned early last century the open fields and crop lands were left to re-forest, with the height of land orchards the last places to remain semi-open.

Several sections of old wild apple trees that grew up after agricultural abandonment have been maintained by MTL over the years on Morgan Hill, providing a historical link to past land use here. These orchards also provide an excellent food source for many wildlife

According to the prior management plan land use history since then has included small-scale sugaring and fuel woodcutting. Prior to MTL's ownership and management three major logging events have taken place on the property, evidence of all still can be seen today in the woods. Some of the earliest and likely the lightest logging unfolded around the early part of the 1900's with a small bull-dozer and perhaps horse or oxen. The areas cut were extensive and the most evident old skid trails cut by the dozer can be seen on the north slopes of Morgan and the eskers in the north compartment. The second major cutting happened around the 1950's, when skidders were used. This operation was conducted under the ownership of Edmond "Peanie" Goodwin, who owned and cut much of the land in this area. These cuttings were largely commercial clearcuts, where all of the saleable wood was cut. In the 1960's Peanie sold the core block of what is known as Morgan Hill Forest to Stanley Golsovich. During the 1970's, forester Jim Neil conducted a few small commercial harvests and carried out a large-scale precommercial timber stand improvement job .

In September of 1991 the Golsovich's placed a conservation easement on the 515-acre ownership through the LCIP program. Sometime soon after the conservation easement implementation, Stanley Golsovich acquired the 65 acre "Mulherin Lot" to the east, annexing it to the 515 acre ownership. The latest cutting occurred in the mid 1990's, where the entire east compartment was treated and a road network was installed the central compartment was constructed. After this commercial sale the entire 580 acres was sold and eventually was

bought by Burgess Youngman. During his brief ownership Mr. Youngman acquired and annexed the 111 acre "Dartmouth College Lot" to the north, thus bringing the current acreage of Morgan Hill Forest to 691 acres. Meadowsend Timberlands purchased this property in December of 1999 from Mr. Youngman. Since MTL has owned Morgan Hill Forest a variety of long-term management activities have occurred on the tract and are outlined in the Management History section below.

LANDOWNER OBJECTIVES

It is not always possible, nor practical, to achieve every landowner objective on each acre of land. Some objectives, "*Be responsible stewards of the land"* 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, though often multiple landowner objectives can be met in the same area. For example, the habitat of certain wildlife species can often be improved while meeting objectives for growing timber. Red oak, a hard mast food source for many wildlife species such as white tailed deer and turkeys is also a good tree to grow for timber. In addition, the opening of the forest canopy during timber harvesting allows more sunlight to hit the forest floor, prompting growth of herbaceous and woody trees and shrubs providing browse, shelter and structural complexities utilized by almost all wildlife species.

Other wildlife objectives could be met through forest management. For example, some forest stands could be improved based on the wildlife habitat they provide. Snag trees and down logs could be created, living cavity trees could be managed for by releasing them from competition. Perch trees could be released or intentionally left protected to meet specific habitat requirements. Forest species diversity could be increased through selective thinning. Forest structure can be manipulated to provide habitat in different levels of the forest. For wildlife species that require dense, undisturbed, mature forest, timber harvesting likely would not be a complimentary management objective. The inverse is true as well; old agricultural areas that have not yet reforested are excellent places to manage open wildlife habitat with a lot of edge through periodic mowing and/or brush hogging. Dynamic planning that allows for islands of shrubby vegetation within these areas would provide shelter and often harbor soft mast species as a food source. Pruning of old apple trees found in these areas is another way to improve wildlife habitat. In these areas timber harvesting obviously is not a compatible objective, but recreation could be if hiking trails were created to provide opportunities for wildlife viewing.

A landowner who has multiple and multifaceted objectives should first clearly identify and then prioritize them. The forest management plan created to meet these objectives is a crucial tool providing an analysis of what the landowner has to work with, a detailed management scheme in which objectives are met according to priority and practicality, and a projection of the expected outcome of management.

Morgan Hill Ownership Objectives:

The landowner objectives of MTL are multi-faceted, yet interrelated. The main objectives of ownership are listed below:

- Enhancement of a sustainable timber resource in both quality and quantity over time
- Be responsible stewards of the land while continually raising our standards of forest management
- Provide opportunities for education and low impact recreation
- Provide a variety of habitats for wildlife enrichment and diversification
- Maintain a healthy, productive and aesthetically pleasing forest that is exemplary in nature
- Maintain or enhance the water quality of streams and wetlands
- Maintain the stability and integrity of the portion of ecosystem within our control
- Meet the standards for continued Tree Farm status
- Consider the elements of a natural forest ecosystem during management decisions
- Uphold the concepts of environmental conservation by keeping this land open-green-space

FOREST INVENTORY PROCEDURES

A forest inventory was conducted to evaluate the timber types, wildlife habitats and recreational resources found on the property. The forest inventory also was used to evaluate the stocking and composition of the forest and the volume of the merchantable timber on the woodlot. Data was collected at points established on a systematic grid.

For the cruise a 20-BAF prism was used to sample trees 5.5 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, pulpwood, or a combination of the two. A 5-BAF prism was used to collect data including species, diameter, status, and crown position on trees between 2 and 6 inches in diameter. Information on snags, cavity trees, and regeneration was also collected. Photographs were taken at each point and at other points of interest.

Products estimated in tallied trees greater than 6 inches in diameter were graded in multiples of eight feet. Hardwood sawlogs were estimated to a 10 inch small-end diameter while spruce and fir softwood logs were estimated to a 6 inch small-end diameter and pine to an 8 inch small-end diameter. Pulpwood was estimated in eight foot lengths up to a minimum 4 inch top.

In order to more accurately determine volume and make forest management and wildlife habitat recommendations, the property was broken into separate management areas called forest stands. Stands were differentiated from each other primarily on the basis of natural community type and past land use, but also considered soils, tree size, species composition, and density. As with any large piece of land, there are many micro-stands on the property (small areas within a larger stand that are distinct, such as a small pocket of rocky ground or a forested seep) but these variations are too subtle to map and too numerous to describe. These subtleties are best left to the intuitive forester to sort out when applying any sort of silvicultural treatment.

The computer program ASSISI was used to process the data collected at the sample points to the entire forest. The detailed computer program output is not included as part of this plan but is available, if needed, from The Ecosystem Management Company.

Often to simplify operations on a large tract, forest stands are compiled to make up operational compartments. Compartments are helpful to identify sections of the property that utilize the same access system.

The following forest type designations are often used in the forest type map:

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

Morgan Hill Forest Inventory:

Forest data was collected during the fall of 2014 at points on a systematic grid providing approximately 1 point for every 5 forested acres. The property was broken down into 4 Operational Compartments and 10 individual forest stands.

GEOLOGICAL ATTRIBUTES

Physiographic Regions

Northern New England can be broken down into different physiographic regions, also called eco-regions. The regions are separated from one another based on a combination of climate regimes, topography, surficial geology, and soils. This in turn influences the plant and animal distribution in those regions.

Morgan Hill Physiographic Regions:

Morgan Hill is located in the one of three distinct regions found in the state, called the Vermont-New Hampshire Upland Section. According to the book Natural Communities of New Hampshire[1], this section covers the southwestern portion of the state. From maximum elevations of 2200 feet, it slopes southeastward to its boundary with the Gulf of Maine Coastal Plain. It is a sloping plateau dissected by steep, narrow valleys and underlain by granite, gneiss, and schist. This region is divided into four subsections: (1) Sunapee Uplands, (2) Hillsboro Inland Hills and Plains, (3) Vermont Piedmont, and (4) Northern Connecticut River Valley.

1 Natural Communities of New Hampshire, Daniel Sperduto and William Nichols, 2004.

Morgan Peak falls into the Northern Connecticut River Valley. This narrow subsection characterized by glacial outwash and glacial lake deposits that abut lower slopes of adjacent hills comprised of glacial till, with distinctive river terraces. The rich metamorphic bedrock in this section yields soils with relatively high nutrient status. Climate here tends to be regulated somewhat by the river, but in general is typical of central New Hampshire, with average mean extreme cold temperature between -20 and -15 degrees Fahrenheit and average annual rainfall of 32 to 36 inches.

Topography and Aspect

The present land formations of New England were shaped by the latest glaciation during the Pleistocene Era, which began approximately two million years ago. At that time New England was covered by ice approximately 1 mile thick. The glaciers receded 10,000 to 12,000 years ago leaving behind the mountains, hills, gullies and valleys we are familiar with today. Following primary succession where pioneer species including lichen, algae and fungi in combination with abiotic factors like wind and water slowly built up soils, the forest began to re-grow. Over long periods of the forest has evolved to the mix of species found here today largely determined by soils type, topography, and aspect but also shaped by more recent land use history.

Morgan Hill Topography and Aspect:

Morgan Hill has complex topographical features with the height of land, Morgan Hill itself, acting as a watershed boundary with two distinct drainage systems, one running west and the other east. Much of the tracts north and south boundaries are at or near heights of land, with the lowest points in between. Slopes ranges from extremely steep to gradual, with little level ground. The highest point occurs on Morgan Hill, at 1,860 feet, dropping below 900 feet along the main drainage where it crosses the western boundary. Aspect is equally variable and complex, influencing the natural biodiversity found here, with more oak on the southern facing slopes and maple, ash and beech on the northern slopes.

Soils

Soils are the substrate upon which all trees grow. Soil productivity is influenced by the rock from which the soil is derived. For example, soils derived from limestone, or calcium-rich bedrock, tend to be more nutrient rich because of a higher pH. As pH increases more nutrients become available. On the other hand, soils derived from granite, or more acidic bedrock, tend to have a lower pH which locks up nutrients. Not only do different soil types largely drive the mix of vegetation found on a site, soil is critical to productive tree growth, one of the primary objectives of forest management. Sound forest management strives to grow the tree species best suited for the site. Fighting the site, for example trying to grow high quality sugar maple on acidic soils, will result in poorly formed, low vigor trees with a higher susceptibility to insect and disease problems. Hence, it is important to consider your soil types when determining landowner and management objectives. Additionally, maintenance and consideration of the long-term productivity of the soil resource is critical to the sustainable forest management.

The threats to the soil resource include the loss of soil through erosion, compaction of the soil from

heavy equipment traffic, and nutrient loss through both leaching and timber harvesting . Erosion results in the direct loss of soil. Compaction reduces soil productivity. Most soil types include about 50% space between particles and soil compaction, which eliminates this space, directly reduces the amount of air and water soil can hold which is required for most soil processes. Nutrient leaching increases when soil is exposed during a timber harvest and when intensive timber repeatedly harvesting occurs

Measures to avoid these threats include[2]:

- Avoid whole-tree removal, particularly on low-fertility sites (i.e., shallow to bedrock soils, coarse sands, wetlands, and area with high water tables), unless replacement of nutrients and organic matter is considered
- Conduct harvest operations during the season of the year that is most appropriate for the site. Operating on snow or frozen ground, whenever possible, minimizes effects of the soils and forest floor.
- Choose harvest equipment to suit the site and minimize disturbance. For example, in dry conditions, and in some wet conditions, consider using tracked vehicles to reduce rutting.
- Minimize skid-trail width using techniques such as bumper trees when appropriate.
- Establish skid trails that follow land contours where possible rather than directed straight uphill.
- When possible, conduct whole-tree harvests of hardwoods during dormant leaf-off season to retain nutrients on site.
- Avoid or minimize practices that disturb the forest floor, remove the organic soil or cover it with mineral soils, except as necessary to accomplish silvicultural goals and to regenerate certain tree species.

Morgan Hill Soils:

There are 13 different soil types on Morgan Hill. The soils are mapped by the United States Department of Agriculture, Natural Resource Conservation Service (formally the Soil Conservation Service). A soils map and soils suitability for forest management map are included in the appendix of this plan.

The soils are largely nutrient rich, supporting good growth of high quality hardwoods, specifically sugar maple, yellow birch, white ash, and red oak. These rich soils dominate the south facing slopes and include Bernardston, Berkshire, Dutchess, Marlow, Peru, Pittstown, and Sunapee. The north facing slopes also have nutrient rich soils, but are much rockier and include rock outcrop complexes made up of Cardigan-Kearsarge, Kearsarge-Cardigan, Monadnock-Lyman, and Tunbridge-Lyman soils. The only variability comes at the eastern boundary with a small amount of Lyme-Moosilauke soils in the wetland supporting best growth of spruce and fir, and a small area just up from there occupied by Monadnock soils which grow less nutrient demanding hardwoods such as white birch and oak.

2 Soil management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

Wetland and Water Resource

Water features are an integral part of the forest ecosystem. Brooks, streams, ponds and wetlands all provide essential riparian habitat and functions. Topography, elevation, bedrock, and soils dictate the water features found on a particular tract of land. The protection of water quality is an integral part of sound, sustainable forest management.

The following are recommended actions to improve and manage the wetland and water resource[3]*:*

Riparian, Wetland and Stream Ecosystems:

- Consider establishing riparian management zones along streams. These are not intended as no-harvest zones. Forest management systems, such as single-tree or small-group selections cuts, that retain relatively continuous forest cover in riparian areas (65-70 percent canopy cover) can help maintain biodiversity by protecting water quality, providing shade, supplying downed woody material and litter, and maintaining riparian wildlife habitat conditions.
- Road construction, stream crossings, skid trails, log landings, and all phases of timber-harvesting operations will conform to Best Management Practices

Springs and seeps:

- Avoid leaving slash in woodland seeps, springs, or associate wildlife trails.
- To the extent feasible, avoid interruption of groundwater flow above or below seeps and above springs. When seeps and springs can't be avoided, minimize flow interruption by strictly adhering to appropriate Best Management Practices for water crossings.
- Where feasible, use woodland seeps and springs as nuclei for uncut patches to retain snags, cavity trees, and other site-specific features.

Morgan Hill Wetland and Water Resource:

Morgan Hill falls into the greater Connecticut River Watershed, with portions of two lesser watersheds including Blood Brook which drains to the west through Hibbard Brook to Blood Brook and into the Connecticut and the Lower Mascoma which drains to the east through Great Brook to the Mascoma and then into the Connecticut. Morgan Hill is the boundary between the two. These east-west drainage systems divide the tract generally into northern and southern halves.

The headwaters of Morgan Hill Forest are largely spring fields or *seeps*, where ground water is discharged throughout the year. The number of forest seeps and spring fields found on Morgan Hill is noteworthy, particularly on the toe slopes of the east and central compartments. Both the seeps and spring fields provide seasonally critical food and water sources for many species of wildlife. These areas are usually unfrozen or freeze late and thaw very early making a reliable water source for mammals and hibernating habitat for

3 Riparian and Stream Ecosystem management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

amphibians. Food habitat is also provided by the seeps and spring fields, where early emergent green vegetation, earthworms and insects supplement diets of various mammals and bird species. Innumerable seasonal streams feed the secondary brooks that drain the two watersheds of Morgan Hill.

Two major wetland complexes are found on Morgan Hill Forest. The one in the north compartment is a open water pond of 6.2 acres (referred to as Hibbard Pond in this plan). Hibbard Pond was established by beaver activity and its drainage forms Hibbard Brook, where along its riparian path several other small wetland communities are found. Heavy trapping during the past ten years has eradicated all beaver activity, including the biological richness often found within beaver influenced wetlands. MTL does not typically endorse trapping on its lands and hopes to see the beaver ecology back soon. The second large wetland is found in the east compartment and is of beaver origin as well. Because beaver disturbance has been non-existent for a long time this wetland community has evolved and is heavy with grasses and shrubs. This wetland eventually drains east into Great Brook.

The Great Brook drainage, shown at left, is located in the East Compartment and is of beaver origin. Invasive exotic shrubs, especially buckthorn, are especially prevalent around the edges of the wetland systems on Morgan Hill.

NATURAL PROCESSES

One of the objectives of sustainable management is to mimic natural processes occurring on both forest and open land. Certain natural processes can be sped up, slowed down, or enhanced through management. Some processes in which nature sets the precedent cannot be “managed” at all. To consider the role these processes play in management activities, it is important to identify and explore the major ones.

Succession

This is a process which takes place naturally on any piece of land, be it forest, wetland, open land, or even developed land. The temporal scale on which this is viewed is important. On a geologic time scale processes such as glaciation, global temperature, and plate tectonics all play a role. In the life of an individual, land-use patterns play the biggest role, but natural disturbances, insect and disease infestations, fire, and natural aging processes all contribute to succession. The process of succession heavily influences silvicultural prescriptions and management objectives.

Different trees species are predisposed to grow in certain conditions and in terms of forest succession this is dictated by the amount of sunlight available to the seedling. It is expressed as a plants shade tolerance. In

general, if allowed to develop naturally, a forest will develop from early successional species that generally require full sunlight to develop, such as white birch, aspen and white pine, to late successional trees like hemlock, red spruce, sugar maple, beech, and yellow birch that can regenerate in their own shade.

Often, early successional species also require some sort of soil scarification and typically are fast growing and shorter lived than late successional species. As early successional species develop they shade the ground as their crowns spread in the canopy, changing the growing conditions on the forest floor to favor late successional, more shade tolerant species. Once a forest hits a late successional stage it will remain in that state until there is a disturbance, such as a wind storm, that changes the amount of sunlight hitting the forest floor and thereby bringing it back to an earlier stage of succession. Wildlife habitat and the species that use a particular habitat change as succession progresses.

Wetland areas undergo change over time as well. Areas of open water become filled in over long periods of time, a process known as eutrophication. Bogs generally exhibit patterns of zonation: on the fringes they are wooded, there is then a zone of partially decomposed peat, and towards the middle there may be open water. Streams change course over time, forming oxbows and new channels. They also erode deep ravines and change the topography over time.

While every management decision cannot possibly be analyzed on every level, it is important to consider what the possible outcomes of a management decision might be. Through prudent consideration, management can be designed to achieve a set of desired results, including accelerating or retarding successional trends.

Water & Nutrient Cycling

This natural process is crucial in maintaining the long-term stability of a forested ecosystem. All types of vegetation, including trees, are involved in nutrient and water cycling. The removal of all trees and other vegetation from a site will lead to less water uptake and thus more runoff. Increased runoff often leads to the leaching of nutrients in the soil which changes down-stream water chemistry. Many nutrients are sequestered in trees and vegetation. The inevitable result of the removal of vegetation from a site is a loss of some nutrients. How water and nutrients are “managed” have important implications for forest productivity.

Most of a tree’s nutrients are concentrated in the leaves, limbs and branches. The bole of the tree has relatively few reserve nutrients. There is some concern that whole-tree harvesting can deplete nutrients from a site because the entire tree is removed. In a thinning situation on productive soils where only a portion of the trees are removed, this is probably not a concern. In clear-cuts, or when whole-tree methods are employed on the same area repeatedly, the potential for nutrient loss is real and must be considered. Soils and sites influence nutrient status and leaching as much as the vegetation. Dry sandy soils or thin soils on high elevations and ridgelines are inherently low in fertility and are prone to rapid leaching.

Adaptation

A plant’s ability to adapt over time helps it to survive in a changing world. Furthermore, the passing of genes from one generation to the next allows the best adapted to thrive. Trees that are expressing themselves

well are usually well-adapted to their environment. An example is red spruce's ability to withstand the harsh growing conditions of the area in which it lives- high elevation and with thin, dry soils. Red spruce has adapted to its environment over thousands of years. Well adapted trees should be encouraged through management decisions favorable to them. While the genetic makeup (genotype) of individual trees or stands of trees is not practical to determine, forest management should encourage trees of superior appearance (phenotype) and high vigor that are free from obvious defects.

Disturbance

All natural systems are prone to disturbance, and forests are no exception. Ice storms, fire, micro-bursts of high winds, hurricanes, floods, long-term weather patterns, and insect and disease outbreaks all affect forests. Approximately 12,000 years ago, New England was covered by ice perhaps a mile thick. When the glacier first retreated, the landscape resembled the arctic tundra. It has changed dramatically since then, and is now a fairly complex forest system. More recent disturbances are often responsible for creating a multiple age structure to a natural forest. For example, a small area of blow-down created by a high wind will often regenerate to shade-intolerant species, thereby setting back succession.

As with the majority of forestland in New Hampshire this forest saw widespread destruction from the great hurricane of 1938. It is still possible to see the "pit and mound" structures created when tree roots are pulled from the ground as the trees were blown down. The root ball eventually decays, but leaves a mound of soil next to the pit where the roots once were. These pit and mound structures resulting from the '38 hurricane can be found throughout New England. New Hampshire sustained some of the highest winds from that storm and as a result lost a record amount of timber, mostly pine.

The 1938 hurricane and the more recent 1998 ice storm which affected millions of acres of forestland in New England are examples of natural disturbances that had wide spread effects. If allowed to recover without human influence, the forest will, over time, grow back usually with a more complex structure than it had before.

A more diverse forest has many more niches for biological development. This increased complexity leads to a wide variety of species. In areas of significant disturbance, the most severely damaged trees will begin to decay and rot. As the dead and dying trees decompose, the abundance of snags will dramatically increase. An increase in wood boring insects will be followed by an increase in woodpeckers and other insectivores that will excavate cavities for other birds and small mammals. As limbs and broken tops of the trees begin to decompose, nutrients will leave the wood and leach into the soil. Some nutrients will be recycled further as the snags begin to fall and decompose. The cycle of the forest is thus a continuum consisting of many inter-relationships.

No discussion about disturbances would be complete without considering human impacts. Human disturbances in recent history have done more to influence the present state of our forests than any natural events. Human disturbances of the forest include clearing, logging, fire, pollution, and the introduction of exotic species. In the 300 years since European settlement, virtually all of the forests in New England have been cut; some areas have been cut more than five times. Much of the land was stumped and used for agricultural purposes. Soils were depleted by a lack of attention to water and nutrient cycling. Intensive development and

subsequent paving of former forest land eliminates natural processes for the foreseeable future. Air pollution and global warming pose real threats to our forests. The introduction of chestnut blight and Dutch elm disease essentially extirpated those species from our forests. The introduction of invasive exotic species poses similar threats. Invasive exotic species are a cause of great concern because of their prolific nature and exotic characteristics enable them to vastly out-compete native plants, having a drastic impact on biodiversity.

NATURAL COMMUNITIES[4]

As written in the book *Natural Communities of New Hampshire* by Daniel Sperduto and William Nichols, "Natural communities are recurring assemblages of plants and animals found in particular physical environments. New Hampshire has a fascinating and complex variety of natural communities, from tidal marshes to alpine meadows, river banks to mountain forests, and streams to lakes. Each type of natural community has a unique set of environmental conditions that support certain species adapted to those conditions."

"Just as individual organisms can be classified into species, plant assemblages can be classified into natural community types. Classifying natural communities is a useful way of viewing the landscape because it allows us to distill the broad range of complex interactions between species and their environments into a limited number of units that share certain key features."

"Natural community types are usually defined in terms of plants because they are easy to study, often compose the physical structure to which most other organisms respond, and are sensitive indicators of physical and biological factors that influence many types of organism."

"The need to classify natural communities is fundamentally pragmatic: People need a way to sort out, understand, and communicate about nature's complexity on order to be good stewards."

Determining natural community types can be a challenge because it is uncommon to find land that has not been influenced by human intervention. Past agricultural and silvicultural practices often change the plant communities that you would find on any given acre naturally. Identifying natural communities then becomes a process of understanding the past management activities, the physical conditions of the site, and the plant communities currently found there and determining to the best of our ability what community would occupy that site without human intervention. Natural community types found here have been identified on a broad level to the best of our ability. A more comprehensive and detailed study by an ecologist would be required to determine natural community types on a more fine-grained and certain basis.

Morgan Hill Natural Communities:

The forested natural communities found on Morgan Hill include some of the richest sites found in New Hampshire. All of the descriptions below come from the book, Natural Communities of New Hampshire. Beginning at the lowest elevations, associated with the wetlands and drainage systems is *Hemlock Forest*. Hemlock Forests typically occur on rocky, coarse, and/or thin soils poor in nutrients, including ravines, gorges,

4 All information on Natural Communities referenced from the publication: Natural Communities of New Hampshire, Daniel Sperduto and William Nichols, New Hampshire Natural Heritage Bureau and The Nature Conservancy, 2004.

river and kame terraces, and other microsites below 2000 ft. elevation. Soils typically have well-developed E horizons, are very acidic, high in exchangeable aluminum, and low in available nitrogen and other nutrients. Unlike many other plants, hemlock may cycle aluminum. Soils may freeze more deeply than sites with hardwoods due to interception of snowfall by the dense hemlock canopy. *Tsuga canadensis* (hemlock) is strongly dominant in the canopy, to the near exclusion of other species. The deep shade and acidic soils of hemlock forests create a typically sparse or absent woody and herbaceous understory. Other species characteristic of northern and transition hardwood - conifer forests may be present in low frequency

Rising in elevation and adjacent to the hemlock forest is *Hemlock-Beech-Northern Hardwood Forest*. This is a mixed coniferous - deciduous forest community characterized by hemlock and northern hardwood tree species. It is found in low to mid elevations till landscapes and some valley bottom soils from 800-2000 ft. elevation (at the same elevation range or below northern hardwood forests and below northern hardwood - spruce forest). This community is fairly distinct but transitions to hemlock - beech - oak - pine at lower elevations and south of the mountains, where sugar maple and yellow birch drop out of the mix. This community is found primarily on moderately well to well drained soils (occasionally somewhat poorly drained) of coarser parent materials, particularly compact till and firm ablation tills and sometimes on outwash, kame-terraces, and shallow-to-bedrock soils. Soils are generally acidic and moderately nutrient-poor.

The rich sites located on mid and low slopes is *Rich Mesic Forest*. Enriched hardwood forests occur on low to mid-elevation slopes below 2600 ft. on moist, often rocky soils with a relatively high nutrient status compared to other forests. Rich mesic forests are indicated by a diverse set of rich-site indicators that are absent in other forest types, including many of New Hampshire's rare upland forest plants. The degree of enrichment in forests is a function of a complex suite of interacting factors including: mineral composition of bedrock and till; topographic position (including colluviation); hydrologic flow through soil and fractured bedrock; moisture status; other soil characteristics (base saturation, texture, and organic matter content); and biological interactions (litter quality, soil and rock mychorrizae). Generally, rich mesic forests have higher base saturation, calcium, and nitrogen availability levels than other forest types.

Topographic position and degree of colluviation affect the extent of accumulated nutrient-rich organic matter, which is particularly pronounced below cliffs or at slope-bases, in ravines, coves, and in other concave slope positions. The effect of colluvial position can be significant: rich mesic forests can occur even on granitic bedrock and till sites where colluvial action is distinct.

Soils are variable in terms of depth, stoniness, organic matter content, texture, and moisture status. They range from deep to shallow, nearly stoneless to extremely gravelly/stony loams, very fine to medium sandy loams, and silt loams. These soils are well to moderately well drained, and range from mesic to wet-mesic. Organic matter is usually comprised of high-quality litter produced by the low C:N ratios of litter from most of the characteristic tree species. An organic-rich "mull" A horizon is found at some sites that presumably result from the rapid decomposition of high-quality litter and humus, subsequent incorporation into the lower mineral horizons, and significant mixing by soil-animal activity. Measured pH of upper B horizons from a limited sample of sites ranged from 5.0-5.5.

Sugar maple is the primary dominant, with white ash basswood frequent associates. American beech and yellow birch are less frequent. Ironwood is occasional and butternut is infrequent in lower elevation examples (<1500 ft.). Any or all species listed for semi-rich mesic forests may be present, although rich mesic forests typically have a broader compliment of enriched-site indicator species that are restricted to the most nutrient-rich end of the gradient. Many of these species are “vernal herbs” in that they flower and fruit early in the season before tree canopies have fully emerged.

Near the heights of land, where is *Rich Red Oak Rocky Woods*. This is a woodland or “thin woods” natural community that occurs on enriched colluvial talus and till slopes in central and southern New Hampshire, and into the lower elevation slopes of major valleys in the White Mountains. It is characterized by a variable and diverse mix of woody, fern, graminoid, and other herbaceous species, including numerous rich site species. This community shares some rich site species with rich mesic forests, but supports certain species preferential to talus or dry-rich rocky habitats, including numerous vines (lianas), and disturbance or open-site tolerant species that occupy gaps.

Soils are rocky, colluvial till or talus from cliffs and have a dry-mesic to mesic moisture regime with inclusions of wetter and drier microhabitats. Tree canopy dominants usually include sugar maple red oak, with lesser amounts of basswood, white ash, ironwood, black birch, red maple, and occasionally yellow birch and paper birch. Softwoods are sparse or absent.

Rare Species and Unique Natural Communities

An in-depth flora and fauna survey was not within the scope of this plan. There were no known endangered plants or animals encountered while collecting the data for this plan. The Natural Heritage Inventory, in Concord, New Hampshire, has been contacted and they have no known records of rare species or exemplary natural communities on the property. This does not mean that none exist, and close adherence to conservation practices discussed in New Hampshire's Good Forestry in the Granite State and Best Management Practices, in addition to recommendations from the book Biodiversity in the Forests of Maine will help to protect any unknown occurrences.

INVASIVE EXOTIC SHRUBS

Invasive exotic shrubs, such as barberry, Asiatic bittersweet, Japanese honeysuckle, multifora rose, and both glossy and common buckthorn, well established throughout much of New England are causing a new realm of problems for landowners because they are able to out-compete what native trees and shrub regeneration we do have. These shrubs are responsible for a decline in biodiversity and are capable of greatly impeding the regeneration of native trees as they die or are harvested. Most invasives were introduced as landscaping plants. Their great popularity and success are due to their prolific growing characteristics. Buckthorn was often planted as a hedgerow because of its fast and dense growth. Barberry is a common landscape shrub because of its attractive form and very hardy growing characteristics. Honeysuckle, ironically, was introduced as a wildlife conservation plant because of the great amount of soft mast, or berries, it produces. All three produce great quantities of

berries, which are all eaten by songbirds, turkeys, and many other wildlife species which then spread their seeds through their excrement.

The characteristics that made these shrubs successful as introduced plants are the very reasons they are such a problem in the natural landscape. They are prolific, hardy, produce vast quantities of seeds, and virtually are able to out-compete all native vegetation. They typically leaf out earlier in the spring and keep their leaves longer into the fall, providing them a much longer growing season and competitive advantage. Their seeds last many years in the soils and can build up to great quantities that germinate when conditions are favorable, such as an increase in sunlight on the forest floor after a harvest.

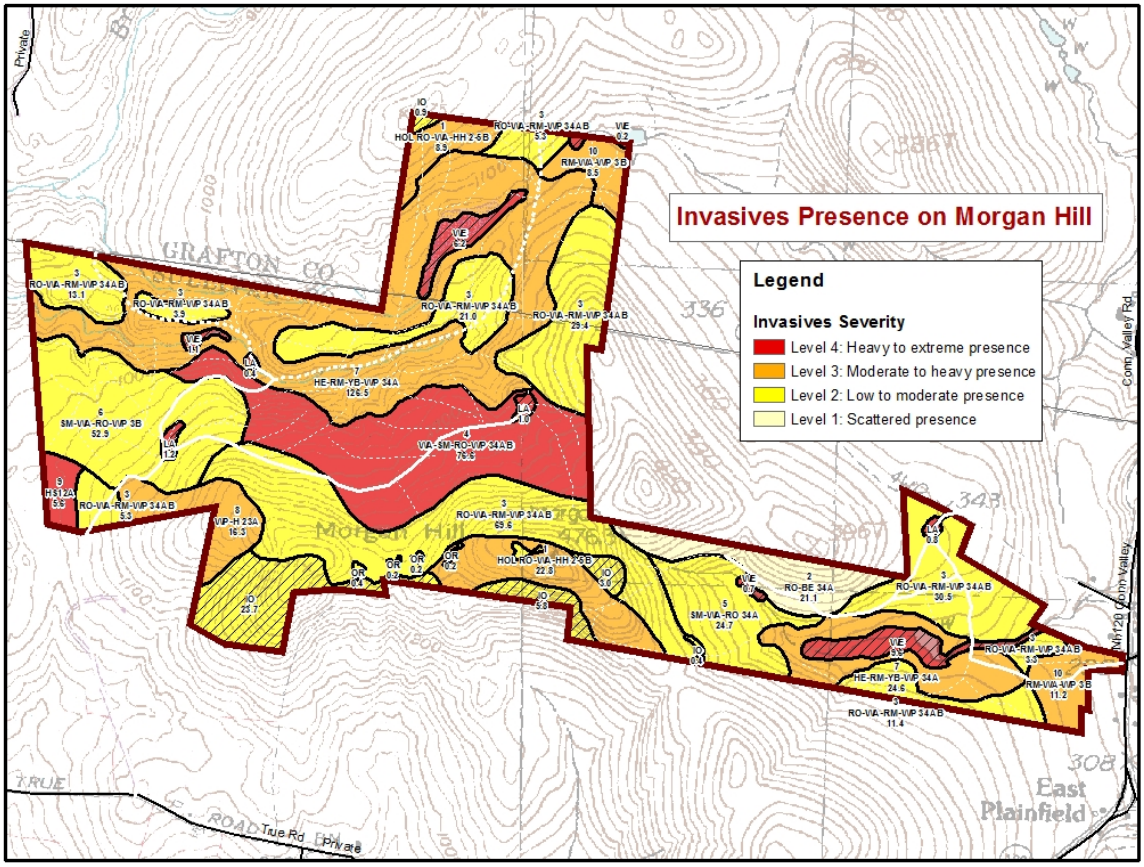
The problem doesn't end there. Controlling invasive exotic shrubs is nearly impossible after they have become established. Even if you eradicate them completely from your land, a daunting task at that, their seed will continue to be distributed from neighboring land by birds and other wildlife. Still, putting an effort into controlling them will have short term benefits which may be enough to give native plants a chance to get established. The control techniques will be described in detail in the appendix, but briefly they consist of manual, mechanical, and chemical means. Knocking these plants back prior to a timber harvest will produce the greatest benefit. Ignoring them and opening up the forest through a harvest gives them the greatest advantage.

Morgan Hill Invasive Species:

Invasive species are a severe problem on Morgan Hill. Glossy buckthorn is the most common, but honeysuckle, barberry, multifora rose, Japanese bamboo and phragmites are all present here. Even where the invasives are at the lowest levels they represent a significant threat to the biodiversity, health and functioning of the forest and wetland systems. Where the population is the heaviest they have taken over the understory stocking with mature, seed producing shrubs. In places, especially along roads, buckthorn has reached 4 to 5 inches in diameter with full, fruit bearing crowns. "Control" of invasives on Morgan Hill will be limited to slowing their spread. This will largely be accomplished mechanically by felling the largest seed producing stems where possible and targeted removals in areas such as the orchards on the height of land. Silvicultural prescriptions will be made with "invasive in mind", including things that promote the release of established native regeneration and maintenance of successful seed producing mast trees. In addition, attempts will be made to reduce the seed production among established invasives through removals. Site scarification will be made where possible in areas in establishment to knock back the invasives and give native vegetation a chance. Along roads mature seed producing shrubs should be targeted for removals as often as possible.

Invasive populations are the heaviest near wetlands, in landings and along roads, and in the most recently harvested areas where basal area was dropped below 70 square feet (roughly). Invasives were noted in every section and stand on the tract, with level of occurrence noted at every inventory plot. Please refer to the map below for population levels across the entire tract. The presence of invasives on the entire property was evaluated during fall inventory process, using a 4-level rating process with one being only scattered presence and 4 being severe. Please refer to the map below for population levels across the entire tract.

Glossy buckthorn is the most problematic invasive shrubs on Morgan Hill. It is established throughout the entire tract, but most intensively near wetlands, on seepy ground in the low-lying areas of the central compartment, and along truck roads. Management of this severe pest will include adaptive silviculture and manual manipulation where the scale is appropriate. The above photographs were taken in the Central Compartment at the toe slope of Morgan Hill. It is generally accepted that invasives are here to stay. Attempting to control this prolific shrub would take an extreme level of resources. Even if successful, seed will continually be spread from neighboring lands. Therefore, management of invasives will largely involve silviculture focused on the establishment of native tree species and reduction of the seed producing invasive shrubs through disturbance.



WILDLIFE ECOLOGY

Habitats

The American Heritage Dictionary defines habitat as "the area or type of environment in which an organism or ecological community normally lives or occurs". Wildlife habitat takes on many different forms. The components of habitat -- *food*, *water*, *cover* and *spatial relationships* -- are all interrelated.

Food for animals varies widely. Herbaceous plants, woody plants, mast or nuts, fruits and berries, insects and grubs, prey, and carrion are all eaten by wildlife. The location and abundance of food sources plays a primary role in determining the quality of the habitat for any species.

Water is required by all living things. Standing water, running water, seeps, and springs are all used. Some animals use water only periodically, while others live in and around it.

Cover is analogous to protective shelter. Cavities in trees, brush piles, nests, ledge outcrops, dense softwood cover and holes in the ground are used to provide cover for different animals.

Spatial relationships, or patterns, tie the habitat components together. If all the habitat requirements of a particular species are found within its "home range", the animal will probably remain in the vicinity. Creating the proper juxtaposition of food, cover, and water is important for wildlife to be attracted to and remain in a particular area. Travel corridors are used by many species to move from one habitat type to another. Ridgelines, streams, and other riparian areas commonly serve as travel corridors.

Habitat Types

Forested Habitat

Forest habitats can be classified in several different ways. One is by species composition, another is through age-class or successional stage, and a third is the vertical diversity or the distribution of canopy layers within a forest. The more diverse a property is in these three areas typically increases the diversity, or "richness", of wildlife that can be found there. Different wildlife species use different tree species, different layers of the forest structure, and different size or age class trees. Some songbirds can only be found in the upper canopy of hardwood trees for example, while other songbirds prefer specific species of tree, such as the pine siskin. Snags and down logs are important parts of forest structure as well. A large number of songbirds and small mammals require tree cavities for nesting, and standing dead trees provide important feeding sites as well.

The upland hardwood areas attract species which browse and/or feed on hard mast, notably white-tailed deer, turkeys, and black bear. Many resident and neo-tropical birds also use these upland areas. Birds such as the red-eyed vireo, white breasted nuthatch, chickadee, hermit thrush, and various woodpeckers are likely visitors to these areas. Softwood areas, especially those along riparian zones are used by many species. Furbearers, such as mink, beaver, otter, fisher, raccoon, and ermine could all be expected. Some of the dense softwood areas could be used both as deer yard and as a corridor for wildlife movement.

There is a great diversity of wildlife habitat available on Morgan Hill. Some of the features encountered during the fall 2014 inventory include: bear scarred beech (upper left), acorns cached in rough bark (upper right), understory trees and shrubs for songbird nesting habitat (middle left), buck rubs (middle right), and a large den tree being used by a porcupine (lower).

Management here will strive to maintain and increase forested habitat valuable for wildlife.

According to Good Forestry in the Granite State[5], deer wintering areas are important for the survival of deer in New Hampshire because it is near the northern limit of their geographic range. Special habitat

5 Bennett, Karen P. editor. 2010. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire (second edition)*. University of New Hampshire Cooperative Extension, Durham, N.H. 224 p.

characteristics of deer wintering areas allow deer to maximize their daily food intake and minimize the amount of energy they expend to move, keep warm, and avoid predators. Most deer wintering areas occur at elevations below 2,000 feet in lowland softwood stands, such as eastern hemlock in the southern part of the state. Deer wintering areas are often associated with watercourses and riparian areas. Only about 3% of New Hampshire's land base meets the habitat requirements for deer wintering. Deer use of wintering areas varies within and between winters, based mainly on differences in snow depth. Deer move into wintering areas when snow depth exceeds 10 to 12 inches. During mild winters deer may range far from softwood shelter or not use a wintering area at all.

Wetland Habitat

In terms of resource value and diversity, riparian areas exceed all others in importance. The areas around streams and other wetland areas provide critical habitat including breeding and nesting sites for many species. Riparian areas also filter runoff thereby keeping the water clean. Riparian areas also are used as travel corridors for animals and fish moving to different habitats and from property to property. Characteristics of good corridors include softwood for cover and steep stream banks which aid in allowing the animals a sense of protection.

Open Land and Edge Habitat

According to Good Forestry in the Granite State, "Nonforested uplands and wetlands ... provide necessary habitat for about 22 percent of new England's wildlife species and seasonally important habitat to nearly 70 percent, including "species of greatest conservation need" such as eastern towhee and new England cottontail. The value of these openings depends on the surrounding landscape. They are more beneficial in large areas of continuous forest cover than in areas with a mixture of forest and nonforest habitats."

The size of the opening is important as well. In general, openings less than 2 acres usually don't attract wildlife species that don't already occur in the vicinity. But, small openings increase the amount and type of foraging and cover available to species already present.

The edge of openings is important as well. Edges occur at the boundary of two habitats, and have their own distinct characteristics and often high levels of biodiversity. Maximizing edge is generally a good way to increase diversity and quality of habitat.

Habitat Management Approach

Two approaches to wildlife habitat management are commonly applied. The *featured species* approach caters to one or two chosen species. Management specifically for white tailed deer or for ruffed grouse is an example. The species richness approach focuses on creating and improving a variety of habitat types to maximize benefit to wildlife.

The *species richness* approach to habitat management is generally the most applicable technique; however, some practices are aimed at specific species. Birds of all types are of special interest to the landowners. Fortunately, managing for a diversity of wildlife species will in fact improve bird habitat as well since different birds

use different species mixes, canopy layers, and different types of opening sizes, and communities. Managing for species richness attempts to provide habitats for as many different species as the property can support. The species richness approach encourages a diverse, healthy ecosystem.

Another common goal for management is to maintain a forest structure typical of a natural forest and to encourage natural forest processes. Manipulation of the forest to benefit a particular species will be discouraged on a large scale. While certain management practices will be beneficial to some species and detrimental to others, the overall goal of management is to create a rich and diverse habitat for wildlife.

Certain wildlife practices should be routinely followed during logging operations, or as separate wildlife habitat enhancement activities. An example is the practice of leaving or creating dead or dying snags where they do not endanger people or aesthetic values. Snags are very important to many species, especially birds and insects. Another practice is to leave or create some coarse woody debris on the ground for use by insects, invertebrates, and fungi. Course woody debris should include large diameter low-value trees, which are cut or fall naturally and left in place in the woods. These large pieces of decomposing wood are important for nutrient cycling, water retention, carbon sequestering and microbial activities. Black bears often work these logs over looking for grubs and ants. Several reptiles and amphibians utilize the moist cover provided by these decaying logs. Coarse woody debris is a component of the natural forest and contributes to ecosystem function.

Recommendations for wildlife habitat management[6]:

Snags, cavity trees, and down logs:

- Avoid damaging existing downed woody material during harvesting, especially large (16"+) hollow logs and stumps.
- Leave downed woody material on site after harvest operations when possible.
- Leave several sound downed logs well distributed on the site, where possible. Especially important are logs >12 inches dbh and > 6 feet long. Hollow butt sections of felled trees are also good choices.
- Create additional snag trees by girdling large cull pine where possible. Attempt to retain or create a minimum of 4 secure cavity or snag trees per acre, with one exceeding 24" dbh and three exceeding 14" dbh. In areas lacking cavity trees, retain love trees of these diameters with defects likely to lead to cavity formation.
- Retain as many live trees with existing cavities and large unmerchantable trees as possible.
- When possible, avoid disturbing cavity trees, snags, and upturned trees roots from April to July to avoid disrupting nesting birds and denning mammals.
- Retain trees with cavities standing dead trees, downed logs, large trees, and large super canopy trees in the riparian management zone to the greatest extent possible.

Habitat Connectivity:

6 Wildlife habitat management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

- Avoid harvests that isolate streams, ponds, vernal pools, deer wintering areas, or other sensitive habitats
- Maintain the matrix of the landscape in relatively mature, well-stocked stands. Where even-aged management is practiced, consider the cumulative effects of multiple cuts and include wider habitat connectors as necessary.
- Consider opportunities for coordinating habitat connectivity with other, on-going land-management efforts that maintain linear forested ecosystems, such as hiking trial corridors and natural buffer strips retained to protect water quality. This may require expanding the physical size of the connector habitat and increasing structural values to fulfill multiple management goals. Also consider the potential for effects that may arise because of incompatible uses (e.g., heavily-used ATV or snowmobile routes around and through deer yards).

Deer Wintering Areas:

- Identify dense stands of mature softwood as potential DWAs, particularly in riparian ecosystems.
- Whenever possible, schedule harvests in DWAs are during December through April.
- Protect advance conifer regeneration during timber-harvesting operations.
- When conducting harvests in coniferous forest adjacent to watercourses, maintain an unbroken conifer canopy along shorelines to protect riparian travel corridors.
- When planning harvests within any DWA, (strive to) maintain a closed-canopy coniferous overstory over at least 50 percent of the area at any given time. Avoid constructing major haul roads within DWAs.
- Throughout the remainder of the DWA, maintain forage areas that provide a steady, abundant source of accessible browse b y clearcutting 1 to 5 acre openings using a 40-year rotation and 10 year cutting cycle. Locate browse cuts within 100 feet of core shelter areas (dense, mature softwood that provides cover).

Beaver influenced ecosystems:

- To the extent possible, locate new roads where they will not be at risk from flooding by beavers, or provide a base for the construction of new dams.

Vernal Pools:

- Identify and mark vernal pool edges in spring when they are filled with water to prevent damage during harvests conducted when pools are difficult to detect
- Avoid any physical disturbance of the vernal pool depression.
- Keep the depression free of slash, tree tops, and sediment form forestry operations.
- Maintain a shaded forest floor, without ruts, bare soil, or sources of sediment that also provides deep litter and woody debris around the pool. Avoid disturbing the organic layer or drainage patterns within the pool watershed.
- Whenever possible, conduct harvests when the rough is frozen or snow covered.

Morgan Hill Habitat Types:

Morgan Hill provides primarily forested and wetland habitat, with a small amount of open land along permanent truck roads and landings. The forest, totaling 592 acres, provides a mix of high elevation open oak woodlands, pockets of old apple orchard, rich hardwood mid and low slopes, gently sloped rich hardwood toe slopes, and hemlock dominated streams and ravines. There are many large, legacy hardwood trees, mostly red oak but also a few sugar maple, providing excellent cavity and den opportunities, as well as a fair amount of mast in the form of apples, acorns, with some birch, beech, maple and pine. An additional 34 acres of steep and/or ledgy ground provides additional forest habitat. Pockets of high elevation, relatively remote orchards total 1.6 acres, and are heavily utilized by many wildlife species.

Morgan Hill has a wide variety of quality wildlife habitat. Hemlock forest and oak-beech hardwood forests are two of the common forest types on Morgan Hill, each providing different habitat qualities for wildlife (upper left and right). Large legacy trees (left) and old wild apple orchards (not shown) provide additional and exceptionally high quality habitat. Open wetlands (lower right) and forested wetlands again provide more diversity.

Open land is the least represented on the ownership, but is readily found on adjacent and nearby

The wetlands, totaling 18.2 acres, provide a mix of forested wetland, shrub wetland, and open water, as well as multiple seeps, springs, and vernal pools. Wetlands increase the diversity of habitat and food sources available to wildlife on Morgan Hill and should be protected during all timber harvest operations. On Morgan Hill there are two major wetland complexes, each draining the two watersheds either side the Morgan Hill height of land divide. The western wetland is better established, feeding into Hibbard Brook to Blood Brook and into the Connecticut River. It has a larger expanse of open water, and though smaller in overall size has a higher flow of water. The eastern wetland appears more strongly influenced by beaver than the western wetland, though there are no signs of recent beaver activity, resulting in a heavier grass and shrub component. This eastern wetland drains into Great Brook to Mascoma River then into the Connecticut River.

Open habitat is limited to permanent truck roads and landings. The landings total 3.4 acres of open space, and the truck roads provide additional acreage but it is not delineated separately from forest land. On average the 3 miles of 20-foot wide truck road found on the tract provide another 7.3 acres of open space included within the 592 forested acres.

SPECIAL WILDLIFE MANAGEMENT CONSIDERATIONS for BIRD HABITAT

Audubon of Vermont has compiled some species management considerations for bird habitat that would be applicable to management throughout New England. These recommendations are generalized below:

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

Minimize harvesting during the bird breeding season—The forest bird breeding season roughly extends from May-August with the most critical time period running through the second or third the second or third week of July. Although it may not be desirable or possible to refrain from harvesting during this time frame, consider less intensive silviculture such as single-tree and small group selection. Shelterwoods and patch cut harvests during the breeding season are likely to have greater impact on bird communities. Harvesting during frozen ground conditions is preferable as it has no direct negative impact on the breeding bird community. Winter harvesting can also help protect advanced regeneration and understory shrubs from damage.

Retain standing snags—Standing dead trees are of significant value to a number of responsibility bird species including northern flicker, chimney swift, and olive-sided flycatcher as well as many other speice4w of wildlife. To the extent possible retain a minimum of six snags and/or cavity trees per acre, with one exceeding 18 inches in diameter and two additional exceeding 16 in. dbh. Priority should be given to hardwood snags as they remain intact longer. Also, retain some live trees of poor form and quality during harvests to serve as the next cohort of snags. If target number of snags does not exist, consider girdling poor quality trees in order to achieve abundance objectives.

Retain large diameter aspen and birch spp.—Yellow-bellied sapsuckers and northern flickers

frequently excavate nest cavities in trees in the sawtimber size class (≥ 13 in. dbh) aspen and birch spp. Cavities are often made in trees with the heartwood decay fungus *Phellinus tremulae* (*Fomes igniarius* var. *populinus*) and *Fomes fomentarius* and sapwood decay fungi.

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

Minimize extent or forest access roads—Forest access roads can serve as pathways for increased nest predation and parasitism, particularly in forests within an agricultural matrix. Maintain <15 percent of a property in roads and access trails and utilize the current trail system as much as possible. Minimize long, straight stretches of access roads into the forest interior. Road/trail widths <20 ft. are preferred. Wider forest roads may decrease habitat quality for ground foraging bird species such as ovenbird along the road edge due to decreases in leaf litter moisture, increase leaf litter temperature, and subsequent lowered densities of leaf litter arthropods. Densities of birds and reproductive success may be affected.

Soften edges between field and forest habitats—At the interface between forest and openland, the transition from low herbaceous vegetation to tree canopy can be considered either “soft” or “hard”. A soft edge refers to a gradual change in vegetation height moving into the forest. This gradual transition is imp9ortant for buffering interior forest bird species like the wood thrush form the incursions of nest predators and nest parasites that are frequently found in open and developed areas. A gradually increasing canopy height will help shield interior nesting birds from view by predators and nest parasites. Additionally, the brush conditions that often develop in a soft edge may provide breeding habitat for early-successional bird species including chestnut-sided warbler and white-throated sparrow.

Monitor and control invasive plants—The fruits of invasive plants such as buckthorn and honeysuckle are eaten by birds, but are of low nutritional value. Because many migrants focus their diets on fruits in the fall as they prepare for long migrations, their choice of these plants comes at an energetic cost at a critical time. Additionally, bird nests in invasive plants are more vulnerable to nest predators. When new light is allowed to reach the forest floor, due to either natural or human-induced changes in forest structure, the growth on invasive plants can be stimulated, and they can outcompete native, desirable plants. If invasive plants are present in an area, their response to any canopy openings should be monitored closely.

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

FOREST STRUCTURE and MANAGEMENT APPROACH

Structure and Age Class Distribution

The size and distribution of vegetation layers make up the structure of the forest including vertical spacing and horizontal layers. Vertical spacing is simply the density of individual plants, shrubs and trees. The horizontal layers are usually described in four levels including ground cover, understory, mid-story, and overstory. The ground cover includes herbaceous plants and small woody plants. The understory includes trees seedlings and small saplings and woody shrubs. The mid-story includes pole size trees and tall saplings, topped by the overstory of the largest trees. Often the different horizontal layers with the exception of ground cover are associated with different age classes of trees, but this is not always the case. A slow, growing shade tolerant trees species, such as Eastern hemlock, can remain in the understory for many years biding time until space an opening above is created. Age structure in a forest system can be simple, with one distinct age class called even-aged. Two-aged forests are just as they sound, two distinct age classes. And forest with more complex age structure are called un-even aged.

Understanding forest structure conditions is important for management. It determines the general type of silviculture to be applied and is closely related to biological diversity and wildlife habitat.

Morgan Hill Forest Structure and Age Class Distribution:

The forestland on this property is composed several age groups. Primarily three age groups are found; the dominant trees in the canopy are 60 to 80+ years old, 20-25 year old pole-size trees exist in the mid-story, and pockets and patches of +/- 15 year old saplings also occur in the areas most recently harvested. As mentioned above in the wildlife habitat section, Morgan Hill also hosts a high number of old legacy trees, mostly red oak but also sugar maple. Most of these trees appear to have been "open grown" and therefore were around when the surrounding land was cleared for agricultural use, which was abandoned early last century, making the legacy trees likely over 100 years old. The sugar maple legacy trees may have once been part of a sugar bush. When discussing the age classes present on Morgan Hill, the dominant overstory in the 60-80 year range will be considered the oldest age group, which likely got their start after the abandonment of agriculture here, as opposed to the legacy trees that were established during agricultural use.

The forest structure on Morgan Hill is largely even aged, but becoming multiple-aged over time through the different timber harvests that have occurred here. The dominant horizontal structure is the overstory, with only patchy areas of mid-story and sapling establishment. Vertical structure reflects the horizontal structure-- with openings where the mid-story and saplings have become established, but also including the open landings, truck roads and wetland features.

Stocking, Timber Quality, 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. Volume refers to the quantity of merchantable timber found on the

property. Timber quality specifically relates to the products found in a tree. A poor quality timber tree may be an excellent quality wildlife tree, and vice versa.

Morgan Hill Forest Stocking, Timber Quality, and Volumes:

Stocking on Morgan Hill is fairly regular, ranging from fully stocked to overstocked. The harvesting that has occurred here over the last treatment period has resulted in stands that remain largely fully stocked (between the A and B-line of the stocking guides). The lowest stocking occurs in Stand 4, due to the fairly regular timber harvesting regime carried out here over the last few decades, but even here it is above the B-line.

Timber quality varies as well, ranging from some excellent quality red oak, to high quality ash, with a fair amount of fair quality red maple, sugar maple, and hemlock. The pine is perhaps the most variable-which is not abnormal for that species with some good quality pine mixed in the hardwoods and hemlock, and a fair amount of poor quality in the higher elevation pine.

The sawtimber volume here is dominated by red oak and white ash, with 363 mbf and 264 mbf respectively. This results in an average of .6 mbf or oak and .5 mbf of ash sawtimber per acre. This is followed by white pine, sugar maple, and hemlock with .2 mbf per acre each. Of the total volume converted to cords, including low grade sawtimber and pulp/chip/firewood, hemlock dominates with over 3,000 cords, resulting in over 5 cords per acre on average total volume. Interestingly this is followed by sugar maple, which makes up a high amount of the total stocking, but an unimpressive amount of sawtimber, at 2,245 total volume in cords (3.8 cords per acre) despite the occasional sugar maple veneer log. Of the total sugar maple volume, about 20% is sawtimber (55% high grade), 10% is growing stock, and the rest is pulp or firewood. This says a lot about the site-- for New Hampshire especially this is a nutrient rich site, but not rich enough to produce high levels of quality sugar maple, instead resulting in higher sawtimber volumes of oak and ash. Oak volume on the other hand is 45% sawtimber (75% high grade).

Forest Health

Forest health can be discussed on an individual tree or disease, or it may refer to the functioning of the complete forest ecosystem. Many forest diseases and pests are ubiquitous and found on a landscape level. At times their presence can signify the forest as a whole is unhealthy, or they can signify more isolated, individual health issues. Health concerns include a whole host of issues, such as tree diseases, insect pests, invasive exotic shrubs, pollution, and soil acidification. Sound forest management can reduce the negative impacts of health issues and often improves overall forest health, where poor management often exacerbates health problems.

Morgan Hill Forest Health:

The most threatening forest health concerns on Morgan Hill are the arrival of Emerald Ash Borer (EAB) and the extensive presence of invasive exotic shrubs. Emerald Ash Borer has become well-established in the southern portions of New Hampshire, notably in Concord, Bow, Canterbury, Loudon, Hopkinton, Salem,

Dunbarton and Weare. It is only a matter of time before it reaches Plainfield and Lebanon, if it is not here already. Once established, EAB damage occurs quickly and thoroughly. Infested trees die in 3 to 5 years. When EAB signs and symptoms are first noticed it is typically too late to manage, and it is impossible to keep this pest out. Our best chance of retaining ash is to manage for as healthy and viable population as possible. Generally MTL polices do not support the pre-salvage of a species due to a health threat, but in this case upcoming harvests here will be geared partially towards the pre-salvage of ash because of the severity of the situation and that ash comprises the second greatest sawlog volume on the tract. New Hampshire Department of Resources and Economic Development recommends the following for management of ash in "Alert Areas" (beyond 10 miles of infestation), such as Morgan Hill:

1. Ash may be harvested as small as 6-inches dbh. Leaving some ash standing slows the movement of EAB.
2. Identify large, healthy ash trees and monitor them for signs of EAB regularly.
3. Follow best management practices to limit accidental EAB spread. consult the quarantine if moving ash material out of the current quarantine area or out of state.
4. You may create trap trees to help detect EAB early. Please contact 603-464-3016 for help.

The second serious health concern is not an insect pest or disease, but instead invasive shrubs, particularly glossy buckthorn, but also including honeysuckle, barberry, Rugosa rose, phragmites, and Japanese bamboo. Invasives on Morgan Hill are addressed directly in the Invasive Section above.

Additionally, though not nearly as worrisome as EAB and invasives, Morgan Hill has seen its fair share of damage due to ice storms especially in the East compartment, with the most significant being the storm of 1998. Damage, especially in hardwood, to tree crowns can be seen at most mid-elevation stands.

Other health related issues include typical disease and pest concerns. Both Eutypella canker and sugar maple borer are affecting the sugar maple, which noted above is widely variable in vigor and generally seems to be struggling on this site. Ash yellows has historically been present, and it responsible in p[art for the decline of a fair amount of ash here. Gypsy moth has caused spring defoliation events when populations surge.

White pine perhaps suffers the most problems, some related to insect damage and others to fungi. The fungus red rot is present here; a common problem for pine which typically occurs only in over mature trees or stressed trees growing on a poor site or in overcrowded conditions. Red rot is a decay fungus that typically infects trees through a wound or branch scar and rots the tree from the inside out. White pine blister rust is an interesting disease and is also present here. It requires 2 hosts to complete its life cycle, white pine and a shrub from the Ribes family, such as Current or Gooseberry. The fungus spends half its life on the Ribes and the other half on the pine, typically creating sunken cankers near the base of the tree. It is likely that some root and butt rot is also present in the spruce on the high, dry sites.

Damage from the white pine weevil is also present. The white pine weevil targets the bud on the leaded stem in a sapling to pole size pine for laying its eggs, which kills the bud forcing one of the lateral branches to take over as the new leaded. This results in a crooked or multi-stemmed pine, which doesn't affect the health of the tree. When working in the pine, trees showing the presence of any of these diseases should be targeted for

removal.

Beech bark disease, another common problem in northeast forests, is present as well and is infecting the majority of the beech found here. This disease has an interesting story as well. It is caused by a fungus that is disseminated by the wind. It enters its host, the American beech, through holes made by the beech scale for depositing eggs. Presence of scale insects is easily detected by inspecting the bark. The scale insects overwinter under a white, felty coating which appears like tiny white speckles on the bark. The fungus can also be seen, especially well with a magnifying glad, and looks like clumps of red-orange waxy material oozing out of tiny cracks or holes in the bark. These infected holes turn into cankers which eventually girdle the tree, killing it by cutting off its food supply from the roots.

Sterile conk of birch is fairly common here as well. This trunk rot appears as a large black mass of fungal tissue extruding from a bark canker. The conk itself is sterile while the host tree is alive, but, once it dies the conk then sporulates, spreading on the wind. The presence of the conk indicates severe decay. Treatment should target infected trees for removal and improving vigor on residual trees.

Worthy of mentioning is the presence of a few remaining butternut trees here. Butternut was nearly wiped out due to an introduced fungal disease. The few remaining trees here on Morgan Hill all show signs of the canker and likely will be completely wiped out in the coming decades despite the presence of a few butternut saplings present.

Another disease not yet found here but to be aware of include hemlock wooly adelgid. Currently no evidence of the Hemlock Woolly Adelgid (HWA) is present in the region, although it is now being found in southern New Hampshire. Because it is likely HWA will become a reality, management strategies should be geared towards increasing vigor in the existing hemlock.

Though not a disease or pest, damage from over browsing by white tailed deer has caused significant problems on Morgan Hill, including conversion of sites to non-preferred species and stunted and/or deformed growth on browsed saplings. Hunting should continue to be supported and encouraged on the tract to help keep deer populations here in check.

Growth Rates and Allowable Cut

An in depth growth study was beyond the scope of this management plan; some rules-of-thumb do apply. A tree's growth is directly related to the substrate (soil) on which it is located. Wet, ledgy, and 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. The average woodlot in New England grows at a rate of .42 cords per acre per year. Additionally, the average managed woodlot in New Hampshire grows at a rate of 2 to 4 percent per year.

Allowable cut is the volume that can be sustainably harvested from a defined area. Typically allowable cut is equal to or less than growth, and is calculated by multiplying the growth rate times the area times the years between harvest entries.

Morgan Hill Growth Rates and Allowable Cut:

It is likely the growth rates on Morgan Hill fall within the upper levels of the average range. But, to be conservative, we'll utilize the average. The total operable and accessible acreage of the ownerships is 589 acres, resulting in about 247 cords of growth per year. Using a cutting cycle of 15 years, this allows total volume removal around 3,700 cords per harvest cycle. Allowable cut currently is about 25% of the total volume on the operable and accessible acres.

The cutting history on Morgan Hill (outlined below) between the years 2002 and 2006 (the last fairly complete cycle on the property) removed a total of 833 mbf of sawtimber, 1,559 tons of chips, and 654 cords of pulp/firewood. The total volume removed converted to cords is 1,813. There have been 13 growing seasons since the beginning of that series of harvests, resulting in a total growth of 3,200 cords (using .42 cords per acre per year). The volume removed during that same period equals 56% of growth (1,813 cords removed and 3,200 cords growth).

Management History

Morgan Hill Management History:

- 1995- East Compartment: Generally a single-tree/group selection harvest
- 2003- North of Hibbard Brook drainage: Generally single tree/group selection harvest. Crop tree release on fair amount of red oak; White birch, red maple, and overstory pine targeted for removal. Heavy establishment of invasives- glossy buckthorn.
- 2004- Remainder of acreage in town of Lebanon (west of Hibbard Brook Drainage) and Current Stand 6: Stand 6- heavy sanitation cut geared towards regenerating oak and pine on drier sites and in Lebanon single tree/group selection.
- 2005- Bulk of Current Central compartment and small residual area north of Hibbard Brook in northwest corner of tract (west of main snowmobile trail): Heavier single tree/group selection focusing on removal of mature white pine and white birch and declining ash. Heavy establishment of invasives- glossy buckthorn.
- 2006- One mile of truck road from Route 120 into East Compartment built using EQIP funding. Log landing established and seeded also with EQIP.
- 2009- 10.5 acres of timber stand improvement completed with EQIP funding.
- 2011- 10 acres of release work in the old apple orchards completed with EQIP funding, as well as 1 acre of early successional habitat development/management.

Forest Management Approach

Forest management utilizes a combination of silvicultural techniques that typically are separated into two general categories, even-age and unevenaged management. Evenaged management methods include clearcut (removal off all trees within a designated area), seed tree (similar to a clearcut but with residual trees for seed source), shelterwood (removal of most overstory trees leaving enough to create sufficient shade to create a micro-

environment for regeneration; once regeneration is established the residual overstory trees are removed in either one or two further entries) , overstory removal (removal of the overstory to release established regeneration) and patch cut (a small clearcut, usually less than 2 or 3 acres in size) applications and may be used to regenerate a new stand when deemed necessary. Unevenaged management methods generally include single tree (removal of single trees to regenerate shade tolerant species) and group selection (removal of groups of trees to regenerate shade tolerant species) used to regenerate small areas resulting in uneven age classes in a given stand. Often though, applied techniques fall somewhere in between these two text-book defined categories. One may define a large group opening (unevenage management) as a small clear-cut (evenage management). Improvement thinnings often fall somewhere in between as well, depending on the intended results and the actual results. A thinning may result in improved growth of the overstory trees, an even-aged treatment. A thinning may also provide similar conditions as single tree selection, an unevenaged technique, and result in regeneration of shade-tolerant species. Crop tree release, a practice where designated “crop trees” are released from shade of competing trees on typically 2 to 3 sides, falls somewhere in between as well. Given the variability of site quality and stocking, even within a defined stand, unless evenaged management is specifically called for, management typically will fall in the unevenage category.

Traditionally, the intent of unevenage management is to attain forest stocking conditions that mimic a specific diameter/age distribution. But, practically speaking, unevenage management is often carried out as a simpler form of multiple-age management resulting in the introduction of a new age-class on a portion of a stand each harvest entry. Given the even-aged condition of the majority of land in New England, encouraging multiple age classes is a more attainable, practicable goal and in effect, desirable goal. To clarify discussion of management technique the term multiple-age management will replace traditional uneven-aged management, but will utilize the same techniques including single tree and group selection.

Applied Silviculture

Below are the generalized silvicultural systems and methods that will be broadly applied to the natural forest communities found on the ownerships and the forest stands within. The methods and their corresponding cutting cycles, rotation ages and target diameters are described and will serve as management guidelines for application in the field unless otherwise noted in individual stand prescriptions

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Mesic Red Oak-Northern Hardwood Silviculture

Mixed hardwood communities will be managed with both even-age and multiple-age systems, but multiple-age systems will predominate. Even-age methods of clear-cut, seed tree, overstory removal and patch cut applications may be used to regenerate a new stand when deemed necessary. In many cases these silvicultural methods this should mimic a large-scale disturbance of wind. This approach will likely be used to increase the stands composition of less shade tolerant species and/or to adjust the age class distribution over the tract level. Rotation length in evenage stands will be between around 100 years, depending on the site. Multiple-age management will be the preferred management system

for hardwood communities. The management will allow for continuous forest cover to be maintained. Areas of high aesthetic value are good candidates for this type of treatment. Methods of multiple-age management will involve one or a combination of singletree and group selection, these two will mimic singletree and canopy gap disturbances. Group selections in hardwood stands typically range from 1/10 to 1 acre in size, but specific situations may call for smaller or larger openings. These silvicultural methods are used to create and/or maintain a multi-aged stand of largely mid-tolerant and shade tolerant species, where residual basal areas should typically average 70 square feet. Depending on a number of considerations, the cutting cycles under this multiple-age system will be between 15 and 30 years. Target diameters for trees in the hardwood community will serve as ideal guidelines. Due to the variability of growth, both diameters and/or age may or may not be reached on certain sites.

White Pine Silviculture

White pine trees generally produce a seed crop every 7 to 10 years during a period commonly known as a “cone year”. The 100-200 seeds produced by each cone are delicately small and remain viable for a short period after dispersal, approximately a year. Because the pine seed is so small, it does not have the stored energy necessary to grow through the forest duff layer, particularly under shady conditions. This means exposed mineral soil, ideally in deep well-drained sandy loams, and heat are required for successful seed germination. Keeping this in mind, these conditions need to be present during the seeds year of viability. To create these requirements, the silvicultural method most appropriate for pine, or most softwood regeneration for that matter, is evenage. Silvicultural techniques that are best applied where opportunity exists are patch, shelterwood and seed tree cuts. These techniques provide the stand dynamics required for pine regeneration that include space, heat, light, uniform canopy level, tight geotropic structure, hence an evenage structure. Timing of treatments is most effective during the snow-less season, where maximum soil scarification is attained. Another variable in obtaining sufficient pine regeneration is the overall ability of the soil to grow hardwood trees. A soil with a high site index for hardwoods is best suited to grow hardwood. In these soils there is a high level of available nutrients that will undoubtedly permit a layer of hardwood regeneration so thick that whatever pine is established will be overgrown readily. This hardwood competition is often seen on the nutrient poor sites as well, but these soils that are better suited for pine. On these sites precommercial weeding of the hardwoods is required for the pine continuance. This hardwood competition is due to the fact that once the seed germinates it has a slow growth rate for approximately 5 years before more rapid growth begins. Site wise, sandy soils, well-drained and low cation exchange, provide excellent pine sites. Timing, silvicultural technique and soil type is critical to promote the continuity of the pine resource.

The actual acreage of white pine communities is rather low, when looking at the entire property. Most stands that currently have white pine are true hardwood communities. Pine became heavily established here due to the agrarian abandonment era, which is the ideal disturbance for pine establishment. With that abandonment era gone and the hardwoods can out-compete the pine, thus many sites are converting to hardwood. This process of hardwood conversion will be assisted with silvicultural applications, although pine will not be discriminated against.

Red Oak Silviculture

The art and science of growing red oak is equally as tricky as the pine, due to regeneration challenges. Good seed years for oak are more frequent than that of pine, being 3-5 years. However, two major obstacles affect the germination success of the acorn. As a highly coveted food resource by most wildlife, the acorn is heavily used and if the wildlife does not find the acorn, insects like the acorn grub do. According to USFS studies, up to 500 acorns are required to produce one seedling, but generally 1% of acorns become available for regenerating northern red oak successfully. Thus, the availability of viable acorns is naturally scarce.

To successfully germinate, the acorn prefers exposed mineral soil, ideally in well-drained, deep loams. Scarifying the duff layer during logging operations in the snow-less seasons best does this. Oak's overall survival is most importantly related to light intensity levels. For the seedlings/saplings to photosynthesis optimally it requires 30% light intensity in the open, where under a closed forest canopy light intensities are less ten 10%. Therefore, heat and space is critical. Once the seed germinates rapid and vigorous taproot development occurs. This root growth contributes to another challenge of oak management, where it causes very slow initial shoot development and competition for light from other species is very common. Thus, achieving lasting regeneration success of oak, weeding of interfering species is often a requirement. The success of regenerating oak is highly dependent on the combination of the availability of viable seed, soil scarification, adequate light levels, implementation of weeding applications and seed distribution by wildlife.

Overall, the oak silvicultural system will be multiple-age. Methods of this system to best achieve the requirements of oak will involve mainly singletree and group selection silviculture. These methods will be used for both regeneration and thinning applications. Cutting cycles of oak dominant types will be between 15-25 years with crop tree diameters of 16-22 inches. During thinning and release applications it is important to maintain minimal direct light exposure to oak boles. Maturing and mature oak stems have large reserves of sensitive hidden buds that respond easily to increased light levels, resulting in epicormic branching and severe quality lose. During these cutting entries, releasing crop

trees on eastern and northern sides, while maintaining heavier shade conditions on the south and west sides will ensure less opportunity for epicormic branching.

Hemlock/Hardwood Silviculture

Hemlock, birch and maple communities on Rattlesnake Ridge Forest will be largely managed using a multiple-age system. Methods of multiple-age management will involve a combination of singletree and group selection silviculture and will mimic singletree and canopy gap disturbances. These silvicultural methods are used to create and/or maintain a multi-aged stand of largely mid-tolerant and shade tolerant species. Residual stand basal area densities following cuts will typically range between 60-90 square ft/acre for the hardwood and 110-200 square ft/acre for areas dominated by hemlock. Where mixed types exist, basal area densities will average between the two types. Depending on a number of considerations, the cutting cycles using this multiple-age system will be between 15 and 20 years. Target diameters of the hemlock and hardwood components are listed below. However because of the variability of sites both diameters and age goals may or may not be reached. Target diameters are as follows:

White Pine	18-24	Red Oak	16-24
Hemlock	16-20	Aspen	12-14
White Ash*	16-22	Sugar Maple	16-22
Red Maple	14-18	Beech	14-18
White Birch	12-16	Yellow Birch	16-22

*Salvage operations for white ash will follow other diameter recommendations

Definitions of Silvicultural Treatments

Definitions of specific silvicultural treatments are listed below and are largely taken from the Society of American Foresters dictionary. Deviations from these treatments will be specified in stand prescriptions.

Crown Thinning (Evenage management): the removal of trees from the dominant and codominant crown classes in order to favor the best trees of those same crown classes

Free Thinning (Evenage or Multiple-Age management): the removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position

Low Thinning (Evenage or Multiple-Age management): the removal of trees from the lower crown classes to favor those in the upper crown classes

Selection Thinning (Evenage or Multiple-Age management): the removal of trees in the dominant crown class in order to favor the lower crown classes

Patch Cut (Evenage or Multiple-Age management): the cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class (typically all Patch Cuts are laid out by delineating the boundary with marking paint; Patch Cut size will be specified in Silvicultural Prescription)

Strip Cut (Evenage management): the cutting of essentially all trees in a strip, producing a fully exposed microclimate for the development of a new age class (all Strip Cuts laid out by delineating the boundary with marking paint; Strip Cut dimensions will be specified in Silvicultural Prescription)

Clear Cut (Evenage management): the cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class (all Clear Cuts laid out by delineating the boundary with marking paint; Clear Cut size will be specified in Silvicultural Prescription)

Seed Tree (Evenage management): the cutting of all trees except for a small number of widely dispersed trees retained for seed production and to produce a new age class in fully exposed microenvironment; (seed trees may or may not be removed after regeneration is established depending on 1: harvest opportunity 2: protection of established regeneration 3: long term success of regeneration)

Shelterwood (Evenage or Multiple-Age management): the cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment —note the sequence of treatments can include three types of cuttings: (a) an optional preparatory cut to enhance conditions for seed production, (b) an establishment cut to prepare the seed bed and to create a new age class, and (c) a removal cut to release established regeneration from competition with the overwood; cutting may be done uniformly throughout the stand (uniform shelterwood), in groups or patches (group shelterwood), or in strips (strip shelterwood); in a strip shelterwood, regeneration cuttings may progress against the prevailing wind

Single Tree Selection (Multiple-Age management): individual trees of all size classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees and to provide space for regeneration

Group Selection (Multiple-Age management): trees are removed and new age classes are established in

small groups; the width of groups is commonly approximately twice the height of the mature trees with smaller openings providing microenvironments suitable for tolerant regeneration and larger openings providing conditions suitable for more intolerant regeneration (Patch Cutting differentiated from Group Selection in that Group boundaries are not delineated with marking paint where Patch Cut boundaries are; Group Selection size will be specified in Silvicultural Prescription)

Crop Tree Release (Evenage and Multiple-Age management): the crown release of selected trees on two to preferably three sides (Number of Crop Trees to be released per acre will be specified in Silvicultural Prescription)

Sustainability

It is recognized that from a social, economic, and wildlife habitat standpoint, forests must be managed in a sustainable, long-term way. Because trees can either naturally regenerate or be replanted in an area from which they have been harvested, trees are considered a renewable resource. For this reason it is possible to harvest trees in a forest, repeatedly, in a way that is sustainable. This implies that portions of the forest may be clear-cut or regenerated at certain times. A balanced age class distribution, as previously discussed, is typically utilized for sustainable forest management. On smaller tracts often there isn't enough acreage to efficiently manage for balanced age classes, so sustainable forest management is accomplished though managing for multiple age classes of trees combined with health, vigorous growth, diversity, and soil/water quality. This type of management allows for sustained periodic harvesting on a regular basis, though some entries will be more improvement based. The scale of sustainability varies with the size of the ownership. The treatments prescribed in this plan are designed to be sustainable over the long term. All of the stands which call for uneven-age management will be able to be re-visited every 15 to 20 years (the "cutting cycle"). Stands which call for even-age management will ultimately have to be regenerated at the end of their rotation age (60 to 120 years, depending on species and forest type), though interim thinning can be applied at 10-20 year intervals in most timber types.

The modern view of sustainability recognizes the need for the entire ecosystem to be sustained, not just one component of the system like timber. If all of the components of the forest are considered, the entire system can function in a sustainable fashion. The Northern Forest Lands Council has identified the following benchmarks of sustainability:

- Maintenance of soil productivity
- Conservation of water quality, wetlands, and riparian zones
- Maintenance or creation of a healthy balance of forest size and age classes
- Protection of unique or fragile natural areas
- Conservation and enhancement of habitats that support a full range of native flora and fauna
- A continuous flow of forest products
- The improvement of the overall quality of the timber resource
- The consideration of aesthetic concerns during timber harvesting

- The continuation of opportunities for recreation

Forest Economics

Economics, while often not an overriding management goal, is an essential part of the management objectives. The carrying costs of owning land alone are expensive. In addition, forestry services critical to proper long-term management involves some expense. In well-managed forests these costs are often viewed as necessary capital investments or annual expenses to achieve owner objectives. Timber management is a primary way for landowners to generate modest income from a naturally renewable resource through careful, thoughtful, and forward thinking management.

Forests add in value in three ways. *Physical growth* accounts for the gains in volume over time. The faster an individual tree grows, the faster the tree increases in value if it is of sufficient quality. Whatever the product, additional volume increases value.

The second way forests increase in value is through *product development*. As a sapling, a tree has no merchantable value. Pole timber can often be marketed as firewood or pulpwood. Once a tree grows into the sawtimber size class (and if it is of sufficient quality) it can be sold for sawlogs or even veneer. The per-unit value increase from pulpwood to sawlogs to veneer is very large, in some cases 1000% or more. It would be unwise from an economic standpoint to cut a pulpwood size tree that could eventually grow into a valuable saw log. Furthermore, an individual tree growing rapidly into sawtimber size is a tree which will have a high rate of return, as will a stand of such trees.

The third way forests add -- or possibly lose -- value is through *relative price changes* in the value of various forest products. The demand for forest products is cyclical, especially for low-value, bulk commodity items such as pulpwood and chip wood.

Briefly, thoughtful forest management can positively influence growth rates, quality of growing stock and thus product development, with an educated awareness of market trends. This “value-growth” approach is a key part of sustainable management and allows for periodic economic returns.

OPERATIONAL CONSIDERATIONS

Boundaries and Property Survey

Identification and monumentation of property boundaries is one of the first management tasks every landowner should undergo, regardless of their interest in active harvesting. The old idiom is true, good fences make good neighbors. Clearly marked boundary lines prevents a multitude of problems, not the least of which is timber trespass.

Property boundaries often include a mix of stone walls and sections of barbed wire fence, but this isn't always the case. Boundary lines should be monumented with permanent blazes which are cut into trees using an ax and then painted with a long-lasting paint. Proper blazing techniques are specific, with rules about location and size of the blaze depending on its location along the line. To protect the historical integrity of a line, new blazes should not be made over old blazes. The blazes should be painted every 10 to 15 years. If

monumentation doesn't exist, a survey may be required to establish the location of the boundary lines.

Morgan Hill Boundary and Survey:

Morgan Hill boundaries are a combination of blazes, stone walls, barbed wire fence, and iron pipe/rod monumentation. The total boundary perimeter is 6.5 miles, with 6.3 miles that need to be maintained. The entire tract was blazed in 2000 and painted in the summer or 2001. During the summer of 2014 the boundary lines east of Morgan Hill were painted and signed. The remainder should be blazed and painted during this planning period.

Three contiguous surveys exist which cover the entire tract. The 111.2 acres in Lebanon was surveyed in 1933 by S. N. Stevens. Jim Neil conducted a compass and tape survey of the original core acreage that is now under a conservation easement in 1990. In 1991, Wayne McCutcheon surveyed the 64.7-acre "Mulherin Lot". All surveys are on file in the MTL New London office.

Boundary lines east of Morgan Hill were blazed and painted during the summer of 2014, the rest of the boundary is in variable condition with blazes and paint still visible (both left and right photos), but needing maintenance in the upcoming planning period.

Access, Operability, and Water Quality Protection

Most management requires a network of skid trails, truck roads and wood landings. Efficient and sound layout of this important infrastructure is an art in itself. There are a whole host of requirements, rules, and recommendations for forest roads and trails and location of landings. In most states a reference of Best Management Practices exists outlining regulations to prevent erosion and protect water quality during timber operations. General rules of thumb apply, roads and skid trails should not be too steep, should neither be located on sensitive sites nor too close to water, wetland and riparian areas, should be appropriately sized, and should utilize proper water diversion structures. Often the access network is the most expensive component of land management, but when properly laid out they not only facilitate timber harvesting , they can enhance landowner access, improve wildlife habitat, and provide recreational assets.

Any time heavy equipment is used in the woods there is the potential for water quality problems. Skid trails in the wrong place or used during the wrong time of the year can cause soil erosion and sedimentation. To avoid water quality problems, proper planning is critical. The timing of the job is the most important factor in

maintaining water quality. Access roads and skid trails should be properly laid out initially. Soil compaction and rutting is the most eminent danger where the ground is wet. Knowledge of specific soil characteristics, drainage location and, often, winter logging can minimize impacts.

Buffer strips along wetland areas and other riparian zones should not be encroached upon. Predetermined buffer widths can be somewhat impractical for planning purposes. A better method is to use on-site indicators and conditions to determine adequate buffer widths. Despite this, some recommended buffer widths are presented on Brooks, Water and Wetlands section of this plan providing a general outline of buffer guidelines. Factors such as topography, a distinctive change in forest cover type, evidence of travel corridors and concentration areas for wildlife, recreational use, and aesthetic concerns should all be used to determine appropriate buffer widths and locations. Depending on the situation, some thoughtful and sensitive individual tree harvesting can be done within buffers to encourage a diverse forest structure.

After any logging, water bars and other drainage-control structures should be installed. Landing areas or places of exposed soil should be seeded and mulch hay may also be required. All brook crossings should be properly restored with the banks mulched and seeded. The most effective safeguard of water quality is a careful equipment operator with common sense and proper supervision from the forester. All access roads and interior skid roads should be maintained according to the publication Best Management Practices For Forestry by the State of New Hampshire Department of Resources and Economic Development. Another good resource for roads is Good Forestry in the Granite State.

Morgan Hill Access and Operability:

Access on and into Morgan Hill is variable. On the east side the Stagecoach Road serves as the main access. This road was abandoned by the town of Plainfield long ago and now is owned exclusively by the landowner's who's land it passes through. Cooperation amongst all landowners is necessary to facilitate neighborly use of this collectively owned private road. A permanent log landing is established off Stagecoach Road. A truck road providing additional access into the East compartment directly off Route 120 was built in 2006 with EQIP funds. This same road was brush-hogged during the fall of 2014. Access to the west side of the tract off True Road is dependent upon landowner permission.

According to the prior management plan, the truck access "is suitable for contemporary logging with minor improvements". Minor improvements involve mainly brushing-back, reshaping and ditching the road network that was developed in the early 1990's. The road network that was built includes the road that separates the Central and South Compartment and the road that separates the West and Central Compartment. The first of the two roads access two established log landings that will function for much the property acreage. This road section required the most work as it traverses the entire north slope of the Morgan Hills. This section of road is heavy to clay, intercepts all water flow from the north slopes and has seen heavy ATV use during wet periods. For winter use it is useable with minor shaping and ditching repair. A second section of road is built with much better material and requires just a good brushing back. This road section ends at the snow machine trail that parallels Hibbard Brook and serves as the North Compartment boundary. Further access and log landing

development will be explored for the operational aspects of the North Compartment.

The truck access off Route 120 is gated (upper left) and in good condition, suitable for year-round use. The landing off Old Stagecoach Road would benefit from being brush-hogged before it closes in any more. Large seed producing invasives are established here as well, and mowing them will at least reduce the amount of seed for the time being.
Truck access off True Road is problematic, requiring landowner permission. The MTL boundary in this section (lower left photo) is about .5 miles from a maintained town road (True Road).

Operability on Morgan Hill is more straightforward. The majority of the terrain is moderately sloped. The inoperable land occurs in wetlands and steep slopes associated with the heights of land or small areas of exposed ledge. None of the operable areas are inaccessible.

Local Markets and Logging Capacity

As of the last few years the markets have been so variable it is difficult, if not impossible to predict what they will be a year or even a month from now. Though in general conditions have slowly improved and are better than they were during the midst of the economic crisis of recent years.

Understanding wood markets is essential to a successful timber harvest, and takes diligent attention. Establishing good, long lasting relationships with mills in the area and as far as Canada is also integral component. Given the variability of markets, successful timber harvest planning needs to be flexible to accommodate changing market conditions.

The local logging capacity and infrastructure are in place to carry out the treatments prescribed in this plan. However, due to the uncertainty in current markets and unstable weather patterns, many loggers are finding it difficult to make ends meet. MTL foresters have established long term relationships with what we consider to be

the best loggers out there. To maintain these relationships we try our best to provide consistent work, but at certain times weather and market conditions prevent steady work.

Currently, several different methods of logging are available to accomplish prescribed silvicultural treatments. There are positive and negative aspects to each method, and the type of equipment needs to be matched to the terrain and the objectives of the job.

Traditionally, the most common method of logging involves the use of rubber-tired cable 'skidders', which skid trees to the landing that are cut with chainsaws. This equipment is capable of working on steep rugged ground with little difficulty. Large diameter trees are not a problem for well-powered skidders. A well-planned job can leave the forest appropriately stocked as skidders can maneuver quite well. There are, however, some down sides to this method. The skidder operators have to be both highly trained and conscientious. Skidders can have an impact on soils if they are not operating at the right time of year or if they are not operated in a thoughtful, professional manner. Soil compaction and soil rutting can have detrimental impacts on long-term soil productivity.

In more recent years a mechanized form of logging has become more common in this region. Mechanical tree harvesters cut the trees instead of a chainsaw. The harvester is commonly on tracks, similar to an excavator. The machine has a harvesting saw-head mounted on a boom, with a fifteen to twenty foot reach. Trees are cut and placed in bunches in the woods and are then dragged to the landing area by either grapple or cable skidders. This logging system has several benefits, most of which involve the mechanical harvester. The harvester has the ability to cut a tree, carry it upright, and place it anywhere. The trees are generally placed in bundles along a skid trail, avoiding damage to the trees left behind. A good harvester operator can cut enough trees to keep two or more skidders busy. As long as the harvester operator is skilled, the skidder operators can do their job with minimal damage to the residual trees. This system of logging is capable of producing a high volume of wood in a short amount of time. This may or may not be good, depending on the objectives. All the soil compaction issues raised above are valid here as well.

So called low-impact logging methods involve the use of animals, bulldozers, or forwarders. The first two are slow, and they cannot economically drag wood very far. They can work on steep slopes, however. A forwarder is a skidder-like piece of equipment that carries the trees out of the woods, rather than dragging them. There is less ground pressure applied so soil compaction can be kept to a minimum. The forwarder is highly maneuverable and it can work in very tight spaces. This logging method is often called a cut -to-length system because the trees are processed (bucked) where they lie. The cut up wood is then loaded onto the forwarder. When it heads to the landing it is not dragging seventy or more feet of tree behind it. Forwarders work best on fairly level ground and are not well-suited to steep or rocky ground. Forwarders have the ability to carry the wood quite a distance, and they require minimal landing space. The relatively high cost of this logging system could be offset by lower road construction costs.

New equipment for logging is always being developed. The push towards an ecosystem approach to forest management will result in the design of more environmentally friendly logging equipment. High flotation tires, tracked equipment and biodegradable hydraulic and chainsaw oils are examples.

Forest Products Utilization

Any time a tree is cut, it is important that it is utilized in such a way that the most value is derived from it. The first step in proper utilization is to know the markets. Specifications for forest products can vary widely from one mill to the next. Once a destination for a particular product is chosen, each tree needs to be carefully evaluated before it is cut. A mistake that turns a veneer log into a saw log can be very costly, especially if it recurs throughout the job.

With the exception of cut-to-length systems, most utilization decisions are made on the landing. A piece of equipment called the loader-slasher has become very commonplace with the advent of mechanized logging. The slasher portion is a circular saw which cuts the trees to a specific product length. The loader handles the tree and is capable of loading trucks and piling the tops of the trees to be chipped. This is a quick, safe and economical way of processing the wood, but it does have some drawbacks. The loader operator is quite a distance from the wood that is being sawn, thus high value logs may not be carefully looked at and cut precisely enough to maximize return to the landowner.

The more traditional method of bucking trees into products involves the chainsaw. The trees are skidded to the landing, measured, and cut by hand. The logger has more of an opportunity to look the entire tree over carefully. After the wood is cut, it is important to properly sort the wood by grade and product so the trucker delivers to the designated mill or processing facility.

Accomplishing Treatments

Commercial treatments are those which involve the harvesting and selling of forest products. These treatments should be laid out and supervised by a forester. 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 forester on the ground is crucial to success. There are many components of a timber harvesting operation that need to fall into place if the treatment is to be successful. The two most important components are a knowledgeable, willing seller and a willing, competent buyer. A stable market for the product being sold is also important.

If an agreement can be made between the seller and buyer through a timber sale contract, the logistics of the operation need to be fully considered. Suitable access and landing areas need to be located; the timing of the operation, payment schedules, and other issues need to be addressed. Patience is often required, as well as good weather conditions. Market issues play an important role as well.

COMPLEMENTARY MANAGEMENT OBJECTIVES

Recreation and Hunting

There are numerous ways active forest management can enhance and complement recreational and hunting opportunities, not the least of which is the creation of trails and roads providing access into the forest.

Morgan Hill Recreation and Hunting:

Morgan Hill recreation opportunities generally include a trail system utilized by ATV's, snowmobiles, horse

and foot traffic. The local snowmobile club, the Blow-Me-Down Snowriders, maintains a section of trail 1.25 miles long entering the tract from Lebanon in the northwest corner, traversing to the east, and exiting the tract back into Lebanon. ATV use on the trails is not heavy, but requires monitoring for abuse and improper trail usage. Other smaller trails created by locals over the years can be found on the tract, and seem only used during hunting season. Skiing, biking, and hiking is a regular recreational use throughout the year.

Of all the traditional low-impact recreational uses, hiking will always be a permitted use. Continuity of this use was made possible through one of the conservation easement purposes that were placed on the property by the Golsovich's. Legally, pedestrian hiking is permitted forever on a certain hiking trail that is located on the western side of Morgan Hill Forest. This trail reserves in perpetuity a 10 foot wide pedestrian right-of-way from True Road, northerly through property to the Poverty Lane Road in Lebanon. (see Forest Management Map for location).

Deer hunting is heavy on Morgan Hill during the fall months and is well known amongst the local hunting community. At numerous locations, especially along the heights of land, are variable aged deer stands ranging from an old chair to a high-tech camouflage blind. In all cases noted during the 2015 forest inventory deer stand placement was respectful and did not damage potential timber value. No name tags were noted. Hunting will continue to be encouraged to help reduce impacts from overbrowsing.

A kiosk has been placed at a major trail intersection before the landing in the Northern compartment to help educate recreational users (bellow left).

Of the deer stands found on the tract, it seems that only the old, disused stands were built using materials that damaged trees, such as nails (right). The recent hunters used either simple chairs or stands that were installed temporarily without causing damage to the trees .

Aesthetics

In human terms the woods are inherently a messy place; trees are often blown down or losing limbs and natural mortality creates snags. Slash reduction following logging, an ice storm or crop tree release operations is important to maintain the visual quality of an area. Brush piles for wildlife cover could be built in areas which are

not visually sensitive. Coarse woody debris or large pieces of trees can be left in areas not readily visible. Roads and trails should be designed so they are pleasing to the eye and fit into the natural landscape: poorly planned and constructed trails may lead to future eyesores. Waterbars and other erosion control methods should be in place at the end of any job. Proper cleanup of log landing areas is also very important. Debris left from logging operations can be very unsightly; it can be brought back into the woods or buried following landing use. After the landing is pushed off it should be limed fertilized and seeded.

While all of the approaches to aesthetic management take extra time, hence extra cost, it is well worth it in the long run as they conform to owner objectives and good forest stewardship. Monies should be set aside for putting a logging job “to bed”. If the logging contractor is required to do this work it should be spelled out before hand so that the cost can be determined and it is not left for the logger to do as an additional practice.

Archaeological Attributes

Protection and enhancement of archaeological attributes should be an objective of every landowner. Stonewalls, cellar holes, and old wells are the most common features found on forestland. These cultural artifacts provide an important link to past land use and history. Guidelines exist to protect these features, and in general are obvious- don't damage or disrupt existing features. If a stonewall has to be crossed, either create a permanent bar-way or be prepared to replace stones after the job has been completed.

Morgan Hill Archaeological Attributes:

On Morgan Hill stone walls and remnants of barbed wire fences are common, especially along the boundary but also interior to the tract. Additionally, there are 3 old farmstead sites in the east compartment. Several locals claim there is a pair of gravestones within the vicinity of these old homesteads, though MTL foresters have not found them yet.

All MTL forestry management activity i.e.(logging, road/trail building, wildlife habitat management or aesthetic work) will avoid disturbance to these important historical features.

OTHER CONSIDERATIONS

Conservation Easement

The most powerful tool for ensuring the long-term existence of open green space is the conveying of conservation easements on part or all of the property. Precluding development on the property will do more to protect wildlife and their habitat over the long run and provide the forestland required for recreation, education and timber production for the future.

Morgan Hill Conservation Easement:

A conservation easement held by the Town of Plainfield was placed on the original core acreage of 515 +/- acres by a prior landowner, Mr. Golsovich, in 1991 through the Land Conservation Investment Program (LCIP) program. This easement has a number of minor use limitations that require consideration during forestry management activities. The greatest use limitation that concerns forest management involves the pedestrian

right-of-way delineated on the Forest Management Map. The trail corridor is 150 feet on both sides (300' total width) and limits forest activities “to salvage, trail maintenance, logging road use, construction, and maintenance, vista clearing; or removal of diseased or hazardous trees.” In addition, the scenic quality must be protected as seen from public roads and public trails. The long-term, sustainable management activities on Morgan Hill by Meadowsend has been reviewed historically by the Plainfield conservation commission and selectmen. This ongoing relationship is mutually beneficial for the town and Meadowsend. The easement is on file in the New London office and is attached as an appendix at the end of this document.

In time options for conserving the remaining two sections of un-eased land will be explored.

Social Climate and Education Opportunities

There always have been mixed feelings among the general public concerning forest management and, in particular, timber harvesting. While many people use forest products, most do not fully understand how they are produced. People's perceptions of what may be happening and what is actually occurring are often quite different. A timber harvesting project designed for wildlife habitat improvement or salvage cutting due to wind storm damage or other natural disturbances may sometimes require patch clear cutting. The idea of any type of tree cutting may upset people unless they understand that it was thoughtfully planned and done purposefully with due consideration for the environment.

Tours of the property or signage for educational purposes can often stimulate interest in management and dispel negative assumptions. In addition to the MTL foresters, the Extension and County Foresters are willing to assist with educational events.

Cost Share Programs

In addition to commercial treatments, where income is normally derived, other treatments involve practices that cost the landowner money. These practices normally either have indirect benefits of wildlife, recreation, etc. or investment benefits of future timber value and management. Ordinarily, there are assistance programs on the local, regional, state and/or federal level that provide funding toward these ownership costs. “Cost-share” programs range from wildlife habitat practices of apple pruning and field brush-hogging to timber management practices of management planning to road repair/construction. Participation in cost share programs typically requires a management plan meeting program standards prepared by a certified Technical Service Provider, and some form of contract specifying the work to be done and cost-share payments.

Cost Share on Morgan Hill:

This plan has been created with funding through the USDA NRCS EQIP program and has been written to meet the requirements of that program. Should additional new cost share practices be desired, such as timber stand improvement, an addendum meeting all plan requirements will be submitted.

Under the previous plan, several cost share practices were completed through the same EQIP program including over 1 mile of access road (practice 560) in the east compartment, establishment and seeding of a landing (practices 655 and 342) also in the east compartment, 10 acres of improvement/release of old established

apple orchards (practice 328) on Morgan Hill, 1 acres of early successional habitat development/management (practice 328), and 10.5 acres of forest stand improvement (practice 666). All practices were completed and certified between the years 2006 and 2011.

Tree Farm

The American Tree Farm System is the largest and oldest woodland certification system in America. It specializes in certifying management of private forests as sustainable in ecological and economic terms. Tree Farm works "to give people the tools they need to be effective stewards of America's forests", provides recognition and validation of family forest owners commitment to sustainable stewardship, and helps protect the forest for future generations. In addition, Tree Farm Certification provides access to some better timber markets. Eligibility requirements are a woodlot with at least 10 acres that is under a forest management plan which meets Tree Farm Standards (this document meets trees farm standards). To enroll, the forest must be inspected to verify the Tree Farm Standards have been met.

Morgan Hill Tree Farm:

Morgan Hill is a certified Tree Farm as part of the MTL New Hampshire ownership, #001350. It is due for re-inspection in 2018.

Taxes, Laws and Required Permits

New Hampshire:

Best Management Practices: BMP's are for protecting water quality during forest harvests. Some BMP's are mandatory and others are voluntary. All BMP's are documented in Best Management Practices for Forestry: Protecting New Hampshire's Water Quality.

Current Use: Current Use is an "open space" taxation program (RSA 79-A). It is a property taxing strategy designed to encourage landowners to keep their open space undeveloped. It taxes agricultural and forestland on its "current use" rather than its real estate market value. Minimum requirements are 10 acres in size and buildings and other improvements must be excluded. Landowners must apply to their town and commit their land to open space conservation. When land is developed it is charged a land use change tax. Current use tax rates are variable, with the lowest rates given to un-posted land under Stewardship Category. This plan meets the Stewardship Category of Current Use.

Timber Tax Law: Ten percent of the value of every timber sale is returned to towns where cutting takes place (RSA 227-J:5 and 79:10). The State of New Hampshire requires filing an "Intent to Cut" form for loggers, foresters and landowners who wish to harvest timber. The Intent to Cut form is for tax purposes since timber is only taxed once it is cut, and is used to make municipal assessing officials aware of cutting operations. Once filed, a Report of Wood Cut form is filed with the town.

Wetlands Law: If harvesting is to occur in or near wetland areas, or which requires stream crossings, a Notification of Minimum Wetlands Impact must be filed with NH DES.

Driveway Permit: A driveway permit is required for vehicles entering a state road from the harvest site. The Driveway Permit application needs to be sent to and approved by the Dept. of Transportation.

Basal Area Law: This law (RSA 227:J:9) regulates cutting over 50% of the basal area adjacent to certain waters and along public highways and requires a Basal Area Variance Request.

Slash Law: The slash law (RSA 227-J:10) is intended to reduce fire danger caused by slash and to improve the aesthetics along roads and water bodies. It prohibits leaving slash in or near year round streams, bodies of water, and along public roads, along railroad beds, on or within 25 feet of the property of another, in a cemetery, and within 100 feet of any occupied structure

TRACT LEVEL DATA

TREATMENT SCHEDULE

All silvicultural treatments are scheduled for the next several years, but may be pushed out due to variable weather, markets, and disease/pest occurrences (specially Emerald Ash Borer).

Stand #	Stand Type	Acres	Treatment	Year
1	HOL RO-WA-HH 2-5B	31.7	Group selection-Crop tree release	2015
2	RO-BE 34A	21.1	Free thinning	2015
3 (W N C)	RO-WA-RM-WP 34AB	147.5	Presalvage-Single tree selection-Free thinning	2015
3 (E)	RO-WA-RM-WP 34AB	45.2	Presalvage-Single tree selection-Free thinning	2015
4	WA-SM-RO-WP 34AB	76.6	Presalvage-Free thinning	2015
5	SM-WA-RO 34A	24.7	Presalvage-Free thinning	2015
6	SM-WA-RO-WP 23B	52.9	Presalvage-Single tree selection-Free thinning	2015
7	HE-RM-YB-WP 34A	151.2	Presalvage-Free thinning	2015
8	WP-H 23A	16.3	Modified Overstory Removal	2015
9	HS 12A	5.6	Treat invasives-Non-commercial thinning	2015
10	RM-WA-WP 3B	19.7	Small group selection	2015
	Apple Orchards	1.6	Release as needed (consider cost share)	As needed
			Establish EAB trap trees for monitoring	asap
			Finish painting and blazing boundary lines (6.3 miles total)	asap
all			Update forest management plan	2025

Stand 1 HOL RO-WA-HH 2-5B 31.7 acres

Stand 1 includes the height of land areas found along the northern border in Lebanon and the southern boundary on the south face of Morgan Hill in Plainfield. The section in the north is more of a woodland, with shorter trees and more hop hornbeam, shown at left.

The oak dominated south facing slopes of Morgan Hill are better sites than the area in the North.

Sections of this remote stand, located on the Morgan Hill height of land, grows some high quality red oak.

GENERAL ATTRIBUTES

Natural Community Type:	Rich red oak rocky woods		
Stand Age:	60-80 years old		
Stocking Level:	Overstocked		
Past Management History:	No recent commercial management; release work in old orchard patches		
Insects/Damage/Disease:	Spider heart in oak; sugar maple borer; deer browse		
Timber Quality:	Marginal commercial quality with scattered good red oak		
Invasives:	Level 3- Moderate to heavy presence, especially buckthorn		
Total BA Per Acre:	128	Trees Per Acre:	672
Total AGS BA Per Acre:	55	% AGS Sawtimber:	88.2%
Quadratic MSD:	5.9	Site Quality:	Height of land, shallow soils

Silvicultural Objectives

Management system:	Manage for multiple age
Desired Composition:	Maintain oak
Crop tree target diameter:	RO 18-22"; SM 16-18"; WA 16-18"
Wildlife Management:	Manage mast for food source

Access and Terrain

Access to Town Road:	No direct access; remote stands
Landing Sites:	Dependent on compartment location
Truck/woods Roads:	Good established roads; see access section for issues related to access in western compartment. Road in western/central compartment requires dry conditions for use.
Terrain:	Mixture of height of land, moderate to steep slopes

Stand 1 includes the heights of land on Morgan Hill and a small height of land along the northern boundary in the Lebanon section of the tract. These heights of land have shallow soils, dominated by oak, hophornbeam and sugar maple with a "woodland" rather than a forested feel. The sugar maple is a high percentage of the stand, but the growing form indicates it is off-site while the oak is variable. This stand is remote, and only marginally commercial. The inoperable sections have been delineated, and treated as a biological reserve. A small portion of Stand 1, along the northern boundary in Lebanon, has been part of an active timber sale under MTL ownership. The southern sections along the Morgan Hill height of land slope to the south with long, marginal access.

Within Stand 1 along the heights of Morgan Hill are several areas of old apple orchard, relics of the strong agrarian use of the land here into the early 1900's. These orchards provide extremely valuable wildlife habitat, providing important food source for everything from bear, deer, raccoons, porcupine to song birds and small rodents. Unfortunately invasive exotic shrubs, primarily buckthorn, are also present in the orchards. The orchards were released with cost share from EQIP during 2007. Continued monitoring and appropriate continued release work recommended. At a minimum, fruiting buckthorn should be manually felled to reduce seed production.

Silviculture 2015: Management in Stand 1 will largely occur in combination with work in adjacent stands. Because of the remoteness, silviculture will be a combination of group or small patch openings with crop tree release. Removals will focus on harvesting mature, low quality, and diseased trees. Compliance with conservation easement requires "protection of scenic quality viewed from public roads and public trails".

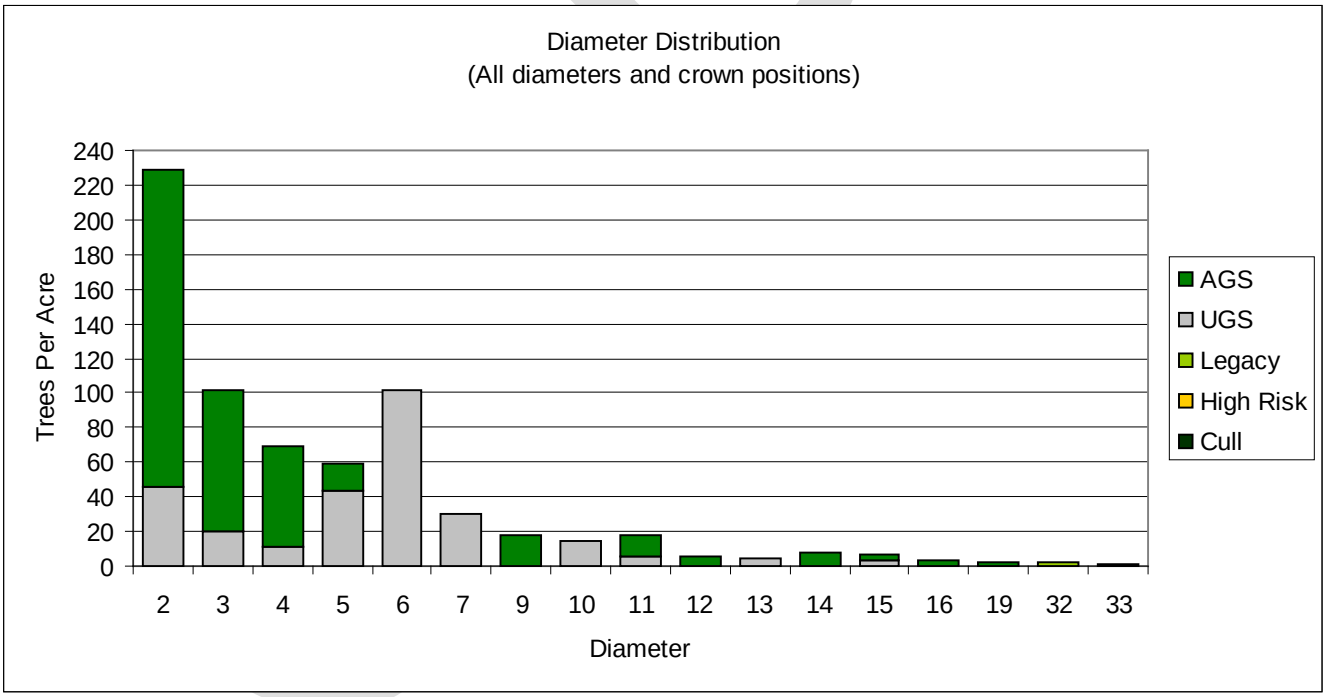
- **Group selection:** In areas of poor quality, diseased, or low vigor overstory create group or small patch openings for regeneration. Openings should be kept small with irregular edges to optimize biodiversity and reduce scenic impact (easement requirement).
- **Crop Tree Release:** Between the groups utilize crop tree release to release good quality red oak and yellow birch for timber and mast production.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk (bf)	AGS Saw	% AGS Saw
Hop Hornbeam	6.3%	0	0	0	1	0.0	0.0	1.3	0	0	0%
Red Oak	7.5%	0	1,196	420	1	0.0	3.5	7.5	0	1,616	100%
Sugar Maple	67.4%	0	0	158	8	0.3	0.0	8.3	0	0	0%
White Ash	17.3%	0	510	142	3	0.0	0.0	4.4	0	651	100%
White Birch	1.5%	0	0	144	1	0.0	0.0	0.9	0	0	0%
Total Hardwood Per Acre:	*100.0%*	*0*	*1,706*	*865*	*14*	*0.3*	*3.5*	*22.4*	*0*	*2,268*	88%
Total Volume Per Acre:	100.0%	0	1,706	865	14	0	3	22	0	2,268	88%
Total Stand Volume:		0	54,071	27,409	441	9	110	710	0	71,891	

Table 1.1: Volumes by species and product.

Graph 1.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

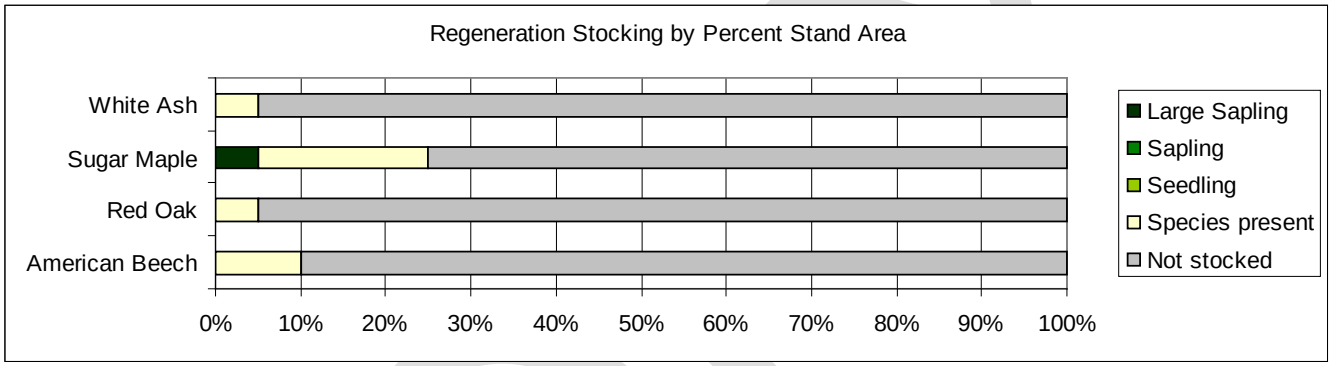
Table 1.1: Snags per acre by size and decay class.

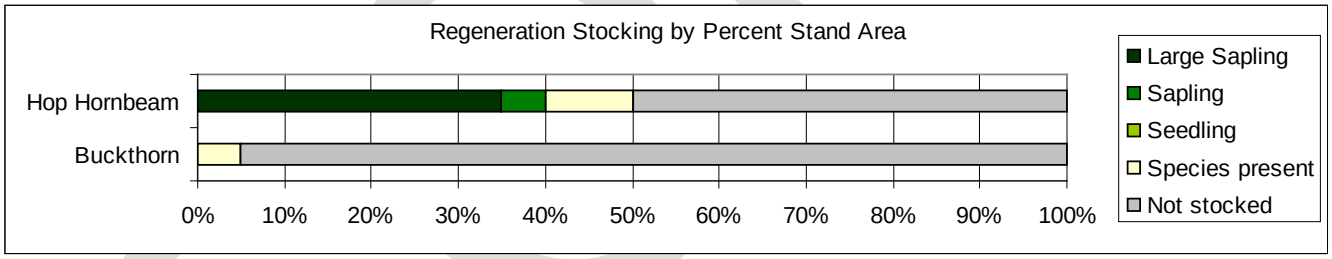
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

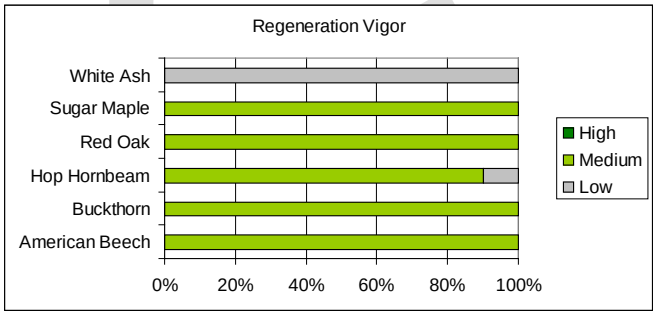
Table 1.2: Down logs per acre by size and decay class.

Graph 1.2 and 1.3: Tree (1.2) and shrub/non-commercial (1.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

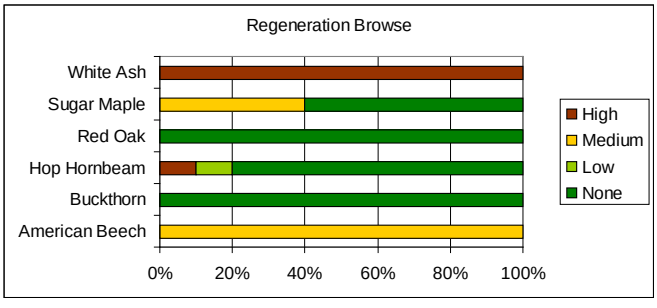




Graph 1.4: Vigor of regeneration and shrub species.



Graph 1.5: Browse level of regeneration and shrub species.



Stand 2 RO-BE 34A 21.1 acres

Stand 2 is located on the height of land along the northern property boundary in the East Compartment. It is a mix of red oak and beech.

High quality red oak can be found throughout this stand, with a variable beech understory. Slopes are steep, but operable.

There is a fair amount of red oak veneer in Stand 2, in addition to an average of 3,000 bf of sawtimber and another 1,500 feet of pallet per acre.

GENERAL ATTRIBUTES

Natural Community Type:	Between rich mesic forest and Rich red oak rocky woods		
Stand Age:	60 to 70 years		
Stocking Level:	Over stocked		
Past Management History:	Harvested in 1995 by Fred Weld under prior ownership		
Insects/Damage/Disease:	Spider heart in red oak; beech bark disease; deer browse		
Timber Quality:	Good to excellent quality red oak		
Invasives:	Level 1, scattered presence		
Total BA Per Acre:	141	Trees Per Acre:	679
Total AGS BA Per Acre:	65	% AGS Sawtimber:	70.3%
Quadratic MSD:	6.2	Site Quality:	Good oak site

Silvicultural Objectives

Management system:	Evenaged
Desired Composition:	Maintain oak
Crop tree target diameter:	RO 18-24"
Wildlife Management:	Create snags and down logs when opportunities exist; maintain oak and beech for mast. There is a high number of deer stands near the height of land in this stand.

Access and Terrain

Access to Town Road:	No direct access to town road; good access to truck road bordering south part of stand.
Landing Sites:	Landing established off Old Stage Road
Truck/woods Roads:	Truck road built in 2006 provides excellent access to stand and landing site.
Terrain:	Moderate to steep slope.

Stand 2 is an isolated stand on the warm, sunny south facing slopes below the northern boundary line in the East compartment. It includes a high quality oak and beech stand on a moderately steep, south facing slopes. The oak tends to be high quality, though spider heart is present. The beech has beech bark disease, but should be maintained for its excellent wildlife qualities especially given the high presence of bear here. There is a fair amount of sugar maple in the mid-story, but it is not high quality. Regeneration here is sparse, consisting mostly of scattered beech saplings. This is an excellent oak site.

Of the 3 mbf of quality sawtimber and another 1.5 mbf pallet grade oak, about 30% is ready to go, the remainder exists on stems below target diameter or otherwise still acceptable growing stock.

The terrain is moderately steep and might prove challenging to large mechanical harvesters, but is not inoperable. Invasive exotics are only sparsely present here, in fact Stand 2 has the lightest presence on the entire tract. Undoubtedly there is a significant seed source built up in the soils which will germinate with a timber harvesting disturbance. In this stand, the best management approach for mitigating spread of invasives is to attempt to time the harvest during a good oak seed year.

Silviculture 2015: Harvest mature, poor quality, diseased or low vigor oak and other overstory trees to release better quality stems and pockets of existing softwood saplings. Leave stems below target diameter or otherwise still acceptable growing stock. Reduce basal area by approximately 1/3 to about 90 square feet. Stand 2 is within the conserved area of the property.

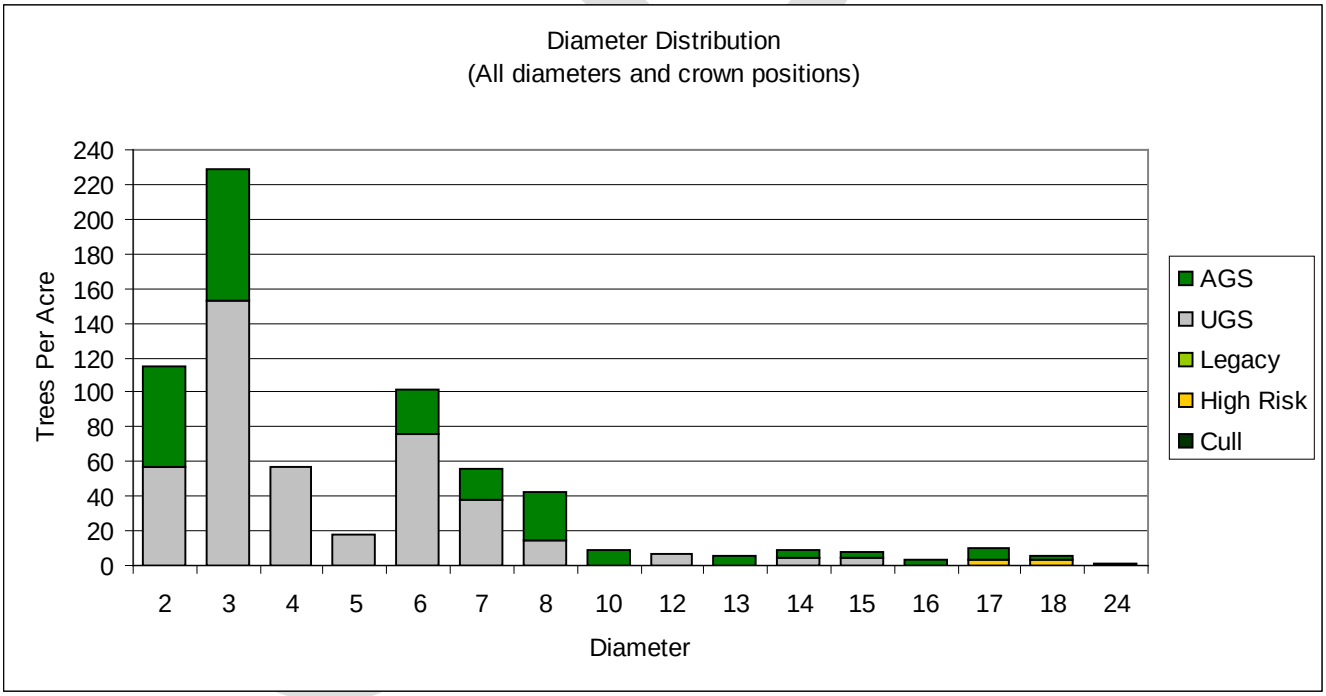
- **Free thinning** throughout removing approximately 1/3 of the basal area targeting poor quality, diseased, and low vigor overstory trees. Maintain bole shade around best quality oaks. Create snags and down logs where possible.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	18.2%	0	0	0	3	0.0	0.0	2.9	0	0	0%
Hop Hornbeam	9.8%	0	0	0	1	0.0	0.0	0.6	0	0	0%
Red Maple	5.5%	0	0	0	1	0.0	0.0	1.2	0	0	0%
Red Oak	28.9%	241	2,949	1,583	9	0.0	0.0	17.9	619	3,354	70%
Sugar Maple	37.5%	0	0	0	4	0.0	0.0	3.5	0	0	0%
Total Hardwood Per Acre:	*100.0%*	*241*	*2,949*	*1,583*	*17*	*0.0*	*0.0*	*26.1*	*619*	*3,354*	70%
Total Volume Per Acre:	100.0%	241	2,949	1,583	17	0	0	26	619	3,354	70%
Total Stand Volume:		5,092	62,223	33,394	364	0	0	551	13,068	70,779	

Table 2.1: Stand volume by species and product.

Graph 2.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

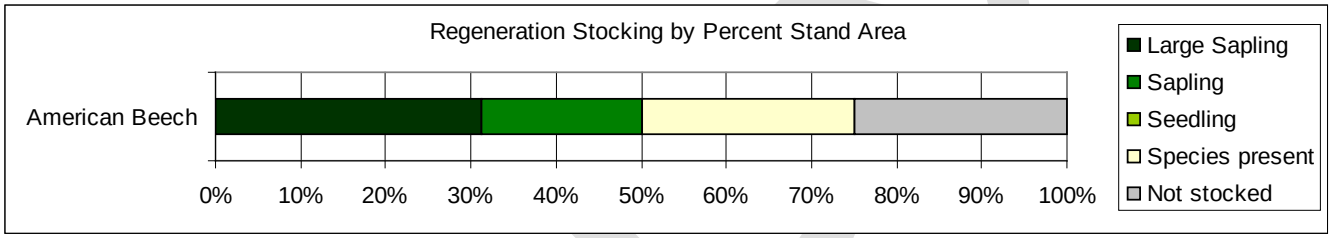
Table 2.2: Standing dead trees per acre by size and decay class.

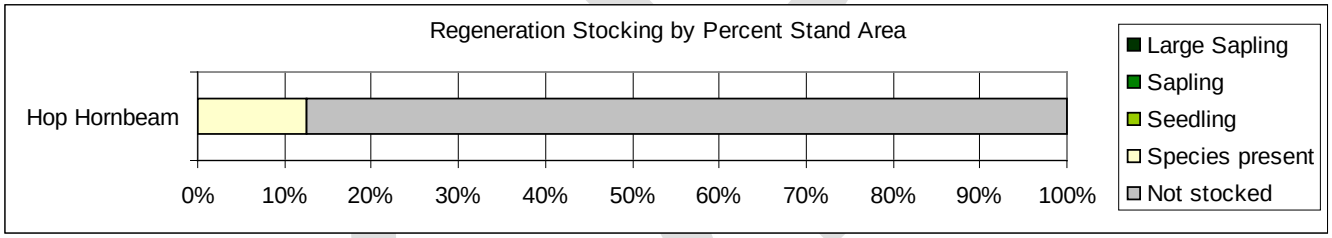
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

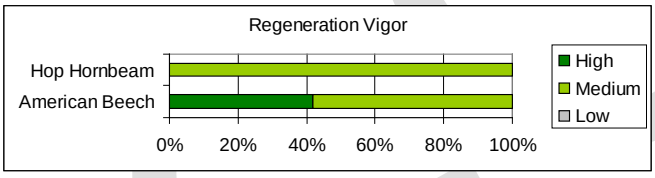
Table 2.3: Down logs per acre by size and decay class.

Graph 2.2 and 2.3: Tree (2.2) and shrub (2.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

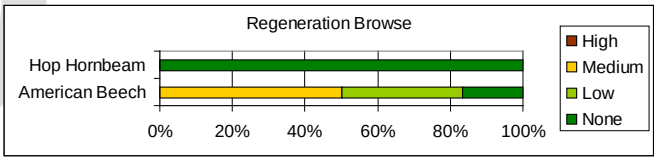




Graph 2.4: Vigor of regeneration and shrub species.



Graph 2.5: Browse level of regeneration and shrub species.



Stand 3 RO-WA-RM-WP 34AB 192.7 acres

Stand 3 is the largest, most diverse stand on the tract. It occupies the intermediate ground between the toe slope rich sites and the upper elevation, oak dominated terrain. Stand 3 includes a mix of red and sugar maple, red oak, ash, white and yellow birch, aspen, basswood, beech, hophornbeam, cherry, hemlock and pine.

Ice damage from recent storms and dating back to the big ice storm in 1998 can be seen on the upper, north facing slopes of Morgan Hill. Where Stand 3 occupies the upper, north facing slopes of Morgan Hill.

Invasives, dominated by buckthorn, are well established in the understory especially in the lower elevations of Stand 3.

Scattered good quality white pine can be found, especially in the north and central compartments of Stand 3.

The best site of sugar maple in Stand 3 in on the north facing toe slope of Morgan Hill.

NOTE: Stand 3 data has been delineated by compartment. The first section includes data for West, Central, and North Compartments combined-- these are the areas harvested since the last plan.
The second section includes data for the East Compartment-- this area has not been harvested since 1995.

Description and Silvicultural Prescription will follow data sections.

STAND 3 WEST-CENTRAL-NORTH COMPARTMENT GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-Northern hardwood forest and Northern hardwood forest		
Stand Age:	50-70 years		
Stocking Level:	Fully stocked		
Past Management History:	West (Zambons), Central (Zambons) and North (Bruce Streeter) compartments treated between 2002 and 2006.		
Insects/Damage/Disease:	Some ash decline; old ice damage; beech bark disease; sugar maple borer; sterile conk; deer browse - typical diseases/pests for diverse stand. No sign of emerald ash borer as 2014.		
Timber Quality:	Variable; good quality oak, ash, and some red maple. Variable birch and pine. Sugar maple variable, generally low to fair quality with some good quality on North facing slope in Central Compartment.		
Invasives:	Level 3, moderate to heavy presence.		
Total BA Per Acre:	94	Trees Per Acre:	413
Total AGS BA Per Acre:	39	% AGS Sawtimber:	67.6%
Quadratic MSD:	6.5	Site Quality:	Some gentle ground to moderately steep, shallow, rocky; scattered seeps

Silvicultural Objectives

Management system:	Convert to multiple age
Desired Composition:	Maintain diversity, especially oak where possible.
Crop tree target diameter:	RO 18-22"; RM 16-18"; YB 16-18"; WB 12-14"; SM 18"; WP 20-22"
Wildlife Management:	Increase snags and down logs; maintain legacy trees; continue conversion to multiple-age stand

Access and Terrain:

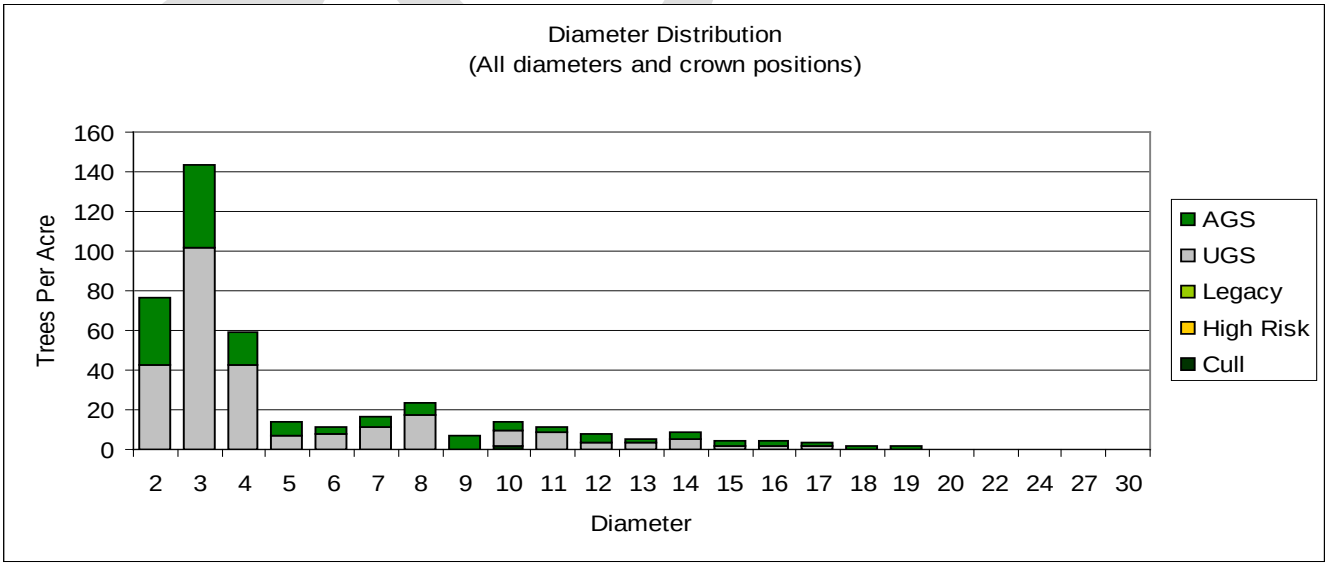
Access to Town Road:	West, Central, and North Compartment historically accessed off True Road. See Access section above.
Landing Sites:	Two centrally located landings along main truck road.
Truck/woods Roads:	Good truck roads to landing sites. Need brushwork and mowing in West, Central and North Compartment. Road in western/central compartment requires dry conditions for use.
Terrain:	Variable- gentle to moderate slope. Drainage variable. Need frozen winter or dry summer conditions.

Forest Composition and Volume (West Central and North Compartments)

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	7.6%	0	0	0	0.5	0.0	0.0	0.5	0	0	0%
Aspen	0.6%	0	83	32	0.0	0.0	0.0	0.3	0	115	100%
Basswood	1.8%	0	0	0	0.1	0.0	0.0	0.1	0	0	0%
Black Birch	1.3%	0	29	30	0.2	0.0	0.0	0.3	0	0	0%
Black Cherry	1.7%	0	0	60	0.3	0.0	0.0	0.4	0	0	0%
Hop Hornbeam	5.8%	0	0	0	0.3	0.0	0.0	0.3	0	0	0%
Red Maple	7.5%	0	0	102	1.3	0.0	0.0	1.5	0	0	0%
Red Oak	5.1%	0	585	162	1.1	0.0	0.0	2.4	175	554	74%
Sugar Maple	31.2%	32	551	330	3.5	0.5	0.2	5.9	0	834	91%
White Ash	14.0%	0	383	182	1.6	0.3	0.0	2.9	0	253	45%
White Birch	7.0%	0	0	0	0.5	0.1	0.0	0.7	0	0	0%
Yellow Birch	3.2%	0	0	0	0.0	0.1	0.0	0.1	0	0	0%
Total Hardwood Per Acre:	*86.7%*	*32*	*1,632*	*899*	*9.4*	*1.0*	*0.2*	*15.3*	*175*	*1,758*	69%
Hemlock	3.0%	0	0	0	0.4	0.0	0.0	0.4	0	0	0%
White Pine	10.4%	0	201	280	2.0	0.0	0.0	2.8	0	299	62%
Total Softwood Per Acre:	*13.3%*	*0*	*201*	*280*	*2.4*	*0.0*	*0.0*	*3.3*	*0*	*299*	62%
Total Volume Per Acre:	100.0%	32	1,833	1,179	11.7	1.0	0.2	18.6	175	2,056	68%
Total Stand Volume:		4,778	276,400	177,800	1,770	144	29	2,801	26,418	310,068	

Table 3.1 (West-Central-North): Volumes by species and product.

Graph 3.1 (West-Central-North): Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	4.2		6.3	10.5
12-18"	2.2	1.2	2.4	5.7
>18"	0.4			0.4
Grand Total	6.8	1.2	8.6	16.6

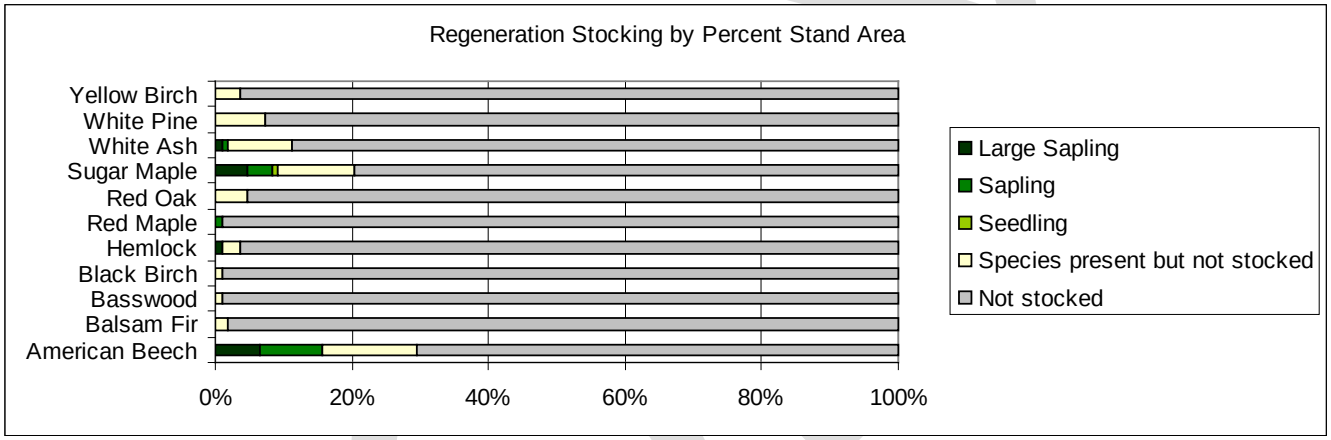
Table 3.1(West-Central-North): Snags per acre by size and decay class.

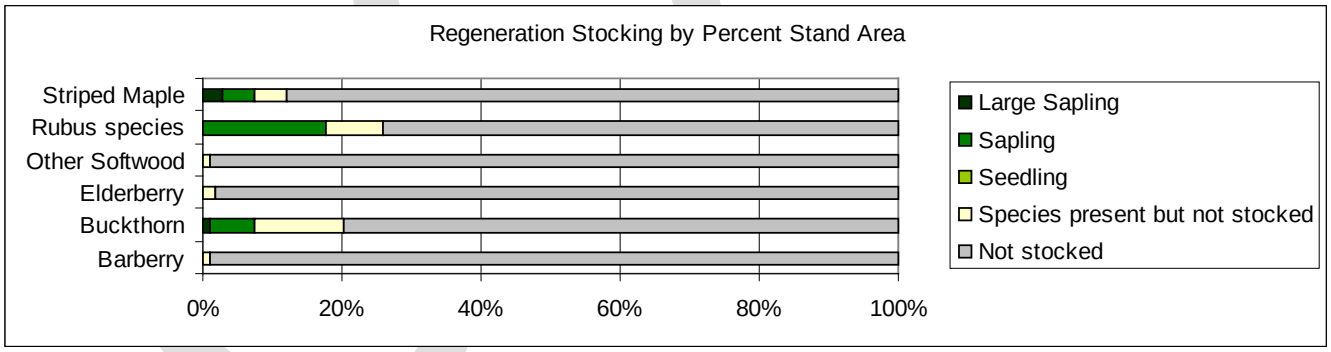
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	10.1	15.9		26.1
12-18"	0.7			0.7
>18"		0.3		0.3
Grand Total	10.8	16.3		27.1

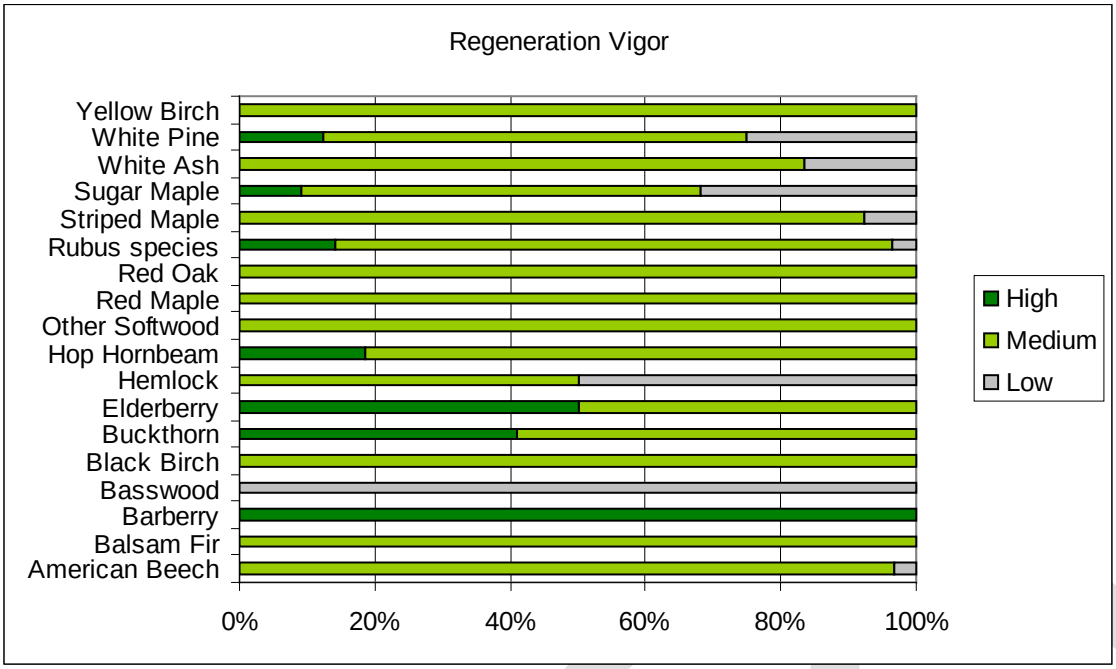
Table 3.2 (West-Central-North): Down logs per acre by size and decay class.

Graph 3.2 and 3.3 (West-Central-North): Tree (3.2) and shrub (3.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

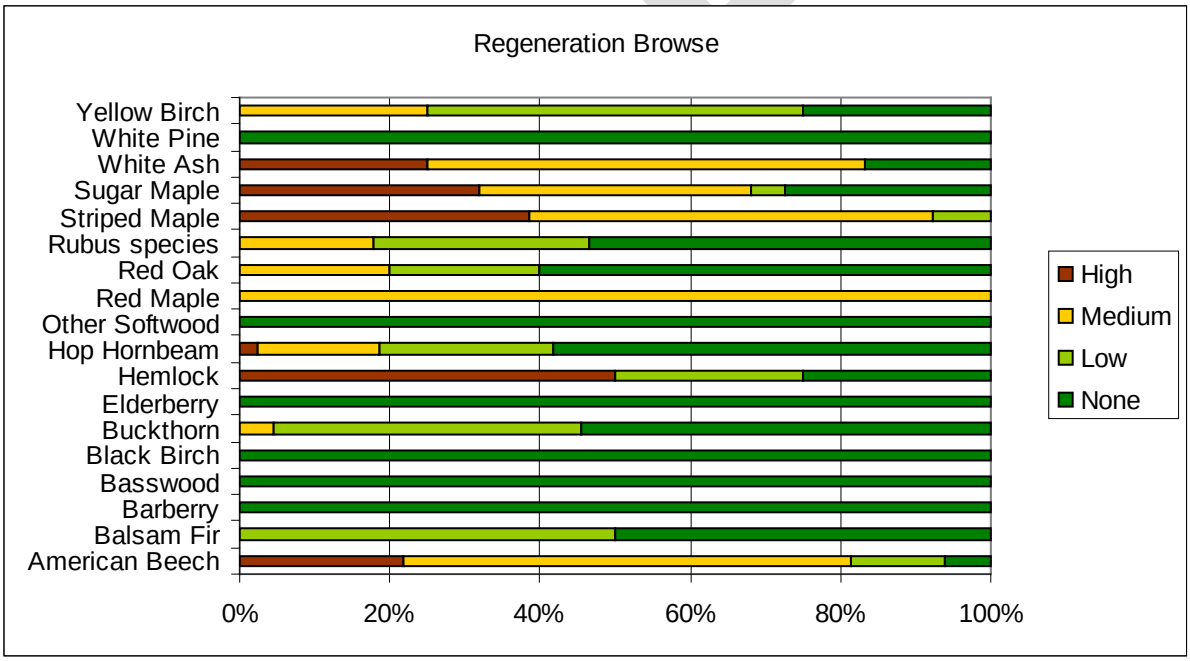




Graph 3.4 (West-Central-North): Vigor of regeneration and shrub species.



Graph 3.5 (West-Central-North): Browse level of regeneration and shrub species.



STAND 3 EAST COMPARTMENT GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-Northern hardwood forest and Northern hardwood forest		
Stand Age:	50-70 years		
Stocking Level:	Fully stocked		
Past Management History:	East compartment treated 1995.		
Insects/Damage/Disease:	Some ash decline; old ice damage; beech bark disease; sugar maple borer; sterile conk; deer browse - typical diseases/pests for diverse stand. No sign of emerald ash borer as 2014.		
Timber Quality:	Variable; good quality oak, ash, and some red maple. Variable birch and pine. Sugar maple variable, generally low to fair quality with some good quality on North facing slope in Central Compartment.		
Invasives:	Level 3, moderate to heavy presence.		
Total BA Per Acre:	111	Trees Per Acre:	706
Total AGS BA Per Acre:	47	% AGS Sawtimber:	61.7%
Quadratic MSD:	5.4	Site Quality:	Moderately steep, shallow, rocky; scattered seeps

Silvicultural Objectives

Management system:	Convert to multiple age
Desired Composition:	Maintain diversity, especially oak where possible.
Crop tree target diameter:	RO 18-22"; RM 16-18"; YB 16-18"; WB 12-14"; SM 18"; WP 20-22"
Wildlife Management:	Increase snags and down logs; maintain legacy trees; continue conversion to multiple-age stand

Access and Terrain:

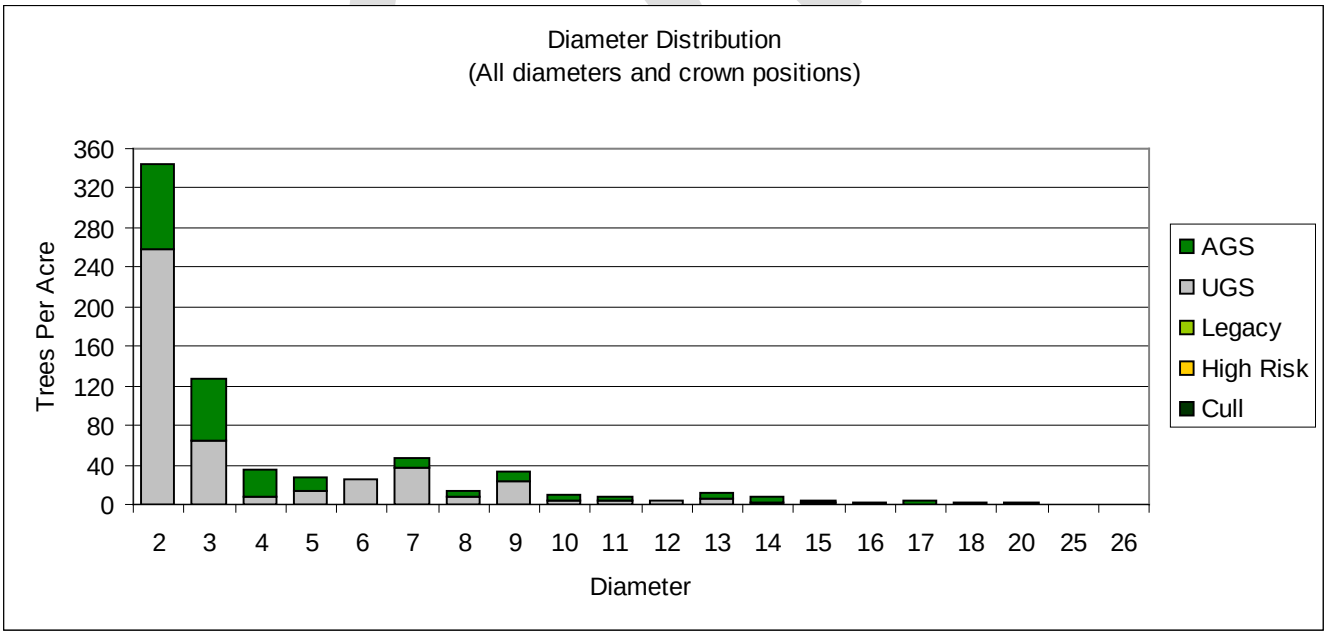
Access to Town Road:	East Compartment good access through newly built truck road (2006) and directly off Old Stage Road.
Landing Sites:	Landing site established off Old Stage Road.
Truck/woods Roads:	Good truck roads to landing site off Old Stage Road. Truck road brushed out in fall 2014.
Terrain:	Variable- gentle to moderate slope. Drainage variable. Operable except during wet ground.

Forest Composition and Volume (East Compartment)

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	9.6%	0	0	0	0.5	0.0	0.0	0.5	0	0	0%
Black Cherry	7.4%	0	0	0	0.3	0.0	0.0	0.3	0	0	0%
Red Maple	12.9%	0	0	204	1.7	0.4	0.0	2.4	0	204	100%
Red Oak	8.3%	0	618	199	1.3	0.4	0.0	3.2	0	726	89%
Sugar Maple	8.8%	0	0	0	0.9	0.2	0.0	1.1	0	0	0%
White Ash	12.8%	0	0	204	2.0	0.0	0.0	2.4	0	204	100%
White Birch	11.5%	0	0	0	2.1	0.4	0.0	2.5	0	0	0%
Total Hardwood Per Acre:	*71.3%*	*0*	*618*	*607*	*8.9*	*1.3*	*0.0*	*12.5*	*0*	*1,134*	93%
Balsam Fir	8.8%	0	62	0	0.5	0.0	0.0	0.7	0	62	100%
Hemlock	5.8%	0	112	0	0.8	0.0	0.0	1.0	0	112	100%
White Pine	14.2%	0	1,157	1,076	4.1	0.0	0.0	8.0	231	933	42%
Total Softwood Per Acre:	*28.7%*	*0*	*1,331*	*1,076*	*5.5*	*0.0*	*0.0*	*9.8*	*231*	*1,107*	46%
Total Volume Per Acre:	100.0%	0	1,949	1,683	14	1	0	22	231	2,241	62%
Total Stand Volume:		0	81,653	70,500	604	54	0	934	9,699	93,889	

Table 3.1 (East Compartment): Volumes by species and product.

Graph 3.1 (East Compartment): Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

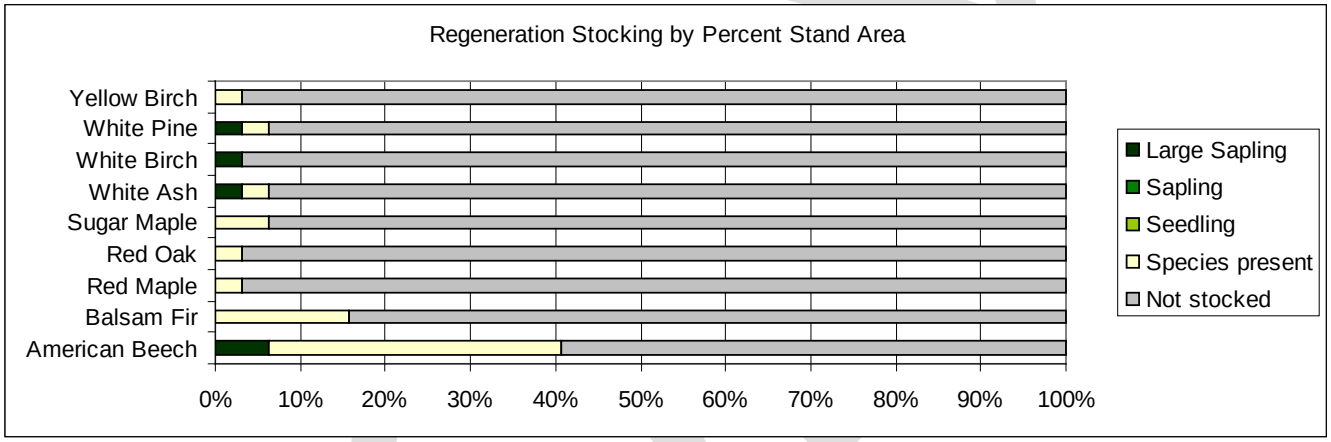
Table 3.1 (East Compartment): Snags per acre by size and decay class.

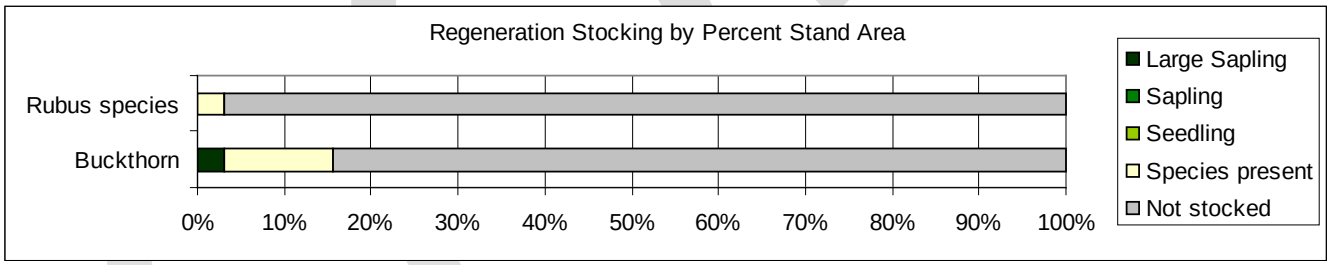
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"		3.8		3.8
12-18"		2.3		2.3
>18"				
Grand Total		6.1		6.1

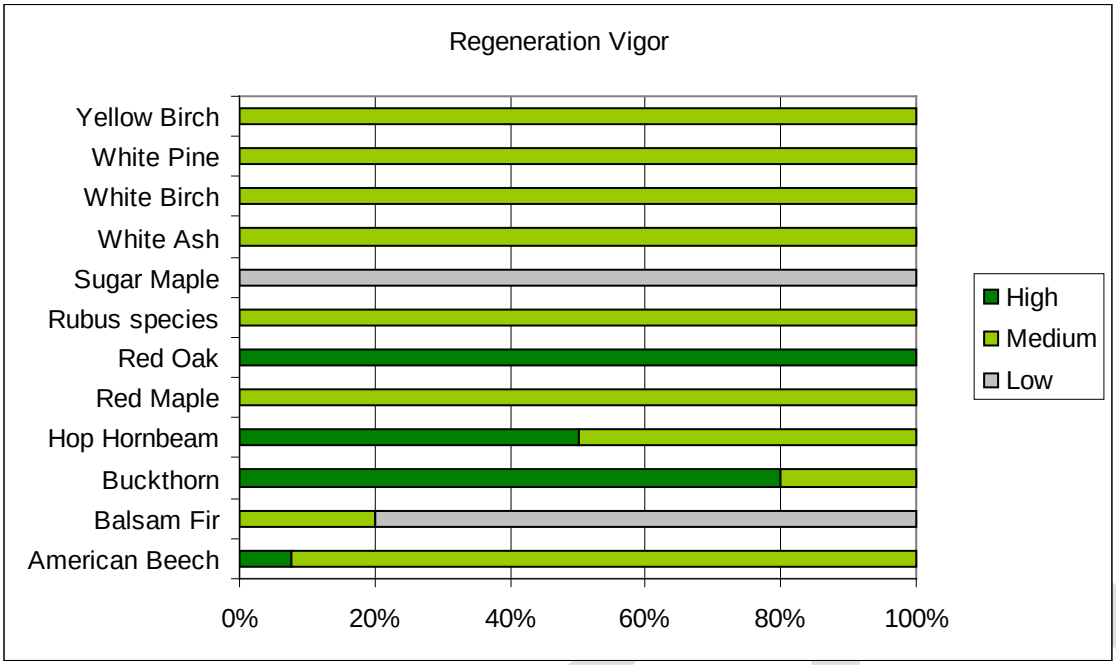
Table 3.2(East Compartment): Down logs per acre by size and decay class.

Graph 3.2 and 3.3 (East Compartment): Tree (3.2) and shrub (3.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

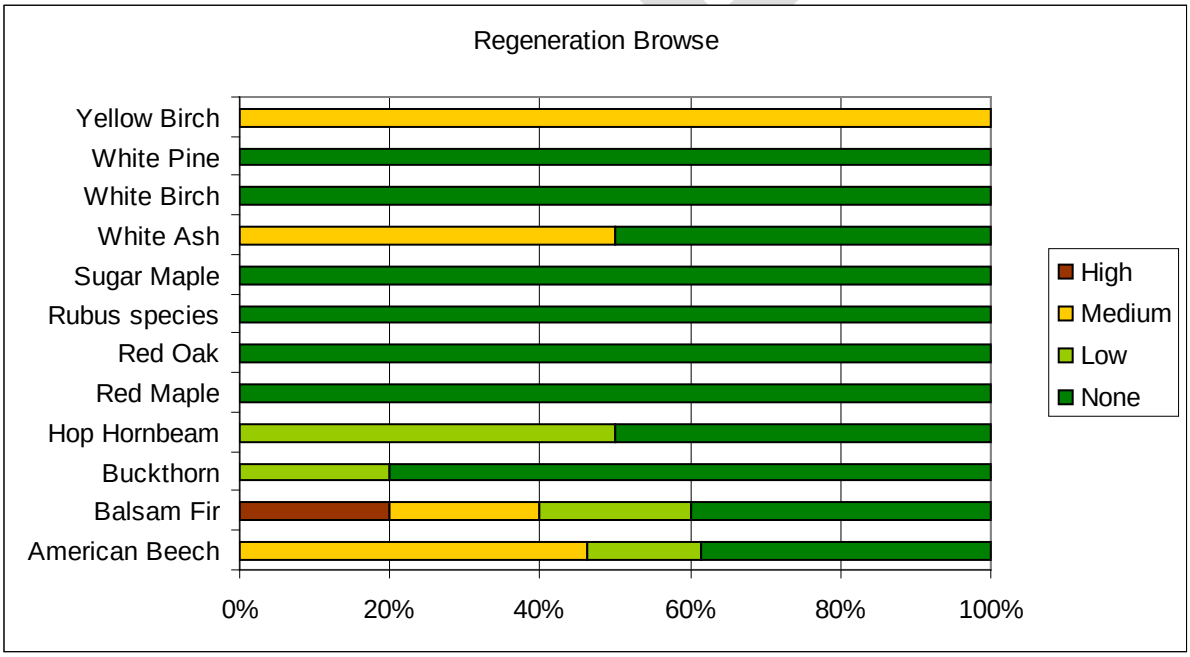




Graph 3.4 (East Compartment): Vigor of regeneration and shrub species.



Graph 3.5 (East Compartment): Browse level of regeneration and shrub species.



Stand 3 is located in several different sections within each compartment. The data was broken down by compartment, combining the West, Central and North compartments, which were harvested between 2003 and 2005. The East Compartment was run separately since it has not been harvested since 1995 and under different ownership. In general Stand 3 includes the hardwood sites between the hemlock and wetland sites and the higher elevation oak, excluding the rich sites (Stand 4 in the Central Compartment and 5 in the East Compartment). This is the most variable and diverse stand on the tract, dominated by a mix of hardwoods including sugar maple, red maple, oak, ash, white and yellow birch, and beech with scattered aspen, cherry and basswood. Scattered pine occur in the overstory, as well as small groups of hemlock especially where the stand borders the hemlock dominated ravines.

Stand 3 is indicative of the tract, with a high percentage of low quality sugar maple in the mix. In general, given the site conditions, quality red maple is a better target species than sugar maple except on the north facing slope of Morgan Hill in the Central Compartment where the site becomes better suited for sugar maple. The oak growing here tends to be good quality, though it represents only a low percentage of the overall stocking. Ash grows quite well here, but unfortunately as discussed above is threatened by the imminent arrival of emerald ash borer. White and yellow birch tend to be average, with the white birch in general becoming overmature and in decline. The scattered pine tend to be either good quality, or residual pine that were marked for removal during the last timber sale but left behind.

On average sawtimber volumes are fairly low for this stand, with only 1,600 feet of quality hardwood and another 500 feet of softwood sawtimber per acre in the West, Central and North Compartment, and significantly less in the East Compartment. Of this, 2/3 is acceptable growing stock. The East Compartment has more pine because of a more recent agricultural history, with 1,00 feet of pine versus only 200 feet per acre in the other compartments.

Basal area is 94 square feet in the West, Central and North Compartment and 111 square feet in the East Compartment.

Invasives are present in this stand at a rating of level 3, moderate to heavy presence. Relative to established regeneration, which is decent for this stand and comprised of a mixture of sugar maple and beech with lower levels of ash, birch, oak and pine, invasives are well established. Buckthorn is present on about 20% of the stand area. Of that 20%, almost half of it has buckthorn well established with a strong, viable population (this involves about 8% of the entire stand area, or 15 acres).

Silviculture 2015: Given emerald ash borer (with ash comprising almost 13% of the trees per acre and 1/7 of the sawtimber and the high level of invasives present in this stand it is recommended to treat this stand targeting large, overstory ash for removal in combination with improvement work. The goal is the lower the ash stocking before the borer becomes established here with the hope that coppicing of healthy ash will be more successful than ash infested with the borer. If desired, trap trees could be established per DRED recommendations for monitoring of EAB arrival. In addition, scarification of areas with heavy invasive presence should be utilized to at a minimum to reduce the seed production and give native species another chance at successful regeneration in these areas. Leave quality seed source trees wherever possible for regeneration. Focus on pine, oak, maple, and birch.

Access to the West, Central and North compartments is via True Road. Please refer to the Access section above for more information.

Portions of Stand 3 are located within the conserved area of the tract (see map). In addition, a portion of the pedestrian ROW falls within Stand 3. Management here, within the 300' corridor, is limited to: "salvage cuts; trail maintenance; logging road use, construction, and maintenance; vista clearing; or removal or diseased or hazardous trees" and in addition, protection of scenic quality viewed from public roads or public trails is required.

Using silvicultural goals to manage towards a multiple-aged stand, reduce basal area to between 60 and 80 square feet through:

- **Pre-salvage White ash:** Target of dominant overstory and sawtimber ash for removal. Establish trap trees per DRED recommendations for monitoring.
- **Single-tree selection:** Select mature, diseased, damaged or otherwise low quality pine for removal. Leave quality pine for growth and seed source.
- **Free thinning**: Elsewhere, removal of low quality, diseased, or low vigor stems to release better quality stocking of various age classes. Harvest aspen in pockets for sprouting.
- **Scarification** in pockets of well established invasives to slow seed production and encourage native species regeneration.

Stand 4 WA-SM-RO-WP 34AB 76.6 acres

Stand 4 includes the riches site on the tract- occupying the central ground with gentle slopes that transition to steeper terrain leading down towards Hibbard Brook. Scattered butternut can be found here, some with impressive crowns and bole diameter. Unfortunately these residual butternut all have the butternut canker and will eventually succumb to the disease.

The moderately steep slopes leading down to Hibbard Brook include some of highest ash concentrations on the tract.

Though relatively steep, the terrain is operable.

On the gentle, level terrain at the toeslope of Morgan Hill where moisture levels are higher invasive exotic shrubs are well established, dominated by buckthorn, but also including barberry, honeysuckle, bamboo and phragmites.

GENERAL ATTRIBUTES

Natural Community Type:	Rich Mesic Forest		
Stand Age:	50-70 years		
Stocking Level:	Adequately stocked		
Past Management History:	Harvested 2005 by the Zambons		
Insects/Damage/Disease:	Scattered white ash decline; white birch decline; beech bark disease; deer browse		
Timber Quality:	Ash sawtimber dominates, good quality		
Invasives:	Level 4- heavy to extreme presence (buckthorn, honeysuckle, Japanese bamboo, barberry)		
Total BA Per Acre:	89	Trees Per Acre:	540
Total AGS BA Per Acre:	48	% AGS Sawtimber:	88.5%
Quadratic MSD:	5.5	Site Quality:	Moderately steep, shallow, rocky; scattered seeps

Silvicultural Objectives

Management system:	Convert to multiple age
Desired Composition:	Encourage hardwood mix, especially birch and quality red maple; maintain pine where possible, maintain some understory ash; encourage butternut seedlings where possible
Crop tree target diameter:	YB 18"; WB 12-14"; RM 16-18"; WP 20-22"
Wildlife Management:	Increase snags and down logs; release YB for songbirds

Access and Terrain:

Access to Town Road:	Central compartment historically accessed off True Road. See Access section above.
Landing Sites:	Two landings centrally located.
Truck/woods Roads:	Good truck roads to landing sites. Need brushwork and mowing. Includes short stretch of Pedestrian ROW with conservation easement restrictions. Road in requires dry conditions for use.
Terrain:	Gentle to moderate slope; need frozen winter conditions

Stand 4 includes the rich sites at the toe slope of Morgan Hill where the terrain levels out before dropping again to Hibbard Brook. This site, with a mix of hardwoods dominated by ash, but also including scattered butternut and elm, as well as a mix of sugar maple, white and yellow birch, and red maple includes the best growing conditions on the tract. Moisture levels are high and soils are deep.

The stand was treated in 2005 by the Zambon Brothers. Silviculture was a mix of modified overstory removal and crop tree release. A fair number of white pine marked to be removed were left, and should be targeted again during next harvest.

Ash makes up the highest percent of stocking, and dominates sawlog volumes. Sugar maple is also a common tree here, but there is not much for sawtimber. The inventory data does not show any sugar maple sawtimber, though it is known to be there, but not in high amounts.

Stand 4 has the same management concerns as Stand 3 regarding invasive species and emerald ash borer, except here the invasives are worse, and the ash volumes higher. Regeneration includes fairly well established sugar maple and pockets of white pine, with ash mixed in. Striped maple and hophornbeam are also here. Buckthorn is the leading invasives specie, and covers about the same percentage of ground as in Stand 3, with the exception that here it is more advanced, often of seed producing maturity and occurring in denser pockets.

Stand 4 is located entirely within the conserved area of the tract which requires the protection of the scenic quality viewed from public roads and public trails. In addition a, a short section of Pedestrian ROW located within Stand 4 (see map). Restrictions limit forest activities 150' on either side of trail “to salvage, trail maintenance, logging road use, construction, and maintenance, vista clearing; or removal of diseased or hazardous trees".

Treatment recommendations for Stand 4 will be similar to Stand 3.

Silviculture 2015: Given emerald ash borer (with ash comprising almost 37% of the trees per acre and the vast

majority of the sawtimber and the high level of invasives present in this stand it is recommended to treat this stand targeting large, overstory ash for removal in combination with improvement work. The goal is the lower the ash stocking before the borer becomes established here with the hope that coppicing of healthy ash will be more successful than ash infested with the borer. Establish trap trees if desired to monitor for arrival of EAB. In addition, scarification of areas with heavy invasive presence should be utilized to at a minimum to reduce the seed production and give native species another chance at successful regeneration in these areas.

Access to the West, Central and North compartments is problematic and will have to be resolved if a timber sale is to be completed in these stands. Please refer to the Access section above for more information.

Heed conservation easement restrictions in 300' wide strip along Pedestrian ROW and scenic protection.

Using silviculture that manages towards a multiple age structure, reduce basal area to between 60 and 80 square feet through:

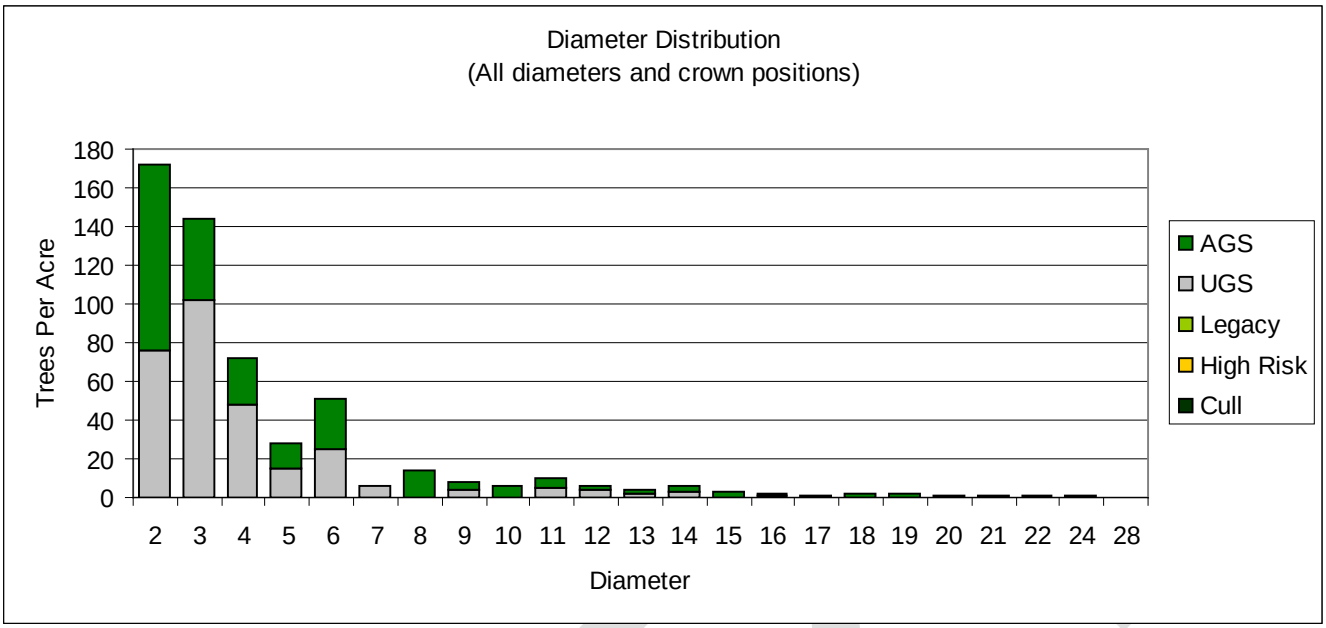
- **Pre-salvage White ash:** Target of dominant overstory and sawtimber ash for removal. Establish trap trees per DRED recommendations.
- **Improvement thinning**: Elsewhere, removal of low quality, diseased, or low vigor stems to release better quality stocking in multiple age classes. Target previously marked white pine for removal.
- **Scarification** in pockets of well established invasives to slow seed production and encourage native species regeneration.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Elm	6.8%	0	0	0	0.2	0.0	0.0	0.2	0	0	0%
Black Cherry	1.7%	0	0	0	0.4	0.0	0.0	0.4	0	0	0%
Butternut	0.5%	0	0	75	0.2	0.0	0.0	0.4	0	0	0%
Red Maple	2.7%	0	0	136	0.6	0.0	0.0	0.8	0	136	100%
Sugar Maple	28.3%	0	0	113	2.0	0.9	0.0	3.1	0	113	100%
White Ash	33.7%	66	1,561	453	2.5	0.4	0.0	6.5	0	2,021	97%
White Birch	17.0%	0	0	77	1.3	0.5	0.0	2.0	0	0	0%
Yellow Birch	2.5%	0	0	0	0.2	0.1	0.0	0.4	0	0	0%
Total Hardwood Per Acre:	*93.2%*	*66*	*1,561*	*854*	*7.4*	*1.9*	*0.0*	*13.8*	*0*	*2,269*	91%
Hemlock	3.8%	0	0	0	1.1	0.0	0.0	1.1	0	0	0%
White Pine	3.0%	0	139	438	0.7	0.0	0.0	1.7	0	436	76%
Total Softwood Per Acre:	*6.8%*	*0*	*139*	*438*	*1.8*	*0.0*	*0.0*	*2.9*	*0*	*436*	76%
Total Volume Per Acre:	100.0%	66	1,700	1,292	9	2	0	17	0	2,705	88%
Total Stand Volume:		5,044	130,230	98,944	706	149	0	1,281	0	207,206	

Table 4.1: Volumes by species and product.

Graph 4.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	4.8		18.5	23.3
12-18"	0.9		1.4	2.3
>18"				
Grand Total	5.7		19.9	25.6

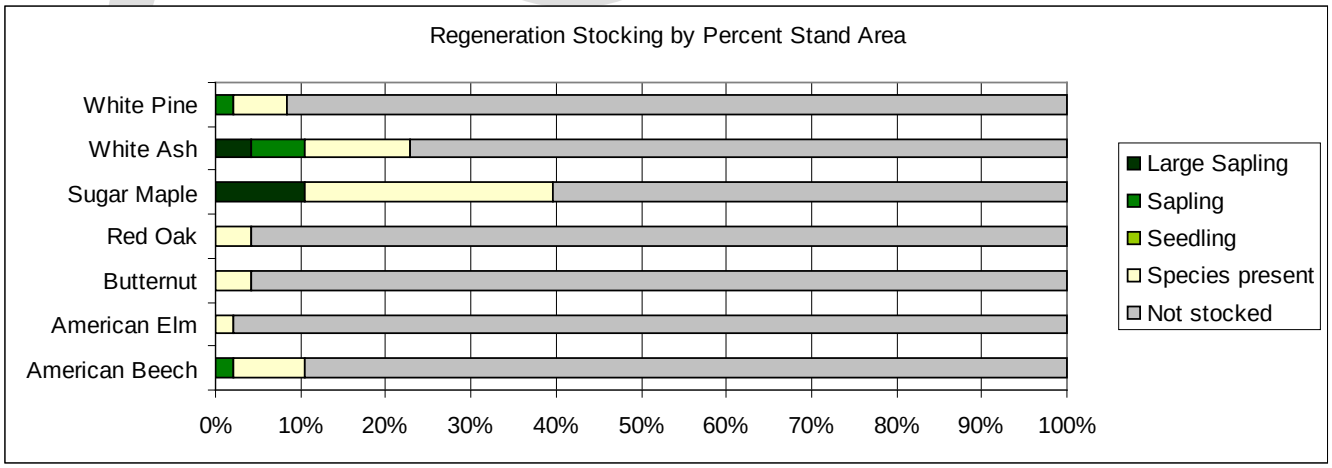
Table 4.1: Snags per acre by size and decay class.

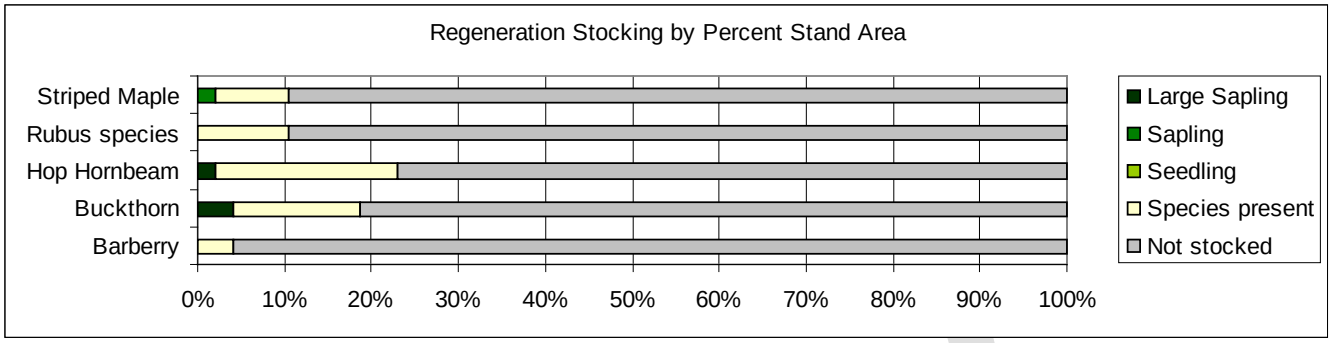
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"	1.4			1.4
>18"				
Grand Total	1.4			1.4

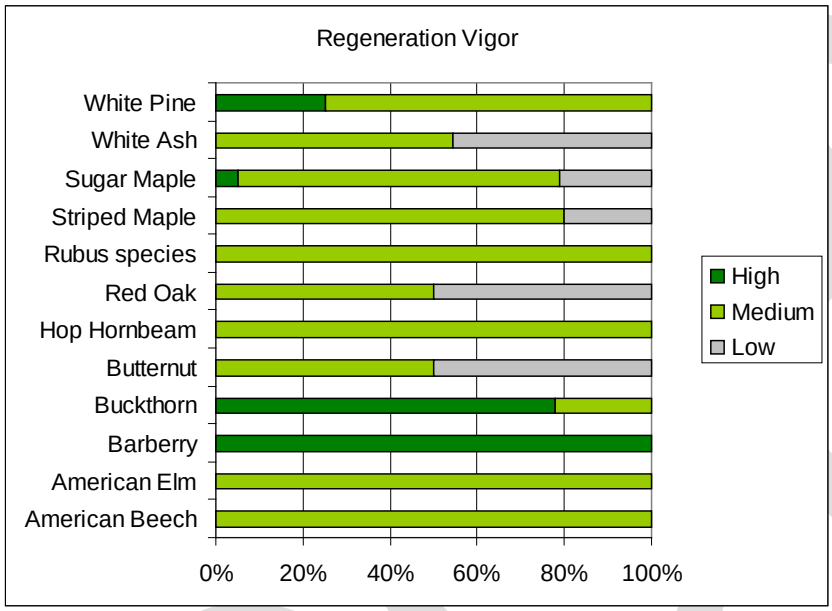
Table 4.2: Down logs per acre by size and decay class.

Graph 4.2 and 4.3: Tree (4.2) and shrub (4.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

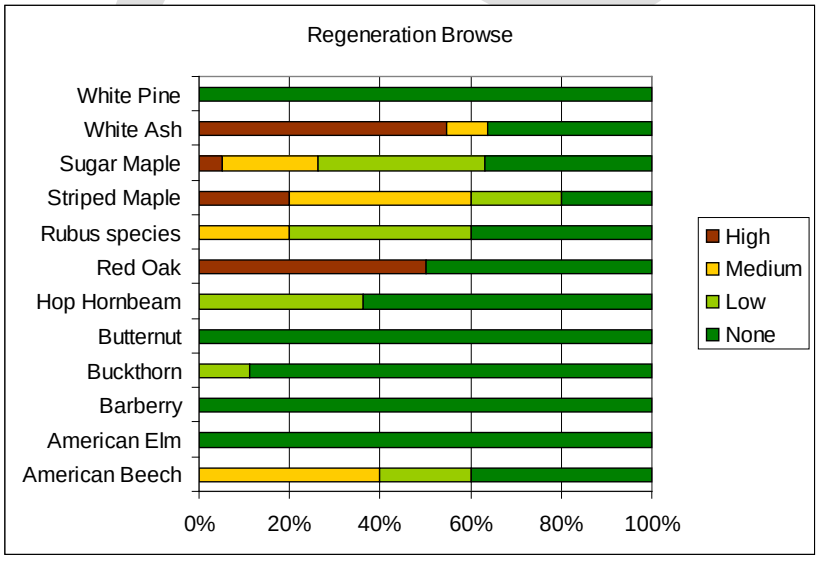




Graph 4.4: Vigor of regeneration and shrub species.



Graph 4.5: Browse level of regeneration and shrub species.



Stand 5 SM-WA-RO 34A 24.7 acres

Stand 5 includes the richest site in the East compartment. It includes the slopes just west of the wetland system that occupies the center of this compartment.

Ash and sugar maple are common overstory trees here.

Maidenhair fern and hepatica, both rich site indicator plants, are readily found throughout Stand 5.

Damage from sugar maple borer is common in Stand 5, as well as damage to oak called spider heart.

GENERAL ATTRIBUTES

Natural Community Type:	Rich Mesic Forest		
Stand Age:	50-70 years		
Stocking Level:	Overstocked		
Past Management History:	Stand harvested in 1995 by Fred Weld under prior landowner		
Insects/Damage/Disease:	Some ash decline; beech bark disease; sugar maple borer; spider heart in oak; imminent threat of Emerald ash borer; deer browse		
Timber Quality:	Good to excellent quality red oak; lesser amounts of ash and white birch; fair to poor quality sugar maple		
Invasives:	Level 3- Moderate to heavy		
Total BA Per Acre:	120	Trees Per Acre:	468
Total AGS BA Per Acre:	62	% AGS Sawtimber:	65.9
Quadratic MSD:	6.9	Site Quality:	Gentle to moderate slope; rich site; some seepy ground; some exposed ledge

Silvicultural Objectives

Management system:	Convert to multiple age
Desired Composition:	Maintain oak and mix of hardwoods; maintain some understory ash
Crop tree target diameter:	RO 18-24"; WB 12-14"; SM 16-20"
Wildlife Management:	Increase snags and down logs; continue conversion to multiple-age stand

Access and Terrain:

Access to Town Road:	Access over new truck road to town roads
Landing Sites:	Landing established off Old Stage Road
Truck/woods Roads:	New truck road built in 2006.
Terrain:	Moderate slope; some seepy ground; some exposed ledge. Need frozen winter conditions or dry summer.

Stand 5 includes the rich site in the East Compartment that occupies the east facing slope of Morgan Hill and the drainage that feeds the tributary to Great Brook. It is moderately steep, with some seepy ground and areas of exposed ledge. A mix of hardwoods, dominated by red oak, white ash, and sugar maple with some white birch, basswood, beech and hophornbeam with scattered hemlock occupies the site. Oak dominates the timber volume, with 2.3 mbf per acre. Other hardwood sawtimber is minimal. Regeneration is fairly sparse here, dominated by hophornbeam, with some pine and beech. Invasives are at a level 3, moderate to heavy, and include both buckthorn and barberry. Barberry is well established in dense pockets here. Though with much less ash volume, Stand 5 has the same management concerns as Stand 3 regarding invasive species and emerald ash borer.

Stand 5 is located within the conservation easement area.

Treatment recommendations for Stand 5 will be similar to Stand 3, except not as much ash exists to be removed.

Silviculture: 2016: Given emerald ash borer (with ash comprising almost 22% of the trees per acre and the vast majority of the sawtimber and the high level of invasives present in this stand it is recommended to treat this stand targeting large, overstory ash for removal in combination with improvement work. The goal is the lower the ash stocking before the borer becomes established here with the hope that coppicing of healthy ash will be more successful than ash infested with the borer. If desired, establish trap trees per DRED recommendations to monitor for arrival of EAB. In addition, scarification of areas with heavy invasive presence should be utilized to at a minimum to reduce the seed production and give native species another chance at successful regeneration in these areas.

Access to the West, Central and North compartments is problematic and will have to be resolved if a timber sale is to be completed in these stands. Please refer to the Access section above for more information.

Reduce basal area no lower than 70 square feet through:

- **Pre-salvage White ash:** Target of dominant overstory and sawtimber ash for removal.
- **Free thinning**: Elsewhere, removal of low quality, diseased, or low vigor stems to release better quality stocking.
- **Scarification** in pockets of well established invasives to slow seed production and encourage native species

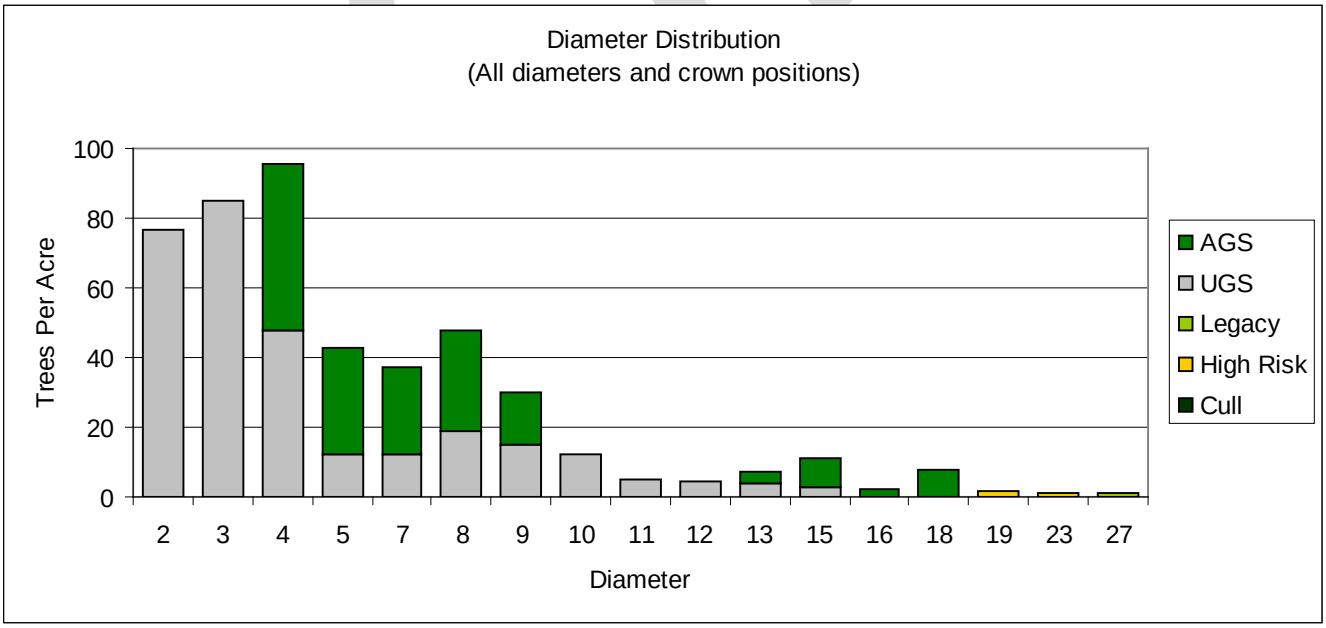
regeneration.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	4.5%	0	0	0	0.5	0.0	0.0	0.5	0	0	0%
Basswood	5.7%	0	0	0	0.8	0.0	0.0	0.8	0	0	0%
Hop Hornbeam	17.4%	0	0	0	2.4	0.0	0.0	2.4	0	0	0%
Red Oak	24.3%	0	2,389	915	4.2	1.0	0.0	11.1	598	2,489	75%
Sugar Maple	20.8%	0	0	138	2.5	0.0	0.9	3.7	0	0	0%
White Ash	22.2%	0	150	227	2.4	1.0	0.0	4.1	0	265	70%
White Birch	2.1%	0	150	211	0.3	0.0	0.0	1.0	0	0	0%
Total Hardwood Per Acre:	*97.0%*	*0*	*2,688*	*1,491*	*13.1*	*2.0*	*0.9*	*23.5*	*598*	*2,754*	66%
Hemlock	3.0%	0	0	0	0.3	0.0	0.0	0.4	0	0	0%
Total Softwood Per Acre:	*3.0%*	*0*	*0*	*0*	*0.3*	*0.0*	*0.0*	*0.4*	*0*	*0*	0%
Total Volume Per Acre:	100.0%	0	2,688	1,491	13	2	1	24	598	2,754	66%
Total Stand Volume:		0	66,397	36,839	331	49	21	590	14,765	68,019	

Table 5.1: Volumes by species and product.

Graph 5.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"			6.4	6.4
>18"				
Grand Total			6.4	6.4

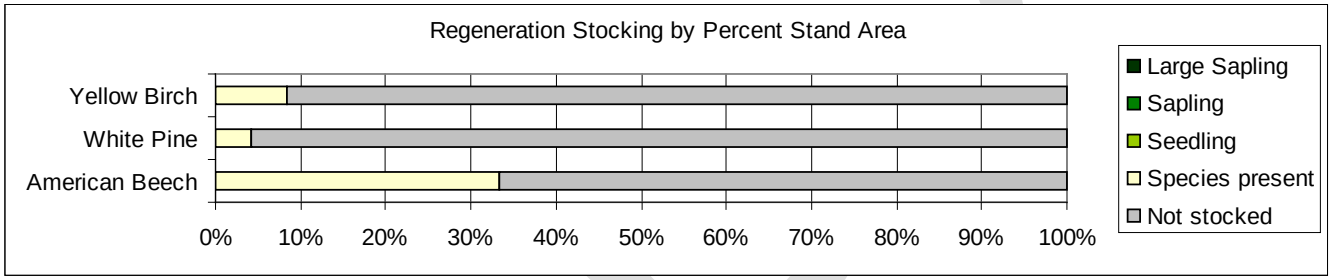
Table 5.1: Snags per acre by size and decay class.

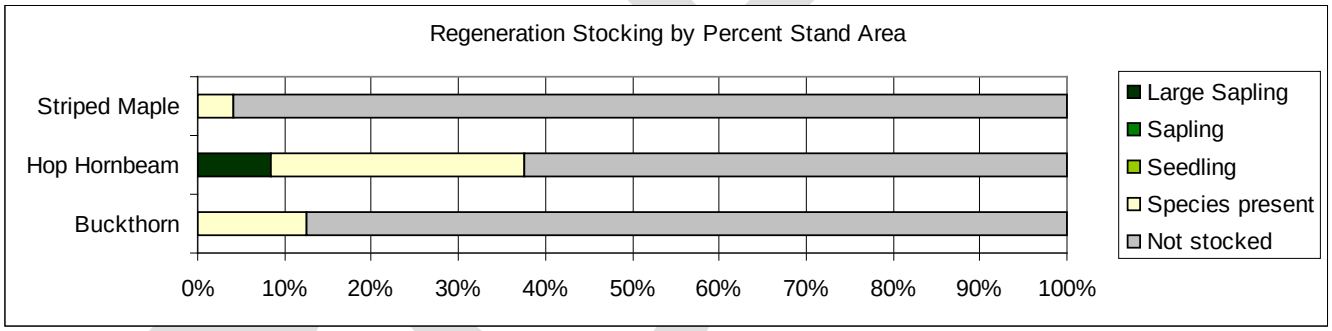
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

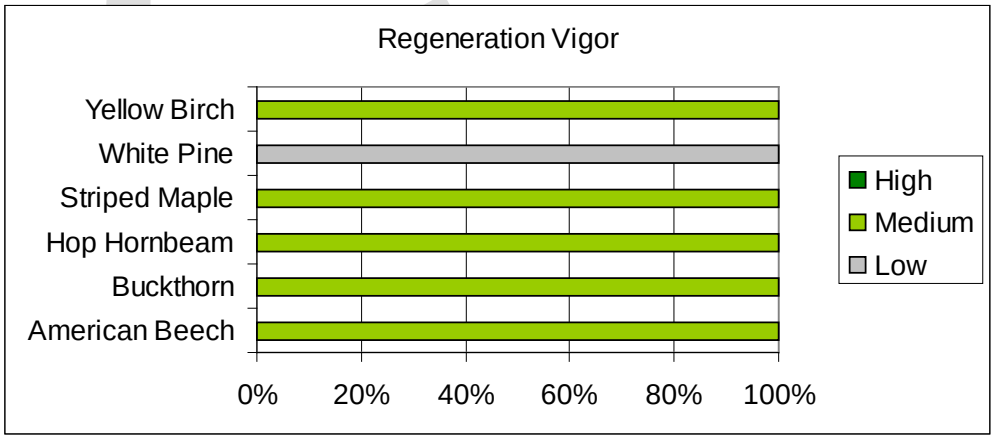
Table 5.2: Down logs per acre by size and decay class.

Graph 5.2 and 5.3: Tree (5.2) and shrub (5.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

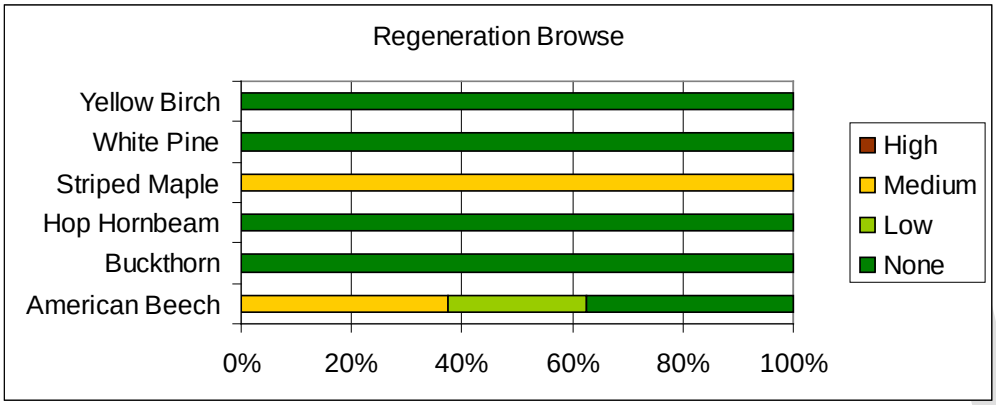




Graph 5.4: Vigor of regeneration and shrub species.



Graph 5.5: Browse level of regeneration and shrub species.



Stand 6 SM-WA-RO-WP 23B 52.9 acres

Stand 6 occupies the gentle ground along the western boundary. The level terrain here has seepy pockets, with some grassy ground cover in areas.

There is a decent stocking of hardwood poles here.

The species mix in Stand 6 is heavy to sugar maple and white ash, with red maple, beech, white and yellow birch, and scattered red oak with pine and pockets of hemlock.

The Stand was treated in 2004 with a combination of thinning from above and crop tree release.

Where stand 6 borders Stand 7 more hemlock and red oak come into the mix, and the terrain starts to drop down to Hibbard Brook.

GENERAL ATTRIBUTES

Natural Community Type:	Semi-rich mesic sugar maple forest		
Stand Age:	50-70 years		
Stocking Level:	Fully stocked		
Past Management History:	Stand was harvested in 2004 by the Zambons, thinning from above and crop tree release		
Insects/Damage/Disease:	Scattered WPBR and red rot in pine; spider heart in oak; beech bark disease; ash yellows/decline; deer browse		
Timber Quality:	Some scattered red oak; some scattered good quality pine; sugar maple fair; white ash good to fair		
Invasives:	Level 2- low to moderate		
Total BA Per Acre:	113	Trees Per Acre:	580
Total AGS BA Per Acre:	53	% AGS Sawtimber:	80.8
Quadratic MSD:	6.0	Site Quality:	Gentle slopes; more poorly drained

Silvicultural Objectives

Management system:	Convert to multiple age
Desired Composition:	Maintain diversity, focus on red oak, yellow birch, pine and sugar maple
Crop tree target diameter:	SM 18"; RO 18-22"; YB 18"
Wildlife Management:	Increase snags and down logs; continue conversion to multiple-age stand

Access and Terrain:

Access to Town Road:	West compartment historically accessed off True Road. See Access section above.
Landing Sites:	First landing located within Stand 6
Truck/woods Roads:	Good truck roads to landing sites. Need brushwork and mowing. Includes portion of Pedestrian ROW with conservation easement restrictions. Road in dry conditions for use.
Terrain:	Gentle to moderate slope; more poorly drained; need frozen winter conditions.

Stand 6 includes gently sloping section of terrain along the western property boundary. The site here is moderately rich and more poorly drained than surrounding areas, but including some drier, warmer areas supporting good growth of pine and oak. On the wetter sites, the stand in general has younger overstory trees, dominated by a mix of ash, red and sugar maple and includes rich site indicators such as maidenhair fern.

This stand was mechanically treated in 2004 by the Zambon Brothers. Silviculture was a mix of crop tree release with partial overstory removal that targeted removal of low grade and mature white birch, pine and red maple.

The residual stand has a decent mix of sugar maple, white ash and white pine regeneration, with a fairly good establishment of pole size trees. Overstory trees vary in health and quality, with scattered presence of white pine blister rust, red rot, some ash decline and beech bark disease. The patchy structure should result in excellent growth on regeneration and understory stocking.

Buckthorn is scattered throughout the stand, but not a severely as other areas on the tract.

Silviculture 2015: Given emerald ash borer (with ash comprising almost 20% of the trees per acre and 13% of the sawtimber) it is recommended to treat this stand targeting large, overstory and sawtimber ash for removal in combination with continued improvement work. The goal is lower the ash stocking before the borer becomes established here with the hope that coppicing of healthy ash will be more successful than ash infested with the borer. In addition, scarification of areas with pockets of buckthorn should be utilized to at a minimum to reduce the seed production and give native species another chance at successful regeneration in these areas. Leave quality seed source trees wherever possible for regeneration. Focus on pine, oak, maple, and birch.

Access to the West compartments is problematic and will have to be resolved if a timber sale is to be completed in here. Please refer to the Access section above for more information.

Stand 6 is located entirely within the conserved area of the tract which requires the protection of the scenic quality viewed from public roads and public trails. In addition a portion of the Pedestrian ROW is located within Stand 6 (see map). Restrictions limit forest activities 150' on either side of trail “to salvage, trail maintenance, logging road use, construction, and maintenance, vista clearing; or removal of diseased or hazardous trees".

Reduce basal area to between 60 and 80 square feet through:

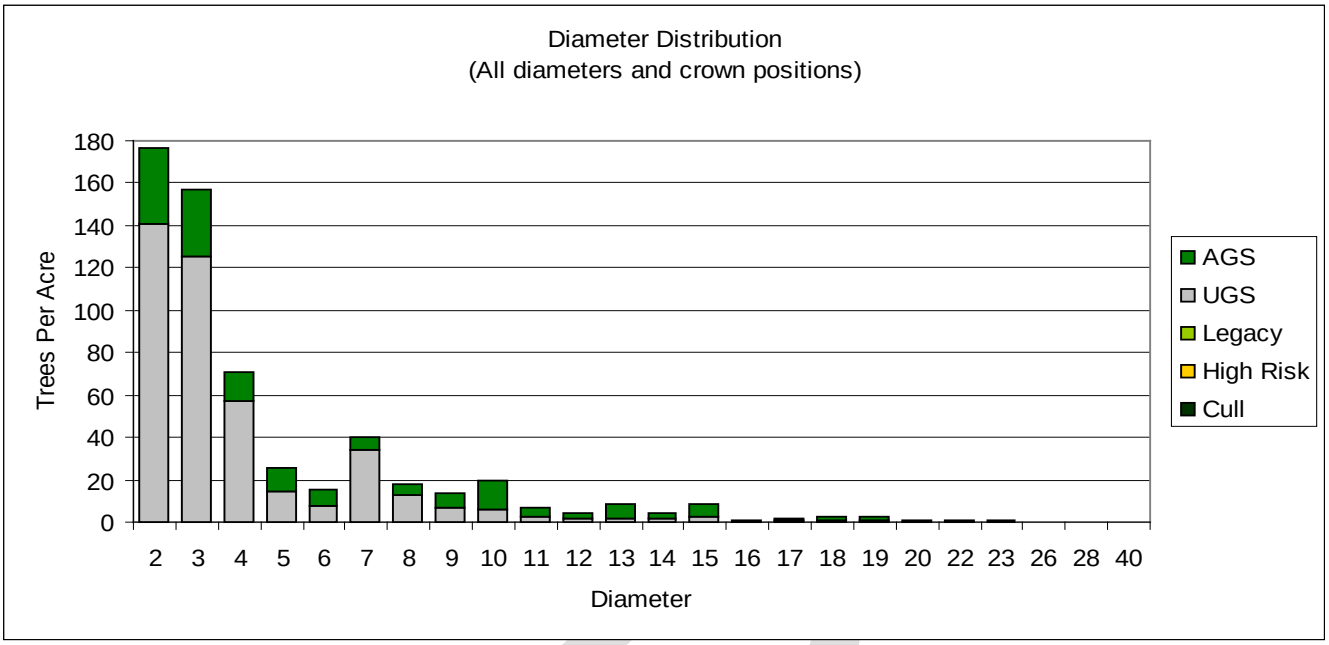
- **Pre-salvage White ash:** Target of dominant overstory and sawtimber ash for removal. Create trap trees per DRED recommendations.
- **Single-tree selection:** Select mature, diseased, damaged or otherwise low quality pine for removal. Leave quality pine for growth and seed source.
- **Free thinning**: Elsewhere, removal of low quality, diseased, or low vigor stems to release better quality stocking. Focus on improved growth on good hardwood pole stocking.
- **Scarification** in pockets of well established invasives to slow seed production and encourage native species regeneration.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	12.8%	0	0	0	0.6	0.0	0.0	0.6	0	0	0%
Basswood	3.8%	0	0	0	0.3	0.0	0.0	0.3	0	0	0%
Black Cherry	1.1%	0	0	0	0.3	0.0	0.0	0.3	0	0	0%
Red Maple	11.7%	0	262	147	2.1	0.0	0.0	2.8	0	357	87%
Red Oak	8.3%	77	1,091	288	1.1	0.3	0.5	4.6	0	1,456	100%
Sugar Maple	21.2%	0	167	226	3.5	0.7	0.0	5.0	0	127	32%
White Ash	20.0%	0	319	120	2.3	0.3	0.0	3.4	0	229	52%
White Birch	4.1%	0	245	89	0.4	0.2	0.0	1.3	0	333	100%
Yellow Birch	4.8%	0	71	55	0.5	0.0	0.0	0.7	0	125	100%
Total Hardwood Per Acre:	*87.7%*	*77*	*2,155*	*924*	*11.2*	*1.6*	*0.5*	*19.1*	*0*	*2,628*	83%
Hemlock	10.3%	0	69	0	1.2	0.0	0.5	1.8	0	69	100%
White Pine	2.0%	0	148	214	1.5	0.0	0.0	2.2	0	200	55%
Total Softwood Per Acre:	*12.3%*	*0*	*217*	*214*	*2.7*	*0.0*	*0.5*	*4.0*	*0*	*269*	62%
Total Volume Per Acre:	100.0%	77	2,372	1,138	14	2	1	23	0	2,896	81%
Total Stand Volume:		4,191	129,495	62,147	760	87	55	1,260	0	158,144	

Table 6.1: Volumes by species and product.

Graph 6.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"				
12-18"	2.0		2.9	4.9
>18"			0.7	0.7
Grand Total	2.0		3.6	5.6

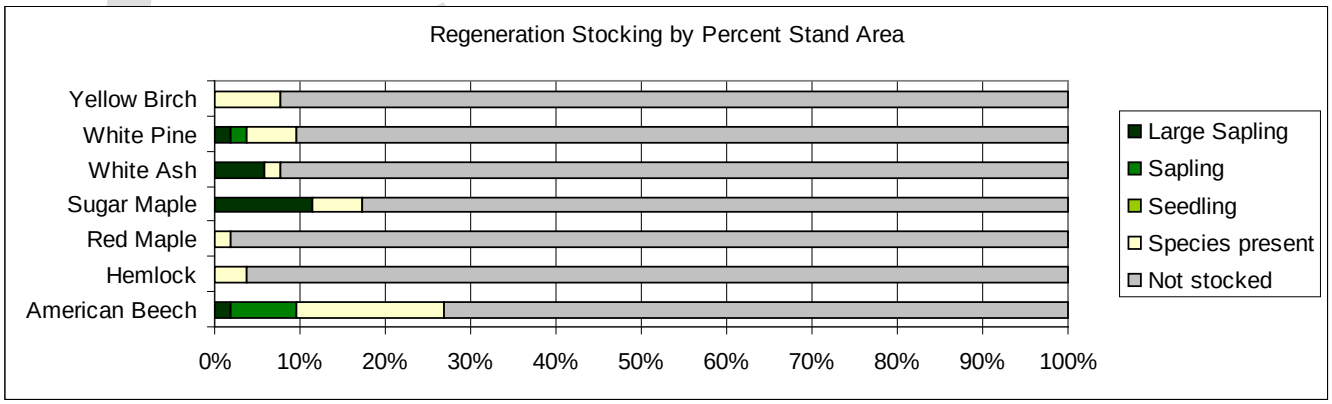
Table 6.1: Snags per acre by size and decay class.

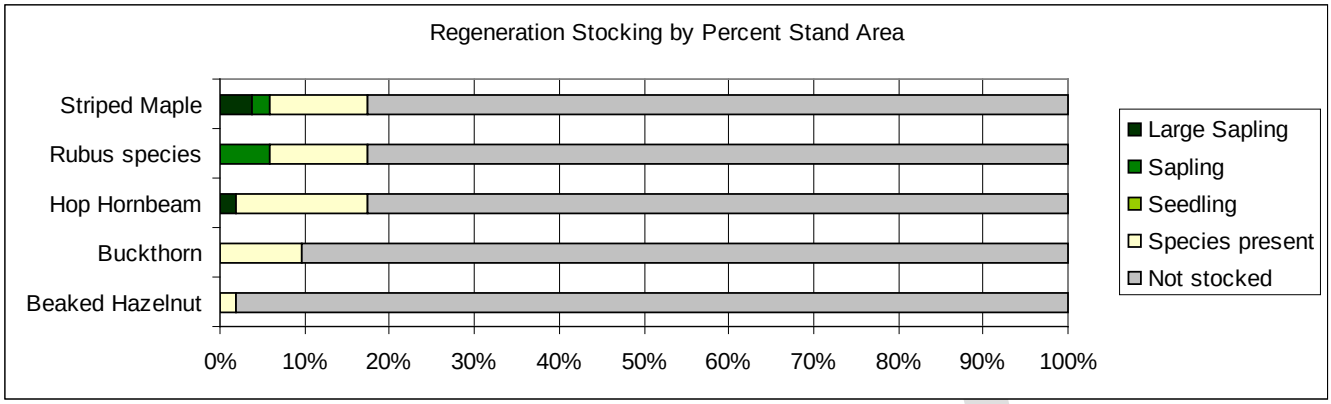
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	2.8		2.8	5.6
12-18"				
>18"				
Grand Total	2.8		2.8	5.6

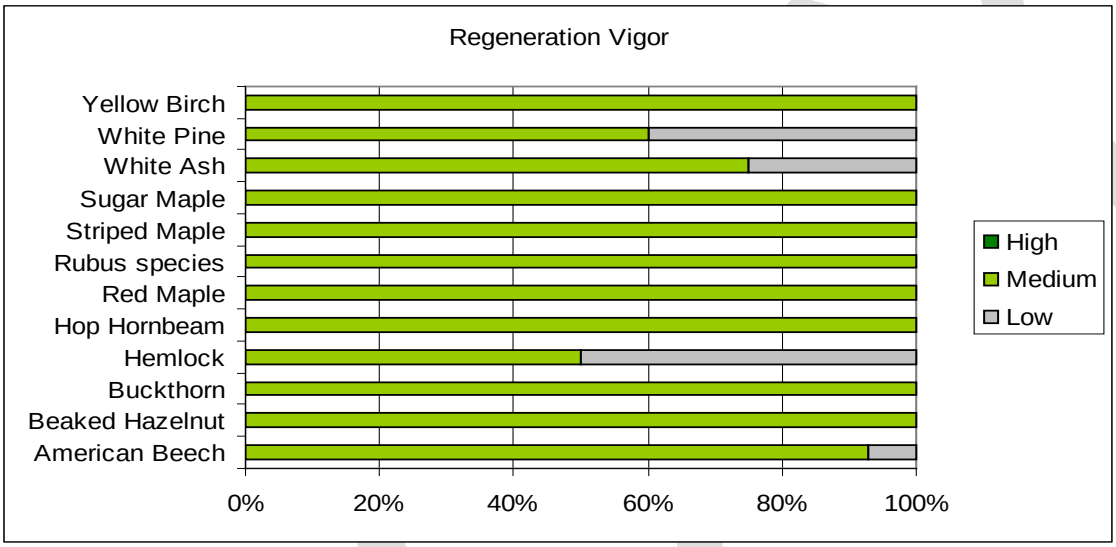
Table 6.2: Down logs per acre by size and decay class.

Graph 6.2 and 6.3: Tree (6.2) and shrub (6.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

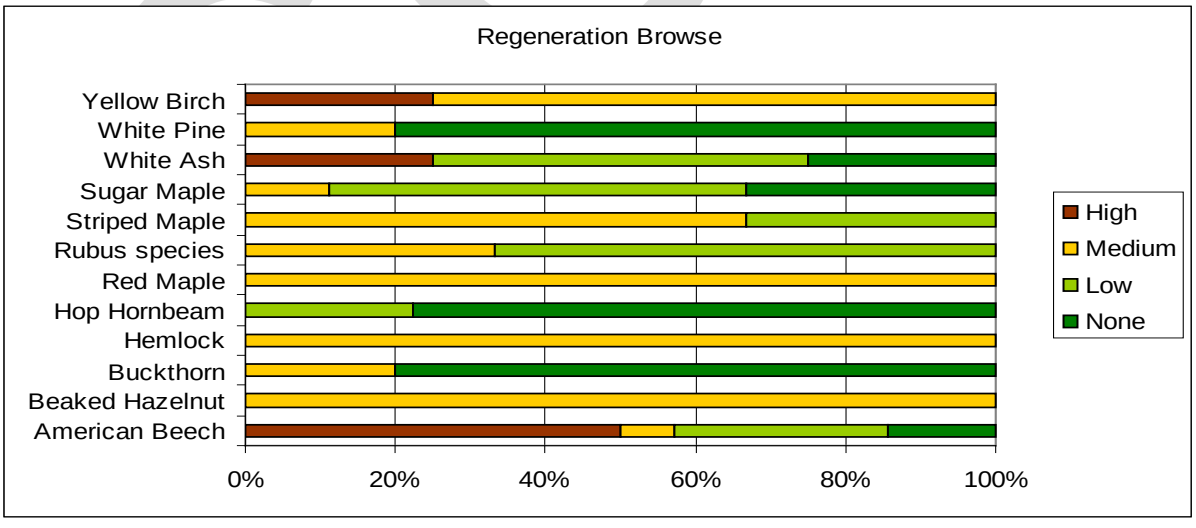




Graph 6.4: Vigor of regeneration and shrub species.



Graph 6.5: Browse level of regeneration and shrub species.



Stand 7 HE-RM-YB-WP 34A 151.2 acres

Stand 7 includes the hemlock associated with the two major drainage systems located on the tract- Hibbard Brook in the North compartment and Great Brook in the East Compartment.

It provides an important travel corridor for wildlife along these two drainage systems.

Though not a rich site, it benefits from some enriched ground, with scattered sugar maple and maidenhair fern.

Pockets of hemlock regeneration can be found in openings, but in most places the understory regeneration is sparse.

As with the majority of the tract, invasive shrubs, most commonly buckthorn, are well established here, especially near the wetland systems.

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock forest and Hemlock- beech - northern hardwood forest		
Stand Age:	60-70 years		
Stocking Level:	Over stocked		
Past Management History:	North Compartment harvested 2003 by Bruce Streeter, East Compartment harvested 1995 by Fred Weld under prior landowner		
Insects/Damage/Disease:	No serious diseases; scattered residual stand damage; beech bark disease; deer browse		
Timber Quality:	Variable; some nice scattered pine, some pockets of hemlock good quality		
Invasives:	Level 3 - moderate to heavy presence		
Total BA Per Acre:	153	Trees Per Acre:	377
Total AGS BA Per Acre:	46	% AGS Sawtimber:	73.1%
Quadratic MSD:	8.6	Site Quality:	Moderately steep to gentle, shallow, ravine

Silvicultural Objectives

Management system:	Multiple age
Desired Composition:	Maintain mix of hemlock and pine
Crop tree target diameter:	HE 18"; WP 22-24"
Wildlife Management:	Maintain travel corridor along stream (major deer trail)

Access and Terrain:

Access to Town Road:	North compartment historically accessed off True Road. East compartment accessed off Old Stage and Route 120. See Access section above.
Landing Sites:	North compartment can use either landing on main road; East compartment can use landing off Old Stage Road
Truck/woods Roads:	Good truck roads to landing sites. North compartment need brushwork and mowing, and includes portion of Pedestrian ROW with conservation easement restrictions. East compartment road mowed during fall of 2014. Road in western/central compartment requires dry conditions for use.
Terrain:	Variable; ravine- moderate with some steep sections. Dry summer conditions.

Stand 7 includes the lower elevation, hemlock dominated sites associated with the main drainage systems on the tract, the Hibbard Brook drainage in the North compartment and the Great Brook drainage in the East compartment. It is a classic hemlock-hardwood site, with scattered pine. Regeneration is largely restricted to scattered hemlock and beech, though it can become dense where larger openings have been made. The terrain is variable, depending on the steepness of slope, and the soils tend to be shallow.

The East compartment was harvested in 1995 when the tract was held by the prior landowner and the North compartment was treated in 2003. A fair amount of low quality wood, mostly hemlock, red maple and white birch, that was marked to be removed was left. Silviculture was largely small group selection and improvement work. A fair amount of marked trees, mainly low quality hemlock, were left standing during the 2003 entry. This hemlock stand provides important wildlife habitat as a corridor along wetlands and stream systems within the tract. Invasives are well established here, and pose a significant threat to the long-term sustainability of the tract.

A portion of Stand 7, in the North compartment, is within the conserved area of the tract which requires the protection of the scenic quality viewed from public roads and public trails. In addition a section of Pedestrian ROW is located within Stand 7 (see map). Restrictions limit forest activities 150' on either side of trail “to salvage, trail maintenance, logging road use, construction, and maintenance, vista clearing; or removal of diseased or hazardous trees".

Silviculture, 2016: The west compartment in general can be left to grow, unless harvesting in adjacent stands. At that point, select removal of ash and marked trees previously left could be removed on edges of stand. The section of Stand 7 in the East compartment is ready for additional treatment. Reduce basal area by approximately 25% to about 110 square feet.

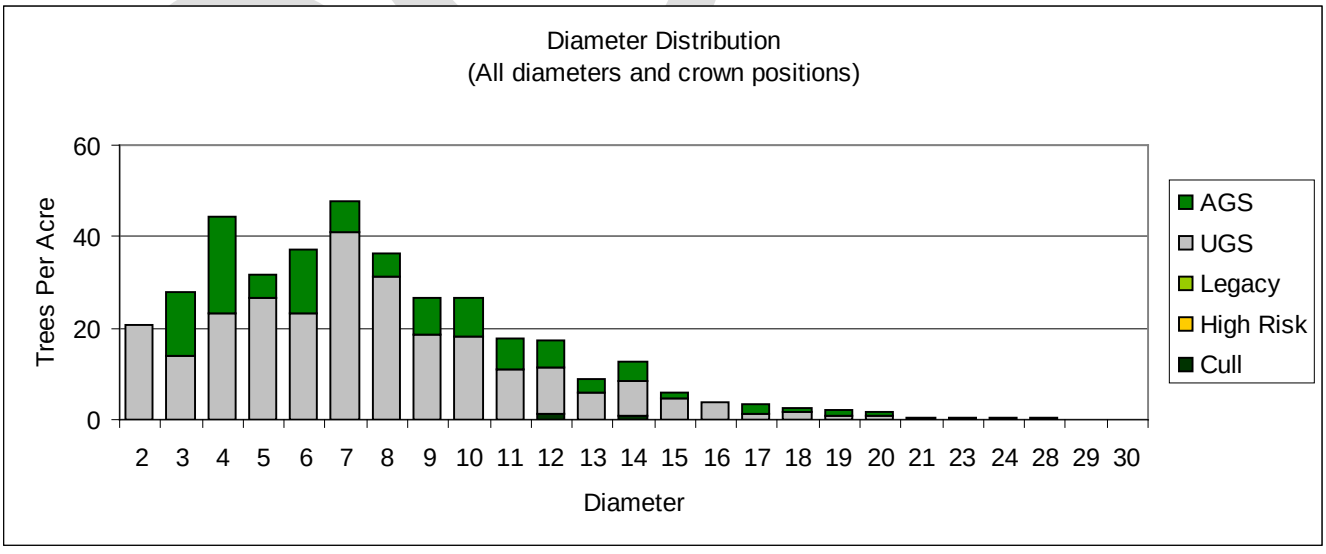
- **Pre-salvage White ash:** Target of scattered overstory ash for removal.
- **Free thinning**: Elsewhere, removal of previously marked low quality, diseased, or low vigor stems to release better quality stocking.
- **Scarification** of well established invasives to slow seed production and encourage native species regeneration.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	2.9%	0	0	0	0.3	0.0	0.0	0.3	0	0	0%
Aspen	1.0%	0	0	0	0.2	0.0	0.0	0.2	0	0	0%
Black Birch	1.8%	0	0	0	0.1	0.0	0.0	0.1	0	0	0%
Hop Hornbeam	1.8%	0	0	0	0.1	0.0	0.0	0.1	0	0	0%
Red Maple	24.3%	0	150	128	5.7	0.0	0.0	6.2	0	278	100%
Red Oak	2.0%	0	162	120	0.5	0.2	0.0	1.2	0	120	43%
Sugar Maple	7.3%	0	204	139	1.2	0.1	0.0	2.0	0	343	100%
White Ash	5.2%	0	297	155	1.2	0.3	0.0	2.3	0	350	77%
White Birch	1.1%	0	0	40	0.4	0.0	0.0	0.5	0	0	0%
Yellow Birch	4.1%	0	42	142	0.6	0.1	0.0	1.1	0	40	22%
Total Hardwood Per Acre:	*51.5%*	*0*	*855*	*724*	*10.3*	*0.7*	*0.0*	*14.0*	*0*	*1,130*	72%
Hemlock	47.0%	0	730	0	16.8	0.0	0.0	18.2	0	670	92%
White Pine	1.5%	0	210	162	0.9	0.0	0.0	1.5	72	160	43%
Total Softwood Per Acre:	*48.5%*	*0*	*940*	*162*	*17.8*	*0.0*	*0.0*	*19.7*	*72*	*830*	75%
Total Volume Per Acre:	100.0%	0	1,795	886	28	1	0	34	72	1,960	73%
Total Stand Volume:		0	271,372	133,975	4,246	111	0	5,104	10,901	296,412	

Table 7.1: Volumes by species and product.

Graph 7.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"			8.5	8.5
12-18"	3.3			3.3
>18"	0.3			0.3
Grand Total	3.6		8.5	12.0

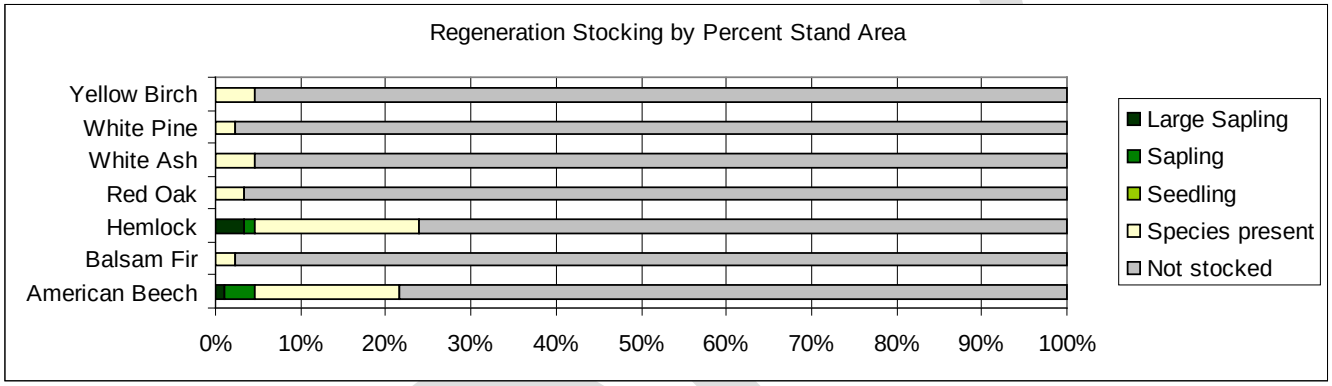
Table 7.1: Snags per acre by size and decay class.

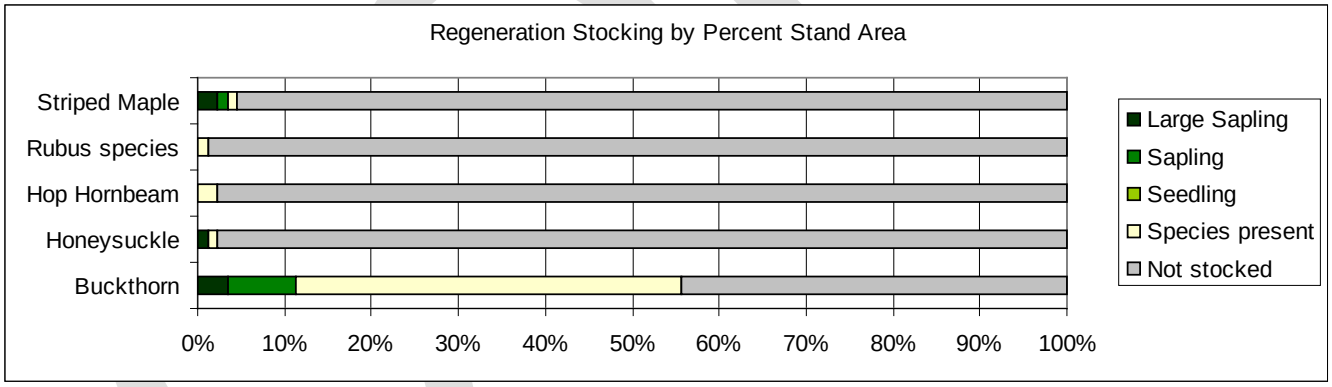
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	4.6	14.5		19.2
12-18"	3.1			3.1
>18"				
Grand Total	7.8	14.5		22.3

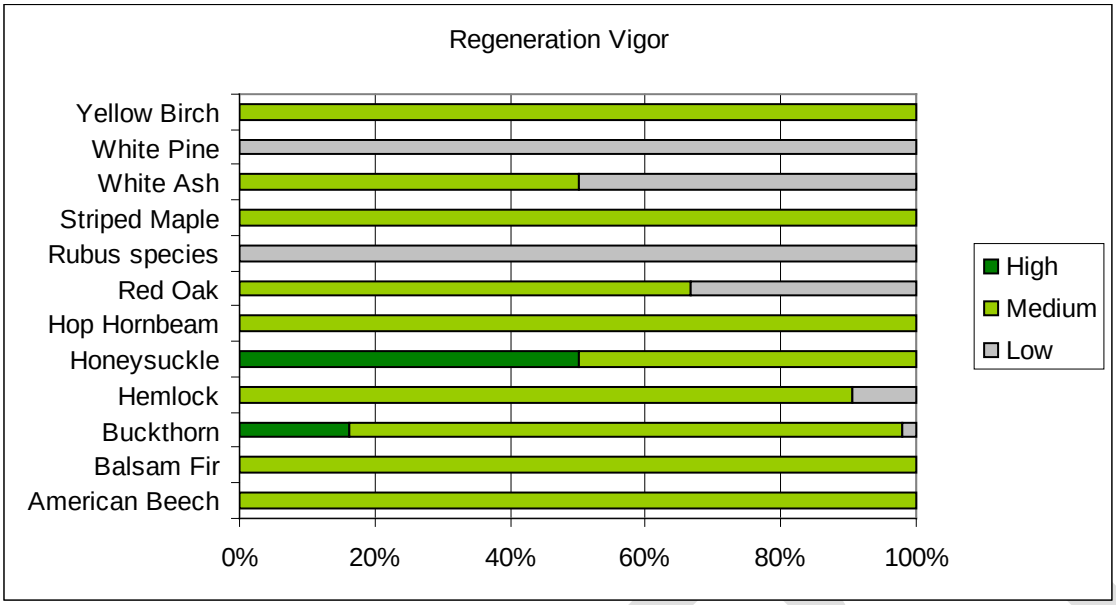
Table 7.2: Down logs per acre by size and decay class.

Graph 7.2 and 7.3: Tree (7.2) and shrub (7.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

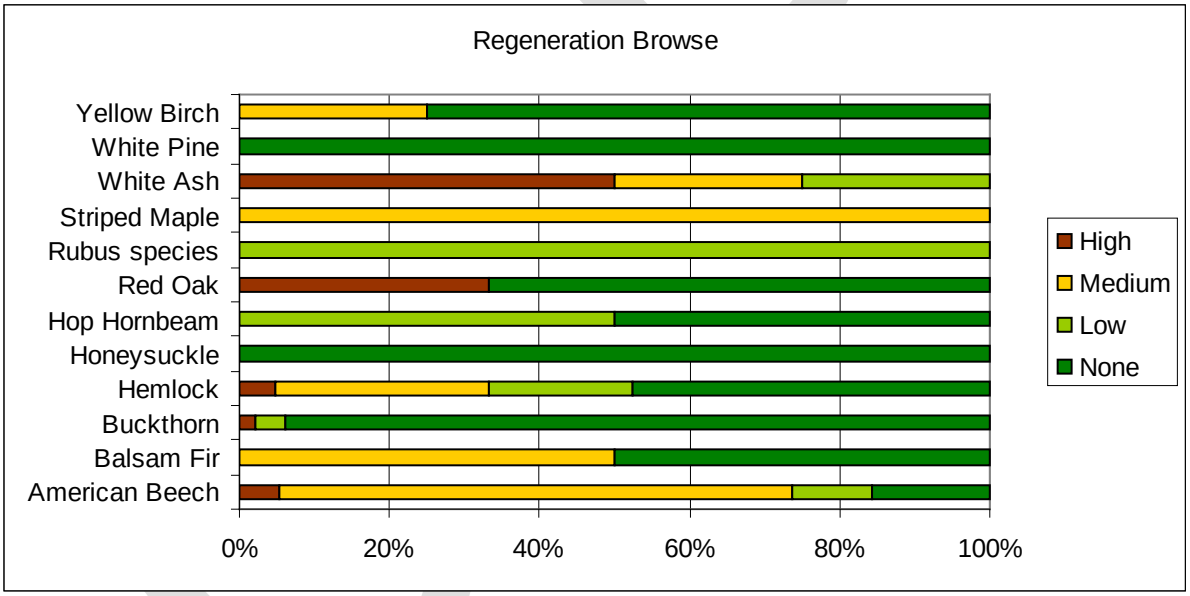




Graph 7.4: Vigor of regeneration and shrub species.



Graph 7.5: Browse level of regeneration and shrub species.



Stand 8 WP-H 23A 16.3 acres

Stand 8 is dominated by poor quality pine that was established at the abandonment of agricultural activity here on Morgan Hill.

Red rot and damage from the white pine weevil are common.

Large legacy trees are scattered throughout stand 8. These trees provide excellent wildlife habitat and are an important component to biological diversity here on Morgan Hill.

The site is a hardwood site, which will convert naturally over time. Silviculture will be geared towards site conversion to hardwoods.

There is a fair amount of hardwood pole stocking present, which will be targeted for release.

GENERAL ATTRIBUTES

Natural Community Type:	Between rich mesic forest and Rich red oak rocky woods		
Stand Age:	50-60 years		
Stocking Level:	Overstocked		
Past Management History:	Stand was treated historically including some TSI, but no recent management		
Insects/Damage/Disease:	Red rot; weevil; white pine blister rust; deer browse		
Timber Quality:	Poor quality pine		
Invasives:	Level 3- moderate to heavy presence		
Total BA Per Acre:	139	Trees Per Acre:	468
Total AGS BA Per Acre:	31	% AGS Sawtimber:	62.3
Quadratic MSD:	7.4	Site Quality:	Moderately steep to gentle slope; shallow soils

Silvicultural Objectives

Management system:	Evenage for site conversion
Desired Composition:	Allow site to convert to hardwoods
Crop tree target diameter:	--
Wildlife Management:	Maintain large, scattered legacy trees

Access and Terrain:

Access to Town Road:	West compartment historically accessed off True Road. See Access section above.
Landing Sites:	First landing located within Stand 6
Truck/woods Roads:	Good truck roads to landing sites. Need brushwork and mowing. Includes portion of Pedestrian ROW with conservation easement restrictions.
Terrain:	Moderate steep to gentle slopes; shallow soils. Dry summer conditions.

Stand 8 includes the pine dominated southwest facing slope of Morgan Hill. The terrain is moderately steep becoming undulating near the height of land. The soils are shallow, with some exposed ledge and glacial erratics. The pine is generally poor quality, limby and low vigor, with sparse to no regeneration. This is a hardwood site; the pine became established here after agricultural abandonment. In some areas, especially on the lower terrain there is a fair stocking of pole size hardwoods. Management here will support the conversion back to hardwood. Buckthorn is scattered throughout.

Large legacy oaks are scattered throughout this stand. These incredible trees provide excellent wildlife habitat and are an important biological legacy and should be protected.

Silviculture 2016: Due to the overall poor timber quality of this stand it should be regenerated leaving the scattered legacy trees. Given the relatively small size, consider a modified overstory removal treatment scarifying soils where invasives have become established. This is an opportunity to test successful regeneration using intensive silviculture where invasives are problematic. Leave pockets of pole size hardwoods intact.

Stand 8 is located entirely within the conserved area of the tract which requires the protection of the scenic quality viewed from public roads and public trails. To meet conservation requirements, cutting will keep aesthetics a priority and minimize slash and debris near the trail.. In addition, edges should be soft and gradual. Large legacy trees will be left for wildlife, diversity, and aesthetics.

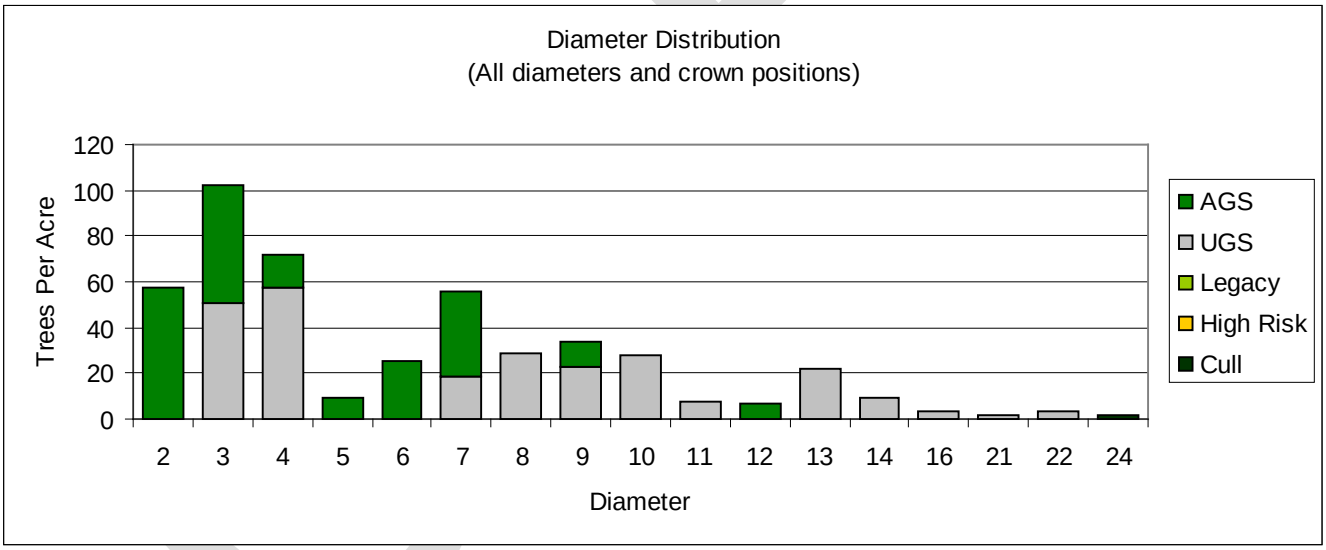
- Regenerate through **Modified overstory removal**. Remove pockets of overstory trees, leaving established areas of pole size hardwoods. Leave legacy trees. Scarify ground where invasives are established.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw (bf)	% AGS Saw
Red Oak	8.2%	0	0	0	0	0.7	0.0	1.2	0	0	0%
Sugar Maple	17.5%	0	0	0	1	0.0	0.0	1.5	0	0	0%
White Ash	21.0%	0	0	666	5	0.0	0.0	5.9	0	666	100%
White Birch	6.3%	0	0	0	1	0.0	0.0	1.0	0	0	0%
Total Hardwood Per Acre:	*52.9%*	*0*	*0*	*666*	*8*	*0.7*	*0.0*	*9.6*	*0*	*666*	100%
White Pine	47.1%	0	0	402	21	0.0	0.0	21.4	0	0	0%
Total Softwood Per Acre:	*47.1%*	*0*	*0*	*402*	*21*	*0.0*	*0.0*	*21.4*	*0*	*0*	0%
Total Volume Per Acre:	100.0%	0	0	1,068	28	1	0	31	0	666	62%
Total Stand Volume:		0	0	17,416	459	12	0	504	0	10,858	

Table 8.1: Volumes by species and product.

Graph 8.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"			9.2	9.2
12-18"	5.4			5.4
>18"				
Grand Total	5.4		9.2	14.6

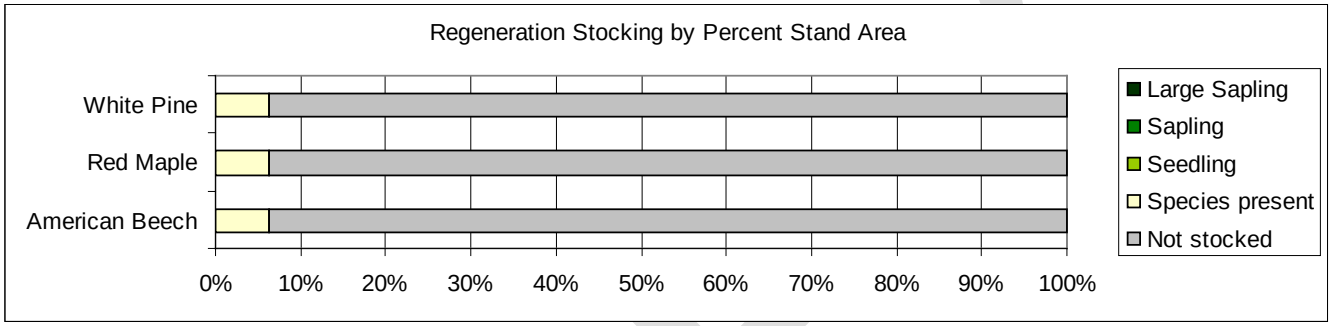
Table 8.1: Snags per acre by size and decay class.

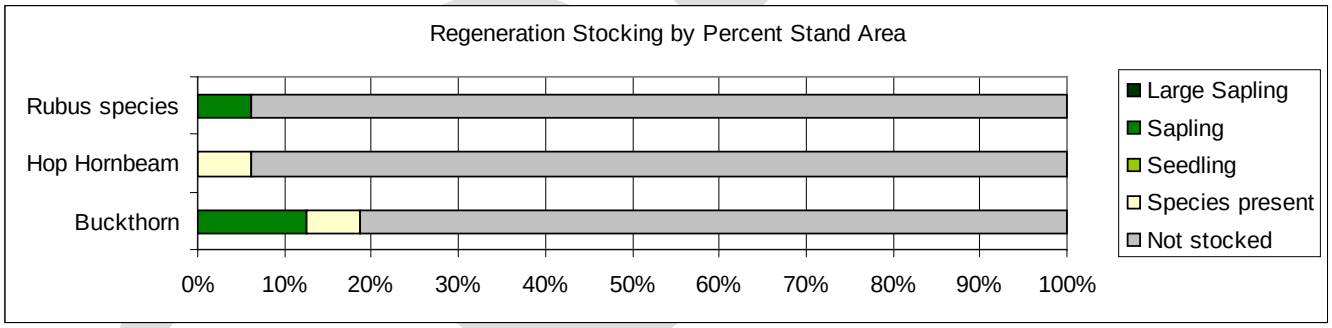
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	14.3			14.3
12-18"	2.8			2.8
>18"				
Grand Total	17.2			17.2

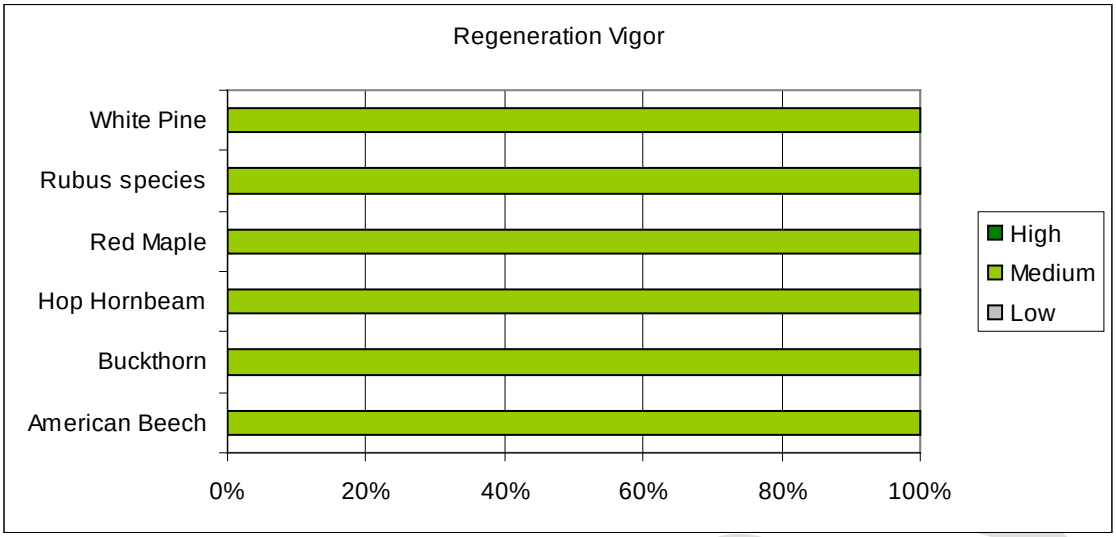
Table 8.2: Down logs per acre by size and decay class.

Graph 8.2 and 8.3: Tree (8.2) and shrub (8.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

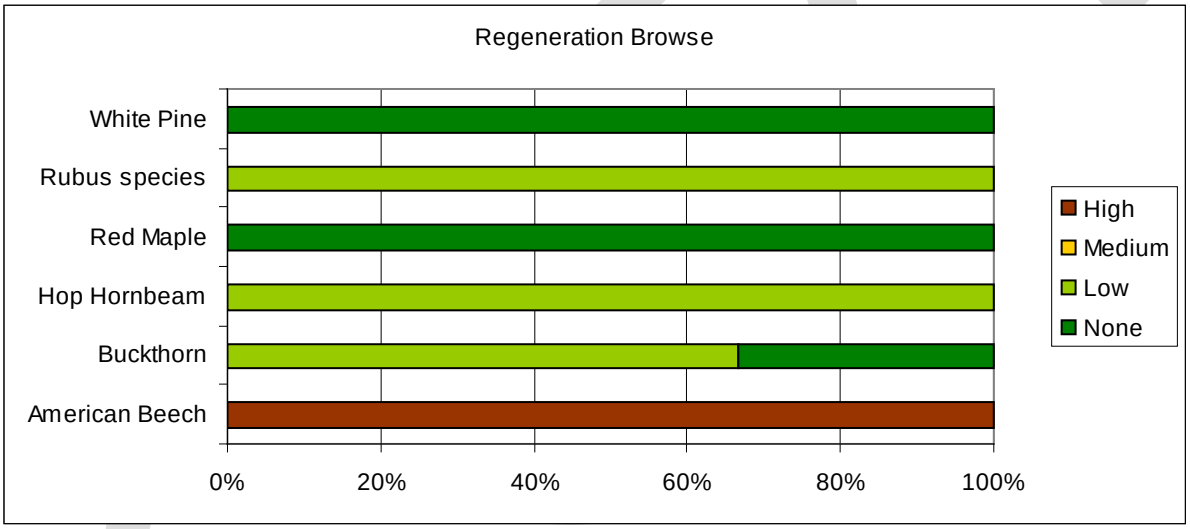




Graph 8.4: Vigor of regeneration and shrub species.



Graph 8.5: Browse level of regeneration and shrub species.



Stand 9 HS 12A 5.6 acres

GENERAL ATTRIBUTES

Natural Community Type:	Semi-rich mesic sugar maple forest		
Stand Age:	15 years		
Stocking Level:	Becoming fully stocked		
Past Management History:	Stand clear cut in late 1990's		
Insects/Damage/Disease:	None noted.		
Timber Quality:	n/s		
Invasives:	Level 4- heavy to extreme presence		
Total BA Per Acre:	n/a	Trees Per Acre:	n/a
Total AGS BA Per Acre:	n/a	% AGS Sawtimber:	n/a
Quadratic MSD:	n/a	Site Quality:	Gentle to level ground. Some seepy areas.

Stand 9 is a 5+ acre patch that was clearcut in the late 1990's. It is a mix of sugar maple, white pine and beech saplings, with a fair amount of buckthorn. Even though buckthorn is well established, the native trees were able to regenerate as well. Given the small acreage of this stand it is potentially a good site to test efficacy of manual and herbicidal treatment of invasives. Doing so would doubly serve as a non-commercial improvement thinning of the stand.

Stand 9 is located within the conserved area.

Silviculture 2016: Consider the following:

- Consider **Manual and/or Herbicide** treatment/removal of invasives. Check for NRCS cost share availability.

Stand 10 RM-WA-WP 3B 19.7 acres

Stand 10 includes the most poorly drained forested sections on the tract, occurring along the easternmost boundary and the northernmost boundary. Terrain is gentle, with seepy pockets but still moderately operable with good frozen ground conditions.

Pockets of well established understory trees and shrubs add to the biodiversity provided by this Stand Type.

Unfortunately, invasives are also well established throughout this site.

GENERAL ATTRIBUTES

Natural Community Type:	Red maple-sensitive fern swamp		
Stand Age:	50-70 years		
Stocking Level:	Variable stocking- generally fully stocked		
Past Management History:	North compartment partially harvested 2005; East compartment partially harvested 1995 under prior landowner		
Insects/Damage/Disease:	Deer browse		
Timber Quality:	Generally poor quality		
Invasives:	Level 3- moderate to heavy presence		
Total BA Per Acre:	110	Trees Per Acre:	500
Total AGS BA Per Acre:	43	% AGS Sawtimber:	0
Quadratic MSD:	6.4	Site Quality:	Forested wetland

Silvicultural Objectives

Management system:	Allow to progress naturally
Desired Composition:	Maintain wetland species: elm etc.
Crop tree target diameter:	n/a
Wildlife Management:	Maintain snags and down logs; create more where possible

Access and Terrain:

Access to Town Road:	North compartment historically accessed off True Road. East compartment accessed off Old Stage and Route 120. See Access section above.
Landing Sites:	North compartment can use either landing on main road; East compartment can use landing off Old Stage Road. Road in western/central compartment requires dry conditions for use.
Truck/woods Roads:	Good truck roads to landing sites. North compartment need brushwork and mowing. East compartment road mowed during fall of 2014.
Terrain:	Gentle, wet ground. Frozen winter conditions required.

Stand 10 includes the operable areas of forested wetland within Morgan Hill. It occurs in two locations, along the easternmost boundary and the northernmost section of the tract. Operability is limited to frozen winter or very dry summer conditions, and will be limited to improvement harvesting to benefit the structure and functioning of these important communities.

The forest type is a mix of hardwoods, including red and sugar maple, American elm, ash, cherry, white birch and beech with pockets of winterberry shrubs and scattered hemlock on the edges.

Forested wetland areas are important wildlife habitat, providing an important food source, especially in the spring. These communities also increase biodiversity of the forest structure and species composition. Unfortunately, invasives are well established on these wet sites.

Neither section of Stand 10 falls within the conservation easement area.

Silviculture 2015: When working in adjacent stands create small openings in Stand 10 to encourage development of multiple age classes and to release understory stocking.
Reduce basal area to between 80 and 100 square feet through:

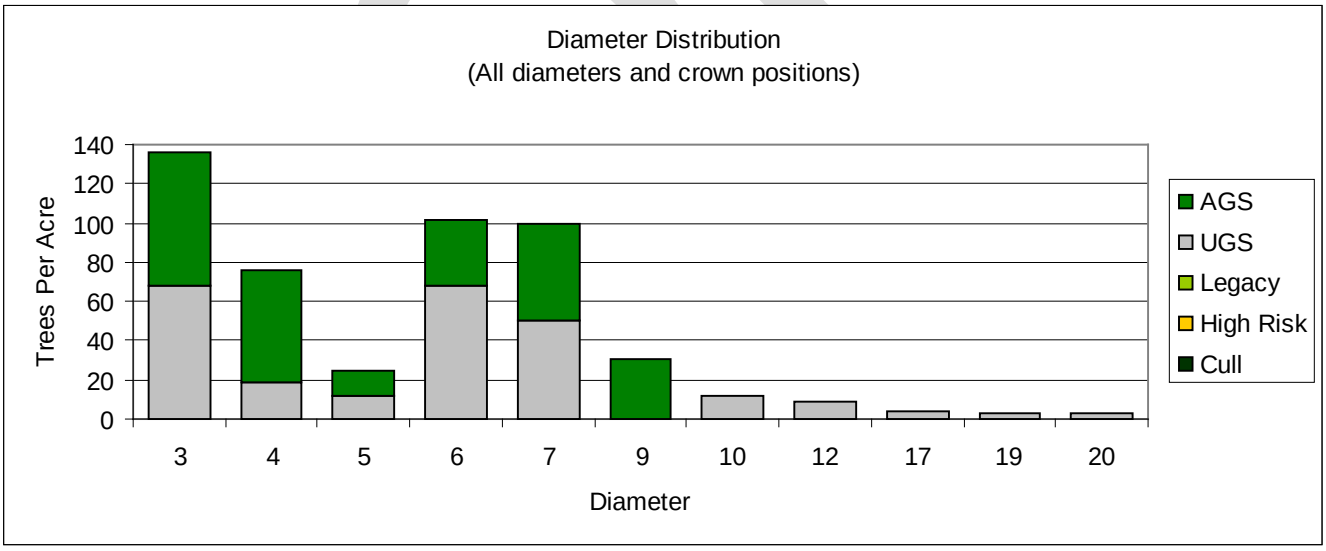
Small group selection: Remove groups of diseased, damaged or low vigor trees to release pockets of understory shrubs (not invasives) and tree regeneration. Create additional snags and down logs.

Forest Composition and Volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	9.5%	0	0	0	0.9	0.0	0.0	0.9	0	0	0%
American Elm	12.9%	0	0	0	0.8	0.0	0.0	0.8	0	0	0%
Black Cherry	4.6%	0	0	0	1.2	0.0	0.0	1.2	0	0	0%
Red Maple	12.7%	0	0	0	2.8	0.0	0.0	2.8	0	0	0%
Sugar Maple	14.2%	0	0	521	2.1	0.0	0.0	3.0	0	0	0%
White Ash	33.8%	0	0	0	3.1	3.0	0.0	6.1	0	0	0%
White Birch	9.5%	0	0	0	1.3	0.0	0.0	1.3	0	0	0%
Total Hardwood Per Acre:	*97.2%*	*0*	*0*	*521*	*12.2*	*3.0*	*0.0*	*16.1*	*0*	*0*	0%
Hemlock	2.8%	0	0	0	3.9	0.0	0.0	3.9	0	0	0%
Total Softwood Per Acre:	*2.8%*	*0*	*0*	*0*	*3.9*	*0.0*	*0.0*	*3.9*	*0*	*0*	0%
Total Volume Per Acre:	100.0%	0	0	521	16	3	0	20	0	0	0%
Total Stand Volume:		0	0	10,261	319	59	0	395	0	0	

Table 3.1: Volumes by species and product.

Graph 3.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



Snags Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"	40.0	15.1		55.1
12-18"				
>18"				
Grand Total	40.0	15.1		55.1

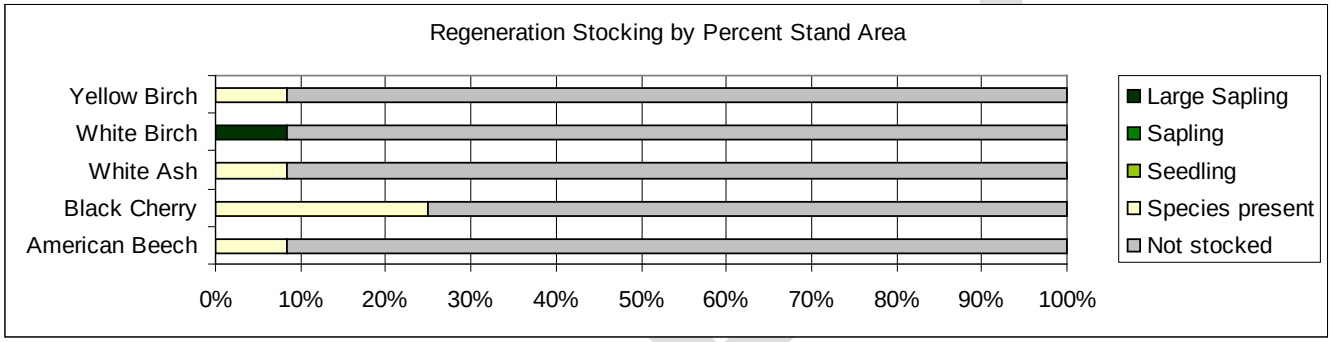
Table 3.1: Snags per acre by size and decay class.

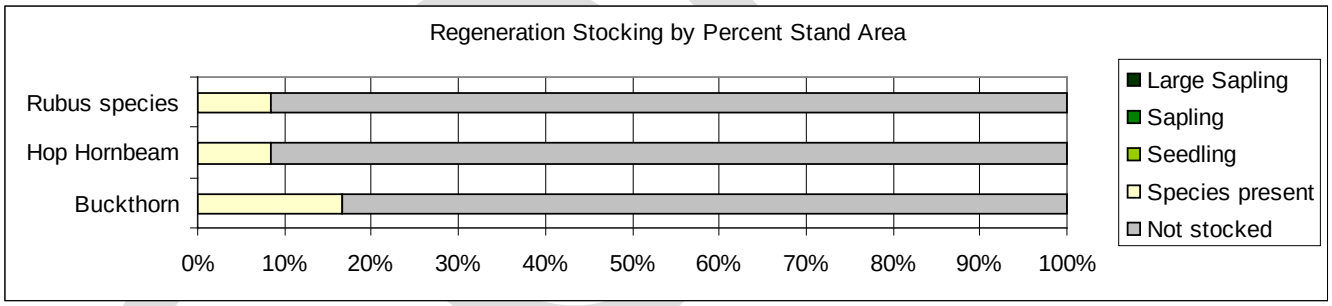
Down Logs Per Acre

DBH Class	Mod. punky	Punky	Sound	Grand Total
<12"		34.0		34.0
12-18"				
>18"				
Grand Total		34.0		34.0

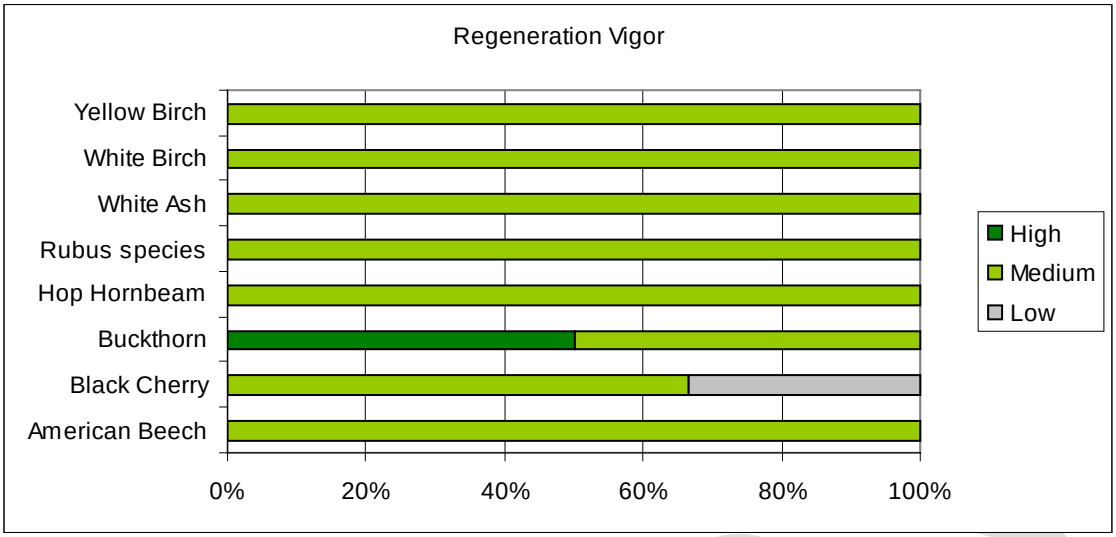
Table 3.2: Down logs per acre by size and decay class.

Graph 3.2 and 3.3: Tree (3.2) and shrub (3.3) species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.

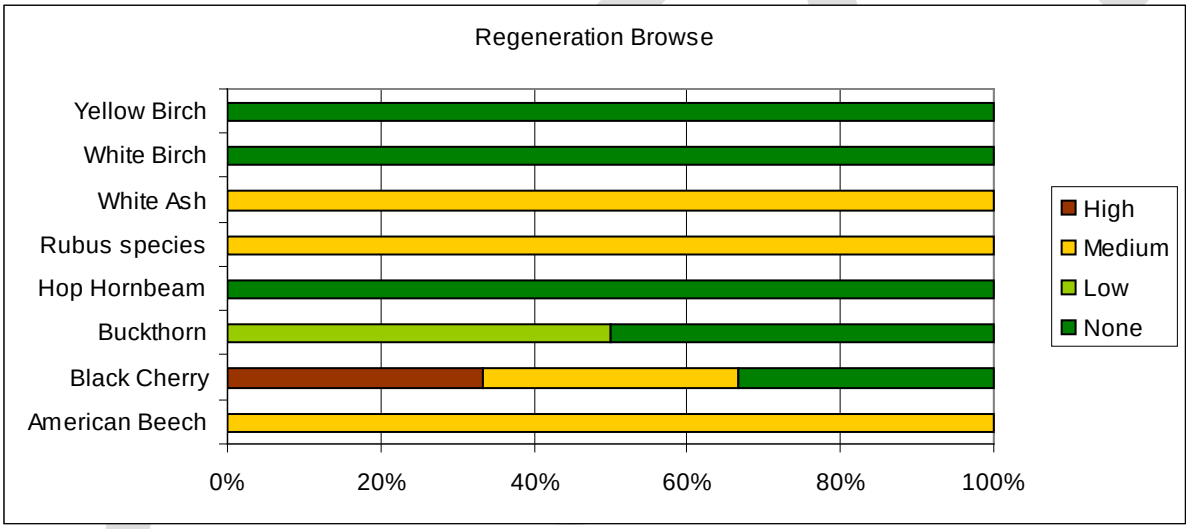




Graph 3.4: Vigor of regeneration and shrub species.



Graph 3.5: Browse level of regeneration and shrub species.



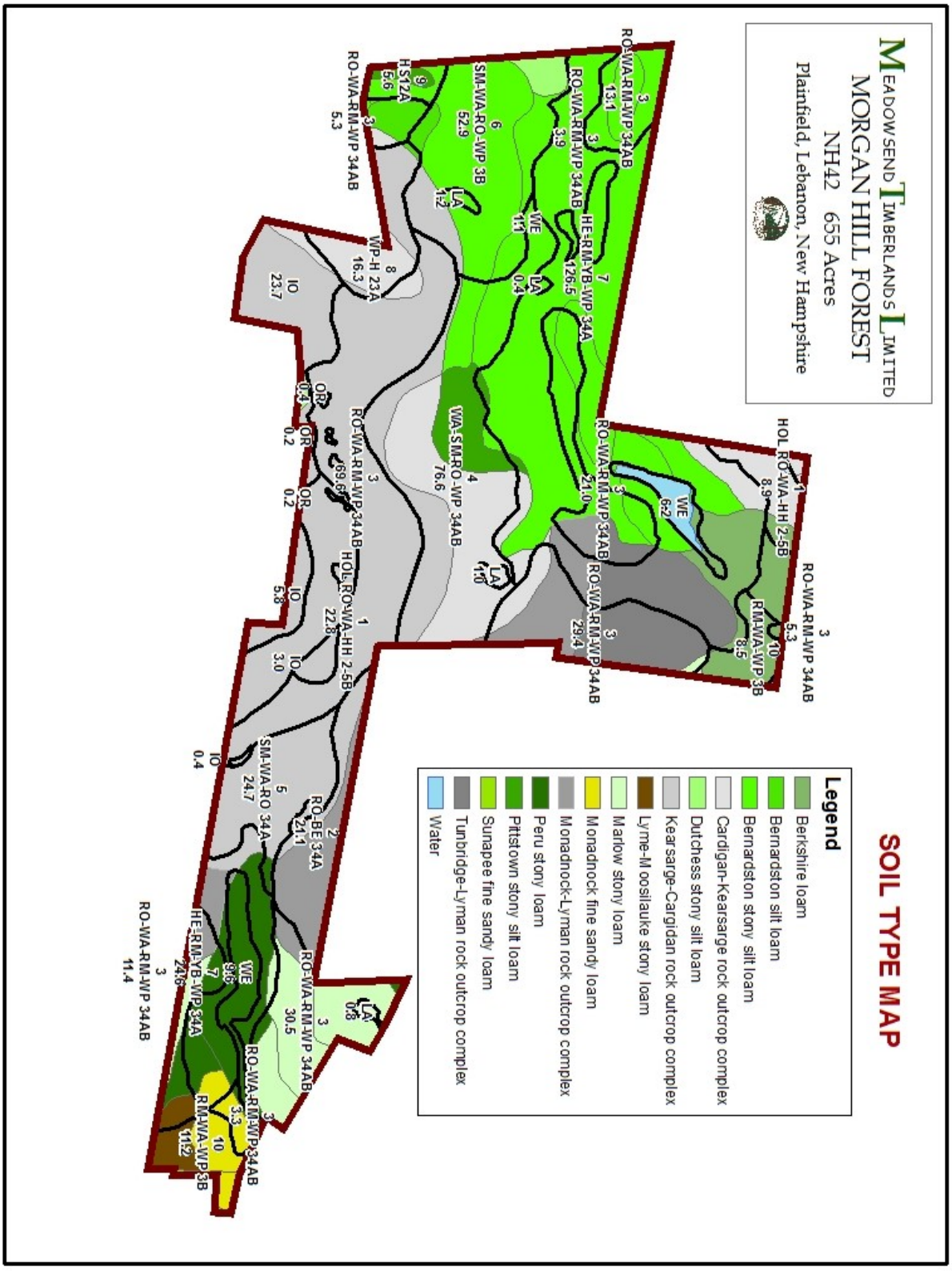
APPENDIX – A

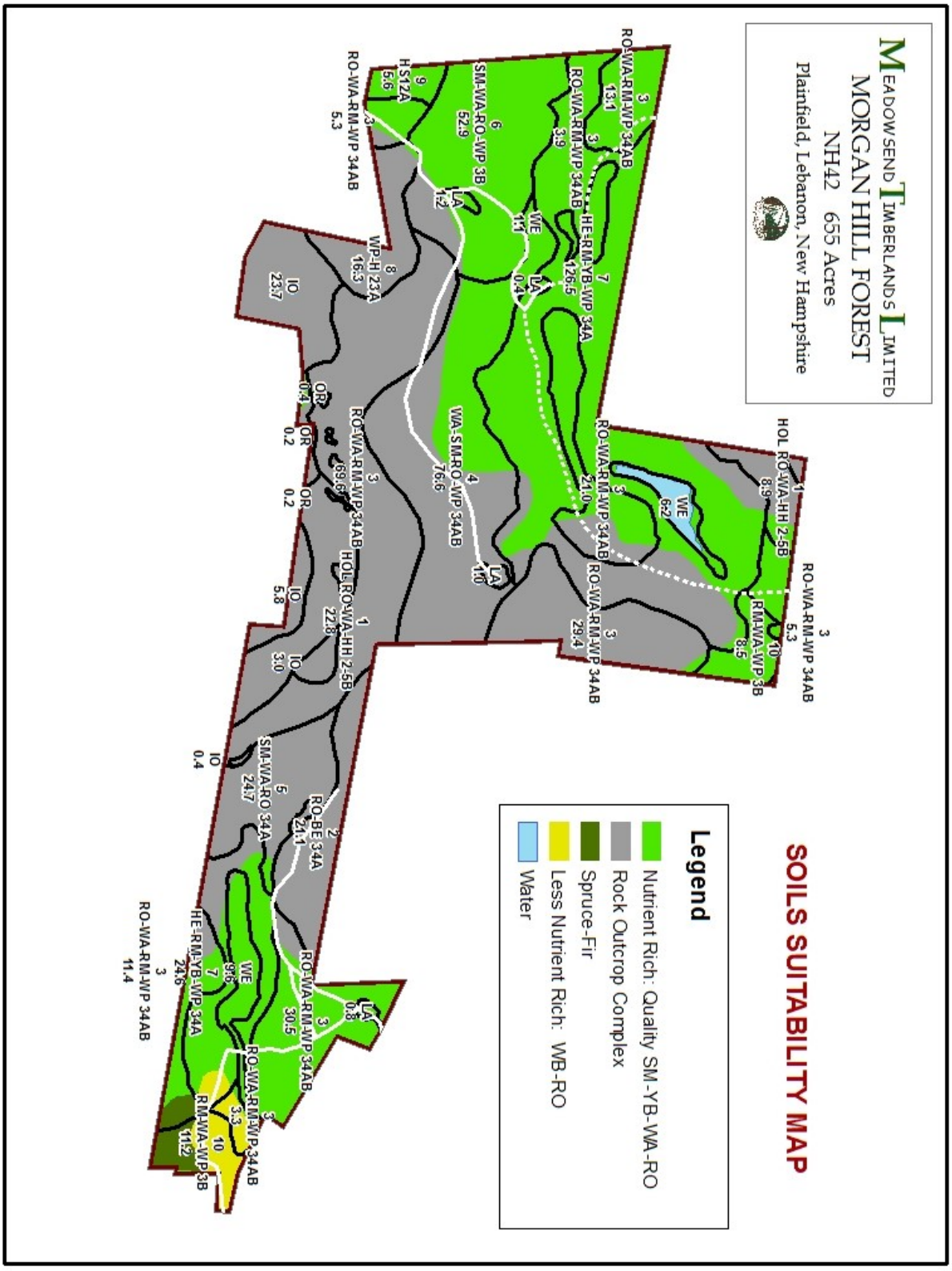
NH42 Morgan Hill

Soils Map

and

Soils Suitability Map

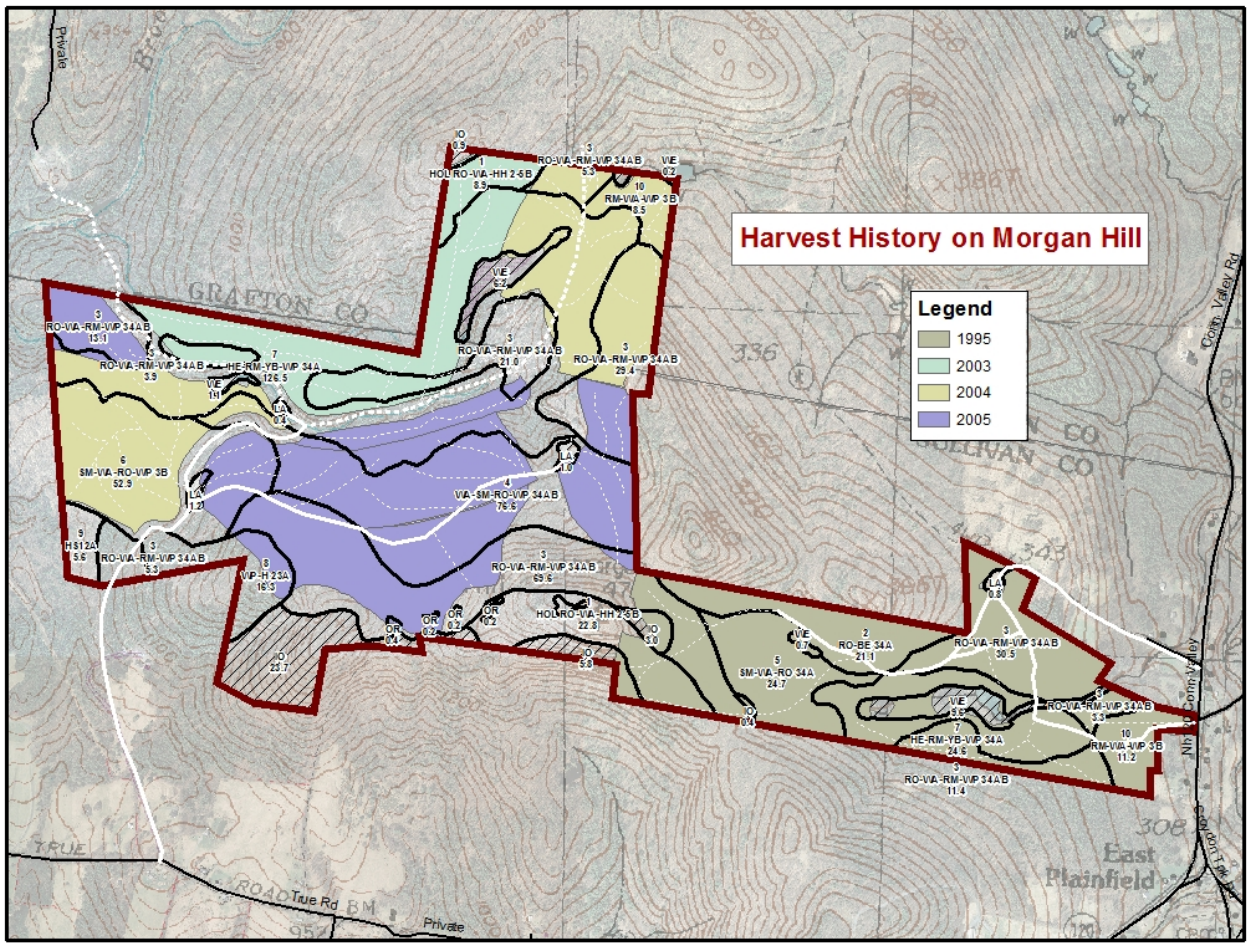

MEADOWSEND TIMBERLANDS LIMITED
MORGAN HILL FOREST
NH42 655 Acres
Plainfield, Lebanon, New Hampshire
SOIL TYPE MAP
Legend
Berkshire loam
Bernardston silt loam
Bernardston stony silt loam
Cardigan-Kearsarge rock outcrop complex
Dutchess stony silt loam
Kearsarge-Cargidan rock outcrop complex
Lyme-Moosilauke stony loam
Marlow stony loam
Monadnock fine sandy loam
Monadnock-Lyman rock outcrop complex
Peru stony loam
Pittstown stony silt loam
Sunapee fine sandy loam
Tunbridge-Lyman rock outcrop complex
Water


MEADOWSEND TIMBERLANDS LIMITED
MORGAN HILL FOREST
NH42 655 Acres
Plainfield, Lebanon, New Hampshire
SOILS SUITABILITY MAP
Legend
Nutrient Rich: Quality SM-YB-WA-RO
Rock Outcrop Complex
Spruce-Fir
Less Nutrient Rich: WB-RO
Water

APPENDIX – B

NH42 Morgan Hill

Harvest History Map



APPENDIX – C

NH Natural Heritage Bureau

Known Records of Rare Species and Exemplary Natural Communities

APPENDIX – D

Invasive Exotic Shrub Control Measures