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WEARE – CHEVY HILL FOREST MANAGEMENT PLAN



1 PLAN PURPOSE AND DESIGN

The purpose of this forest management plan is to provide the Town of Weare and the resource manager with a comprehensive description of the property and proposed management activities. It is meant to be a “User’s Guide” that reflects Weare’s objectives and will remain flexible as changes in the property condition or objectives change through time. A 10-year management schedule can be found at the end of this plan and used as a quick reference to the timing and areas with scheduled management.

Management planning on the Weare ownership is a threefold system including a master plan, forest management plans, and pre-harvest planning. The master plan covers broad property descriptions, ownership objectives, and management strategies. Forest management plans, such as this one, are the second piece of this threefold system. They cover specific property descriptions and management activities intended to span a 10-year period. Forest management plans are stand-alone documents. The third part of this system involves pre-

harvest plans, detailing even more specific management concerns and objectives particular to individual harvests. As their name indicates, pre-harvest plans are prepared prior to a scheduled harvest.



2 PROPERTY LOCATION AND BRIEF DESCRIPTION

Chevy Hill Forest is a contiguous tract situated on 156.3 acres that is almost entirely forestland and is managed by the Weare Conservation Commission. The terrain is moderately to steeply sloping, with an almost exclusively eastern aspect. The highest elevation (approximately 1185') is found in the southwest portion of the Forest, along the western property boundary; the lowest elevation (approximately 800') is more or less the eastern property boundary. Access is provided via the north end of Chevy Hill Road in the south and with frontage along Tiffany Hill Road in the north.

Much of Chevy Hill Forest was at one time part of a proposed 27-lot subdivision. The south portion of Chevy Hill Forest includes the northernmost 19 lots from that proposed subdivision. The rest of the Chevy Hill Forest, the north portion, is a 63-acre tract that was part of a different 2-lot subdivision. The subdivision plans at one time included extending Chevy Hill

Road several hundred feet north from its present terminus at the southern boundary of the Forest.

The forestland is varied, and is characterized as mixedwood timber. The most common species are red oak, red maple, white pine, and hemlock, which account for over 60% of the volume of wood in the Chevy Hill Forest. The remaining volume is comprised of a mixture of hardwood species typically found in this geographic region, including sugar maple, white ash, white birch, yellow birch, beech, and black cherry.

Woodlot History

In addition to its inclusion in subdivision proposals from the mid-1980s and late-2000s, the Chevy Hill Forest has an earlier agricultural history. Weare had a prosperous agricultural history, which peaked in the mid- to late-1800s. This agricultural use of the land slowed drastically early last century, when many farmers throughout New England abandoned their agrarian lifestyles, and once-open land has since become reforested. At the Chevy Hill Forest, the presence of stone walls or barbed wire along much of the boundary, along with several internal stone walls and wire fencelines within the property suggests a fairly intense use. Evidence within the property also suggests that some portion of the Chevy Hill Forest was once used as a sugar bush.



Sugar house remains. left – close-up of bricks and metal debris; right – foundation of sugar house. Note size of trees growing on top of remains

The majority of the tract acreage was at one time open agricultural land, primarily pasture, with perhaps a small area dedicated to crops and hay production. The relatively consistent steep slopes within the Chevy Hill Forest would have made hay and crop production a difficult endeavor, thus the land here was much more suited to pasturage and woodland. The sugarbush could well

have been a wooded pasture, rather than woodlands or forest. The present forest has canopy trees that are approximately 100 to 160 years old, with sub-canopy and understory trees ranging from 15 to 90 years old.

Immediately following abandonment, the open agricultural land tended to favor the establishment and growth of white pine. The resulting forest has been through a series of timber harvests since its reforestation in the early part of last century, as evidenced by old forest access roads and tree stumps of varying ages. This has transformed the Chevy Hill Forest from pine dominated to hardwood dominated, although there is still a significant volume of pine and hemlock. The most recent timber harvest was conducted circa 2006 in the north portion of the forest. Many other harvests occurred from the mid-1900s up to 2006; the harvests contributed to the change from pine to hardwood forestland.

3 LANDOWNER GOALS AND OBJECTIVES

As stated in Weare's forest master plan, goals and objectives of management on the Town of Weare forestlands are:

1. Maintain the diversity of plant and animal life so as to sustain ecological processes.
2. Maintain a healthy and vigorous forest that can sustainably yield forest products.
3. Allow hunting, fishing, hiking, botanical observation, wildlife observation, and other recreational activities. The town forests will be managed to maintain and enhance these opportunities.
4. Maintain Tree Farm status.

4 GEOLOGIC ATTRIBUTES

Topography and Aspect

The Chevy Hill Forest ranges from 800 to 1180 feet. The property generally has an easterly aspect. The terrain is primarily sidehill, ranging from gentle to moderately steep slopes. Flattest areas occur in the northernmost portion of the property.

Brooks, Ponds, and Wetlands

Chevy Hill Forest has limited water resources. There are no perennial streams crossing through the property, nor were any intermittent streams noted during the cruise. There are some seasonal drainages which have flow following rain events and during snowmelt, but these rarely flow for any great length of time.

A portion of a wetland is located along the northeast corner along the eastern property boundary. The soil is identified as Borohemists, ponded, which are typically found in beaver ponds

and marshes. They consist of moderately decayed organic matter, and are usually covered by water for most of the year. This wetland is unsuited to commercial use, either for crops or for forestry, and no equipment should encroach in this area. There are a few other smaller forested wetlands (less than 1/4-acre) within the Chevy Hill Forest, primarily situated in poorly drained soils, or where ledge restricts infiltration. These areas should be identified prior to logging, and disturbance to the underlying soils should be avoided.

Recommended Actions to Improve and Manage the Wetland and Water Resource of the Chevy Hill Forest¹:

Riparian and Stream Ecosystems:

- Establish a riparian management zone along the edge of the beaver pond. This is not intended as a no-harvest zone. Forest management systems, such as single-tree or small-group selection 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.
- No-cut zones of 16 to 100 feet are recommended by several management guides on river or pond shores containing wet seeps, shallow or poorly drained soils, or area with slopes greater than 8 percent. Limited single-tree cutting can occur on other sites within this zone, with cabling from outside the zone suggested.
- Consider management at the watershed-level as an approach to avoiding stream channel degradation from excessive runoff.
- Road construction, stream crossings, skid trails, log landings, and all phases of timber-harvesting operations should conform to Best Management Practices

Springs and seeps:

- Avoid leaving slash in woodland seeps, springs.
- To the extent feasible, avoid interrupting 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.

Soils

The upland soils were derived from glacial till and are primarily moderately well drained stony silt loam soils. The primary soil types present (90% of the acreage) are Tunbridge-Lyman-Monadnock complex, stony (160D and 160C) and Marlow stony loam (77D and 77C). These soils are well drained and generally productive, but have limitations due to rockiness and slope. For other

¹ 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

soil types and other details see soils map in Appendix A.

Recommended Actions to Improve and Manage the Soil Resource of the Chevy Hill Forest²:

Forest soils, forest floor and Site Productivity:

- 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 to 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.

5 NATURAL COMMUNITIES³

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.”

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

³ All information on Natural Communities referenced from the publication: *Natural Communities of New Hampshire*, Daniel

“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. The natural community types found on Weare forestland has 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.

The dominant natural community type found on the Chevy Hill is hemlock-beech-oak-pine forest. Hemlock-beech-oak-pine is a common, broadly defined community occupying glacial till and terrace soils of low to mid elevations in central and southern New Hampshire. Other natural communities are imbedded within the hemlock-beech-oak-pine forest, usually in relatively small clusters, including: hemlock forest, sugar maple-beech-yellow birch forest, semi-rich mesic sugar maple forest, and rich mesic forest.

Rare Species and Unique Natural Communities

An in-depth flora and fauna survey was not within the scope of this plan. There were no endangered plants or animals knowingly encountered while collecting the data for this plan. The Natural Heritage Bureau was contacted for a search of their data records involving rare species/exemplary natural communities within the entire Weare Town Forest(s) ownership. Only two records were found and both involve the Eastman Lot. The *Weare Town Lands Inventory* conducted by Bill Nichols made no mention of any natural communities or plant species considered rare/endangered/threatened located on the Chevy Hill property; however that does not mean there are not any.

Integrating the varied habitat conditions found on Chevy Hill Forest demands *adaptive management*. All attempts will be made on the management level to identify unique areas, learn what makes them unique, how to best manage them and most importantly, refine the management of these areas as the knowledge base grows.

A small patch of northern maidenhair fern was noted during the timber cruise. It was found

Sperduto and William Nichols, New Hampshire Natural Heritage Bureau and The Nature Conservancy, 2004.

south of the sugar house ruins, in the south-center of the property (approximately 1000' elev.). Maidenhair fern tends to be an enriched or semi-enriched site indicator, and while not rare, the plant is uncommon in south central New Hampshire. The associated natural community is likely rich mesic forest or semi-rich mesic sugar maple forest. An extensive community of Christmas fern was also noted in this location, along with numerous ironwood stems.



Maidenhair fern, left, and Christmas fern, right

“Ecological Reserve” Areas

As part of the management of the Chevy Hill Forest, some areas may be designated as “Ecological Reserve”, meaning there will be no active management allowing the area to progress and change naturally without human influence in terms of active management. “Ecological Reserve” areas offer unique opportunity to learn about the natural succession and disturbance pattern on the forest. These areas can be incorporated into the recreational and educational components of the forest, as well as benefit the diversity of wildlife habitat. These areas can be designated on the forest management map. Acceptable uses of these areas include establishing non-motorized trails to and through them. Unacceptable uses include motorized traffic (logging equipment, ATVs) and infrastructure development (benches, shelters). Ecological reserves will not be actively managed, and will not be traveled through when actively managing adjacent forest stands.

Invasive Species

There are some minor instances of invasive plants found in the Chevy Hill Forest, including common mullein and multiflora rose. Many invasives colonize abandoned fields, roadsides, stream banks, wetlands and other disturbed sites (such as the recent blowdown/ icedown sites). They were often introduced for horticultural uses. These plants are detrimental to the natural succession of the

forest as they out-compete the native trees and shrubs. Additionally, they often produce copious quantities of berries, seeds, or fruits that are consumed and disseminated by songbirds, small mammals and turkeys. At present, they are growing in a few isolated spots, and seem to be represented as individual plants in these spots, rather than dense tangles of multiple plants.



Left – common mullein located in an area with recent blowdown timber. Right – forest floor covered with hay-scented fern. Note lack of any seedlings, herbaceous growth, forbs, or other fern species.

The locations were not specifically mapped, nor were the positions recorded via GPS or other means. Their presence was merely noted and remarked upon. At present they don't appear to be excluding native plants, but that may change over time. Locating, mapping, and eradicating invasive species is labor-intensive and time-consuming. Mapping every occurrence of each invasive is well beyond the scope of developing a forest management plan. Site-colonization of invasives should be monitored to detect expansion. Invasive exotic shrubs are becoming an increasingly devastating problem for forests globally and in the Northeast. Multiflora rose is present in the clearcut located in the north of the property, along the Tiffany Hill Road area. Common mullein was noted in an area with recent blow/ice down damage. There are likely other invasive species located on the property.

Cultural control methods are described below for dealing specifically with hay-scented fern, and could be applied to invasives, too.

A native invasive of concern is hay-scented (boulder) fern, which has a growth habit similar to invasive species. Hay-scented fern is well established throughout the Chevy Hill Forest. It is a rapid colonizer of disturbed sites, and it readily excludes nearly all other plants from becoming established under its dense cover, blocking sunlight. It may also exclude other plants through allelopathy, a form of control by natural chemical means. Allelopathic plants exude or emit a substance that inhibits or

prevents seeds of other plants from germinating. Whatever the means, it appears to be very difficult for tree seeds to germinate in an area covered by hay-scented fern. It is probably important to establish regeneration in the understory prior to creating large enough openings for hay-scented fern to thrive, which may preclude intolerant species from those areas.

6 WILDLIFE HABITAT CONDITIONS

Chevy Hill Forest provides a variety of habitats for wildlife, but is primarily mixed hardwood/conifer forestland. There are places with substantial hardwood browse, especially where harvesting took place circa 1990 later. Deer and moose evidence is abundant. Bear sign, most notably claw marks on beech trees, was noted. Bear likely frequent the adjacent wetland areas to the east of the property. Red oak, also fairly abundant on the property with many large individual stems, provides a source of hard mast (acorns) that is eaten by a variety of birds and many mammals including, turkey and deer. Beech is another mast producer (beech nuts) that is present on the property, with many large-stemmed individuals. Beech nuts are also consumed by many birds and mammals; they are an important part of a black bear's diet prior to hibernation.



Typical forest conditions. Left: mature beech tree. Right: decent red oak stem among smaller sugar maples, with much larger sugar maples in the background.

There aren't many upland open areas or agricultural fields that have recently been abandoned, although there is some open land associated with the clearcut located mostly in the non-Chevy Hill Forest lot that was part of the 2-lot subdivision in the north. Some of the margins of the clearcut were included in the lot that became part of the Chevy Hill Forest, but the acreage is small.



Along edge of ca. 2007 clearcut. Numerous early-successional species, including rubus, white birch, aspen, grape, and the invasive multiflora rose.

The forestland does vary and offers some structural diversity. Previous timber harvesting has created pockets of young seedlings and saplings surrounded by mature (and sometimes intermediate aged) trees. Large snags near these openings offer perching sites for raptors. Residual woody material created by logging has contributed some large debris. As this woody debris decays, it houses numerous insects, invertebrates, small mammals, amphibians, birds and larger mammals. As many as 40 different types of songbirds use standing dead trees with cavities as part of their habitat requirements. Down logs are a crucial part of amphibian habitat as they provide cool moist, shady conditions necessary for their survival. Because of their importance as habitat components, snags and down logs will be managed for throughout the property.



L – saplings established along a skid trail, appx 12 years old R – saplings established in a clearcut, appx 25 years old.



Foreground covered with moss; also hollow and mostly decayed snag.

Releasing existing understory trees, especially mast producers, will improve the wildlife habitat. Early successional habitat is fairly well represented with some dense sapling and small poletimber stands, which offer low cover to a variety of birds and small mammals.

The New Hampshire Wildlife Action Plan includes mapping of significant wildlife habitats as they occur throughout the state and provides strategies for the management of wildlife that occur on these habitats, especially as they relate to threatened and endangered species, but also including information on common wildlife species. According to their delineation, a variety of habitat types can be found on Chevy Hill and on adjacent lands. Hemlock-Hardwood-Pine dominates the site.

Recommended actions to improve and manage the wildlife habitat of Chevy Hill Forest⁴:

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.

⁴ Wildlife habitat management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

- 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 live 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:

- 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 trail 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.

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 from 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 ground is frozen or snow covered.

7 RECREATIONAL and EDUCATIONAL OPPORTUNITIES

Recreation

Chevy Hill Forest provides recreational opportunities. Although there isn't an extensive defined trail network, skid trails exist throughout the forest, providing the means to access most of the interior. The property is also likely hunted during deer season in the fall. Other recreation opportunities include snowshoeing and cross country skiing during winter months, and hiking in the summer. Recommended Actions to Improve and Manage the Recreational Resource of the Chevy Hill Forest:

- **Improve existing signage.**
 - Post a Welcome sign to the land that identifies the owner and what is allowed or encouraged on the land. This is not the best place to detail what is not allowed.
 - Post signs at all property corners and at intervals along the boundary identifying the landowner.
 - Improve informational signage about use of trails, explaining what is allowed and what is not allowed. For example:
 - Stay on the trail
 - Carry in and Carry out
 - Avoid trails if conditions are muddy
- **Clearly identify what trails are open to motorized and non-motorized use**
 - Post a map of the trails and allowed uses.
- **Locate and maintain trails to prevent erosion**⁵
- **Locate trails** so they avoid sensitive areas or valuable wildlife habitat such as vernal pools and deer wintering areas.
- **Create additional foot traffic trails** for hiking and snowshoeing to more remote areas of the forest and to vista sites
- **Create vistas** overlooking views and significant or interesting natural features of the forest
- **Install benches** for resting along trails and at vistas

Education

Educational opportunities are limitless on Chevy Hill. Forest management operations provide educational opportunities in the form of public workshops to see timber harvesting in action or school field trips focused on management of renewable natural resources or to learn more about what land ownership and management can be about. Interpretive signs put in place during forest management operations can be a helpful educational resource that aid in public relations and understanding of land management. The Hillsborough County forester is an excellent resource for public education

⁵ Two good resources include: *Lightly on the Land*, *The SCA Trail-Building and Maintenance Manual* by Robert C. Birkby and [Best Management For Erosion Control During Trail Maintenance and Construction](#) by New Hampshire Department of Resources and Economic Development, Division of Parks and Recreation, Bureau of Trails

needs and is usually willing to participate in workshops or provide educational resources. There are many creative ways to educate; opportunities are not limited to those listed here.

Suggested opportunities to utilize the public education potential of Chevy Hill Forest:

- **Encourage local schools/clubs/etc.** to utilize this valuable resource.
- Prior to, during, or after any forest management activities, **promote and present workshops** inviting the public to come learn about management activities on Chevy Hill Forest.
- Create and **post educational signage** about Chevy Hill Forest and management philosophy and activities.
- Create **interpretive trails** with signs about management and natural features

8 FOREST CONDITIONS

Forest Types

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

COVER TYPES

H ≥ 70% dominant & co-dominant trees are hardwood

S ≥ 60% dominant & co-dominant trees are softwood

HS = Mixed species but dominated by hardwood

SH = Mixed species but dominated by softwood

(in some instances a dominant species, such as WP or HE may be included in the cover type)

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

An inventory was conducted in June, 2010 consisting of 45 sample points. Data was collected as outlined in the Weare master plan.

Age and Age Class Distribution

As with most forests in New England, Chevy Hill Forest is largely even-aged, with the bulk of the trees getting their start after the abandonment of agriculture here early last century. That said, different species and individuals within the same species grow faster and mature at different rates than others. White pine, a fast growing tree, can get to quite a large size, compared to a hemlock of the same age. White birch, another fast growing tree, doesn't get as large as white pine and in addition, matures at an earlier age. Variability exists within an evenage forest, providing opportunity to manage for multiple size classes and diversify the forest structure, providing better wildlife habitat,

continuous forest cover, and relatively less intensive silvicultural management. In general, Chevy Hill Forest is dominated by 110 to 130 year old red oak, sugar maple, hemlock and white pine the overstory. Younger trees, often clusters of pole-sized hardwood species, can be found in pockets where past harvesting or natural disturbances, such as blow down, created openings. There are some areas in the forest that experienced small-scale blowdown/icedown events in the previous 5 years.

Growth Rates

An in-depth study of tree growth is beyond the scope of this plan. While not statistically sound, some growth observations can be made by counting tree rings on old stumps and taking increment cores of some trees. Although volume growth is very difficult to accurately calculate using this method, some rules-of-thumb do apply. A tree's growth is directly related to the substrate 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 managed woodlot in New Hampshire grows at a rate of 2 to 4 percent per year. This corresponds to volume increases of approximately 0.5 cords or 250 board feet per acre per year. Given the site conditions and the current density of the forest, it is likely that tree growth of the Chevy Hill Forest falls within this range.

Tree Quality and Tree Health

Overall tree quality on the Chevy Hill Forest is average to below average. Some of the low quality is attributable to highgrading practices during past logging jobs, where a lower percentage of low quality timber was removed than high quality timber. Some is attributable to damage caused by natural factors, including wind, ice, snow, lightning, and insects. Many of the larger trees are unsound, with cavities and seams. Even though many of the defective or otherwise poor quality trees have reduced timber value, many still have acceptable or desirable attributes for other value categories (den trees, mast producers, maple sugar production, aesthetics, cover, etc.).

Red oak (22%), white pine (18.9%), red maple (17.4%) and hemlock (15.6%) dominate the timber volume on the forest, found in stems of variable size and quality. Red oak appears to do well on these sites and should be favored, especially intermediate and young stems that exhibit strong growth and quality characteristics. The remaining volume is a mix of species, including decent quality intermediate black birch and sugar maple of several size-classes.

The soils on Chevy Hill Forest are relatively productive, and should contribute to high tree vigor and volume production. The most pressing health concern involves commonly occurring tree

diseases and damage that were noted on the forest; including white pine weevil damage, beech bark disease, sugar maple borer, decline in the white ash, and sterile conk of birch. These diseases and insect damage alone do not signal the need for treatment, but should one occur high priority should be given to improving stand quality and health by removing trees with signs of the above mentioned diseases or other forms of damage, including prior logging injury.

Forest Management Approach

Management on the Chevy Hill forest will utilize a combination of silvicultural techniques that typically are separated into two general categories, even-age and unevenaged management. Evenaged management methods include clearcut, seed tree, shelterwood, overstory removal and patch cut applications and may be used to regenerate a new stand when deemed necessary. Unevenaged management methods generally include single tree and group selection 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.



Unevenaged group selection, left; evenaged shelterwood, right. Both resulted in heavy white pine

regeneration. Regeneration is more widespread under shelterwood, and more contained in distinct locations using group selection.

Further discussion of unevenage management is required. Traditionally, the intent of unevenage management is to attain forest stocking conditions that mimic a specific diameter/age distribution. But, practicably 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 on Weare lands, 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 Chevy Hill Forest 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. Target diameters 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	Beech	14-18
Hemlock	16-20	Aspen	12-14
White Ash	16-22	Sugar Maple	16-22
Black Cherry	14-18	Red Oak	16-24
White Birch	12-16	Red Maple	14-18
Yellow Birch	16-22		

Hemlock/Hardwood Silviculture

The hemlock and hardwood community on Chevy Hill 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 range between 60-90 square ft/acre for the hardwood and 110-200 square ft/acre for areas dominated by hemlock and pine. 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.

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 pine 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 soils on Chevy Hill are generally suited for vigorous white pine growth if it becomes established, however, these soils favor hardwood growth and establishment in forested situations. Few areas in the Chevy Hill Forest have adequate quantities of white pine seedlings and saplings established to perpetuate white pine here.

Red Oak Silviculture

The art and science of growing red oak is equally as tricky as for 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 much wildlife, the acorn is heavily consumed; if the wildlife does not find the acorn, insects like the acorn grub do. According to USDA Forest Service 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 snowless seasons best does this. Oak's overall survival is most importantly related to light intensity levels. For the seedlings/saplings to photosynthesize optimally it requires 30% light intensity in the open. Under a closed forest canopy light intensities are less than 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, to achieve 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 loss. 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.

Access

Chevy Hill Forest has frontage along Tiffany Hill Road in the north, and borders the turn-around at the end of Chevy Hill Road to the south. An older truck road leads to a log landing from Chevy Hill Road, however, this internal access needs quite a bit of upgrading in order to be useful. Needed upgrades include improving the roadbed and surface, improving drainage, and developing the log landing to current specifications. There is no internal access provided from Tiffany Hill Road. A new access road and landing will need to be constructed for access from here. However, an updated access road and log landing installed off of Chevy Hill Road would probably be sufficient to

allow practical harvesting from the northern half of the Chevy Hill Forest.

Operability

The terrain and ground conditions on this tract in general do not limit operability, although seasonal restrictions should be observed in some places. While much of the property has slopes ranging from 15 to 30 percent, there are very few places that are inoperable. The surface is also relatively free of large rocks and boulders that can hamper logging equipment. Some attention should be paid to scheduled harvests in the spring to avoid soil compaction and erosion issues. Winter harvesting on frozen ground with good snow cover will provide the best protection for the soils found here. But, given the unreliability of winter conditions, operations may occur during the summer in dry periods as long as wet areas are avoided or tracked with equipment that minimizes impacts, including a cut-to length system that creates a mat of slash to drive over, therefore protecting wet ground from rutting and mitigating negative impacts.

Property Boundary

The Chevy Hill Forest boundary is in variable condition and includes approximately 2.6 miles of maintainable boundary line. A combination of stonewalls, wire fencing, corner monumentation and painted blazes make up the boundary. The entire boundary should be blazed and painted where needed as soon as possible. The property line between the lots of the 2-lot subdivided portion of the Chevy Hill Forest in the north has no boundary blazes installed, although it may have the corners monumented. These were not located during the cruise, as the information pertaining to this part of Chevy Hill Forest had not been provided at that time. It is recommended that the entire boundary be monumented with Town of Weare signs, especially at corners, roads, and trails.

FOREST DATA

Stand 1 WP4B/H3B**12.5 acres**

Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type:	hemlock-beech-oak-pine
Past Management History:	field reversion; cut ca 1980
Approximate Age of Dominant Trees:	90 to 110
Stand Health:	fair, not critical
Insects/Damage/Disease:	white pine weevil; blister rust; beech scale

SITE CONDITIONS

Determined by:	soils map & field observation
Tree vigor:	average
Soils:	Tunbridge-Lyman-Monadnock Complex, stony; Marlow stony loam; Marlow loam
Drainage:	well-drained
Terrain:	not as steep as other stands
Aspect:	east

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"				
12-18"				
>18"				
Grand Total				0

Table 1.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Cavity/Hollow	Moderately punky	Punky throughout	Sound	Grand Total
<12"			76.4		76.4
12-18"			7.2		7.2
>18"					
Grand Total			83.6		83.6

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

WILDLIFE HABITAT

Forest type:	conifer (wp), with some mixed hardwoods (ro, be, wa, rm)
Vertical diversity:	developed canopy and understory, less mid-story
Vegetative diversity:	moderate, hardwood regeneration
Hard mast:	minor; red oak, beech
Soft mast:	moderate; pine seed, cherry, maple, ash
Special habitat features:	perching sites in large pines
Snag trees:	minimal, some small diameter pine
Down logs:	moderate, but mostly less than 12"
Special wildlife practices:	retain large WP to create future snags; favor mast trees

RECREATION

Recreational features:	minimal
Recreational infrastructure:	none
Aesthetic resources:	fern glade, heavy hardwood seedling cover in some places
Public access:	no direct trails, but 2 stands not far from Chevy Hill Road end

SILVICULTURE**Structural and Silvicultural Attributes**

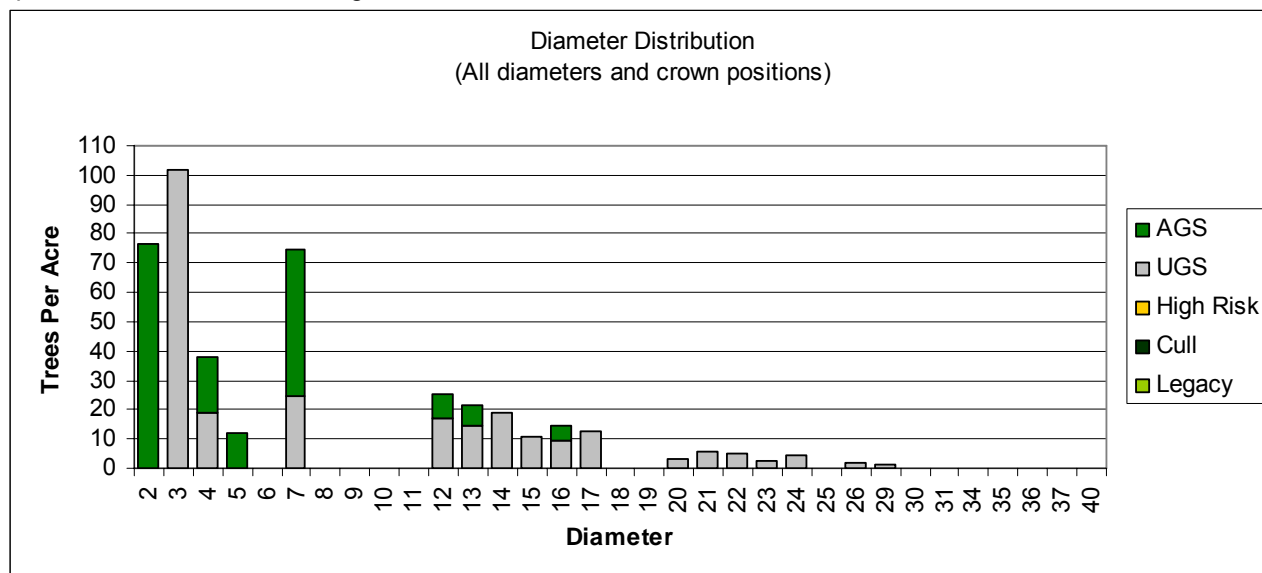
Broad Forest Type:	WP4B/H3B
Size Class:	medium sawtimber
Stand Structure:	even-aged
Crown Closure:	85%
Total Basal Area Per Acre:	212
Total Merchantable Basal Area Per Acre:	202
Total Acceptable Basal Area Per Acre:	38
Trees Per Acre:	431
Quadratic Mean Stand Diameter:	9.5
Percent AGS Sawtimber:	28.6%
Basal Area of AGS Sawlogs:	20
Timber Quality:	low

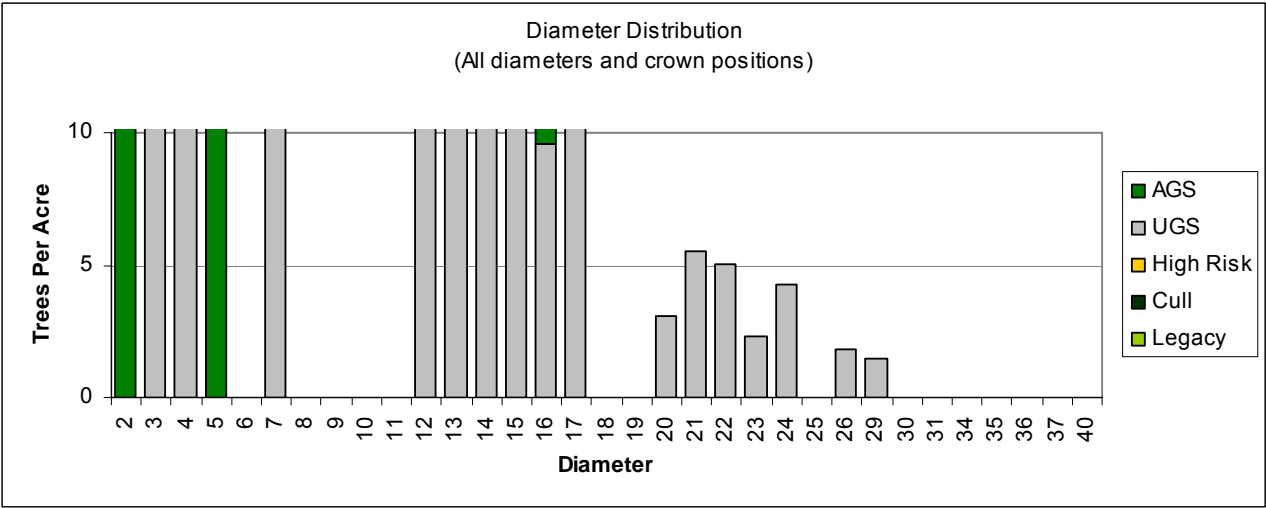
Forest Composition and volume

Species	% TPA	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	24.7%	0	0	1.4	0.0	0.0	1.4	0.0	0	0%
Red Oak	25.6%	591	1,091	3.2	0.9	0.0	7.1	0.0	813	48%
White Ash	2.1%	322	0	1.4	0.0	0.0	2.0	0.0	0	0%
Total Hardwood Per Acre:	52.4%	913	1,091	6.0	0.9	0.0	10.5	0.0	813	41%
White Pine	47.6%	1,682	2,365	27.0	0.0	0.0	35.2	0.0	919	23%
Total Softwood Per Acre:	47.6%	1,682	2,365	27.0	0.0	0.0	35.2	0.0	919	23%
Total Volume Per Acre:	100.0%	2,594	3,456	33	1	0	46	0	1,732	29%
Stand Volume:		32,375	43,131	412	11	0	570	0	21,614	

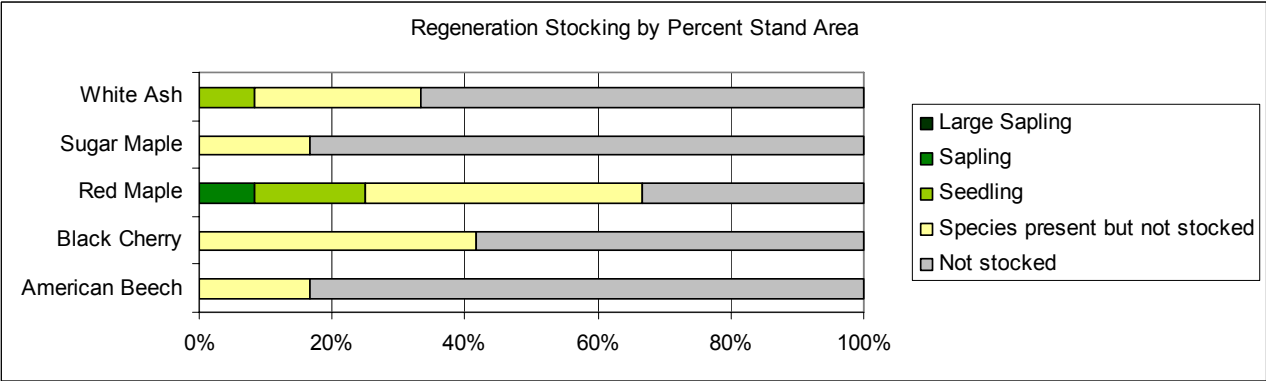
Table 1.3: Stand volume by species and product per acre values.

Graph 1.1a and 1.1b: 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. 1.1b provides a close-up of the breakdown in the larger diameter classes.

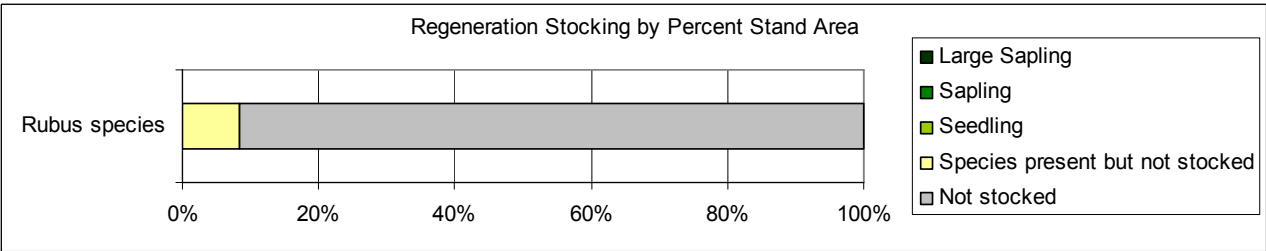




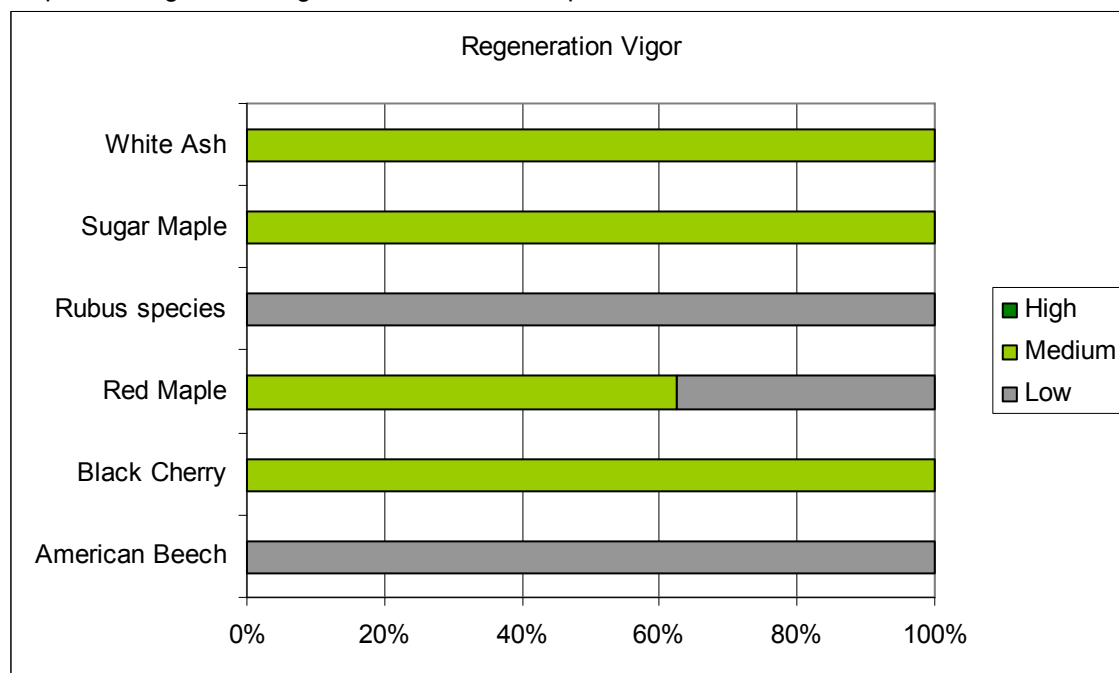
Graph 1.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



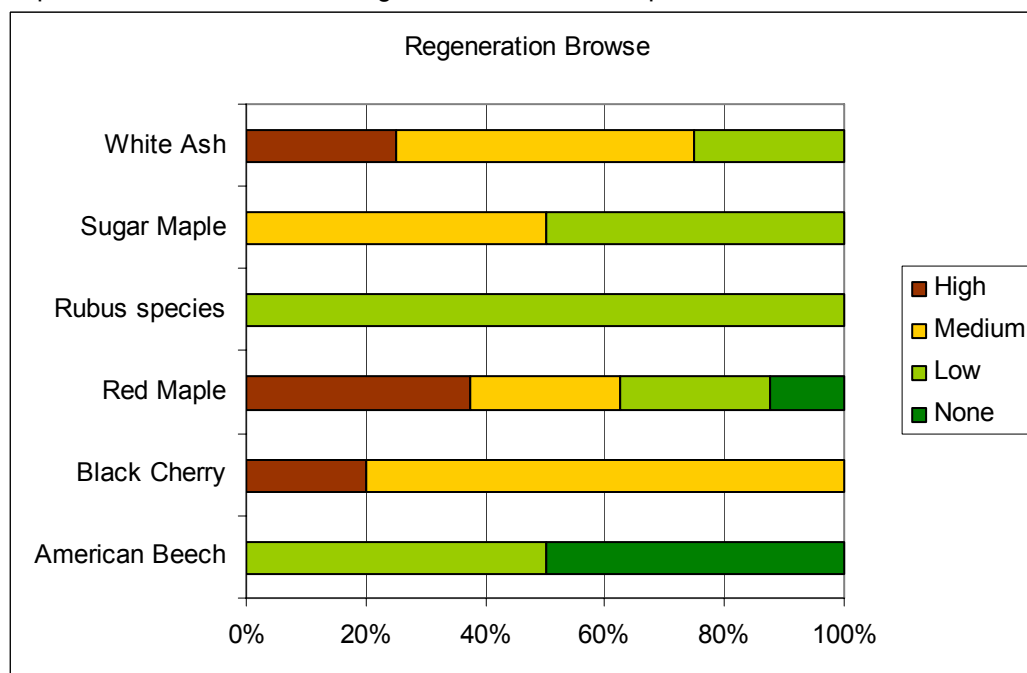
Graph 1.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 all regeneration and shrub species.



Graph 1.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	uneven aged - small groups and single stem	
Harvest Entry:	within 10 years, then every 15 to 25 years	
Products:	pulp, sawtimber, veneer, cordwood	
Desired Composition:	high quality hardwood conversion, retain some large WP, especially for snag creation	
Crop tree target diameter:	WP – 20	RO - 20
	WA - 16	SM - 18

Operational Considerations

Operability:	highly operable
Seasonal limitations:	minor (spring) for 2 lower elevation stands
Terrain:	some minor ledge outcrops, but not steep
Access and landing area:	from Chevy Hill Road
Access distance:	less than one-quarter mile
General maintenance:	upgrades needed for access and landing
Brook-wetland crossings/buffer requirements:	minimal, seasonal related (spring)

**STAND SUMMARY
AND
10-YEAR MANAGEMENT SCHEDULE**

Type 1 includes 3 non-contiguous stands characterized by relatively poor quality white pine. The soils in this type are well-drained, and will favor production of high quality hardwoods. The drier microsites will favor red oak and white birch, while the mesic sites can support ash, sugar maple, and red oak. The pine growing in this type has characteristics consistent with field reversion or open-grown (clearcut) condition; more than 50% are multi-stemmed or crooked, the result of white pine weevil damage.

White pine dominates the product volumes (over 65%), while hardwoods account for just over 50% of the total stem count. The canopy is relatively closed in most parts of the type, averaging 85% closure. Total type basal area is high, at over 210 square feet per acre. The understory is patchy, and tends to be hardwoods, though there is some hemlock scattered in the type.

Regeneration is modest, and tends to be found in distinct groups. Stem counts are dominated by red maple, while ash and black cherry are well represented. Heavy fern colonization may be problematic for creating new seedlings in some areas.

The long-term goal of management in this stand is to develop several age classes of quality hardwood sawtimber and veneer trees of species well suited to the site, particularly red oak and to a lesser extent sugar maple. The age classes will exist primarily as pockets of similarly aged trees mixed throughout the stand. This multiple-age composition will provide a diversity of forest structure beneficial to wildlife and will provide opportunity for a mix of silvicultural operations. The current species composition does not reflect the natural species mix and likely will significantly change over time, primarily via a decrease in the white pine component.

Silviculture: The focus of management here will be to harvest poor quality white pine and

hardwoods, and attempt to establish high quality hardwood regeneration. These goals will be accomplished by removing about 1/2 of the overstory in groups, focusing on removing those individuals of poor quality and retaining the individuals that are of high quality and vigor.

2014: Harvest significant white pine volume, removing the poorest quality wood as a priority, but also include high-quality mature stems. Release groups and individual intermediate and regeneration stems, especially red oak and white ash. Reduce basal area to approximately 100-130 square feet through:

- **Group Selection:** Create openings of 5-10 trees to establish intermediate shade tolerant and intolerant regeneration. If harvest is to be done in the summer, scarifying areas with no regeneration or areas of undesirable seedlings/saplings will help promote the regeneration of light seeded individuals such as birch, hemlock, and pine. In places with existing heavy hardwood regeneration, remove 40 to 60% of the overstory, leaving a somewhat well distributed overstory of average to above average quality white pine and hardwood to serve as protective cover for those seedlings. A second thinning can be implemented 15 to 20 years after this initial thinning.

Wildlife: Wildlife habitat here will become more diverse as a multiple age structure is developed. White-tailed deer browse the areas with hardwood saplings. Any treatments that promote hardwood regeneration will likely benefit deer, moose and rabbits by providing better browse opportunities. Multiple age classes help to ensure there is always a level of browse for wildlife. Specific wildlife habitat improvements will include retaining hard mast producing hardwoods; retaining beech trees with evidence of bear use; creating hardwood browse especially in areas with low-valued or poor vigor trees; creating standing snag trees by girdling some large white pine with no commercial value; creating down woody debris by felling and leaving some large white pine on the forest floor; and retaining some living large diameter pine to provide perching sites.

- Create additional large snag trees by girdling up to 5 trees >18" in diameter per acre.
- Create down logs by felling up to 5 trees > 18" in diameter per acre.
- Maintain existing snags and large down logs.
- Retain and favor soft and hard mast producing hardwoods.

Stand 2 H3/4A**32.6 acres**

Stand Structure



Stand Structure



Stand Structure

GENERAL ATTRIBUTES

Natural Community Type: hemlock-beech-oak-pine; semi-rich mesic; rich mesic sugar maple; sugar maple-beech-yellow birch; beech

Past Management History: clearcuts and large groups, ca 1950, 1970

Approximate Age of Dominant Trees: 70 to 90

Stand Health: decent

Insects/Damage/Disease: wind/ice throw; beech scale; sugar maple borer

SITE CONDITIONS

Determined by: soils map & field observation

Tree vigor: moderate to high

Soils: Marlow stony loam; Tunbridge-Lyman-Monadnock Complex, stony; Pillsbury stony loam

Drainage: well-drained, except for Pillsbury

Terrain: steep, some ledge, generally smooth

Aspect: east

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	2.8		8.5	11.3
12-18"	1.3		2.3	3.6
>18"		0.4		0.4
Grand Total	4.1	0.4	10.9	15.3

Table 2.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Cavity/Hollow	Moderately punky	Punky throughout	Sound	Grand Total
<12"		17.5		84.6	102.0
12-18"			1.5		1.5
>18"	0.8				0.8
Grand Total	0.8	17.5	1.5	84.6	104.3

Table 2.2: Down logs per acre by size and decay class.

WILDLIFE HABITAT

Forest type:	Hardwood
Vertical diversity:	moderate; developed understory, midstory and canopy
Vegetative diversity:	high; enriched and semi-enriched sites; numerous species
Hard mast:	oak, beech
Soft mast:	maple, ironwood, ash, cherry, birch, hemlock
Special habitat features:	old living sugar orchard relics with cavities
Snag trees:	numerous, but generally small diameter
Down logs:	moderate; small and medium diameter
Special wildlife practices:	retain large hardwood cull trees; create large snags

RECREATION

Recreational features:	sugar house ruins
Recreational infrastructure:	none
Aesthetic resources:	maidenhair fern observation opportunity
Public access:	no trails, but near Chevy Hill Road end.

SILVICULTURE**Structural and Silvicultural Attributes**

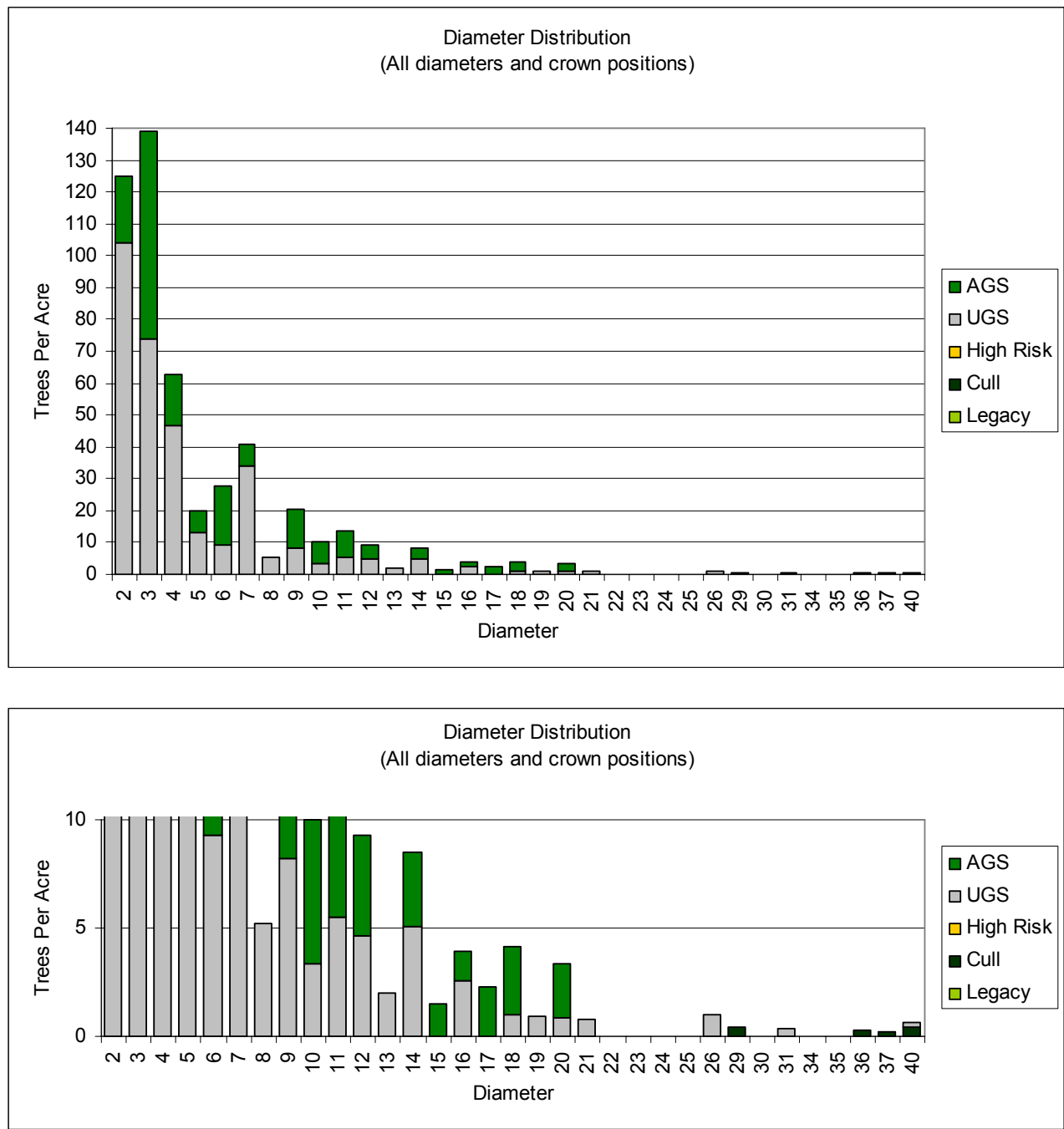
Broad Forest Type:	H3/4A
Size Class:	medium to large sawtimber; poletimber
Stand Structure:	two-aged; trending to uneven-aged
Crown Closure:	90%
Total Basal Area Per Acre:	123
Total Merchantable Basal Area Per Acre:	108
Total Acceptable Basal Area Per Acre:	51
Trees Per Acre:	504
Quadratic Mean Stand Diameter:	6.7
Percent AGS Sawtimber:	63.0%
Basal Area of AGS Sawlogs:	31
Timber Quality:	average, poles better

Forest Composition and volume

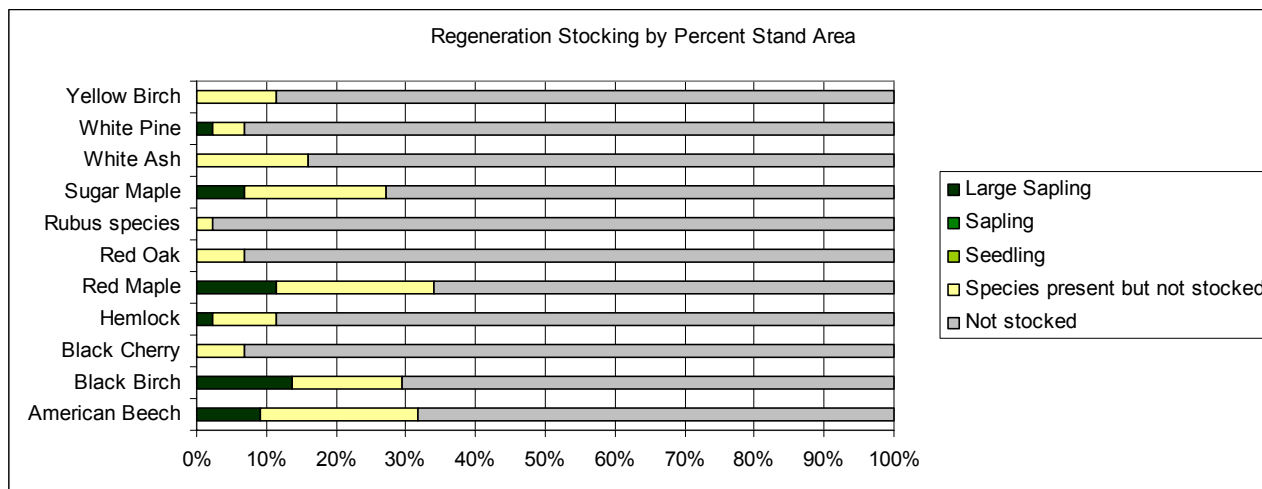
Species	% TPA	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	0.3%	0	0	0.7	0.0	0.0	0.7	0.0	0	0%
Black Birch	1.7%	136	151	0.3	0.0	0.0	0.9	0.0	0	0%
Hop Hornbeam	5.8%	0	0	1.0	0.0	0.0	1.0	0.0	0	0%
Red Maple	18.4%	296	0	2.5	0.0	0.0	3.1	0.0	0	0%
Red Oak	15.0%	1,711	608	2.1	0.3	0.0	6.6	0.0	1,699	73%
Sugar Maple	27.7%	439	421	2.4	0.0	0.0	4.6	0.0	533	62%
White Ash	4.4%	294	0	1.1	0.0	0.0	1.6	0.0	294	100%
White Birch	2.6%	0	0	0.2	0.0	0.0	0.2	0.0	0	0%
Yellow Birch	1.7%	77	0	0.3	0.0	0.0	0.4	0.0	77	100%
Total Hardwood Per Acre:	77.7%	2,952	1,180	10.5	0.3	0.0	18.9	0.0	2,603	63%
Hemlock	22.0%	0	0	1.4	0.0	0.0	1.4	0.0	0	0%
White Pine	0.3%	0	0	0.5	0.0	0.0	0.5	0.0	0	0%
Total Softwood Per Acre:	22.3%	0	0	1.9	0.0	0.0	1.9	0.0	0	0%
Total Volume Per Acre:	100.0%	2,952	1,180	12	0	0	21	0	2,603	63%
Stand Volume:		96,280	38,479	403	11	0	677	0	84,900	

Table 2.3: Stand volume by species and product per acre values.

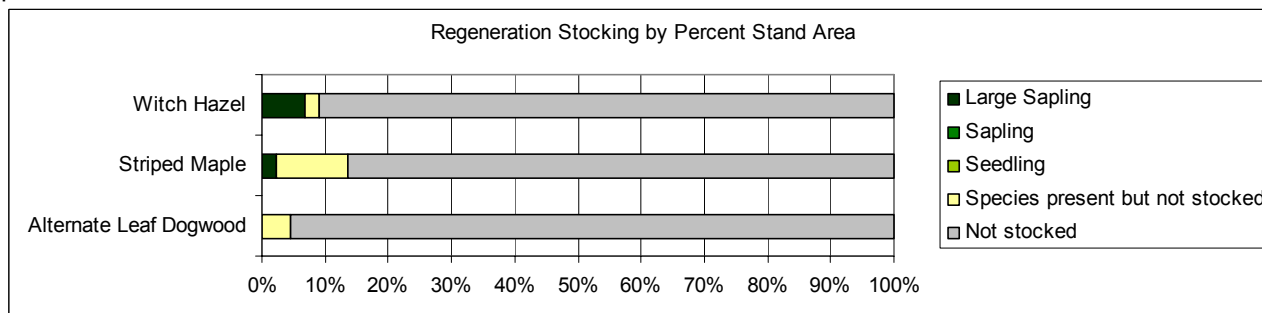
Graph 2.1a and 2.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 2.1b provides a close-up of the breakdown in the larger diameter classes.



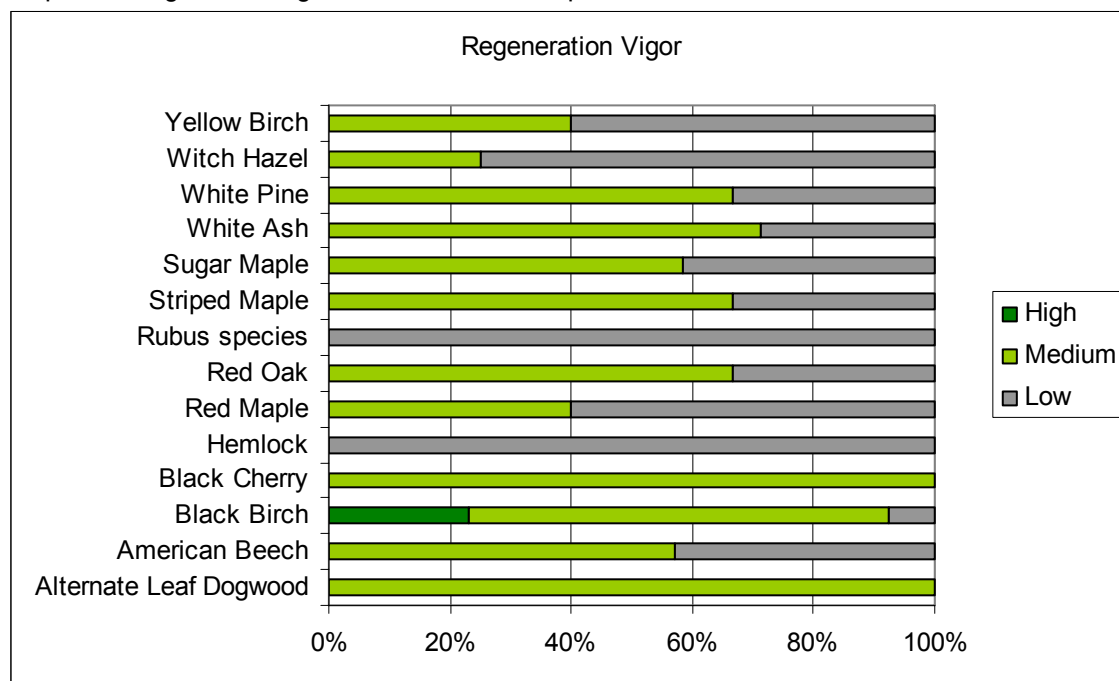
Graph 2.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



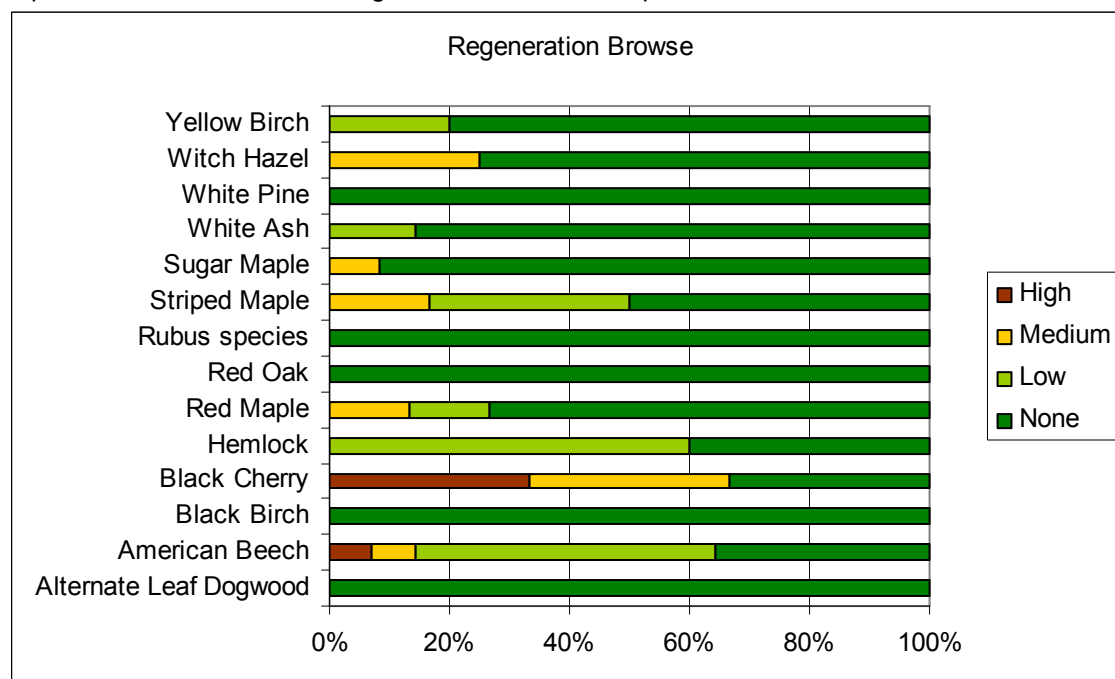
2.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 all regeneration and shrub species.



Graph 2.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	uneven aged – single stem release and small groups	
	even aged – large groups	
Harvest Entry:	ca 1970, 1990	
Products:	sawtimber, veneer, pulpwood, cordwood	
Desired Composition:	northern hardwoods; multiple size/age classes	
Crop tree target diameter:	SM – 20	RO – 22
	RM – 16	BB/YB - 18
	WA – 20	WB - 14

Operational Considerations

Operability:	highly operable
Seasonal limitations:	minor in wet/rainy season
Terrain:	steep; smooth; minimal rocks
Access and landing area:	from Chevy Hill Road
Access distance:	mostly within one-quarter mile
General maintenance:	needs upgrades
Brook-wetland crossings/buffer requirements:	minimal

**STAND SUMMARY
AND
10-YEAR MANAGEMENT SCHEDULE**

Type 2 includes 4 non-contiguous hardwood stands. Red oak, sugar maple, and red maple account for over 60% of the total volume, with the rest a combination of other northern hardwoods and hemlock. Sugar maple, hemlock, red oak and red maple account for over 85% of the total stems. The canopy is generally closed in most parts of the type, averaging 90% closure, while basal area is above average for the type, around 120 square feet per acre. Current stand structure and characteristics indicate the type is two-aged, but there are enough existing seedlings and saplings to push the type toward uneven-aged if allowed to continue growing *and* released from some overstory competition. The soils in this type are potentially very productive for hardwoods, especially red oak, black birch, and sugar maple, and have few operational limitations for forestry work.

Recent snow loads or icing has created small (less than 1/4-acre) areas with uprooted trees. There are several of these pockets within the type, which provide open canopy areas and allow more sunlight to reach the forest floor.

Regeneration is decent, with beech, sugar maple, black birch and red maple found in 25% of the type. Hemlock, ash, and yellow birch are also somewhat abundant, found in 10% of the type. Most of these are desirable species for sawtimber production, and are suited to the site.

Intermediate stems (poletimber and small sawtimber) are present in acceptable numbers, and there are many quality examples within the type. These intermediates should be released during overstory removals and at the edges of group selections. Intermediates to favor are red oak, black birch, sugar maple, and white ash.

Sawtimber opportunities are somewhat limited at present in this type (~4,000 board feet per acre), but opportunities and volume should increase significantly in the next 15 to 25 years following

improvement thinnings to reduce competition from poor-quality stems.

Silviculture: The focus of management in this type will be to favor high quality and vigorous hardwoods, especially those with the potential to yield veneer. This should be accomplished using multiple methods, including single stem release, small group selection, and large group selection. Species to favor, especially intermediate stems, include black birch, sugar maple, and red oak.

2014: Harvest moderate volume of high risk and poor quality hardwoods. Focus on releasing intermediate poletimber exhibiting excellent form. Some priority should be given to releasing target-species saplings. Basal area should be reduced to between 75 and 95 square feet through:

- **Group Selection:** Create openings of 3 to 7 trees to establish intermediate shade tolerant regeneration. For oak regeneration, groups should be slightly larger.
- **Single Stem Release:** Where intermediate stems are already established, remove 1 to 2 competing stems to increase crown spacing. Can also be used for larger stems that have the potential to reach veneer status within 30 years. Crown density should remain at 75% or greater. This may favor tolerant hardwoods (sugar maple, beech), but isn't a priority; the goal is to give existing stems better growth opportunities.

Wildlife: Wildlife habitat here will become more diverse as a multiple age structure is developed. White-tailed deer and moose browse the areas with hardwood and hemlock saplings. Any treatments that promote hardwood regeneration will likely benefit deer, moose and rabbits by providing better browse opportunities. Multiple age classes help to ensure there is always a level of browse for wildlife. Specific wildlife habitat improvements will include retaining hard mast producing hardwoods; retaining beech trees with evidence of bear use; creating standing snag trees by girdling some large hardwoods with no commercial value; creating down woody debris by felling and leaving some large hardwood stems on the forest floor.

- Create additional down logs by felling up to 2 trees > 18" in diameter per acre.
- Maintain existing snags and large down logs.

Stand 3 HS4/3B

111.2 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type:	hemlock-beech-oak-pine; hemlock; hemlock-beech-northern hardwood
Past Management History:	cut ca 1960, 1975, 1990
Approximate Age of Dominant Trees:	115 to 125
Stand Health:	decent
Insects/Damage/Disease:	wind/ice throw; beech scale; white pine weevil

SITE CONDITIONS

Determined by:	soils map & field observation
Tree vigor:	good
Soils:	Tunbridge-Lyman-Monadnock Complex , stony; Marlow stony loam; Borohemists, ponded
Drainage:	well drained
Terrain:	steep; some ledge
Aspect:	east

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"		3.7	14.8	18.5
12-18"		0.8		0.8
>18"	0.3	0.1		0.5
Grand Total	0.3	4.7	14.8	19.8

Table 2.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Cavity/Hollow	Moderately punky	Punky throughout	Sound	Grand Total
<12"	1.0	8.8	26.1	4.0	39.9
12-18"	0.7	0.8			1.6
>18"					
Grand Total	1.7	9.7	26.1	4.0	41.5

Table 2.2: Down logs per acre by size and decay class.

WILDLIFE HABITAT

Forest type:	hardwood
Vertical diversity:	decent, has multiple size classes and crown heights
Vegetative diversity:	good, numerous tree (>10) and shrub (>5) species
Hard mast:	red oak, beech
Soft mast:	blueberry, maple, ash, cherry, hemlock
Special habitat features:	wetland along upper east boundary
Snag trees:	adequate; could use some larger diameter snags
Down logs:	adequate; could use some larger diameter logs
Special wildlife practices:	allow for large snags and down logs

RECREATION

Recreational features:	minimal
Recreational infrastructure:	none
Aesthetic resources:	small fern glades; small ledge outcrops; potential view to east
Public access:	limited; no good parking along Tiffany Hill Road

SILVICULTURE**Structural and Silvicultural Attributes**

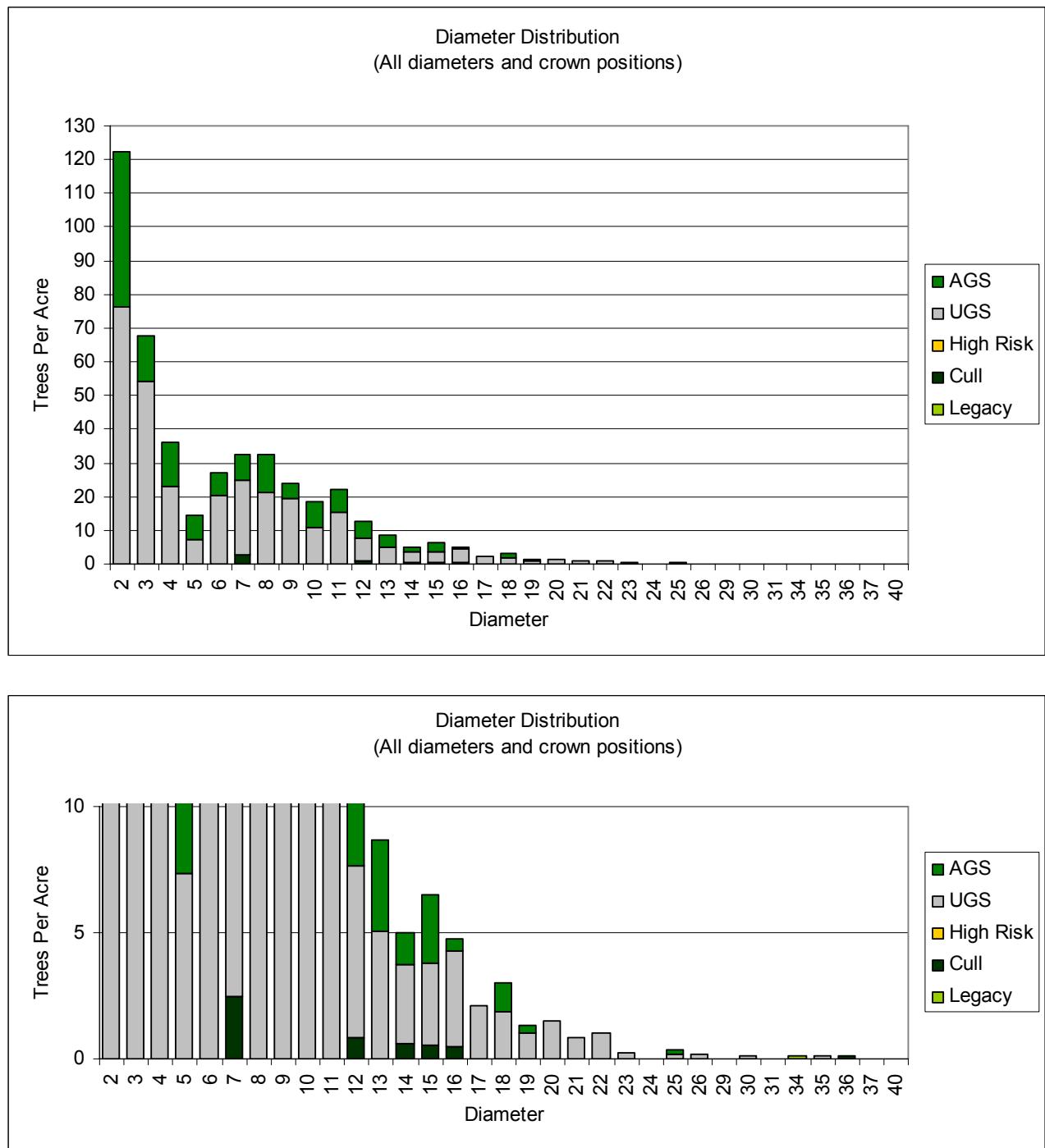
Broad Forest Type:	HS4/3B
Size Class:	medium to large sawtimber
Stand Structure:	uneven aged
Crown Closure:	70%
Total Basal Area Per Acre:	135
Total Merchantable Basal Area Per Acre:	125
Total Acceptable Basal Area Per Acre:	38
Trees Per Acre:	447
Quadratic Mean Stand Diameter:	7.4
Percent AGS Sawtimber:	56.4 %
Basal Area of AGS Sawlogs:	21
Timber Quality:	fair

Forest Composition and volume

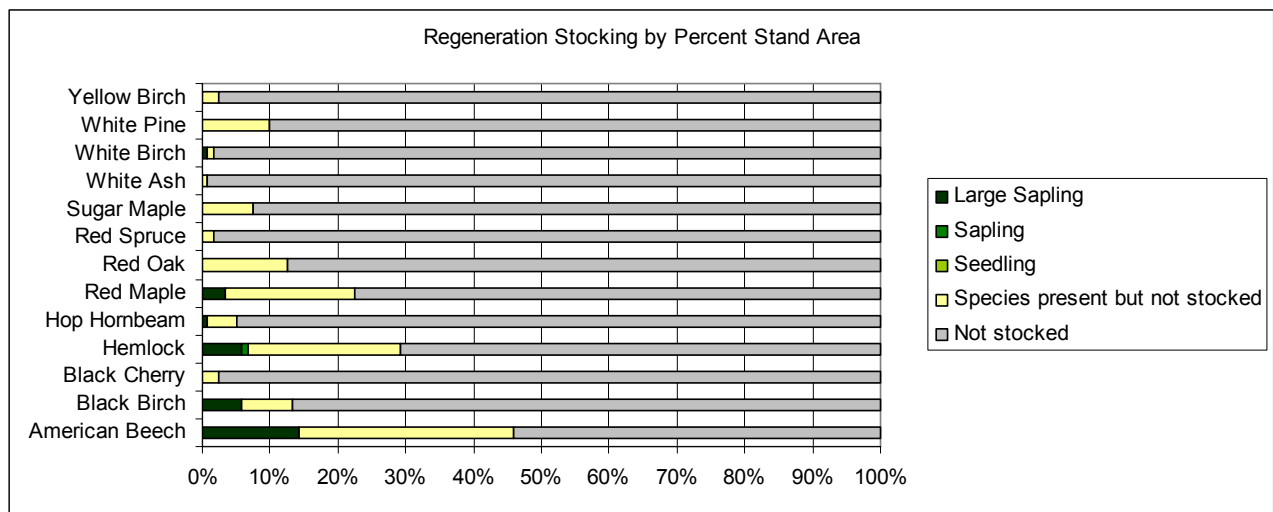
Species	% TPA	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Volume in Cords	High Risk	AGS Saw	% AGS Saw
American Beech	8.6%	0	34	2.3	0.0	0.0	2.4	0.0	0	0%
Black Birch	3.0%	0	0	0.5	0.0	0.0	0.5	0.0	0	0%
Black Cherry	1.0%	0	28	0.2	0.0	0.0	0.3	0.0	0	0%
Hop Hornbeam	2.9%	0	0	0.0	0.0	0.0	0.0	0.0	0	0%
Red Maple	25.9%	59	46	4.8	0.0	0.0	5.0	0.0	59	56%
Red Oak	14.3%	864	508	2.2	0.0	0.0	4.8	0.0	693	50%
Sugar Maple	5.1%	180	54	0.6	0.0	0.0	1.0	0.0	234	100%
White Ash	4.8%	114	25	0.6	0.0	0.0	0.8	0.0	82	59%
White Birch	4.1%	0	0	0.3	0.0	0.0	0.3	0.0	0	0%
Yellow Birch	1.5%	57	0	0.3	0.0	0.0	0.4	0.0	57	100%
Total Hardwood Per Acre:	71.1%	1,274	695	11.9	0.0	0.0	15.5	0.0	1,125	57%
Hemlock	25.5%	717	0	3.5	0.0	0.0	4.9	0.0	443	62%
Red Spruce	0.6%	0	0	0.1	0.0	0.0	0.1	0.0	0	0%
White Pine	2.8%	185	94	1.5	0.0	0.0	2.3	0.0	103	37%
Total Softwood Per Acre:	28.9%	903	94	5.1	0.0	0.0	7.3	0.0	546	55%
Total Volume Per Acre:	100.0%	2,177	789	17	0	0	23	0	1,671	56%
Stand Volume:		241,984	87,669	1,892	0	0	2,535	0	185,807	

Table 2.3: Stand volume by species and product per acre values.

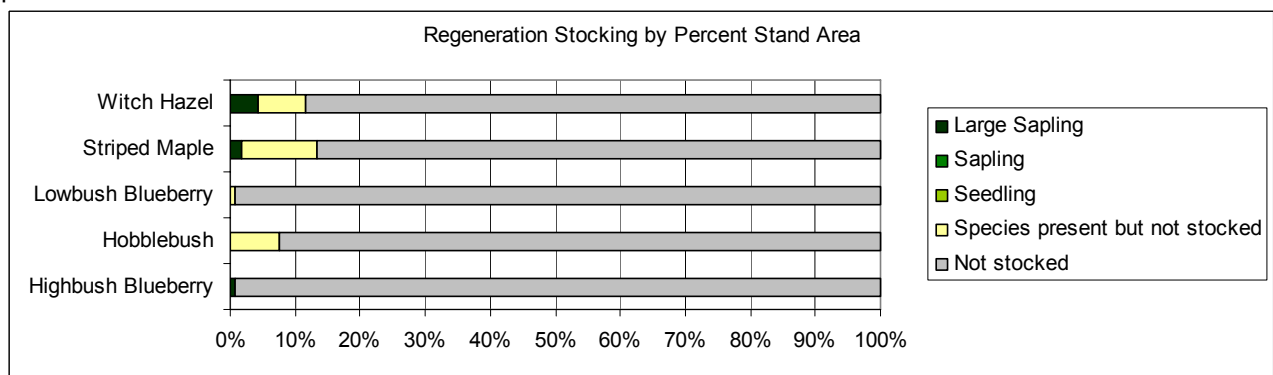
Graph 2.1a and 2.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 2.1b provides a close-up of the breakdown in the larger diameter classes.



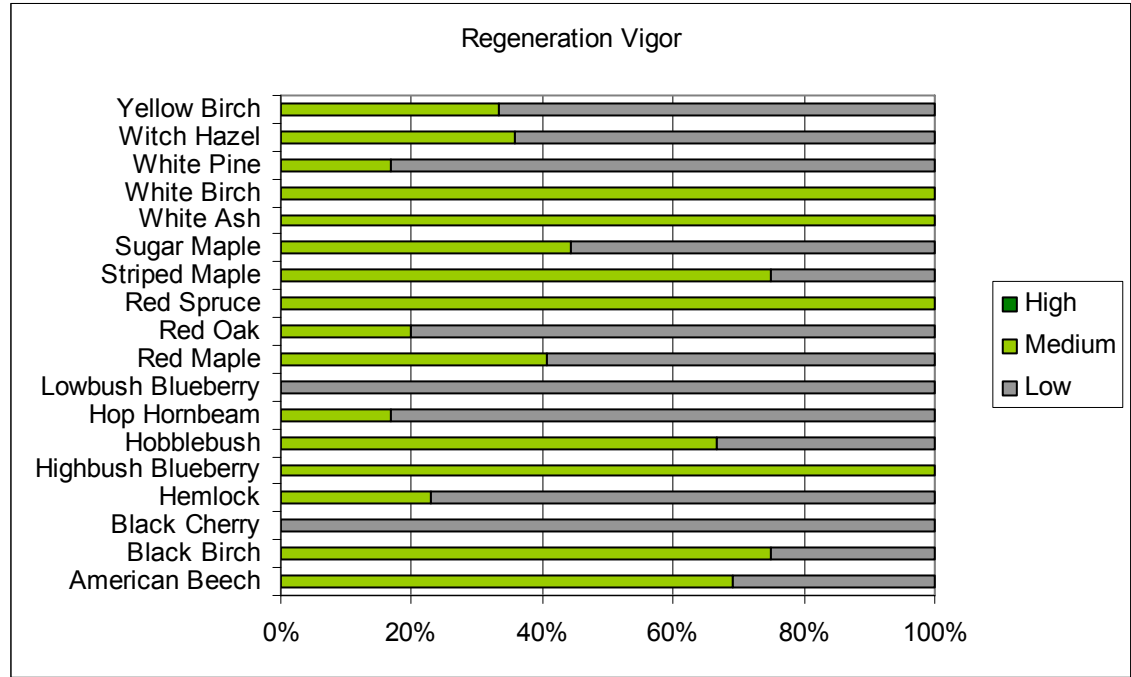
Graph 2.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



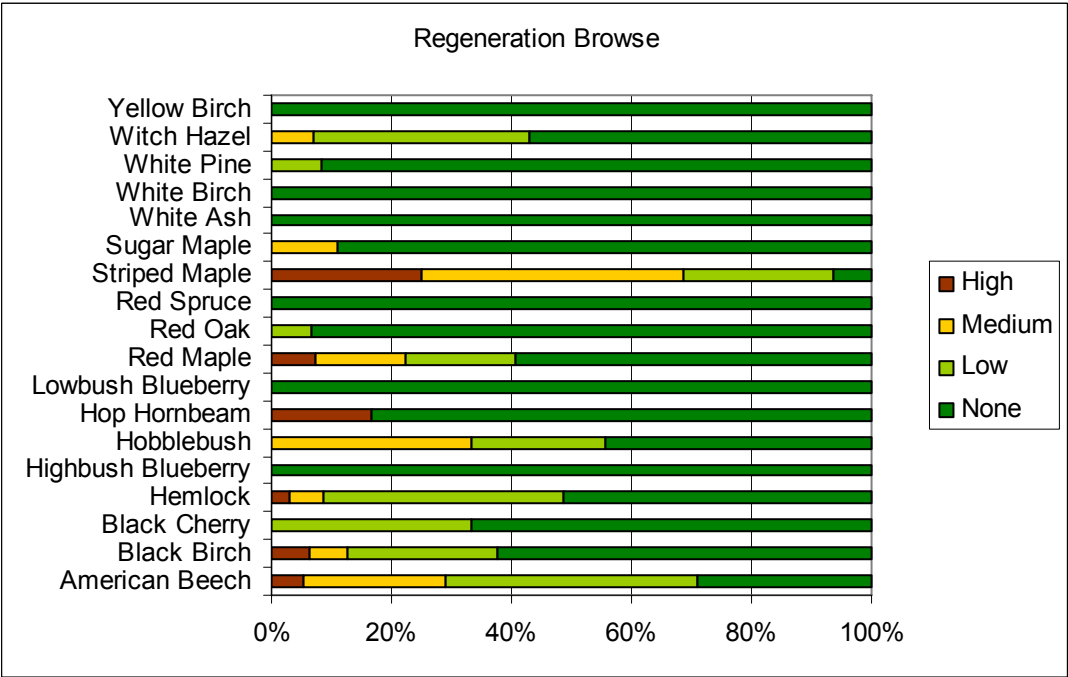
2.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 all regeneration and shrub species.



Graph 2.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	uneven-aged	
Harvest Entry:	10 to 15 years	
Products:	sawlogs, pulp, cordwood	
Desired Composition:	mixed stand with softwood component	
Crop tree target diameter:	RO – 22	YB/BB – 18
	SM – 20	WP – 22
	HE – 18	WA - 20

Operational Considerations

Operability:	highly operable
Seasonal limitations:	minimal
Terrain:	steep; smooth
Access and landing area:	from end of Chevy Hill Road
Access distance:	up to 3/4-mile from the north
General maintenance:	access/landing needs improvements to be used
Brook-wetland crossings/buffer requirements:	stay out of wetland along northeast boundary; otherwise none noted

STAND SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Type 3 is really one contiguous stand, characterized by red maple, hemlock, red oak, beech and white pine which account for over 75% of the total stem count and over 90% of the total product volume in the stand. The canopy is somewhat uneven and open, with areas dominated by either saplings, poletimber, or sawtimber; crown closure is around 70%. Basal area is slightly low for mixedwood type, around 135 square feet per acre. Current stand structure and characteristics indicate the type is unevenaged, with multiple age classes and size classes present. Some regions of the type have dense overstory with minimal ground vegetation and regeneration, while other regions have heavy sapling densities and very few overstory trees.

Regeneration is excellent within old clearcut areas, and on many skid trails; it is less established or nonexistent where the overstory is more intact. Beech can be found on almost 50% of the type, while hemlock and red maple can be found on more than 20%. Black birch, red oak and white pine can be found on at least 10% of the area.

Intermediate stems (poletimber and small sawtimber) are well-represented, and there are many quality examples within the type. These intermediates should be released during subsequent harvest entries by removing stems with competing crowns from two sides. Intermediates to favor are red oak, black birch, white ash, yellow birch and sugar maple, which appear to have the best quality and highest potential in this type.

Sawtimber opportunities are somewhat limited at present, with an estimated 3,000 board feet per acre for all species. There are some good quality individuals, especially among sugar maple, yellow birch, ash, red oak and red maple. The long-term goal of management in this stand is to perpetuate the uneven-aged structure in the type, while providing selected crop trees with beneficial conditions to maximize growth. Increasing overall stem quality should coincide with this goal.

The resulting pattern of harvesting should maintain a multi-aged stand that will provide a diversity of forest structure beneficial to wildlife and will provide opportunity for a mix of silvicultural operations. The current species composition reflects the natural species mix and likely will not significantly change over time, although beech may be more present in the overstory.

Silviculture: The focus of management in this stand will be to harvest poor quality stems of all size-classes, especially those that interfere with crop trees or potential crop trees. High risk trees should also be harvested during each entry. Release existing groups of regeneration, especially black birch and red oak, but also work with quality yellow birch, white pine, and sugar maple examples.

2016: Thin the type to release crop trees and advanced regeneration by removing stems from most size/age classes, removing the poorest quality wood as a priority, but also include high-risk mature stems. Release groups and individual intermediate and regeneration stems, especially black birch, red oak yellow birch and sugar maple. Reduce basal area to approximately 110 square feet through:

- **Group Selection:** Create openings of 3 to 7 trees to establish intermediate shade tolerant and intolerant regeneration. If harvest is to be done in the summer, scarifying areas with no regeneration or areas of undesirable seedlings/saplings will help promote the regeneration of light seeded individuals such as birch, hemlock, and pine.
- **Single Stem Release:** Where intermediate stems are already established, remove 1 to 2 competing stems to increase crown spacing. Can also be used for larger stems that have the potential to reach veneer status within 20 years. Crown density should remain at 60% or greater. This may favor tolerant hardwoods (sugar maple, beech), but isn't a priority; the goal is to give existing stems better growth opportunities.

Wildlife: Wildlife habitat here is somewhat diverse with a multiple age structure developed. White-tailed deer and rabbits browse the areas with hardwood seedlings and small saplings. Adequate hard mast is provided by mature oak and beech, and soft mast is provided by maple, ash, blueberry, and hemlock. Multiple age classes help to ensure there is always a level of browse for wildlife. Specific wildlife habitat improvements will include retaining hard mast producing hardwoods; retaining beech trees with evidence of bear use; and creating a few large diameter snags and down logs per acre.

- Create additional down logs by felling up to 2 trees > 18" in diameter per acre.
- Create additional snags by girdling up to 2 trees >18" in diameter per acre.
- Maintain existing snags and large down logs.
- Protect the wetland in the northeast area of the type
- Maintain areas with dense hemlock overstory for winter cover.

CHEVY HILL
TOTAL FOREST TIMBER AND PULP VOLUME
August, 2010
156.3 Forested Acres

Species	Sawlog (bf)	Tielog (bf)	Total BF	Pulp (cds)	Growing Stock (cds)	Cull (cds)	Total Volume in Cords	% Cords
<i>Hardwood</i>								
American Beech	0	3,760	3,760	300	0	15	302	8.0%
Black Birch	4,423	4,935	9,358	63	0	0	80	2.1%
Black Cherry	0	3,134	3,134	25	0	0	31	0.8%
Hop Hornbeam	0	0	0	36	0	5	36	1.0%
Red Maple	16,221	5,132	21,352	612	0	6	657	17.4%
Red Oak	159,218	89,906	249,124	355	22	48	832	22.0%
Sugar Maple	34,274	19,763	54,038	150	0	81	265	7.0%
White Ash	26,288	2,737	29,025	115	0	0	167	4.4%
White Birch	0	0	0	43	0	0	43	1.1%
Yellow Birch	8,881	0	8,881	41	0	0	58	1.5%
Total Hardwood:	249,305	129,367	378,672	1,740	22	155	2,471	
<i>Softwood</i>								
Hemlock	79,728	0	79,728	436	0	4	589	15.6%
Red Spruce	0	0	0	8	0	0	8	0.2%
White Pine	41,606	39,911	81,517	526	0	46	715	18.9%
Total Softwood:	121,334	39,911	161,245	970	0	50	1,312	
Total Volume:	370,639	169,278	539,917	2,710	22	205	3,783	

CHEVY HILL FOREST

10-YEAR TREATMENT SCHEDULE

The dates given in this treatment schedule are meant to help prioritize work on the entire Weare ownership. It is meant to be flexible and may change due to weather and market conditions or to unforeseen opportunities and access issues. The treatment activities may change due to the same reasons if silviculturally justifiable and agree with landowner mission, principles and management objectives.

Stand #	Acres	Treatment	Priority	Year
all		upgrade access and landing	high	
1	12.5	group selection; remove poor WP; limit hay-scented fern colonization	mod-high	2014
2	32.6	single stem, group selection; favor hardwood veneer & sawtimber	mod-high	2014
3	111.2	single stem & groups; maintain uneven aged structure	med	2016
		Paint boundary lines	high	2011
all		Reevaluate and update management plan		2020

APPENDIX A: SOILS MAP

