

Table of Contents

1 PLAN PURPOSE AND DESIGN..... 3

2 PROPERTY LOCATION AND BRIEF DESCRIPTION 3

 Woodlot History 4

3 LANDOWNER MISSION, PRINCIPLES, AND OBJECTIVES 4

4 GEOLOGIC ATTRIBUTES..... 6

 Topography and Aspect 6

 Brooks, Ponds, and Wetlands 6

 Soils..... 8

5 NATURAL COMMUNITIES 8

 Rare Species and Unique Natural Communities 9

 “Ecological Reserve” Areas 10

6 WILDLIFE HABITAT CONDITIONS..... 10

7 RECREATIONAL and EDUCATIONAL OPPORTUNITIES 13

8 FOREST CONDITIONS 15

 Forest Types..... 15

 Age and Age Class Distribution..... 16

 Growth Rates..... 16

 Tree Quality and Tree Health 16

 Forest Management Approach 17

 Applied Silviculture 17

 Access 20

 Operability 20

 Boundary Delineation 21

FOREST DATA 23

 Stand 1 Hemlock/Hardwood/White Pine 3-4A 83.4 acres 25

 Stand 2 Hemlock/Hardwood 3-4A 41.5 acres 33

 Stand 3 White Pine/Hemlock/Red Spruce/H 3-4A 175.7 acres 41

 Stand 4 Red Pine 3-4 A 11.8 acres..... 49

 Stand 5 Hardwood/Hemlock 3-4A 30.0 acres 55

 Stand 6 Pioneer Hardwood H2A 13.8 acres 63

 Stand 7 Hardwood 3-4A 61.5 acres 71

 Stand 8 White Pine 3-4A 12.1 acres 79

 Stand 9 Reservoir Buffer 18.9 acres 85

TOTAL FOREST TIMBER AND PULP VOLUME 93

10-YEAR TREATMENT SCHEDULE..... 95

APPENDIX A: NATURAL COMMUNITY MAP 97

APPENDIX B: SOILS MAP 101

APPENDIX C: NEW HAMPSHIRE IMPORTANT FOREST SOIL CLASSIFICATION 105

CLAREMONT – WHITEWATER RESERVOIR FOREST FOREST MANAGEMENT PLAN

1 PLAN PURPOSE AND DESIGN

The purpose of this forest management plan is to provide the City of Claremont 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 Claremont’s objectives and will remain flexible as changes in the property condition or objectives change through time.

Management planning on the Claremont 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

The Whitewater Reservoir Forest is 471.4 acres¹, including a +/- 17 acre water reservoir that serves the people of Claremont. The bulk of the land is located in Cornish, with only the southern +/- 50 acres in the town of Claremont. The forest is located on the north side of the end of Whitewater Brook Road, in a rural residential area. There are two ways to access the forest: access to the dam is approximately 1/3 of a mile west of the end of the town maintained portion of Whitewater Brook road to the north and the second access is a continuation of Whitewater Brook road and enters the forest above the dam. Both access points are gated.

The forest is dominated by a mix of white pine, hemlock and hardwoods with some pine plantations on the east side of the reservoir. The forest varies from dry, south facing oak dominated sites, to a mix of pine, hemlock and hardwood on the mid slopes, and hemlock dominated areas on elsewhere. The terrain is variable, but generally includes gentle to moderate slope with some rocky ground. Whitewater Brook and associated wetlands bisect the forest, draining into the Reservoir.

The forest includes a popular trail network accessed by ATV’s in the summer and snowmobiles in the winter. The trail system incorporates some of the reservoir access roads.

¹ Mapped Acres

Woodlot History

The land in this area of New Hampshire has a long agricultural history; the presence of stone walls and wire fence in the forest is testament to this past use. Likely though agriculture was not a dominant use for a long period of time here, as the stone walls and fence area relatively sparse compared to other tracts of land in this part of the state. Nonetheless, the agricultural use of the land came to a halt early last century when many farmers in New England abandoned their agrarian lifestyles and once open-land has since become reforested. Given the topography and general rockiness of the soil likely the land was used as pasture or perhaps some areas of hayland. Neighboring open fields on flatter terrain likely were the tilled portions of the farmland.

The forest has been worked multiple times in the last century, and the condition varies from dense, overstocked stands of economically over-mature white pine and dense hemlock, to areas of adequate stocking. The most recent work appears to have occurred in the early 1990's, and evidence of harvesting dating back to the 1950's can still be detected. In general, the forest will be treated with a combination of improvement thinning, salvage work, and regeneration cutting to establish multiple age classes of trees well suited to the site and indicative of the natural community type.

3 LANDOWNER MISSION, PRINCIPLES, AND OBJECTIVES

As stated in Claremont's master plan, the mission and principles of management on the City of Claremont forestlands are:

Mission Statement

The City of Claremont will actively manage Claremont's natural areas with a strong land ethic in order to achieve responsible land stewardship. These stewardship activities will help to promote Claremont as a healthy community with a quality of life that values the environmental quality of forest ecosystems and the benefits of commercial and recreational land uses.

Principles for Management

- Adopt a holistic view of natural systems which places human activity within rather than apart from the natural environment.
- Implement forest management that is ecologically, economically, and socially responsible.
- Resource extraction should not exceed the regenerative capacity of the ecosystem or reduce natural productivity or diversity.
- Whenever possible management shall incorporate the results of previous actions into future decision-making efforts.
- Management practices shall support indigenous habitats and prevent fragmentation so that

wildlife can migrate for seasonal food and reproductive needs.

- Manage for ecologically and socially sustainable recreational opportunities.

Management Objectives for Whitewater Reservoir Forest

Overall:

- Be responsible *stewards* of the land and its resources
- Maintain the stability and integrity of the ecosystems within our control
- Maintain a healthy, productive and aesthetically pleasing forest
- Manage with respect to *Natural Community* type
- Maintain and improve natural *biological diversity*

Timber:

- Enhance the *quality* and *quantity* of our timber resource
- Manage for *Sustainable* harvest and growth
- Provide *periodic revenue* through the sale of forest products

Education and Recreation:

- Provide opportunities for *education*
- Designate some “forever wild” areas to serve natural diversity and educational opportunities
- Create educational infrastructure such as interpretive signs and kiosks
- Identify and conserve important *archaeological* and *cultural* sites
- Provide for both motorized and non-motorized sustainable *recreation* opportunities such as ATV and snowmobile trails, foot paths, and cross county skiing and snowshoe trails
- Provide recreational infrastructure such as picnic areas and shelters where appropriate
- Create aesthetic *vistas* along recreational trails
- Create *wildlife viewing* areas
- Provide opportunity for *hunting*

Wildlife:

- Provide and enhance the naturally diverse variety of wildlife habitat in forest, wetland, and openland settings

Water Quality:

- Protect and maintain our *water resource*
- Protect and improve the *water quality* of streams and wetlands

4 GEOLOGIC ATTRIBUTES

Topography and Aspect

The Whitewater Reservoir Forest ranges from 880 to about 1,340 feet in elevation. The terrain is variable, but mostly consists of gentle to moderate, with small areas of steep slope. The aspect includes the full spectrum.

Brooks, Ponds, and Wetlands

As mentioned above, the 17-acre reservoir is the main water feature of Whitewater Reservoir Forest. It is fed by Whitewater Brook, whose headwaters originate approximately 2.5 miles to the east on the western flanks of the Croydon Mountains. The brook and its tributaries pass through fairly remote forestland before entering the Whitewater Forest. Prior to entering the reservoir the brook slows and collects in a system of wetlands including forested wetland, shrub wetland and beaver meadows before draining into a small, shallow pond above the reservoir. From there it drains through another small section of brook before entering the reservoir.



Whitewater Reservoir is approximately 17 acres and provides clean water for the residents of Claremont (left photo). There is a smaller pond above the reservoir (right photo).

There are several other important water features on the property. Additional streams enter from the north and the east. The northern stream drains into the wetland system north of the reservoir, and the eastern stream drains directly into the body of the reservoir. The western side of the property hosts numerous forested wetlands including seeps and vernal pools. These wetland systems are important aspects to wildlife habitat and contribute to the overall diversity of the forest.



The left photo is Whitewater Brook as it enters the Upper Pond. The right photo is of a small tributary to Whitewater Brook that drains directly into the reservoir.

Recommended Actions to Improve and Manage the Wetland and Water Resource of the Whitewater Reservoir Forest²:

Riparian and Stream Ecosystems:

- Establish riparian management zones along streams, rivers, ponds, and lakes. 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.
- 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. (The Whitewater Reservoir shall have a no-cut zone of 50 feet, increasing where needed within the buffer as terrain dictates—including no-cut zones where slope is greater than 8% and where the soils are wet. Elsewhere within the buffer light single tree selection shall be allowed. No roads or landings shall be created within the buffer. Existing roads to access the reservoir shall be maintained according the New Hampshire BMP's).
- 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, or associate wildlife trails.
- To the extent feasible, avoid interruption 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.

² 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

- 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 major soil types present include Bernardston silt loam and stony silt loam and silt loam, Cardigan-Kearsarge rock outcrop complex, Dutchess stony silt loam, Lyman-Monadnock rock outcrop complex, Lyme-Moosilauke stony loams, Monadnock-Hermon Association, and Monadnock-Lyman rock outcrop complex. The majority of the soils are well drained and generally productive, but have limitations due to rockiness and to a lesser degree slope. Monadnock-Lyman rock outcrop complex dominates the soil types. The more productive soils, including the Bernardston silt loam and stony silt loam and the Dutchess stony silt loam are geared towards producing high quality hardwoods. The Lyme-Moosilauke soils are better suited for growing softwoods, especially spruce and fir. Other soils are either generally wet or stony. See soils map in Appendix B.

Recommended Actions to Improve and Manage the Soil Resource of the Whitewater Reservoir Forest³:

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 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.

5 NATURAL COMMUNITIES⁴

As written in the book *Natural Communities of New Hampshire* by Daniel Sperduto and

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

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

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 in 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 Claremont 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 on this forest is Hemlock-beech-oak-pine. 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. On Whitewater Reservoir Forest, this community grades into red oak-pine rocky ridge on the northernmost height of land and to hemlock-white pine on the steep banks of the reservoir.

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 Inventory, in Concord, New Hampshire, has been contacted and they have no records of any endangered plant communities in the vicinity. That does not mean there are not any,

however.

Realizing the significant habitat conditions found on Whitewater Reservoir 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.

“Ecological Reserve” Areas

As part of the management of the Whitewater Forest, some areas have been designated as “Ecological Reserve”, meaning there will be no active silvicultural management allowing the area to progress and change naturally. “Ecological Reserve” areas offer unique opportunity to learn about the natural succession and disturbance pattern on the forest. These areas will be incorporated into the recreational and educational components of the forest, as well as benefit the diversity of wildlife habitat. These areas will 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 including logging equipment, infrastructure including benches and or shelters. These areas will not be actively managed, and will not be traveled through with logging equipment when actively managing adjacent forest stands.

6 WILDLIFE HABITAT CONDITIONS

Whitewater Reservoir Forest provides a variety of habitats for wildlife, but is dominated by dense mixed forestland of white pine, hemlock and hardwoods, primarily red oak, red maple and white birch. There is a substantial amount of dense hemlock to provide shelter during winter months for white tailed deer and other small mammals. Several deer were seen during the fall 2007 inventory. Bear sign was found in several areas, the most prominent was near a wetland found on the easternmost boundary. Red oak, also fairly abundant on the property provides a source of hard mast (acorns) that is eaten by a variety of animals from birds to many mammals including both turkeys and deer. There is a small amount of open land adjacent to the reservoir and below the dam, but it is a relatively underrepresented type. The height of land at the northern boundary provides habitat somewhat unique for the forest, as it is a warm and dry south-facing slope with abundant red oak. Another somewhat unique areas is the knoll located near the easternmost boundary above the wetland area, it is the only area of the forest dominated by mast-producing beech, also likely frequented by bear. The wetland areas provide important habitat for amphibians such as the spotted salamander and red newts. Wetlands also provide an important source of food in early spring as

they tend to be of the first places to “green up” providing a much needed early food source. Likely moose are also frequent visitors to these wetlands systems. Whitewater Brook provides habitat for riverine associated animals, including mink and likely otters. Beavers are active on the property both in the reservoir itself and the wetland areas above it.



Whitewater Reservoir Forest is utilized by a variety of wildlife, including beaver (upper left), moose as evidenced by this moose bed (upper right), porcupine- this den was found in a rocky outcrop (lower left), and bear as evidenced by bear-bite marks on a hemlock tree near a wetland (lower right).

The forestland on Whitewater Reservoir Forest is fairly dense and uniform, offering little in terms of early successional habitat or a variety of structure types. Creating new age classes of trees and releasing existing understory trees will improve the wildlife habitat. Early successional habitat can be increased by doing large patch cuts especially in areas where there currently is aspen that will sprout after cutting. Aspen sprouts are a preferred browse source for many kinds of wildlife. Silviculture will also address maintenance of deer wintering areas, a key part of deer habitat. In addition, maintaining open grassy areas near the reservoir will benefit more wildlife, especially small mammals and the predators that prey on them. Snags and down logs will be managed for

throughout the property. 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.

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, the Whitewater Reservoir Forest is dominated by Hemlock-Hardwood-Pine type, with a small amount of Lowland Spruce-Fir on the poorer, wetter soils. A small amount of Marsh exists above the reservoir. A summary of these habitat types and the wildlife species found there is in Appendix B in the Master Plan.

Recommended actions to improve and manage the wildlife habitat of Whitewater Reservoir Forest⁵:

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 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

⁵ Wildlife habitat management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

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

Whitewater Reservoir Forest provides ample recreational and educational opportunities. An extensive trail network exists throughout the forest, used heavily by motorized recreation such as ATV's and snowmobiles. Unfortunately the location and misuse of some of these trails pose a threat to the water quality of the reservoir. Trails that run through the buffer zone of the reservoir must be either closed completely or relocated. The trail system is part of a larger network extending throughout and beyond Sullivan County, New Hampshire. The main trails on Whitewater are in good shape, with only minor regular maintenance needed such as cleaning of drainage ditches and creating additional water turn-outs. Additional trails for non-motorized use (foot traffic) would greatly enhance the recreational value of the forest. There are abundant opportunities to locate these trails to unique and interesting areas of the forest and potential to open up some vistas.

Best Management Practices provide trail construction and maintenance guidelines that will help prevent soil erosion. Additional signage outlining proper trail use and respect of the land would also benefit the condition of the trails and surrounding forest, as well as provide educational opportunities. Regular upkeep of signs and trail maintenance is important as it demonstrates integrity of the leadership and clubs involved.



Recreational trails are abundant on Whitewater Reservoir Forest. This well-maintained snowmobile trail receives plenty of use during the winter. Unfortunately not all trails are well-maintained or properly located, and some riders go off trail as seen in the pond above the reservoir (right photo).

Recommended Actions to Improve and Manage the Recreational Resource of the Whitewater Reservoir 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 erosion⁶**
- **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
- **Consider designating low impact camping sites**

⁶ 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

Education

Educational opportunities are limitless on Whitewater Reservoir Forest. 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 Sullivan County forester is an excellent resource for public education 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 Whitewater Reservoir 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 Whitewater Reservoir Forest.
- Create and **post educational signage** about Whitewater Reservoir 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 ≥ 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

(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 December, 2007 consisting of 107 sample points. Data was collected as outlined in the Claremont master plan.

Age and Age Class Distribution

The property contains a range of trees that are 5 to 100 years old, but primarily it is an even-aged forest dominated by 60-70 year old white pine, hemlock and hardwoods in the overstory. Older individuals can be found throughout the forest, especially in the more remote areas.

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 Whitewater Reservoir Forest falls within this range.

Tree Quality and Tree Health

Overall tree quality on the Whitewater Reservoir Forest is generally fair to good. A large percentage of the stocking includes maturing and overmature white pine, average quality hemlock, good quality red oak, and pole size hardwood growing stock. The majority of the quality hardwood sawlog volume is acceptable growing stock meaning it is economically immature and will be managed for the future.

Forest health conditions on the Whitewater Reservoir Forest are typical for forests of this type and management history. The most pressing health concern involves a fair amount of red rot and blister rust in the white pine. This is common on pine of this age and initiation, and its presence typically indicates a timber harvest is overdue. Other commonly occurring tree diseases and damage were noted on the forest; including weevil damage in pine, beech bark disease, sugar maple borer, and sterile conk of birch. Sapsucker damage on hemlock was not uncommon. These diseases and insect/bird 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 and damage.

Forest Management Approach

Management on the Whitewater Reservoir 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.

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 Claremont 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 Whitewater Reservoir 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.

Hemlock/Hardwood Silviculture

The hemlock and hardwood community on Whitewater Reservoir 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. 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	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		

Mesic Red Oak-Northern Hardwood Silviculture

Mixed hardwood communities on Whitewater Reservoir Forest will be managed with both even-age and multiple-age systems. Even-age methods of clearcut, 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 100 and 150 years, depending on the site. Multiple-age management will be the most used 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 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 will be from 1/10 to 1 acre in size. 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 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 is abundant in Whitewater Reservoir Forest. 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. Previous harvesting in the white pine during the 1990's was geared towards either a first-stage shelterwood or a typical thinning.

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.

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 snowless 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 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, 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 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

Road access to the Whitewater Reservoir Forest is good. Access roads to the reservoir have been well-maintained and are suitable for large trucks. Interior access is fair, better on the eastern half. The majority of the ATV/snowmobile trails run on old or historic skid roads. Access to the western half will require crossing Whitewater Brook and associated wetland system.

Operability

The terrain and ground conditions on this tract in general do not limit operability. The wetland areas associated with Whitewater Brook can be avoided as long as proper crossings are created. Terrain for the most part is operable, with some exceptions due to steep slope and rockiness. Soil

protection is a high priority on this property, so operations shall preferably be done during the winter with frozen ground and snow cover. But, given the unreliability of winter conditions, operations may occur during dry periods as long as wet areas are avoided or tracked with equipment that minimizes impacts such as a cut-to length system that creates a mat of slash to drive over, therefore protecting wet ground from rutting and mitigating negative impacts. All truck roads, landings and skid trails should be created and maintained according to Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire. Another helpful road building manual is a USDA publication #NA-TP-06-98: A Landowner's Guide to Building Forest Access Roads by Richard L. Wiest.

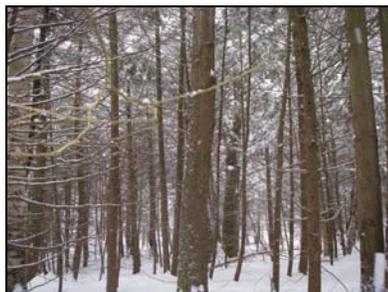
Boundary Delineation

The Whitewater Reservoir Forest boundary is in variable condition and includes approximately 5 miles of maintainable boundary line. A combination of stonewalls, wire fence, corner monumentation and painted blazes make up the boundary. The entire boundary should be blazed and painted where needed as soon as possible. It is recommended that the boundary be monumented with City of Claremont signs, especially at corners, roads, and trails.

FOREST DATA

Stand 1 Hemlock/Hardwood/White Pine 3-4A

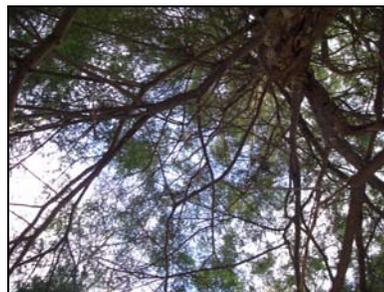
83.4 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: Multiple past harvesting, most recent in early 1990's
 Approximate Age of Dominant Trees: 67-70 years old
 Stand Health: Fair to good
 Insects/Damage/Disease: Some blister rust and red rot in the pine

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Medium
 Soils: Dutchess stony silt loam, Bernardston stony silt loam, Monadnock-Lyman rock outcrop complex, Lyman-Monadnock rock outcrop complex, Lyme-Moosilauke stony loams
 Drainage: Variable, fairly well-drained except for wet pockets
 Variable: steep gully associated with stream, moderate slope elsewhere, somewhat rocky
 Terrain:
 Aspect: Generally north and west
 Elevation: 880-1,320'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	2.9		10.2	13.1
12-18"	0.8	2.6	3.2	6.6
>18"	0.2			0.2
Grand Total	3.9	2.6	13.4	19.9

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

Down Logs Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	5.9	1.8		7.8
12-18"			1.1	1.1
>18"				
Grand Total	5.9	1.8	1.1	8.8

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

WILDLIFE HABITAT

Forest type: Mixedwood
 Vertical diversity: Moderate
 Vegetative diversity: Moderate
 Hard mast: Pine, oak, minimal spruce and beech
 Soft mast: None
 Special habitat features: Mixed stand contains some dense hemlock for shelter
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; manage for natural diversity; maintain areas of dense hemlock for deer wintering areas

RECREATION

Recreational features: Stand includes heavily used ATV/Snowmobile trail
 Recreational infrastructure: Some signage associated with trail
 Aesthetic resources: Dense hemlock stand
 Public access: Open to motorized and non-motorized access on designated trails and foot traffic elsewhere.

SILVICULTURE

Structural and Silvicultural Attributes

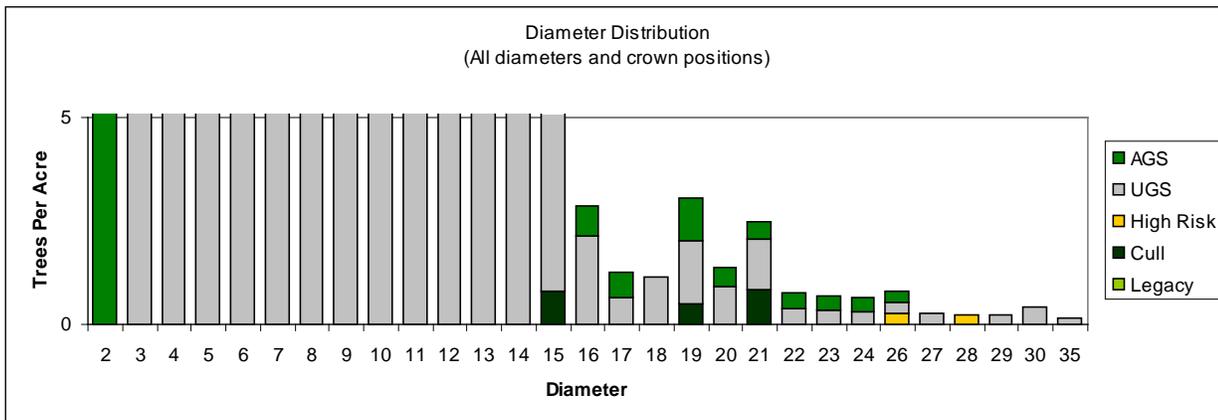
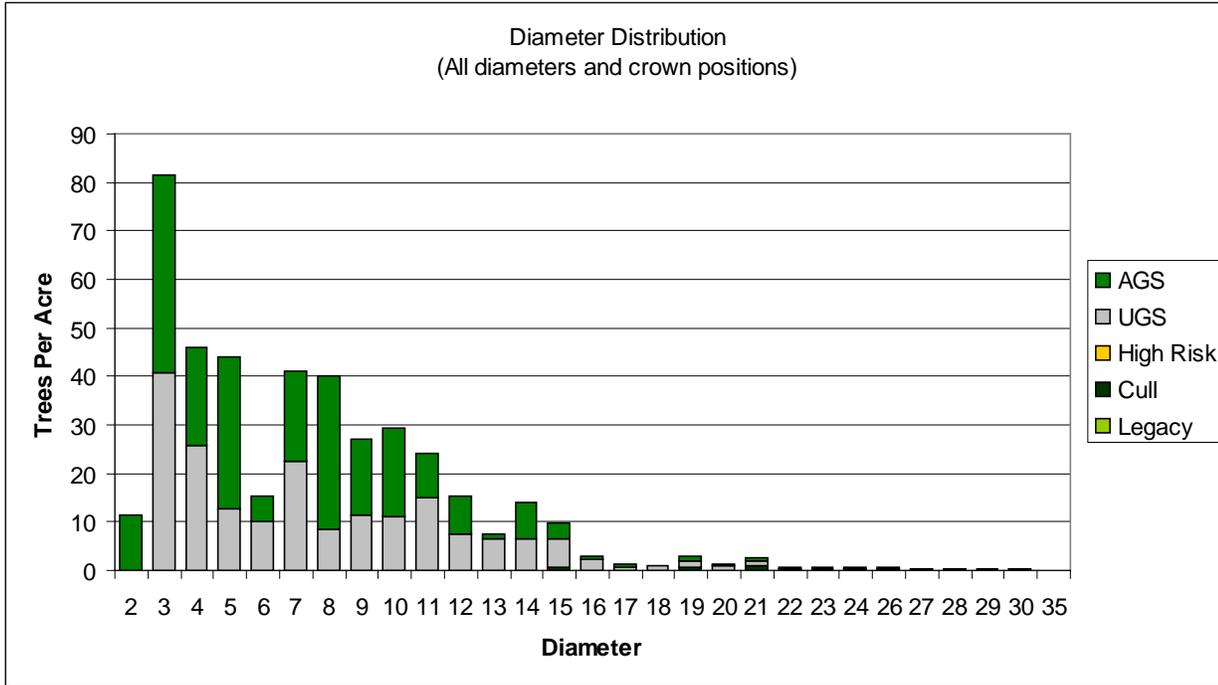
Broad Forest Type: SH3A
 Size Class: Small sawtimber
 Stand Structure: Evenage
 Crown Closure: 90%
 Total Basal Area Per Acre: 170
 Total Merchantable Basal Area Per Acre: 162
 Total Acceptable Basal Area Per Acre: 77
 Trees Per Acre: 423
 Quadratic Mean Stand Diameter: 8.6
 Percent AGS Sawtimber: 66.1%
 Basal Area of AGS Sawlogs: 35
 Timber Quality: Fair

Forest Composition and volume

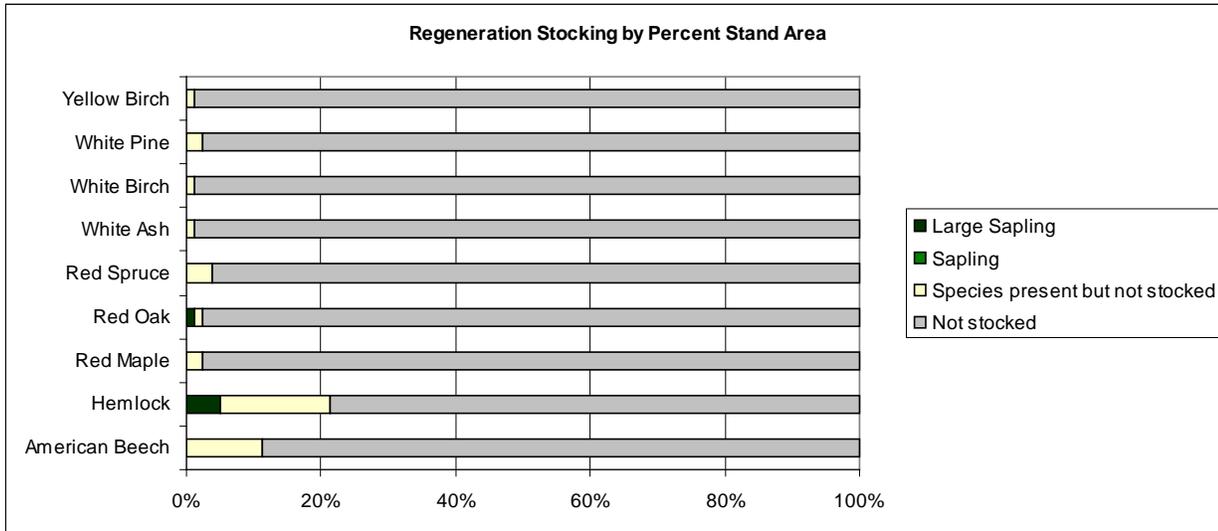
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	0.9%	0	0	0	0.1	0.0	0.1	0.0	0	0%
Red Maple	17.0%	0	129	65	4.1	0.0	4.6	0.0	83	43%
Red Oak	5.7%	0	134	34	0.7	0.8	1.9	0.0	168	100%
Sugar Maple	1.9%	0	78	78	0.4	0.1	0.8	0.0	0	0%
White Ash	0.5%	0	46	0	0.6	0.0	0.7	0.0	46	100%
White Birch	3.6%	0	191	62	1.4	0.0	1.9	0.0	77	31%
Yellow Birch	3.9%	0	0	0	0.8	0.2	1.1	0.0	0	0%
Total Hardwood										
Per Acre:	33.5%	0	578	239	8.2	1.2	11.1	0.0	374	46%
Hemlock	44.7%	0	2,380	0	13.9	0.7	18.9	0.0	2,161	91%
Red Spruce	8.3%	0	840	0	0.2	0.0	2.3	0.0	638	76%
Scotch Pine	1.2%	0	0	0	0.1	0.0	0.1	0.0	0	0%
White Pine	10.2%	0	1,645	949	4.1	0.2	9.3	324.1	1,208	47%
White Spruce	2.1%	0	0	0	0.2	0.2	0.3	0.0	0	0%
Total Softwood										
Per Acre:	66.5%	0	4,864	949	18.4	1.1	30.9	324.1	4,007	60%
Total Volume										
Per Acre:	100.0%	0	5,442	1,187	27	2	42	324	4,381	66%
Stand Volume:		0	453,888	99,027	2,222	193	3,507	27,027	365,379	66%

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

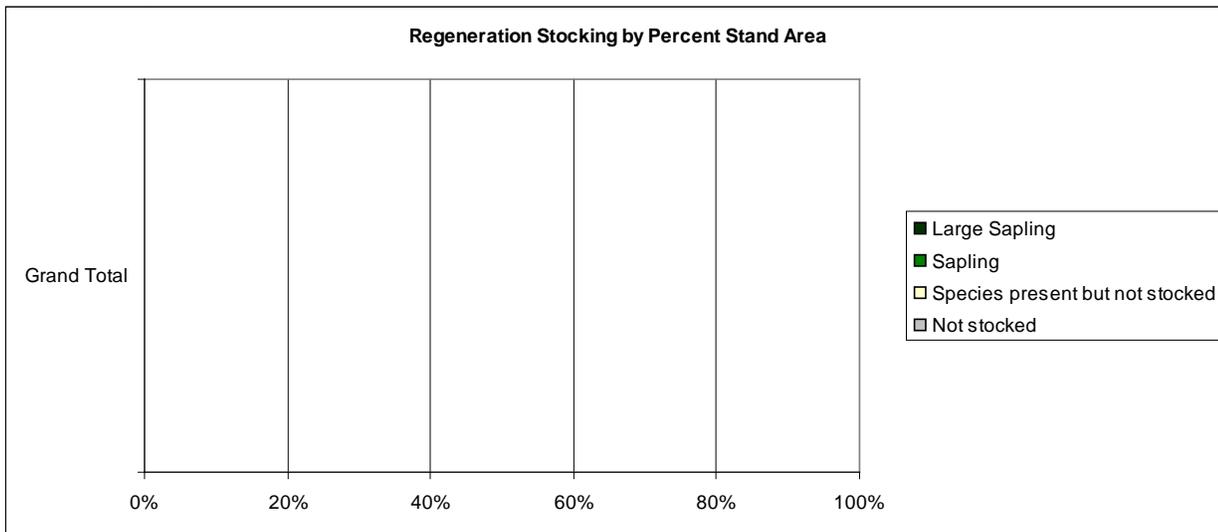
Graph 1.1a and 1.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 1.1b provides a close-up of the breakdown in the larger diameter classes.



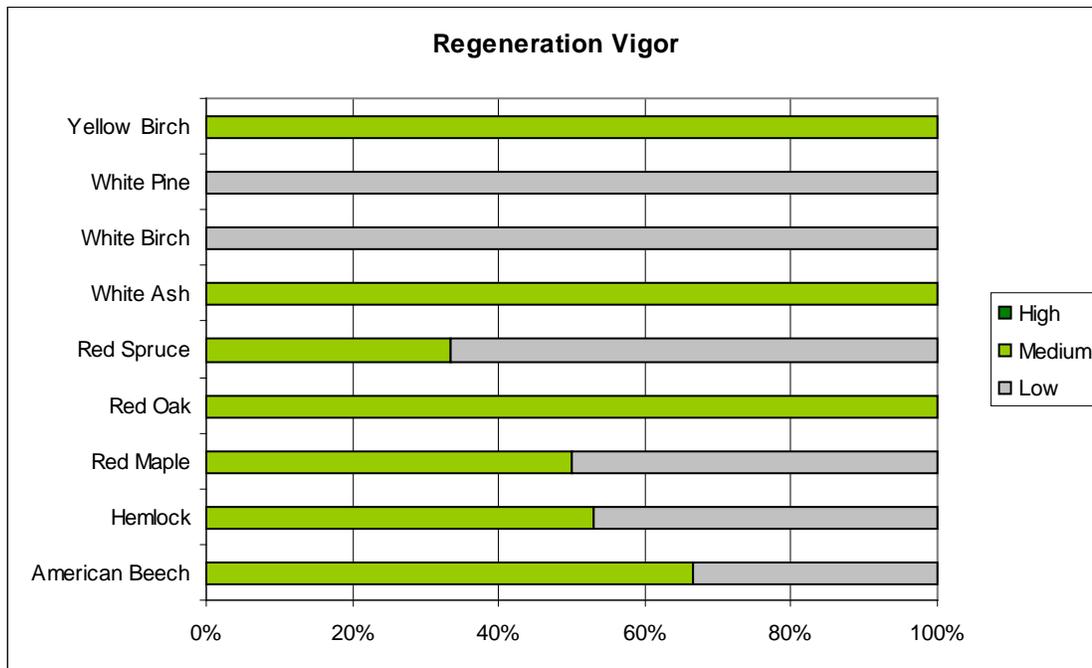
Graph 1.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less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



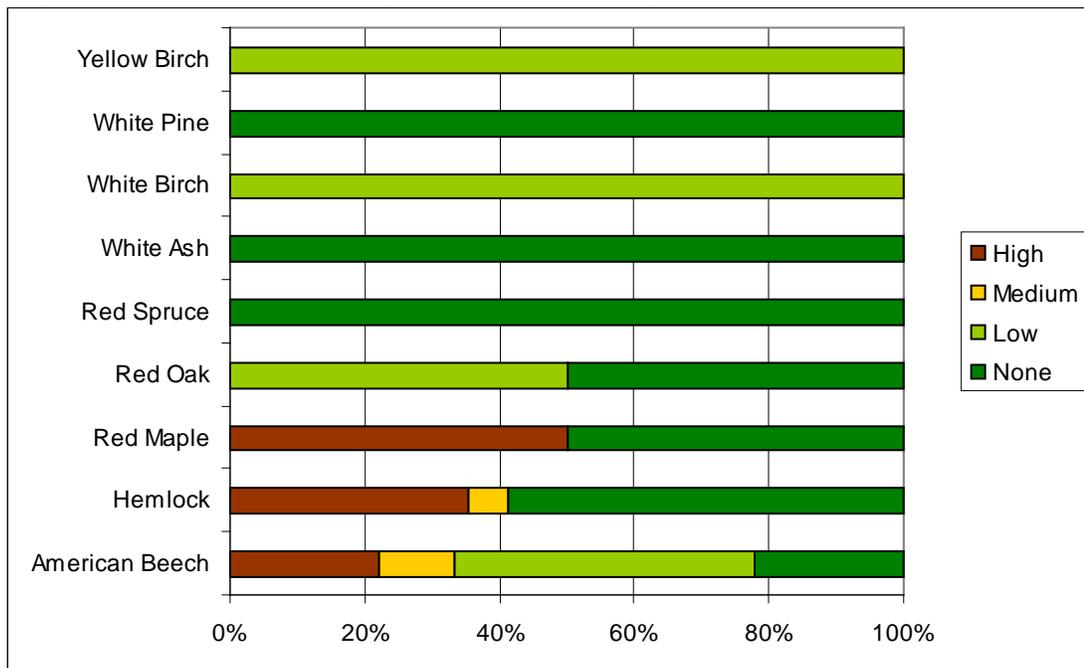
Graph 1.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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:	Multiple-age
Harvest Entry:	15 years
Products:	Mix of logs and pulp
Desired Composition:	Manage towards natural community type, favoring quality hardwood crop trees and pine with dense pockets of hemlock
Crop tree target diameter:	Hemlock 18-20" White pine 20-22" Red oak 20"

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Moderate slope, some rocky areas
Access and landing area:	No landings exist, opportunities exist along access road to reservoir- 2 landing sites likely needed, truck access good into property
Access distance:	3/4 mile to furthest point
General maintenance:	Build landing
Brook-wetland crossings/buffer requirements:	Break stand into two compartments, one north of brook and one south of brook due to steep gully leading to brook

STAND SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 1 is a nice mix of dense hemlock with scattered hardwoods, dominated by red maple and red oak and areas of white pine and hardwoods. The stand is likely the hemlock-beech-oak-pine natural community type with pockets of hemlock community mixed in. There are areas of dense hemlock with no other species and no understory or herbaceous growth. In the northeastern section of the stand exists a small forester swamp, likely a red maple-sensitive fern swamp. This is a common type of red maple swamp with saturated or seasonally saturated to seasonally flooded soils. The size can range from 10 to 100 acres and typically occupy headwater basins. This wetland has a sparse overstory of red maple and occasional yellow birch with dense pockets of swamp winterberry shrub.

The surrounding forest is dominated by hemlock but includes scattered hardwoods and grades into areas with more white pine and hardwoods as you move north through the stand. The hemlock and hardwoods are of average quality, though the white birch in beginning to fall out of the stand. The other species of hardwood, including red oak and red maple, tend to exist are fairly small diameter, generally pole-size and slightly larger. According to the inventory data there is only 500 board feet of hardwood per acre, with over 2,000 feet of hemlock and around 1,500 feet of pine. The pine quality and health varies drastically from some superb trees that are high quality, healthy and vigorous, to poor quality limby trees, to some declining due to white pine blister rust. The southern portion of the stand has more dense hemlock and should be managed more for improved wildlife

habitat than timber objectives, though the silviculture remains similar. Primary regeneration here is hemlock and red oak, but it is sparse in general. The long term goal is to manage for multiple age classes of trees indicative of the natural community type, protect water quality, improve wildlife habitat, and provide for recreational opportunity.

Silviculture: The focus of management here is to improve the growth on the best stems and create openings for regeneration to become established. This will be accomplished by a mix of thinning out some area of higher quality stems, removing groups of mature, low quality or diseased stems and by releasing individual crop trees favoring quality hardwoods. Attempt to release 15-20 crop trees per acre on at least two sides. All treatments should be accomplished by removing the poorest quality and diseased individuals. Maintain dense areas of hemlock for shelter.

Priority: Medium

2015: Reduce overall basal area to approximately 120 square feet through:

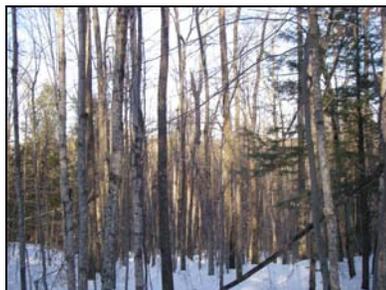
- **Single tree and Group selection:** Single tree selection to capture value on mature or high risk trees. Group selection up to ½ acre trees to remove pockets of poor quality stems and create conditions for successful regeneration.
- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.

Stand 2 Hemlock/Hardwood 3-4A

41.5 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: Prior harvest 15-20 years ago
 Approximate Age of Dominant Trees: 60-70 years old
 Stand Health: Fair
 Insects/Damage/Disease: Beech bark disease

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Medium
 Soils: Bernardston stony silt loam, Lyme-Moosilauke stony loams, Lyman-Monadnock rock outcrop complex, Monadnock-Lyman rock outcrop complex
 Drainage: Fairly well drained, stand borders wet area
 Terrain: Moderate to fairly steep slope
 Aspect: Southwest
 Elevation: 1,040-1,260'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	5.7	17.2		22.9
12-18"				
>18"		1.0		1.0
Grand Total	5.7	18.2		23.9

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

Down Logs Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	22.2		7.5	29.6
12-18"		1.3	1.4	2.7
>18"				
Grand Total	22.2	1.3	8.9	32.3

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

WILDLIFE HABITAT

Forest type: Mixedwood
 Vertical diversity: Moderate
 Vegetative diversity: Moderate
 Hard mast: Oak, minimal beech
 Soft mast: Serviceberry
 Special habitat features: Mixed stand contains some dense hemlock for shelter
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; manage for natural diversity; maintain areas of dense hemlock for deer wintering areas

RECREATION

Recreational features: Stand includes heavily used ATV/Snowmobile trail
 Recreational infrastructure: Some signage associated with trail
 Aesthetic resources: Dense hemlock stand
 Public access: Open to motorized and non-motorized access on designated trails, foot traffic elsewhere

SILVICULTURE

Structural and Silvicultural Attributes

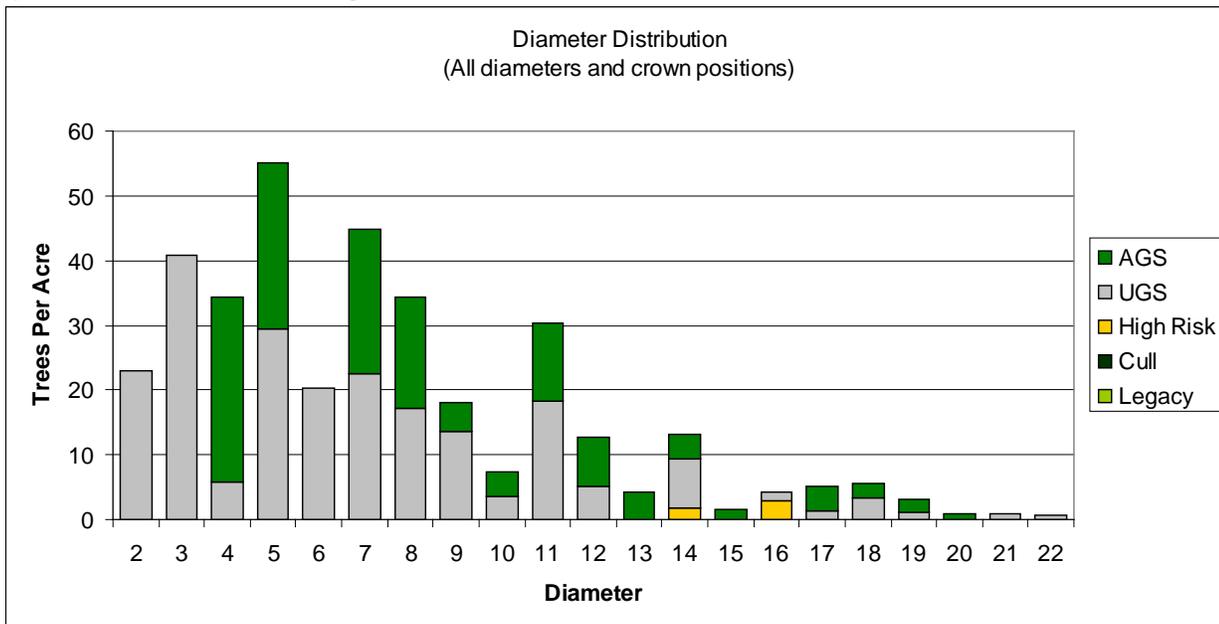
Broad Forest Type: SH3A
 Size Class: Small sawtimber
 Stand Structure: Evenage
 Crown Closure: 90%
 Total Basal Area Per Acre: 139
 Total Merchantable Basal Area Per Acre: 134
 Total Acceptable Basal Area Per Acre: 62
 Trees Per Acre: 361
 Quadratic Mean Stand Diameter: 8.4
 Percent AGS Sawtimber: 69.5%
 Basal Area of AGS Sawlogs: 40
 Timber Quality: Good

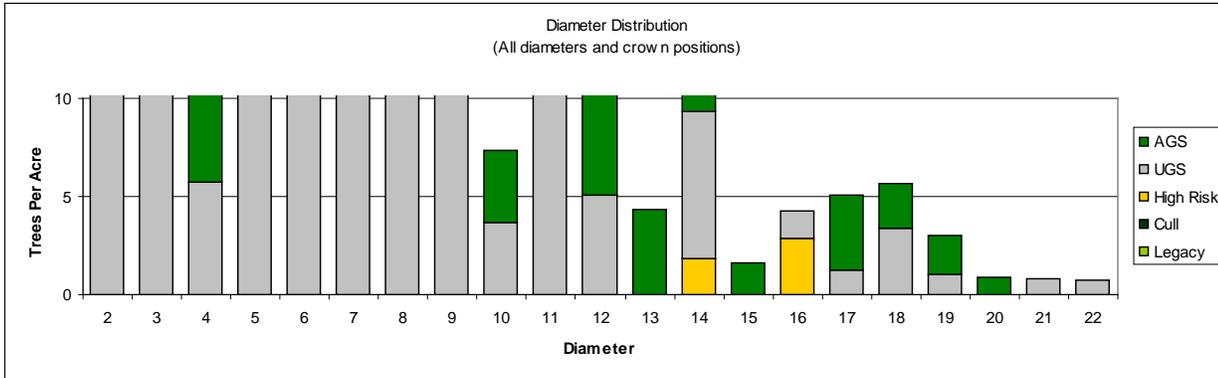
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	6.3%	0	87	67	1.4	0.0	1.7	0.0	155	100%
Red Maple	15.5%	0	344	204	4.0	0.0	5.0	74.1	0	0%
Red Oak	17.1%	0	2,090	706	2.8	0.4	8.3	163.0	2,178	78%
Serviceberry	2.2%	0	0	0	0.0	0.0	0.0	0.0	0	0%
Sugar Maple	6.3%	0	0	210	0.9	0.4	1.7	0.0	0	0%
White Ash	3.9%	0	87	126	1.5	0.0	1.9	0.0	213	100%
White Birch	13.3%	0	74	180	2.3	0.4	3.1	74.1	0	0%
Yellow Birch	3.6%	0	0	0	0.4	0.0	0.4	0.0	0	0%
<i>Total Hardwood Per Acre:</i>	<i>68.2%</i>	<i>0</i>	<i>2,683</i>	<i>1,493</i>	<i>13.4</i>	<i>1.2</i>	<i>22.2</i>	<i>311.1</i>	<i>2,546</i>	<i>61%</i>
Hemlock	31.8%	0	1,653	0	7.7	0.9	11.6	0.0	1,504	91%
<i>Total Softwood Per Acre:</i>	<i>31.8%</i>	<i>0</i>	<i>1,653</i>	<i>0</i>	<i>7.7</i>	<i>0.9</i>	<i>11.6</i>	<i>0.0</i>	<i>1,504</i>	<i>91%</i>
Total Volume Per Acre:	100.0%	0	4,336	1,493	21	2	34	311	4,050	69%
Stand Volume:		0	179,932	61,960	876	85	1,404	12,911	168,067	69%

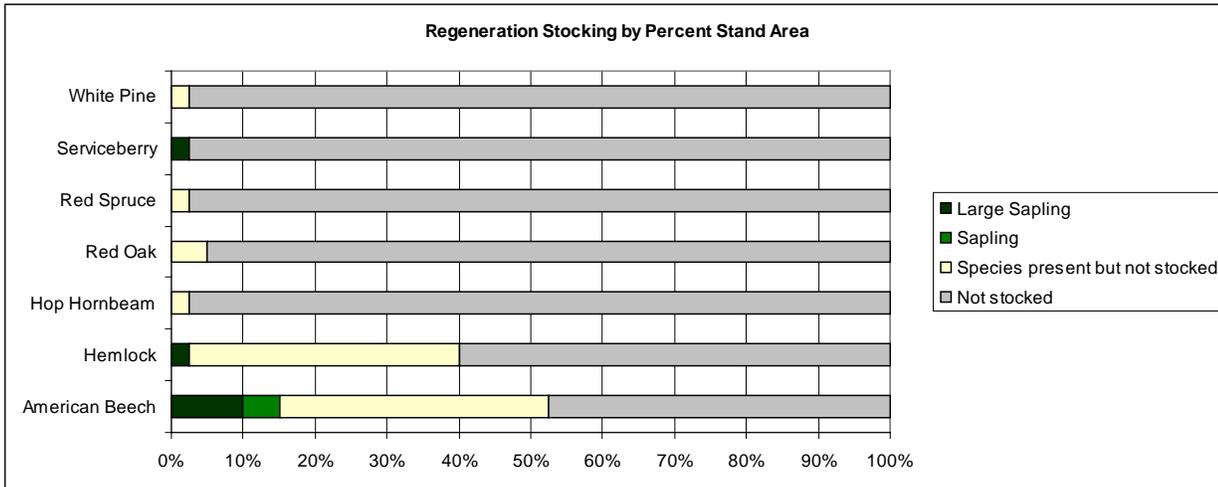
Table 2.3: Stand volume by species and product per acre values.

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.

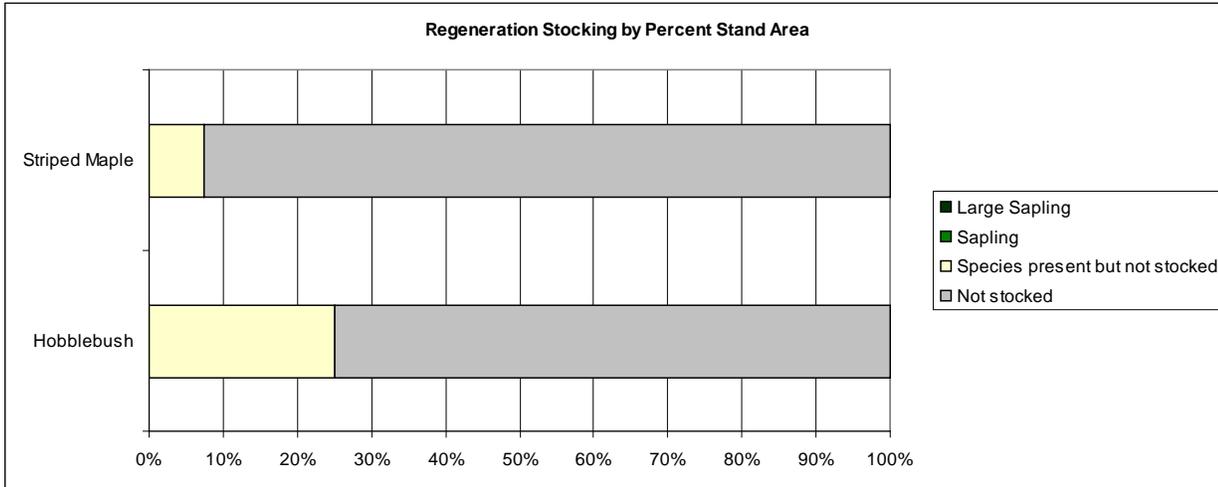




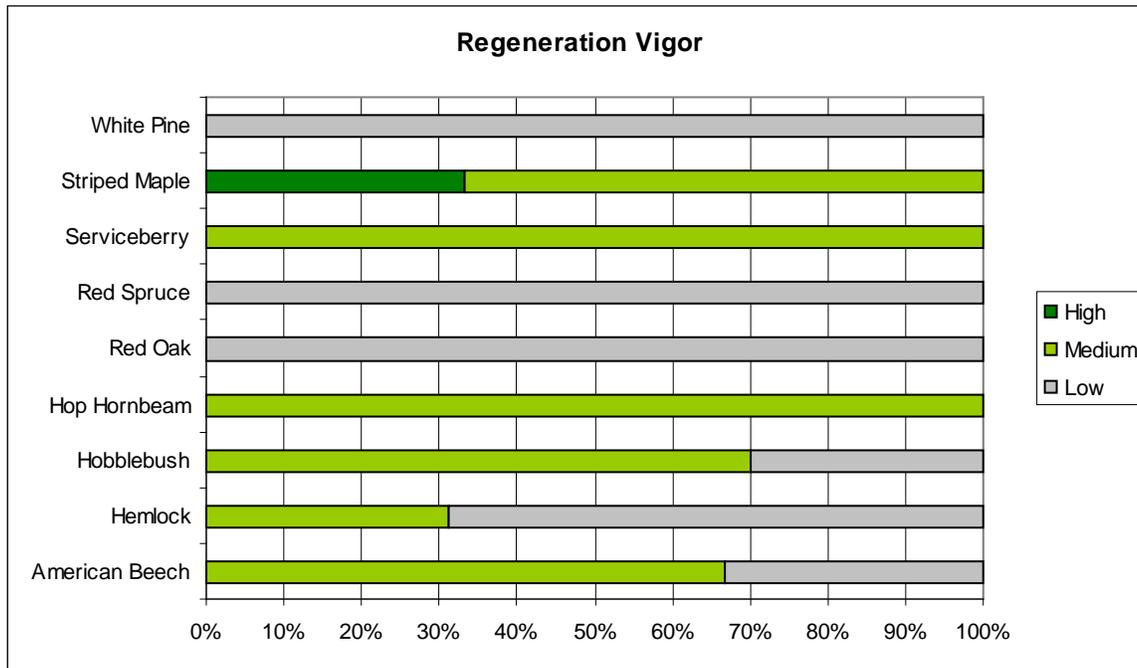
Graph 2.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less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



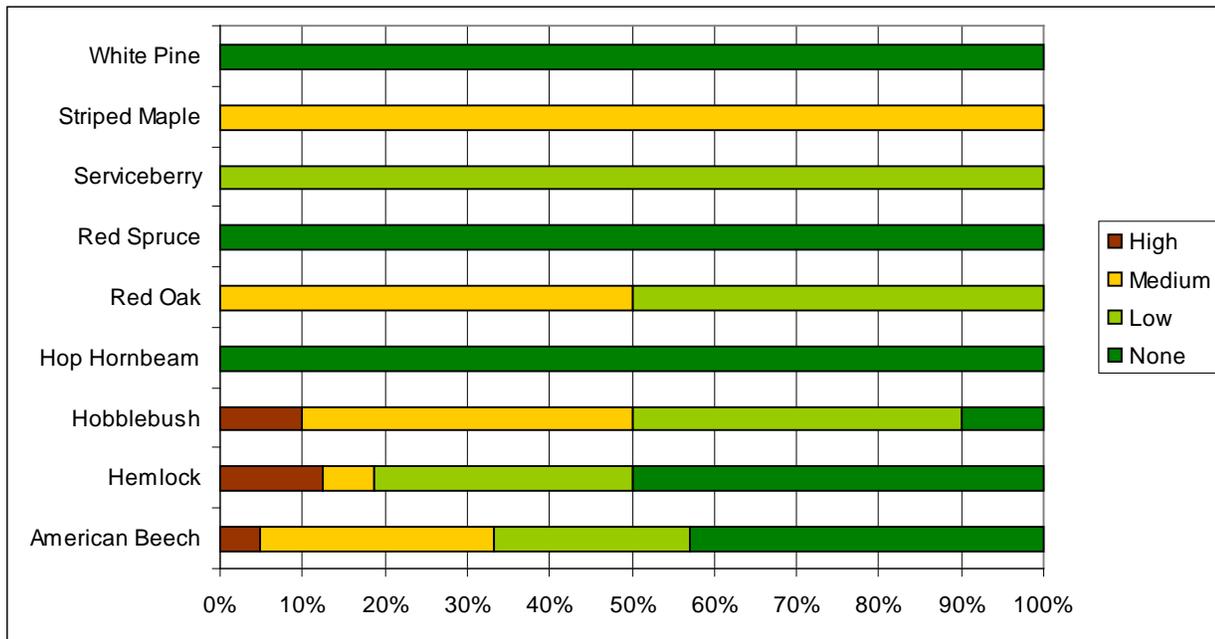
Graph 2.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (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:	Multiple-age
Harvest Entry:	15 years
Products:	Hemlock logs and pulp, mixed hardwood logs and firewood/pulp
Desired Composition:	Manage towards natural community type, favor quality red oak
Crop tree target diameter:	Hemlock 18-20" Red oak 20"

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Variable, some steep slope but generally moderate slope with some rocky areas
Access and landing area:	No landings currently exist, truck access into property via access road to reservoir
Access distance:	1/2-3/4 mile
General maintenance:	Create landing
Brook-wetland crossings/buffer requirements:	Whitewater brook requires crossing, currently there is a ATV/snowmobile bridge but likely will need bigger bridge or temporary bridge elsewhere

STAND SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 2 is a mixed stand of hemlock and hardwoods. The hemlock is dense in some areas and of average quality. Red oak is a common hardwood tree and is mixed throughout the stand. Regeneration is dominated by beech and hemlock, both of which are getting browsed. There is some serviceberry in the stand, a valuable wildlife tree because of the copious soft mast it produces first thing in the spring. The stand is adjacent to a beaver meadow, part of the wetland system associated with Whitewater Brook.

The long term goal for Stand 2 is to manage for multiple age classes of trees indicative of the natural community type, protect water quality, improve wildlife habitat, and provide for recreational opportunity.

Silviculture: The focus of management here is to improve the growth on the best stems and create openings for regeneration to become established. This will be accomplished by a mix of thinning out some area of higher quality stems, removing groups of mature, low quality or diseased stems and by releasing individual crop trees favoring quality hardwoods. Attempt to release 15-20 crop trees per acre on at least two sides. All treatments should be accomplished by removing the poorest quality and diseased individuals. Maintain dense areas of hemlock for shelter.

Priority: Medium

2014: Reduce overall basal area to approximately 100 square feet through:

- **Single tree and Group selection:** Single tree selection to capture value on mature or high risk trees. Group selection up to ½ acre trees to remove pockets of poor quality stems and create conditions for successful regeneration.
- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.

Water Quality⁷:

- Maintain a 100' forested buffer around reservoir with only limited harvesting that retains relatively continuous forest cover (65-70 percent canopy cover) to protect water quality.
- Avoid making either roads or landings within the 100' buffer.
- Avoid adding woody material to streams (or reservoir).

⁷ Water quality protection management recommendations from the publication Biodiversity in the Forests of Maine; Flatebro, Gro, Foss, Carol, and Pelletier, Steven, 1999, UMCE Bulletin #7147

Stand 3 White Pine/Hemlock/Red Spruce/H 3-4A 175.7 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: No recent management
 Approximate Age of Dominant Trees: 60-70 years old
 Stand Health: Fair
 Insects/Damage/Disease: Some blister rust and red rot in pine, beech bark disease, some severe browse and moose biting (red maple)

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Variable
 Soils: Lyman-Monadnock rock outcrop complex, Monadnock-Lyman rock outcrop complex, Lyme-Moosilauke stony loams, Bernardston stony silt loam, Dutchess stony silt loam
 Drainage: Variable- well drained to pockets of wet ground
 Terrain: Variable- moderate to steep slope, some rocky ground
 Aspect: Primarily south and west, but also includes east and north
 Elevation: 980-1,280'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	15.5	7.3	11.2	34.0
12-18"	1.0	0.5	0.6	2.1
>18"	0.5		0.7	1.2
Grand Total	17.1	7.7	12.5	37.2

Table 3.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	11.3	7.0	5.0	23.3
12-18"	0.7	1.8		2.6
>18"	0.2	0.2	0.4	0.8
Grand Total	12.3	8.9	5.5	26.7

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

WILDLIFE HABITAT

Forest type: Mixedwood
 Vertical diversity: Moderate
 Vegetative diversity: Moderate
 Hard mast: Pine, oak, minimal spruce, beech and bitternut hickory
 Soft mast: Some serviceberry and black cherry
 Special habitat features: Mixed stand contains some dense hemlock for shelter and multiple vernal pools
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; manage for natural diversity; maintain areas of dense hemlock for deer wintering areas; protect vernal pools

RECREATION

Recreational features: Stand includes ATV/Snowmobile trail
 Recreational infrastructure: Some signage associated with trail
 Aesthetic resources: Scattered large pine and oak, exposed ledge
 Public access: Open to motorized and non-motorized access on designated trails, foot traffic elsewhere

SILVICULTURE

Structural and Silvicultural Attributes

Broad Forest Type: SH3-4A
 Size Class: Small to Large sawtimber
 Stand Structure: Evenage
 Crown Closure: 90%
 Total Basal Area Per Acre: 163
 Total Merchantable Basal Area Per Acre: 152
 Total Acceptable Basal Area Per Acre: 74
 Trees Per Acre: 474
 Quadratic Mean Stand Diameter: 7.9
 Percent AGS Sawtimber: 63.4%
 Basal Area of AGS Sawlogs: 44
 Timber Quality: Fair

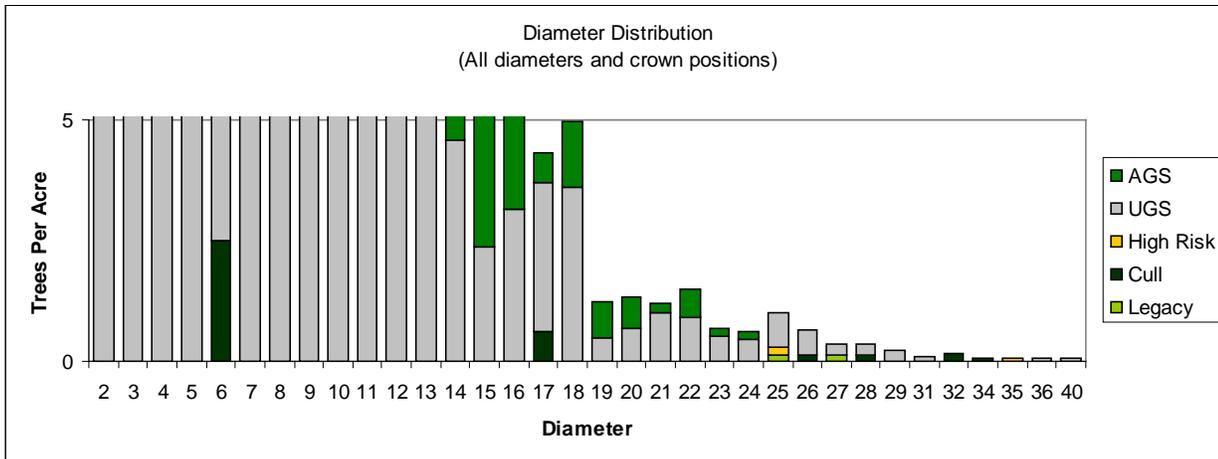
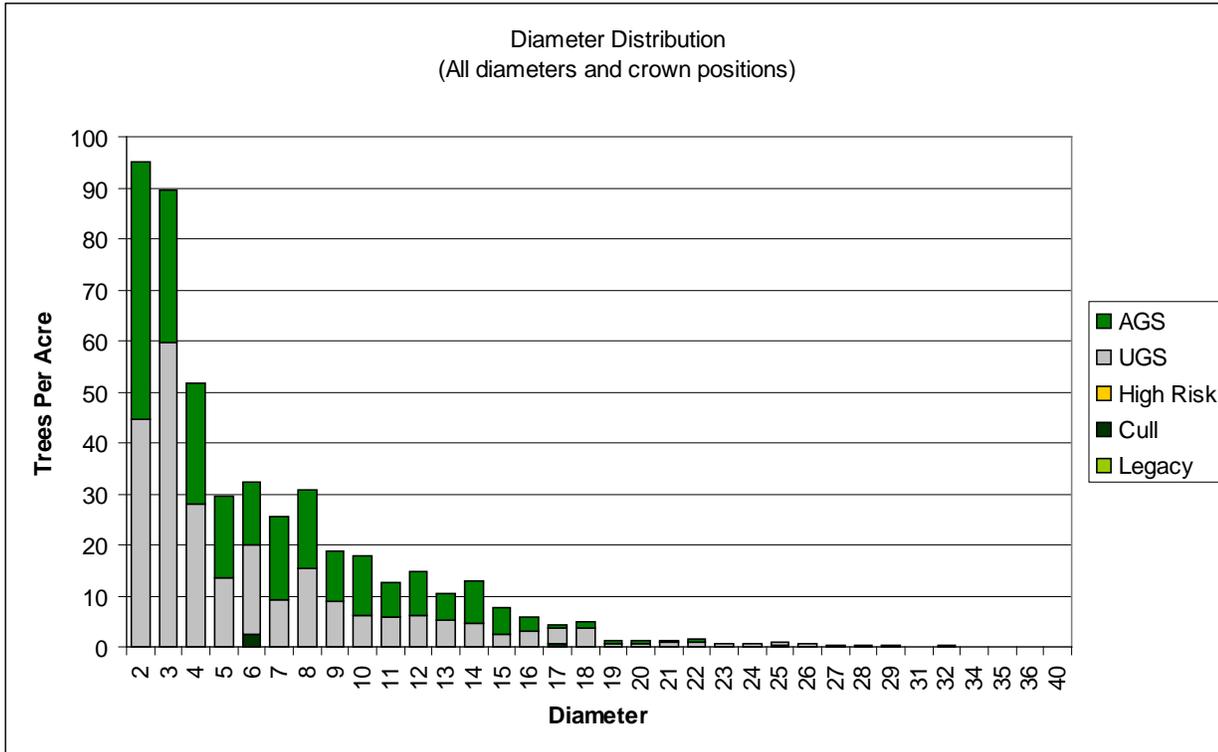
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Legacy (cd)	Total Cords	High Risk (bf)	AGS Saw	% AGS Saw
American Beech	2.1%	0	25	0	0.7	0.0	0.0	0.8	0	25	100%
Aspen	1.9%	0	0	0	0.4	0.0	0.0	0.4	0	0	0%
Bitternut Hickory	0.9%	0	0	0	0.1	0.0	0.0	0.1	0	0	0%
Black Cherry	0.5%	0	41	61	0.1	0.0	0.0	0.3	0	102	100%
Red Maple	14.9%	0	87	59	3.1	0.1	0.0	3.6	0	22	15%
Red Oak	16.3%	0	1,010	425	3.0	1.0	0.0	6.7	0	1,416	99%
Serviceberry	1.2%	0	0	0	0.0	0.0	0.0	0.0	0	0	0%
Striped Maple	0.7%	0	0	0	0.0	0.0	0.0	0.1	0	0	0%
Sugar Maple	2.7%	0	64	62	0.4	0.0	0.0	0.7	0	59	47%
White Ash	5.6%	0	46	48	0.8	0.0	0.0	1.0	0	0	0%
White Birch	9.2%	23	69	14	1.3	0.3	0.0	1.8	0	105	100%
<i>Total Hardwood Per Acre:</i>	<i>56.1%</i>	<i>23</i>	<i>1,341</i>	<i>669</i>	<i>9.9</i>	<i>1.4</i>	<i>0.0</i>	<i>15.4</i>	<i>0</i>	<i>1,729</i>	<i>85%</i>
Hemlock	30.5%	0	1,348	0	7.7	0.5	0.0	10.9	0	1,181	88%
Red Spruce	2.1%	0	331	25	0.2	0.0	0.0	0.9	0	134	38%
White Pine	11.3%	0	3,008	1,351	5.7	0.0	0.0	14.0	100	2,086	48%
<i>Total Softwood Per Acre:</i>	<i>43.9%</i>	<i>0</i>	<i>4,686</i>	<i>1,376</i>	<i>13.6</i>	<i>0.5</i>	<i>0.0</i>	<i>25.8</i>	<i>100</i>	<i>3,401</i>	<i>42%</i>
Total Volume Per Acre:	100.0%	23	6,028	2,045	23	2	0	41	100	5,131	63%
Stand Volume:		4,012	1,059,072	359,350	4,118	337	0	7,247	17,645	901,485	63%

Table 3.3: Stand volume by species and product per acre values.

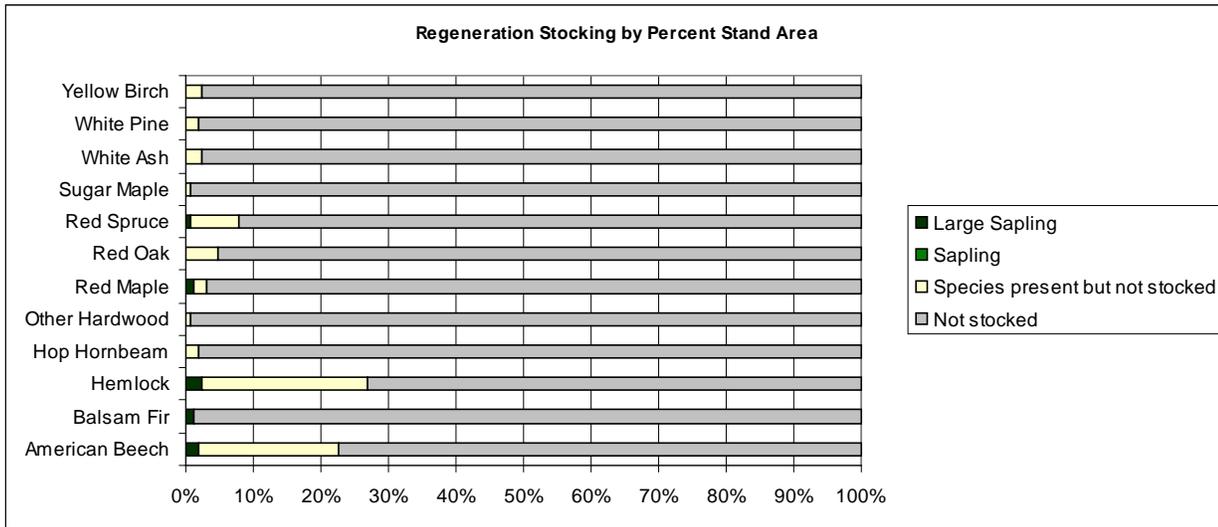
Graph 3.1a and 3.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis

and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 3.1b provides a close-up of the breakdown in the larger diameter classes.

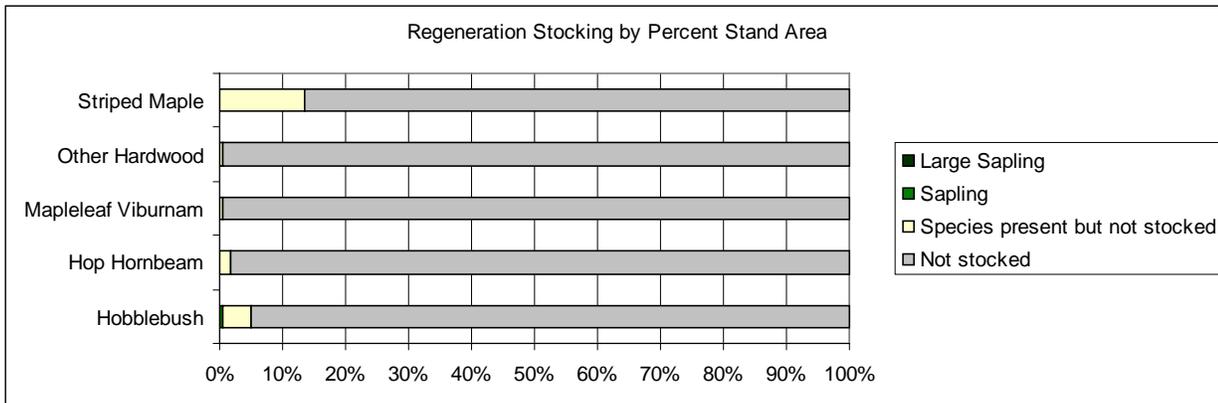


Graph 3.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered

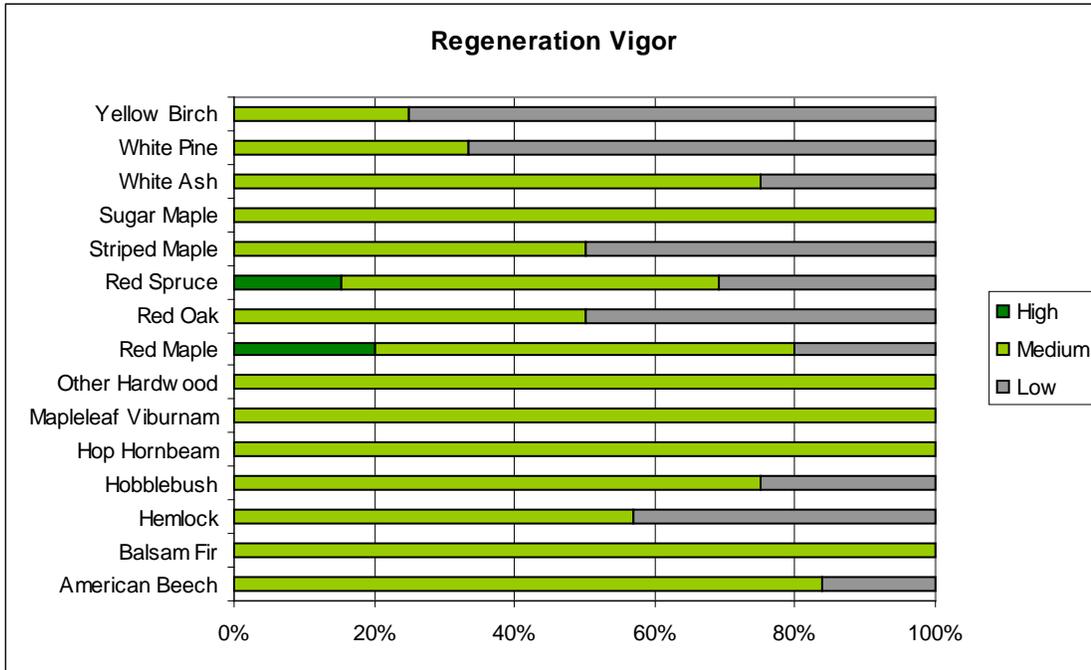
“stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less than 3 feet tall (Seedling). If a species is present but does not meet one of these conditions, it is recorded as present but not stocked.



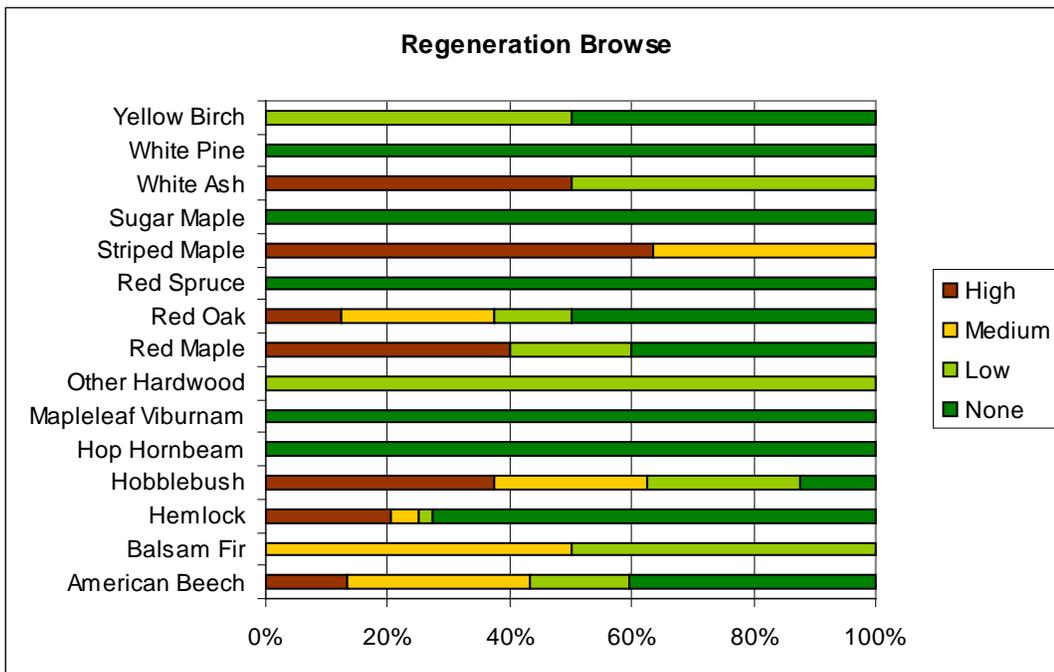
Graph 3.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (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 3.4: Vigor of all regeneration and shrub species.



Graph 3.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Multiple-age	
Harvest Entry:	15 years	
Products:	Hemlock and pine logs and pulp, mixed hardwood: red maple, white birch, red oak...	
Desired Composition:	Manage towards natural community type, favor quality hardwoods and pine, maintain hemlock for shelter	
Crop tree target diameter:	Hemlock 18-20"	White pine 20-22"
	Red oak 20"	

Operational Considerations

Operability:	Operable
Seasonal limitations:	Many vernal pools especially in western half, preferably winter harvest with frozen ground
Terrain:	Variable: moderate to steep slope, exposed ledge, some rocky areas
Access and landing area:	Truck access to eastern half of tract on reservoir access road, no landings currently exist. Interior access to western half requires avoiding wetland complex associated with Whitewater Brook and reservoir, must go north around reservoir
Access distance:	Up to 1 mile
General maintenance:	No landing, truck access good
Brook-wetland crossings/buffer requirements:	Avoid wetland complex associated with Whitewater Brook, need to cross the brook in at least 1 place, avoid vernal pools in western half of stand. Buffer of 100' around wetland and Whitewater Brook with single tree selection harvest-avoid roads and landings within buffer

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

Stand 3 is the largest stand on the property and is truly a mixed stand with hemlock, white pine, some red spruce, and hardwoods including red oak, red maple, white birch, white ash, sugar maple, some black cherry and bitternut hickory, beech, and aspen. Hemlock is the dominant species followed by red oak, red maple, and white pine. There is approximately 6,000 board feet per acre of sawtimber half of that being white pine followed by hemlock and red oak with about 1,000 feet each. The timber quality is variable. Pine ranges from some large valuable trees that are over-mature, to vigorous high quality trees of good growing stock, to poor quality or health cull stems. The oak varies as well, with some large cull trees in the overstory and a good amount of good quality growing stock. The hemlock is of average quality. White birch is becoming over-mature here as well. Regeneration is equally variable, but relatively sparse. Deer and moose are having a significant browse impact on some species, including white ash, red oak, red maple, beech and hobblebush, a shrub.

The terrain varies here, with some nearly level, gently sloping areas to very steep sections with exposed ledge. Overall the ground is rocky. The soil depth ranges as well. Vernal pools are abundant in the western half of the stand; one comes across another one after almost every hump in the ground. These appear to be bedrock driven.

The long term goal for Stand 3 is to manage for multiple age classes of trees indicative of the natural community type, protect water quality, improve wildlife habitat, and provide for recreational opportunity.

Silviculture: The focus of management here is to capture value in senescing trees (especially pine), improve the growth on the best quality, health and vigor stems and create openings for regeneration to become established or to release existing regeneration. This will be accomplished by a mix of thinning out some area of higher quality stems, removing groups of mature, low quality or diseased stems and by releasing individual crop trees. Attempt to release 15-20 crop trees per acre on at least two sides. All treatments should be accomplished by removing the poorest quality and diseased individuals. Maintain dense areas of hemlock for shelter. Maintain large oak trees in canopy for mast.

Priority: High

3a 2015/ 3b 2011: Reduce overall basal area to approximately 100 square feet through:

- **Single tree and Group selection:** Single tree selection to capture value on mature or high risk trees. Group selection up to ½ acre trees to remove pockets of poor quality stems and create conditions for successful regeneration.
- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.

Stand 4 Red Pine 3-4 A

11.8 acres



Stand Structure



Forest Canopy



Forest Floor

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: Red pine planted 30-40 years ago(?)
 Approximate Age of Dominant Trees: 30-40 years
 Stand Health: Fair
 Insects/Damage/Disease: No serious problems noted

SITE CONDITIONS

NH soil classification: 1B
 Determined by: Soils and field observation
 Tree vigor: Low
 Soils: Bernardston silt loam, Udorthents (smoothed)
 Drainage: Well-drained
 Terrain: Gentle slope, level
 Aspect: Slight west
 Elevation: 980-1060'

Snags Per Acre

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

Table 4.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

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

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

WILDLIFE HABITAT

Forest type: Red pine plantation
 Vertical diversity: Low
 Vegetative diversity: Low
 Hard mast: Pine
 Soft mast:
 Special habitat features:
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; allow stand to transition to natural community type

RECREATION

Recreational features: Stand includes heavily used ATV/Snowmobile trail
 Recreational infrastructure: Some signage associated with trail
 Aesthetic resources: Red pine park-like atmosphere
 Public access: Open to motorized and non-motorized access on designated trails, foot traffic elsewhere

SILVICULTURE

Structural and Silvicultural Attributes

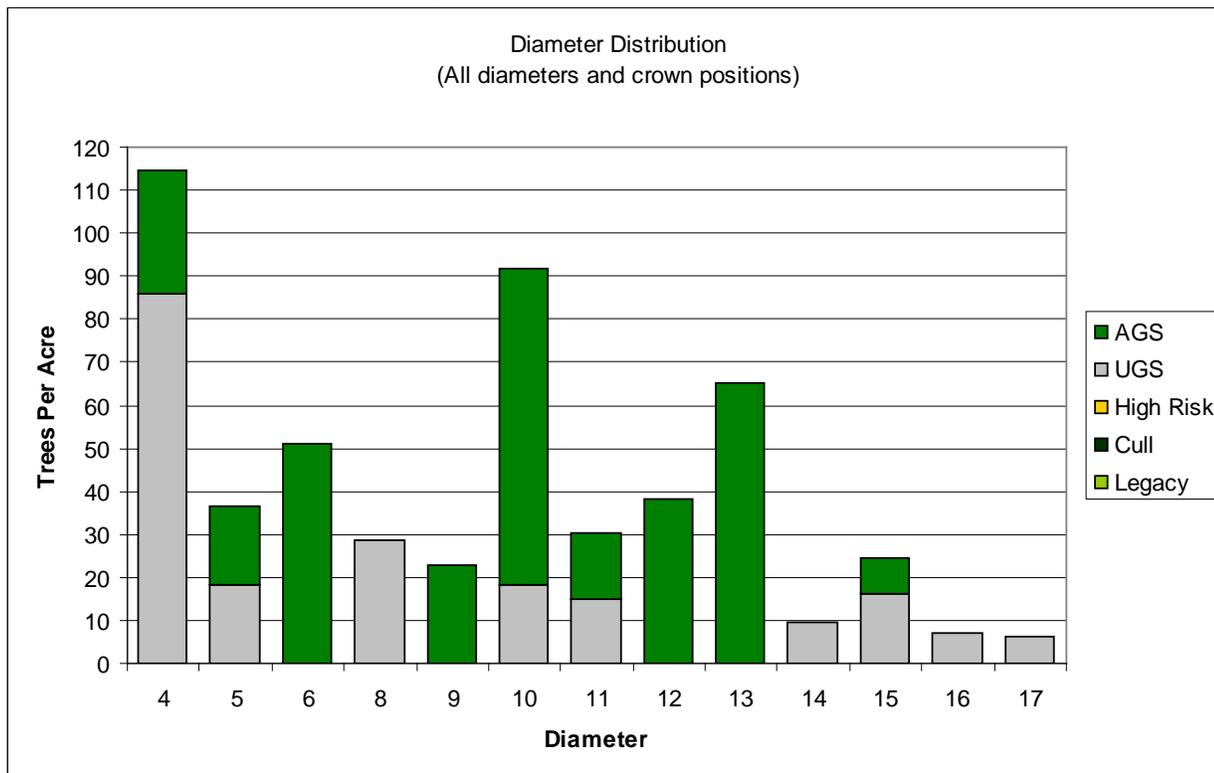
Broad Forest Type: S3-4A
 Size Class: Small sawtimber
 Stand Structure: Evenage
 Crown Closure: 95%
 Total Basal Area Per Acre: 265
 Total Merchantable Basal Area Per Acre: 255
 Total Acceptable Basal Area Per Acre: 175
 Trees Per Acre: 526
 Quadratic Mean Stand Diameter: 9.6
 Percent AGS Sawtimber: 82.6%
 Basal Area of AGS Sawlogs: 110
 Timber Quality: Fair to Good

Forest Composition and volume

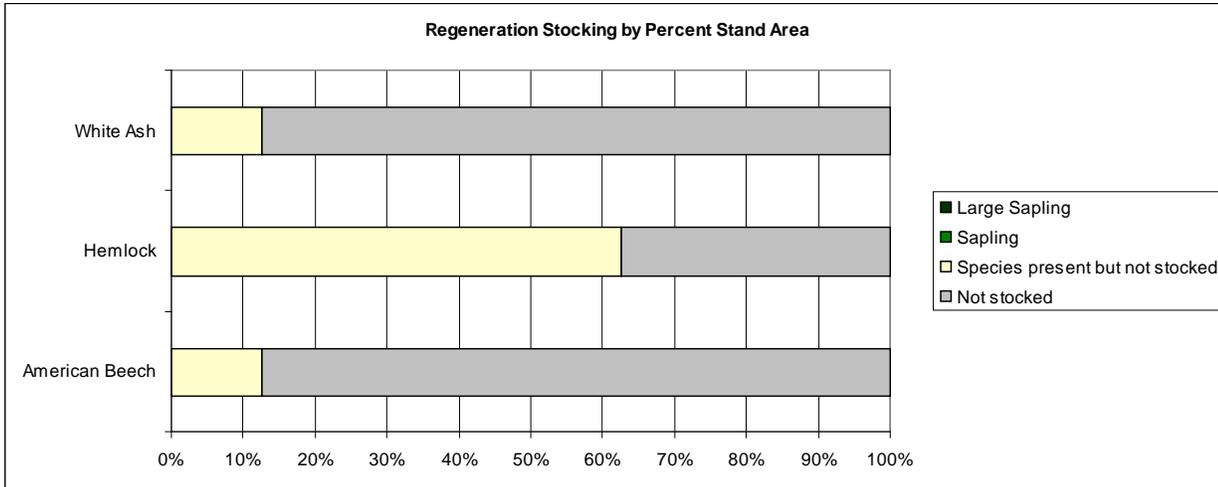
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk (bf)	AGS Saw	% AGS Saw
Hemlock	13.6%	0	0	0	0.8	0.0	0.8	0.0	0	100%
Red Pine	78.8%	0	14,654	0	39.3	0.0	69.0	0.0	12,237	84%
White Pine	7.6%	0	1,372	459	7.6	0.0	11.0	0.0	1,372	75%
Total Softwood										
Per Acre:	100.0%	0	16,026	459	47.7	0.0	80.8	0.0	13,610	83%
Total Volume										
Per Acre:	100.0%	0	16,026	459	48	0	81	0	13,610	83%
Stand Volume:		0	189,112	5,420	563	0	953	0	160,592	83%

Table 4.3: Stand volume by species and product per acre values.

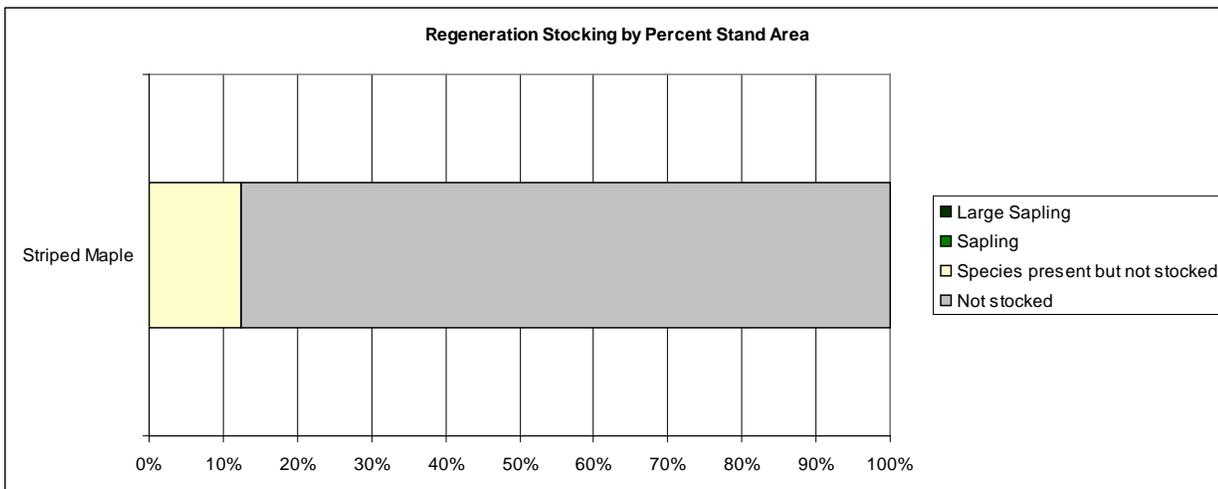
Graph 4.1: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



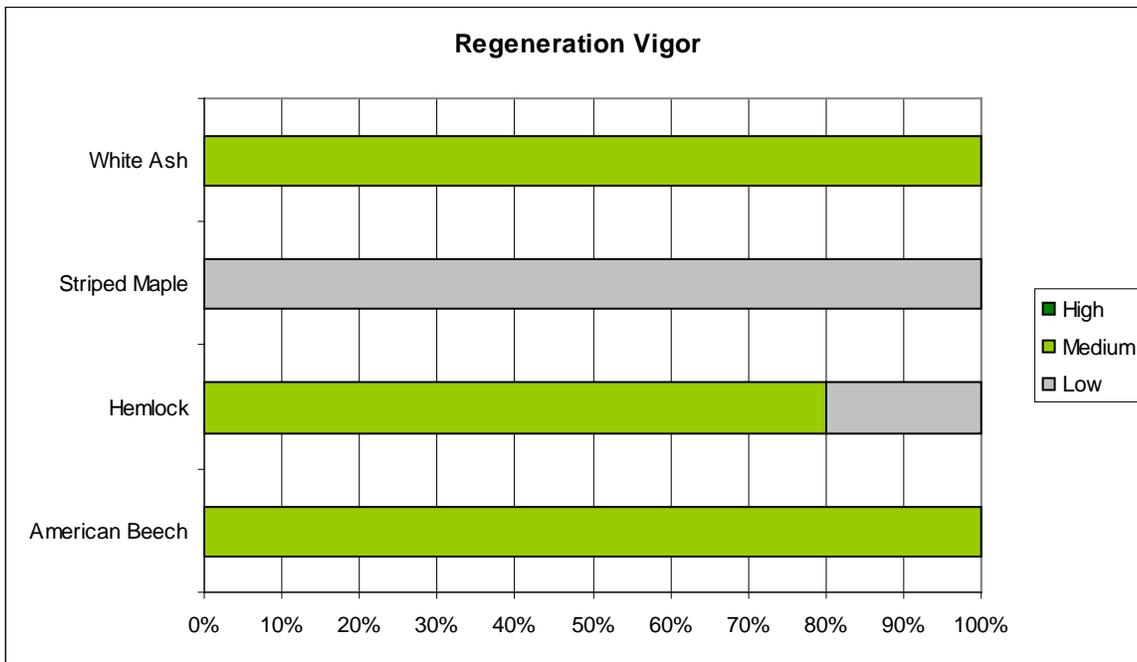
Graph 4.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



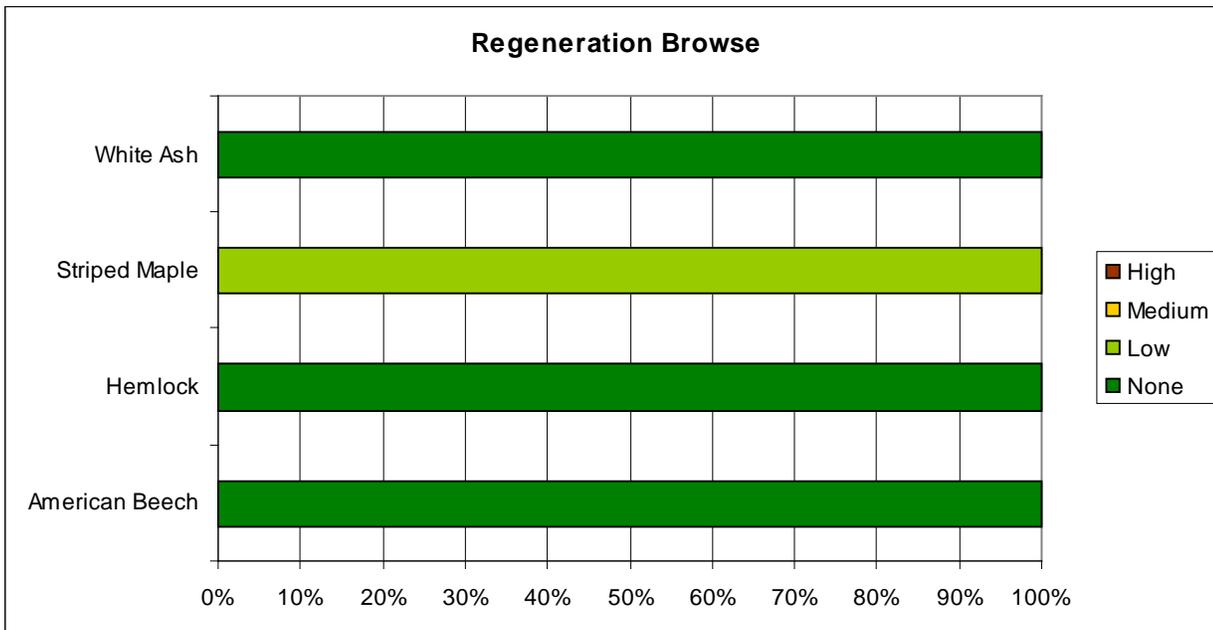
Graph 4.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 4.4: Vigor of all regeneration and shrub species.



Graph 4.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Even-aged
Harvest Entry:	15 years
Products:	Red pine logs and pulp Allow stand to transition to natural community
Desired Composition:	type
Crop tree target diameter:	Red pine 16-18"

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Gentle
Access and landing area:	Access via reservoir access road, no landing established
Access distance:	Short
General maintenance:	Build landing
Brook-wetland crossings/buffer requirements:	No crossings, buffer Whitewater brook with 100' single tree selection zone

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

Stand 4 is a dense red pine plantation, planted approximately 30-40 years ago. The red pine is of average quality, generally fairly limby but straight and tall. Pine plantation offer little in terms of wildlife habitat.

The long-term goal of management in this stand is to allow this stand to transition to its natural community type and manage for multiple age classes. The near term goal is to improve the growth on the best quality and vigor stems.

Silviculture: The focus of management here is to improve the growth on the best stems, through a combination of thinning from above and below. Reduce overall basal area by approximately 1/3 to 145 square feet of basal area of the best quality and vigor stems.

Priority: Medium to High

2010: Reduce overall basal area by 1/3 approximately 150 square feet through:

- **Thin:** Combination of thing from above and below to release best quality, health and vigor trees. Leave trees that appear wind firm, sound and vigorous.

Stand 5 Hardwood/Hemlock 3-4A

30.0 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: No recent management
 Approximate Age of Dominant Trees: 50-60 years old
 Stand Health: Fair
 Insects/Damage/Disease: Beech bark disease, browse

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Medium
 Soils: Lyman-Monadnock rock outcrop complex,
 Cardigan-Kearsarge rock outcrop complex
 Variable- Generally well drained but includes wet
 pockets
 Drainage:
 Terrain: Moderate to steep slope, ledge outcrops, rocky
 Aspect: West
 Elevation: 940-1,240'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	14.8	5.0		19.8
12-18"	2.4			2.4
>18"				
Grand Total	17.2	5.0		22.2

Table 5.1: 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"		4.1			4.1
12-18"		2.5	4.4	4.2	11.2
>18"	0.8				0.8
Grand Total	0.8	6.6	4.4	4.2	16.1

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

WILDLIFE HABITAT

Forest type: Mixedwood
 Vertical diversity: Moderate
 Vegetative diversity: Moderate
 Hard mast: Oak, minimal beech
 Soft mast:
 Special habitat features: Mixed stand with rocky ground/shelters
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; manage for natural diversity

RECREATION

Recreational features: Stand includes ATV/Snowmobile trail
 Recreational infrastructure:
 Aesthetic resources: Potential view sites to west, ledge outcrops
 Public access: Open to motorized and non-motorized access on designated trails, foot traffic elsewhere

SILVICULTURE

Structural and Silvicultural Attributes

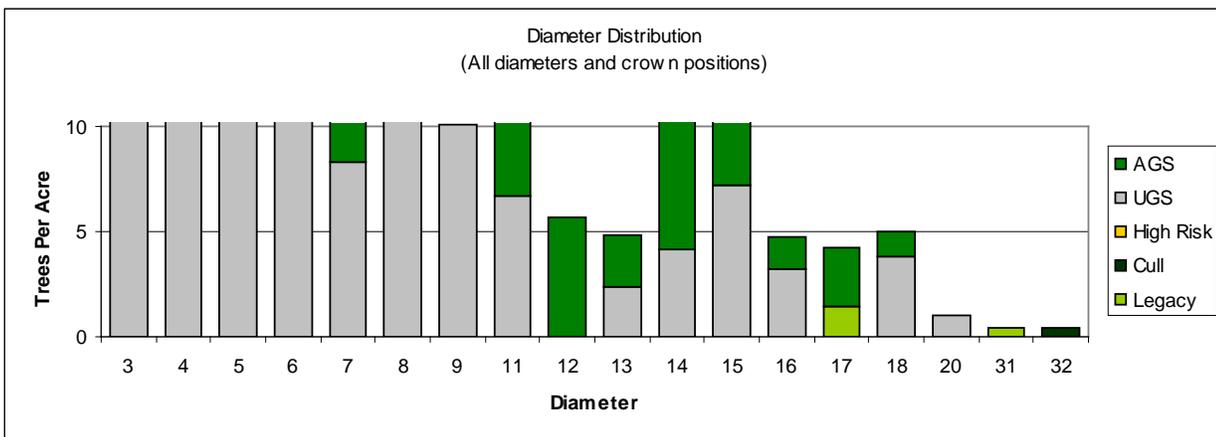
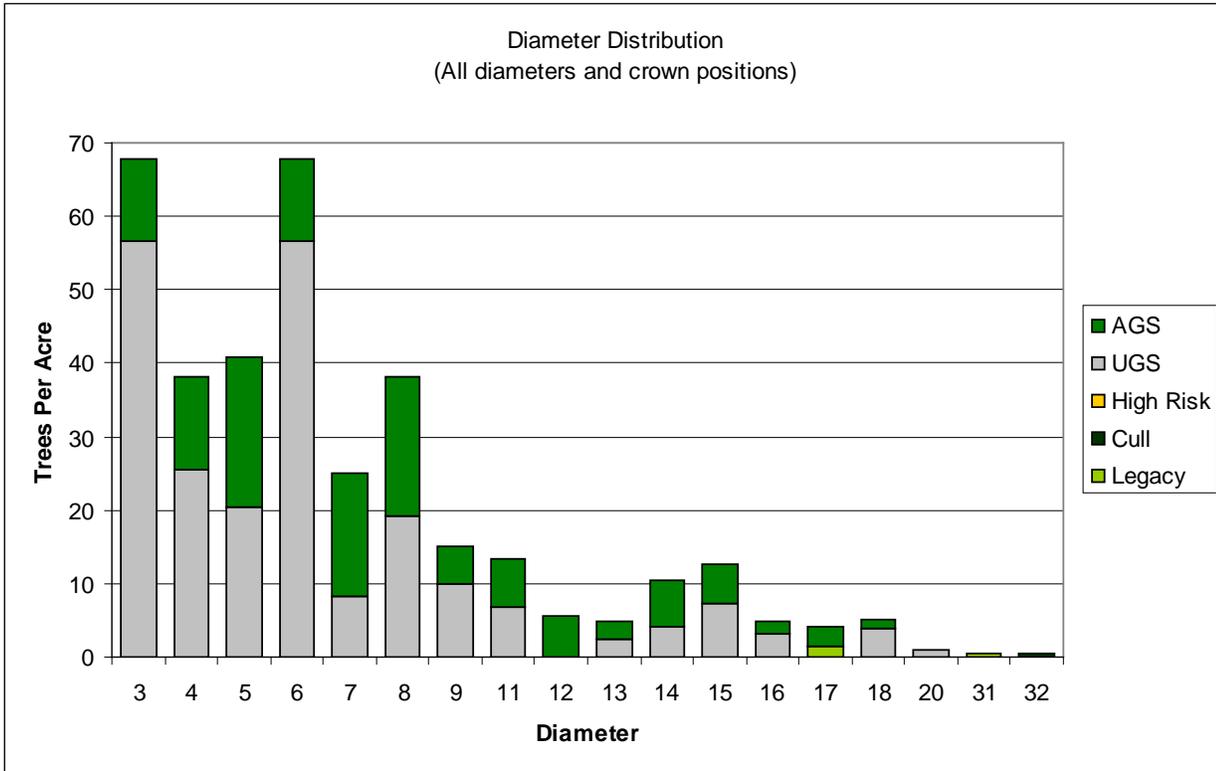
Broad Forest Type: HS3-4A
 Size Class: Small sawtimber
 Stand Structure: Multiple-age
 Crown Closure: 85%
 Total Basal Area Per Acre: 126
 Total Merchantable Basal Area Per Acre: 119
 Total Acceptable Basal Area Per Acre: 53
 Trees Per Acre: 356
 Quadratic Mean Stand Diameter: 8.0
 Percent AGS Sawtimber: 73.0%
 Basal Area of AGS Sawlogs: 33
 Timber Quality: Poor

Forest Composition and volume

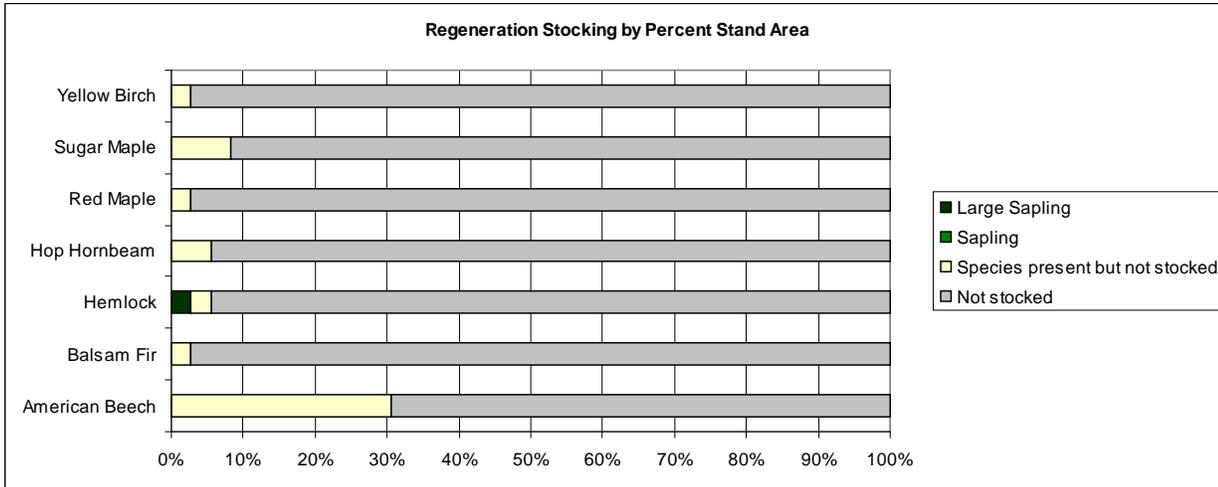
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
American Beech	3.2%	0	0	0	0.9	0.0	0.9	0.0	0	0%
Red Maple	6.1%	0	102	326	1.7	0.0	2.6	0.0	428	100%
Red Oak	14.0%	0	1,383	572	2.8	0.0	6.4	0.0	1,688	86%
Sugar Maple	8.7%	0	0	145	1.0	0.0	1.4	0.0	0	0%
White Ash	8.6%	0	416	69	2.7	0.3	4.0	0.0	235	48%
White Birch	9.5%	0	0	0	0.7	0.0	0.7	0.0	0	0%
Total Hardwood Per Acre:	50.1%	0	1,902	1,111	9.8	0.3	16.0	0.0	2,351	78%
Balsam Fir	5.5%	0	0	0	0.2	0.0	0.2	0.0	0	0%
Hemlock	44.3%	0	747	0	7.4	0.0	9.0	0.0	394	53%
White Pine	0.2%	0	0	0	0.0	0.0	0.0	0.0	0	0%
Total Softwood Per Acre:	49.9%	0	747	0	7.6	0.0	9.2	0.0	394	53%
Total Volume Per Acre:	100.0%	0	2,648	1,111	17	0	25	0	2,744	73%
Stand Volume:		0	79,446	33,341	522	10	755	0	82,330	73%

Table 5.3: Stand volume by species and product per acre values.

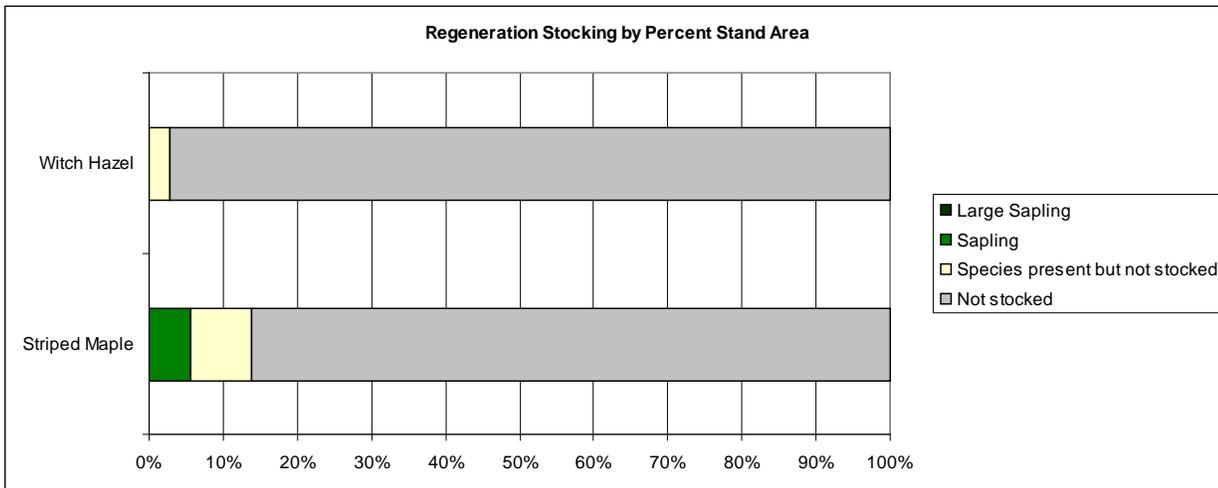
Graph 5.1a and 5.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 1.1b provides a close-up of the breakdown in the larger diameter classes.



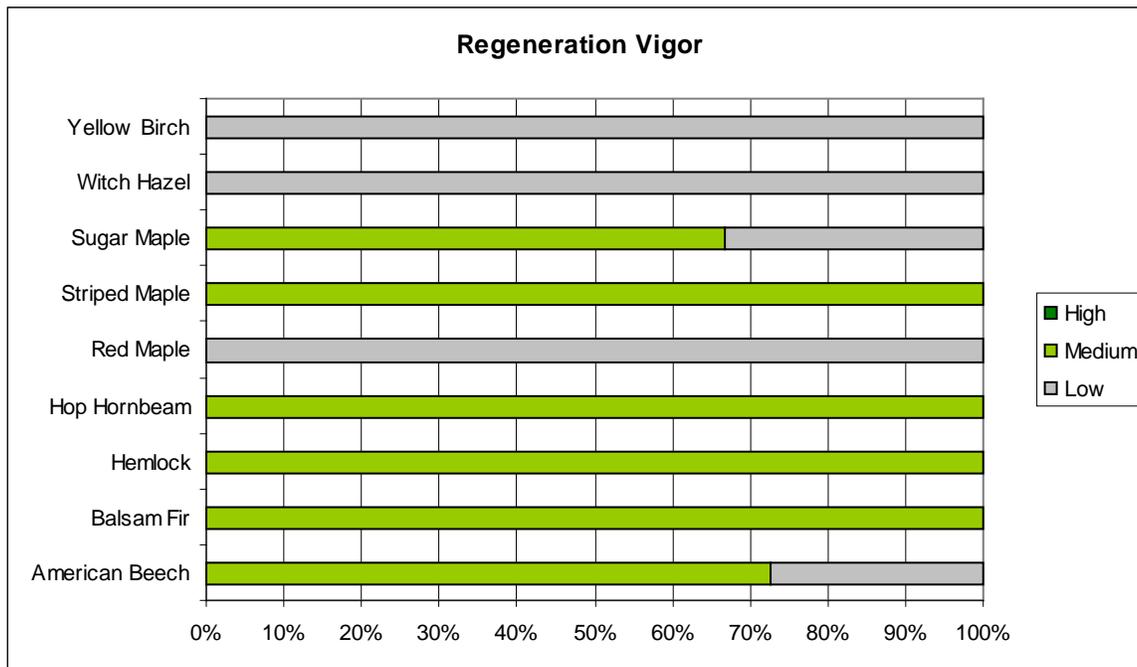
Graph 5.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



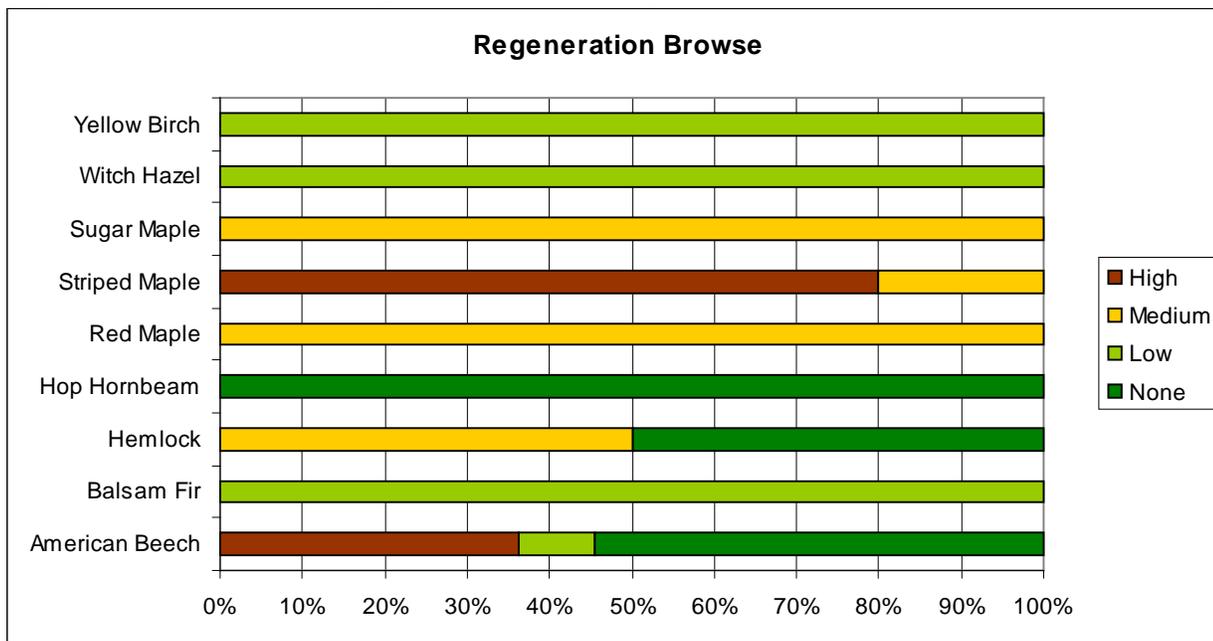
Graph 5.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 5.4: Vigor of all regeneration and shrub species.



Graph 5.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Management system
Harvest Entry:	20 years
Products:	Hardwood pulp/firewood/logs, hemlock
Desired Composition:	Maintain hardwood dominated component
Crop tree target diameter:	Red oak 20" Hemlock 18-20"

Operational Considerations

Operability:	Marginally operable
Seasonal limitations:	Winter only to protect soils
Terrain:	Steep, rocky, ledge
Access and landing area:	No landing or truck access to this side of tract, interior access to this stand marginal due to steep slope tipping off property in areas
Access distance:	Up to 1 mile
General maintenance:	No landing, no truck access to this side
Brook-wetland crossings/buffer requirements:	Whitewater brook crossing required, avoid vernal pools

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

Stand 5 occurs in three separate areas on the forest, all bordering the western boundary. Hardwood is a larger component of this stand, though generally in poor to fair quality and health. Interior access to this stand poses the biggest hurdle as much of it tips off to the west and consequently off the property. The middle section of the stand is only accessible from neighboring lands. Regeneration is variable but sparse.

This stand shall be managed when adjacent stand 3 is being harvested. Work in sections of Stand 5 that can be accessed.

The long term goal of this stand is to favor the hardwood component, protect wetlands, and provide recreational opportunity.

Silviculture: The focus of management here is to improve the growth on the best quality, health and vigor stems and create openings for regeneration to become established or to release existing regeneration. This will be accomplished by a mix of thinning out some area of higher quality stems, removing groups of mature, low quality or diseased stems and by releasing individual crop trees. Attempt to release 15-20 crop trees per acre on at least two sides. All treatments should be accomplished by removing the poorest quality and diseased individuals. Maintain dense areas of hemlock for shelter. Maintain large oak trees in canopy for mast.

Priority: Low

2011: Reduce overall basal area to approximately 100 square feet through:

- **Single tree and Group selection:** Single tree selection to capture value on mature or high

risk trees. Group selection up to ½ acre trees to remove pockets of poor quality stems and create conditions for successful regeneration.

- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.

Stand 6 Pioneer Hardwood H2A

13.8 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Red maple floodplain forest, medium/high variant
 Past Management History: None
 Approximate Age of Dominant Trees: 20-30 years old
 Stand Health: Fair
 Insects/Damage/Disease: Invasive exotic shrub present: glossy buckthorn

SITE CONDITIONS

NH soil classification: 2B
 Determined by: Soils and field observation
 Tree vigor: Fair to good
 Soils: Lyman-Monadnock rock outcrop complex, Borohemists ponded, Udorthents smoothed, Bernardston stony silt loam
 Drainage: Variable- Poor to well-drained
 Terrain: Variable- Rocky to gentle, smooth
 Aspect: Southwest
 Elevation: 1000-1080'

Snags Per Acre

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

Table 6.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

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

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

WILDLIFE HABITAT

Forest type: Mixedwood-early successional
 Vertical diversity: Low
 Vegetative diversity: Moderate
 Hard mast:
 Soft mast:
 Special habitat features: Stand adjacent to Beaver flow, part of wetland/floodplain system associated with Whitewater Brook
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; protect water quality/soils

RECREATION

Recreational features: Stand includes heavily used ATV/Snowmobile trail
 Recreational infrastructure: Some signage associated with trail
 Aesthetic resources: Wetland system
 Public access: Motorized trail network needs to be relocated away from wetlands. Foot traffic allowed.

SILVICULTURE

Structural and Silvicultural Attributes

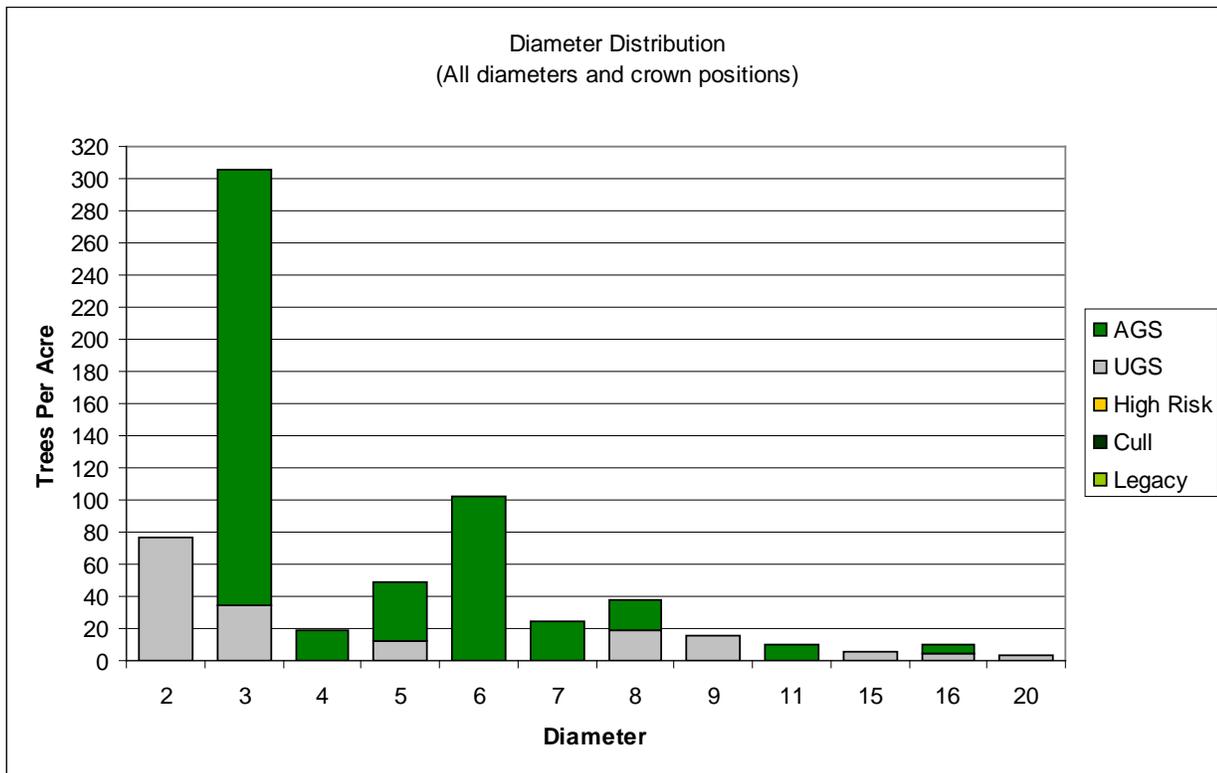
Broad Forest Type: Pioneer
 Size Class: Pole
 Stand Structure: Evenage
 Crown Closure: 85%
 Total Basal Area Per Acre: 105
 Total Merchantable Basal Area Per Acre: 87
 Total Acceptable Basal Area Per Acre: 67
 Trees Per Acre: 658
 Quadratic Mean Stand Diameter: 5.4
 Percent AGS Sawtimber: 100.0%
 Basal Area of AGS Sawlogs: 13
 Timber Quality: Good

Forest Composition and volume

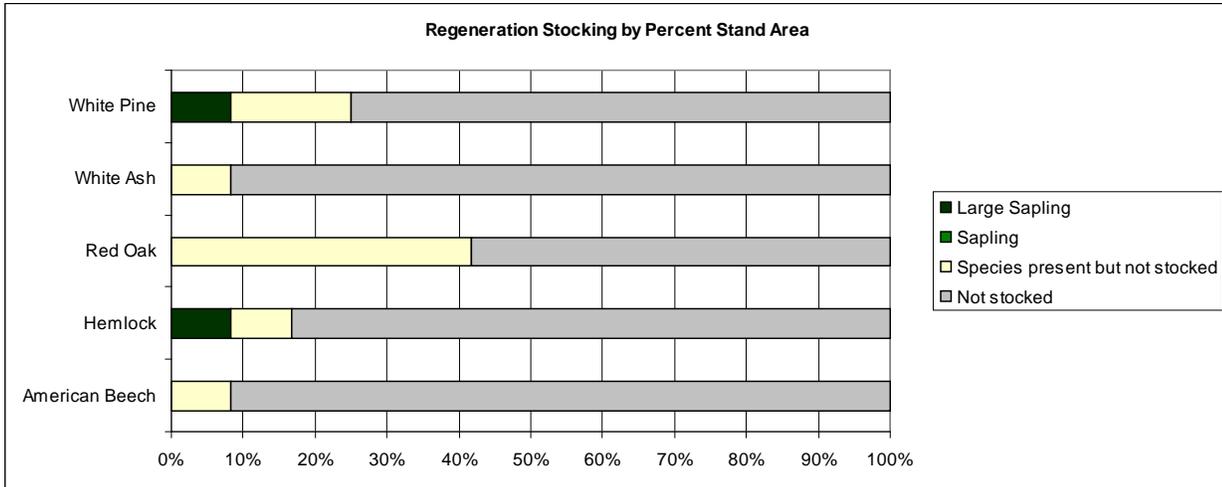
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
Aspen	36.5%	0	0	0	5.3	0.0	5.3	0.0	0	0%
Sugar Maple	38.9%	0	0	0	0.0	2.4	2.4	0.0	0	0%
White Ash	14.3%	0	0	0	0.0	1.6	1.6	0.0	0	0%
Total Hardwood Per Acre:	89.7%	0	0	0	5.3	4.0	9.3	0.0	0	0%
Hemlock	11.3%	0	247	0	7.6	1.6	9.7	0.0	247	100%
Total Softwood Per Acre:	11.3%	0	247	0	7.6	1.6	9.7	0.0	247	
Total Volume Per Acre:	100.0%	0	247	0	13	6	19	0	247	100%
Stand Volume:		0	3,407	0	180	78	262	0	3,407	100%

Table 6.3: Stand volume by species and product per acre values.

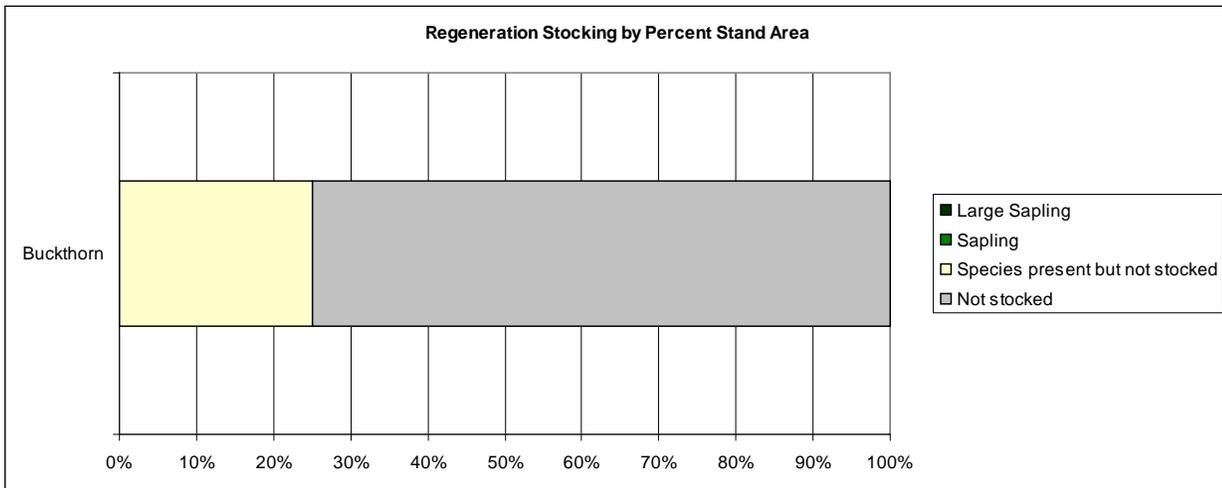
Graph 6.1a and 6.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter.



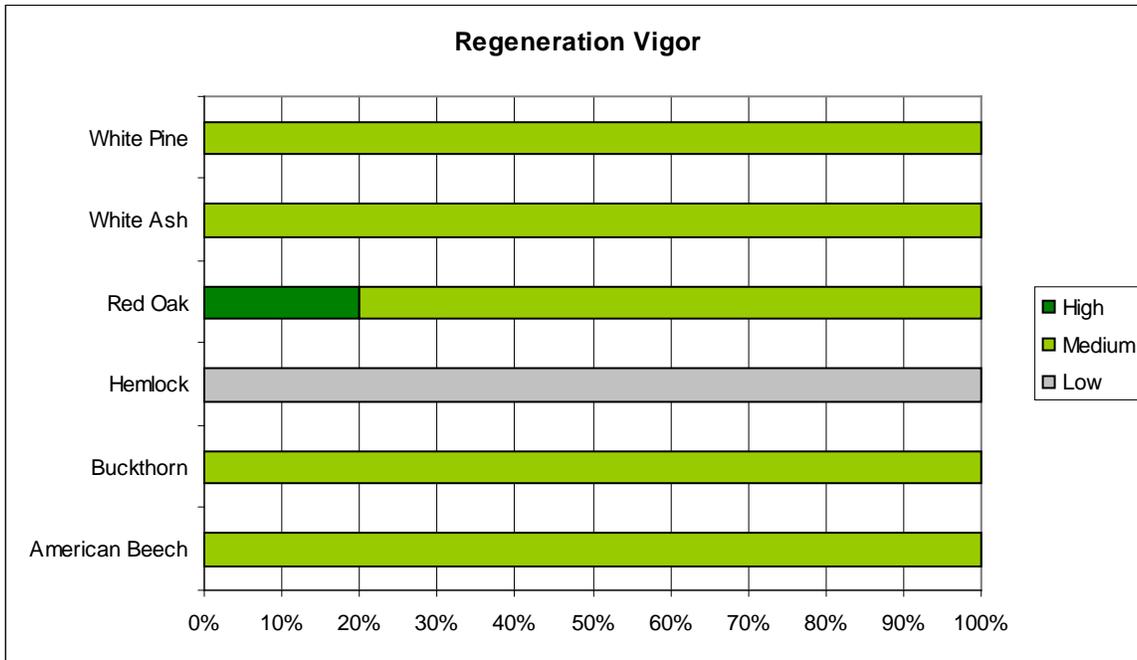
Graph 6.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



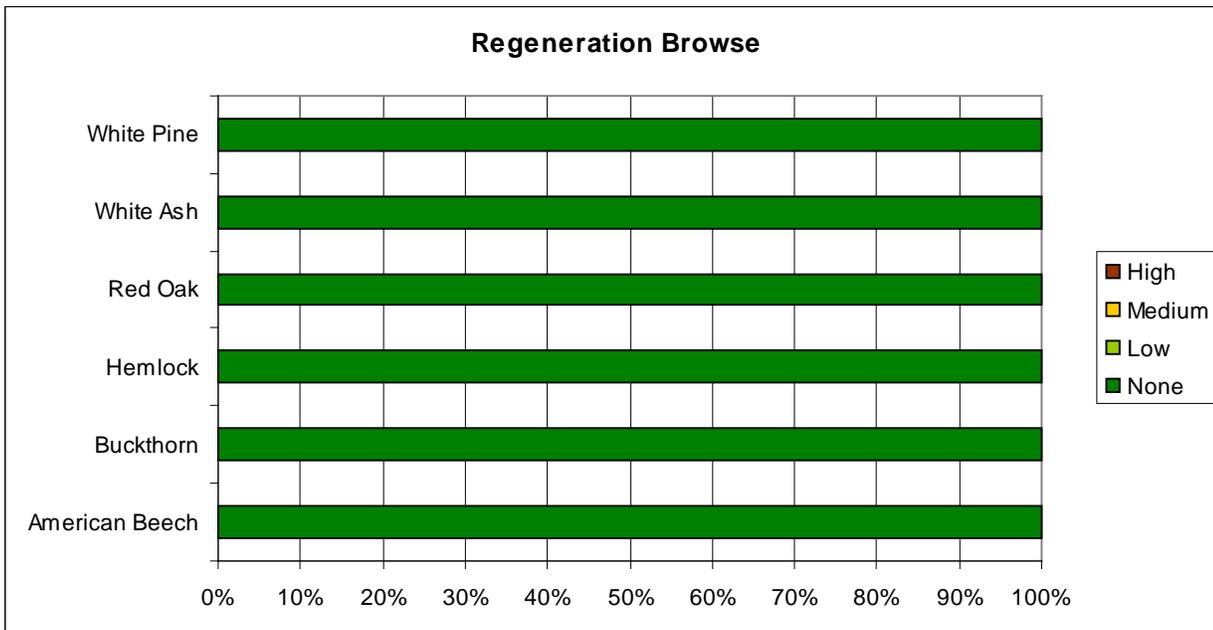
Graph 6.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 6.4: Vigor of all regeneration and shrub species.



Graph 6.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Convert to multiple age
Harvest Entry:	15-20 years
Products:	Hardwood and Softwood pulp/firewood
Desired Composition:	Maintain natural diversity, manage towards natural community type, attempt to regenerate aspen for wildlife
Crop tree target diameter:	

Operational Considerations

Operability:	Marginally operable
Seasonal limitations:	Frozen winter with snow cover to protect soils and water
Terrain:	Level to moderate slope, wet ground
Access and landing area:	Access via reservoir access road, no landing established
Access distance:	.2 miles
General maintenance:	Build landing
Brook-wetland crossings/buffer requirements:	Stand borders and includes wet ground

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

Stand 6 is an early successional floodplain forest associated with Whitewater Brook. It is an important component of the wildlife habitat offered by the Whitewater Forest as it is both early successional and wetland. The bulk of the stand is located on hydric soils. It would be benefit wildlife to maintain the aspen component of the stand over time by repeatedly regenerating patches of it. This work ideally should be done in winter with frozen ground and snow cover to protect the soils and water quality. Because of the location and make-up of this stand, it would best be managed for wildlife habitat as the primary objective. Creating and protecting large snags, especially with cavities, and down logs are additional goals of stand treatment.

Silviculture: The focus of management here is to maintain and improve this important wildlife habitat through creating pockets of early successional habitat, especially aspen sprouts, and by creating and maintaining large diameter snags and down logs.

Priority: Medium

2011: Generate aspen sprouts through:

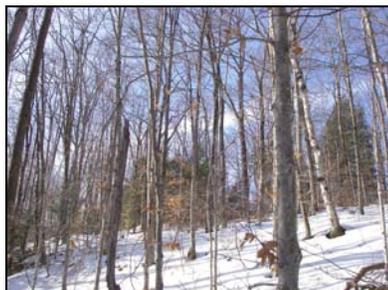
- **Small patch cuts:** Where site suitable, create small patch cuts to regenerate early successional species especially aspen sprouts. Create and maintain snags and down logs as described in the wildlife section.

Riparian and Stream Ecosystems:

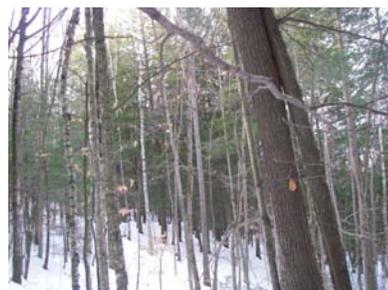
- Establish riparian management zones along streams, rivers, ponds, and lakes. These are not intended as no-harvest zones. Forest management systems, such as single-tree or small-group selections cuts, that retain relatively continuous forest cover in riparian areas (65-70 percent canopy cover) can help maintain biodiversity by protecting water quality, providing shade, supplying downed woody material and litter, and maintaining riparian wildlife habitat conditions.
- 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. (The Whitewater Reservoir shall have a no-cut zone of 50 feet, increasing where needed within the buffer as terrain dictates—including no-cut zones where slope is greater than 8% and where the soils are wet. Elsewhere within the buffer light single tree selection shall be allowed. No roads or landings shall be created within the buffer. Exiting roads to access the reservoir shall be maintained according the New Hampshire BMP's).
- 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

Stand 7 Hardwood 3-4A

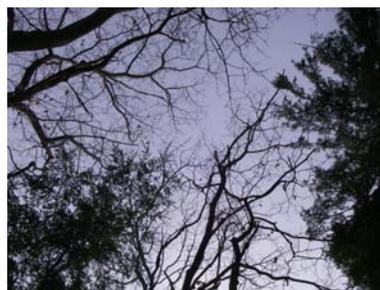
61.5 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Red oak-pine rocky ridge (northern section)/Hemlock-beech-oak-pine (eastern section)
 Past Management History: Some management +/- 15 years ago
 Approximate Age of Dominant Trees: 50-60 years old
 Stand Health: Fair to poor
 Insects/Damage/Disease: Heavy beech bark disease

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Fair to poor
 Soils: Monadnock-Lyman rock outcrop complex, Lyman-Monadnock rock outcrop complex, Lyme-Moosilauke stony loams
 Drainage: Variable: Well drained at height of land, wet-poorly drained in eastern section
 Terrain: Steep slope to gentle terrain
 Aspect: All
 Elevation: 1,160-1,340'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	26.5		6.2	32.8
12-18"	1.1			1.1
>18"				
Grand Total	27.6		6.2	33.8

Table 7.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	2.5		6.2	8.8
12-18"	2.1	1.2		3.3
>18"				
Grand Total	4.6	1.2	6.2	12.1

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

WILDLIFE HABITAT

Forest type: Hardwood dominated
 Vertical diversity: Moderate
 Vegetative diversity: Moderate
 Hard mast: Oak, beech, minimal pine
 Soft mast:
 Special habitat features: Stand includes height(s) of land with open forest, dry red oak sites
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Portions of the stand including the northern section and part of the eastern section recommended for designation as "Ecological Reserve"-not to be actively managed.

RECREATION

Recreational features: Recommend creating (non-motorized) foot trails
 Recreational infrastructure:
 Aesthetic resources: Dry, open red oak forest, potential vistas at height of land
 Public access: Open to foot traffic

SILVICULTURE

Structural and Silvicultural Attributes

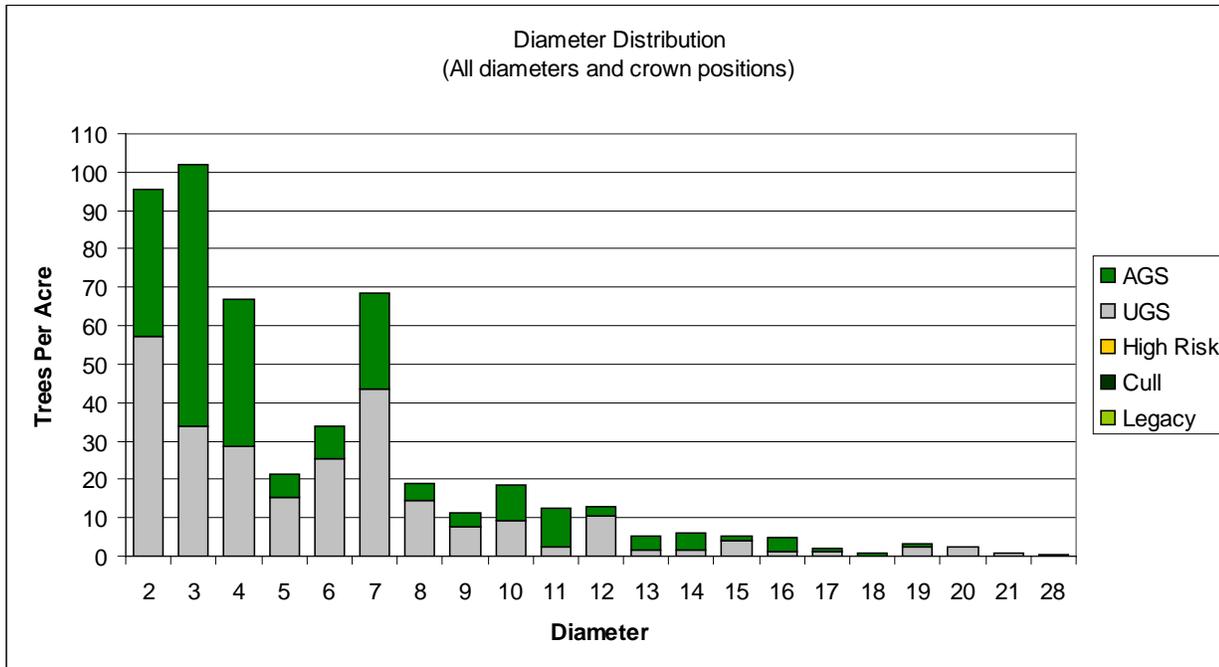
Broad Forest Type: H3-4A
 Size Class: Small sawtimber
 Stand Structure: Evenage
 Crown Closure: 80%
 Total Basal Area Per Acre: 126
 Total Merchantable Basal Area Per Acre: 113
 Total Acceptable Basal Area Per Acre: 53
 Trees Per Acre: 494
 Quadratic Mean Stand Diameter: 6.8
 Percent AGS Sawtimber: 69.4%
 Basal Area of AGS Sawlogs: 28
 Timber Quality: Fair

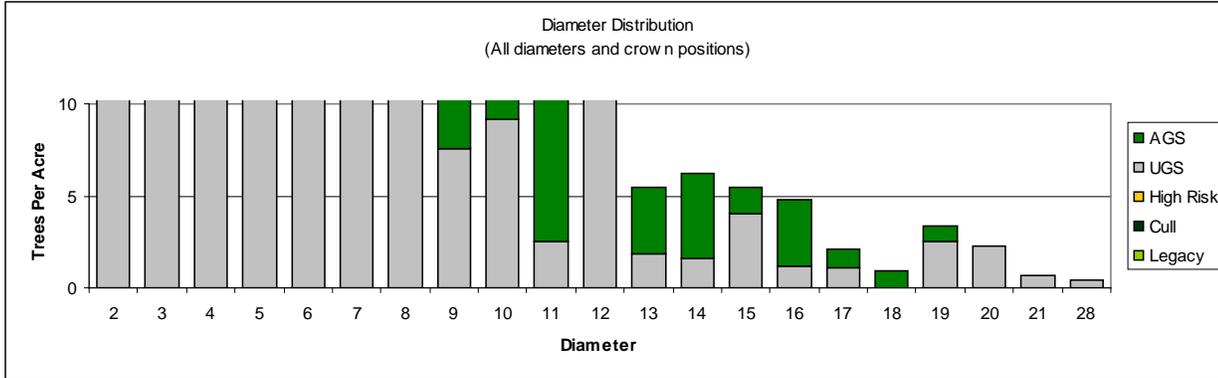
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
American Beech	19.5%	0	0	0	3.1	0.0	3.1	0.0	0	0%
Black Cherry	1.0%	0	0	0	0.3	0.0	0.3	0.0	0	0%
Red Maple	34.2%	0	790	261	7.7	0.9	10.5	0.0	591	56%
Red Oak	22.4%	0	1,030	223	4.0	0.5	6.8	0.0	1,087	87%
Sugar Maple	11.3%	0	184	272	1.8	0.2	2.9	0.0	236	52%
White Birch	6.0%	0	0	0	0.6	0.2	0.9	0.0	0	0%
Total Hardwood Per Acre:	94.5%	0	2,003	756	17.5	1.9	24.4	0.0	1,914	69%
Hemlock	4.9%	0	0	0	1.9	0.1	2.0	0.0	0	0%
White Pine	0.6%	0	0	0	1.2	0.0	1.2	0.0	0	0%
Total Softwood Per Acre:	5.5%	0	0	0	3.1	0.1	3.2	0.0	0	0%
Total Volume Per Acre:	100.0%	0	2,003	756	20.6	2.0	27.6	0.0	1,914	69%
Stand Volume:		0	123,209	46,479	1,269	123	1,700	0	117,706	69%

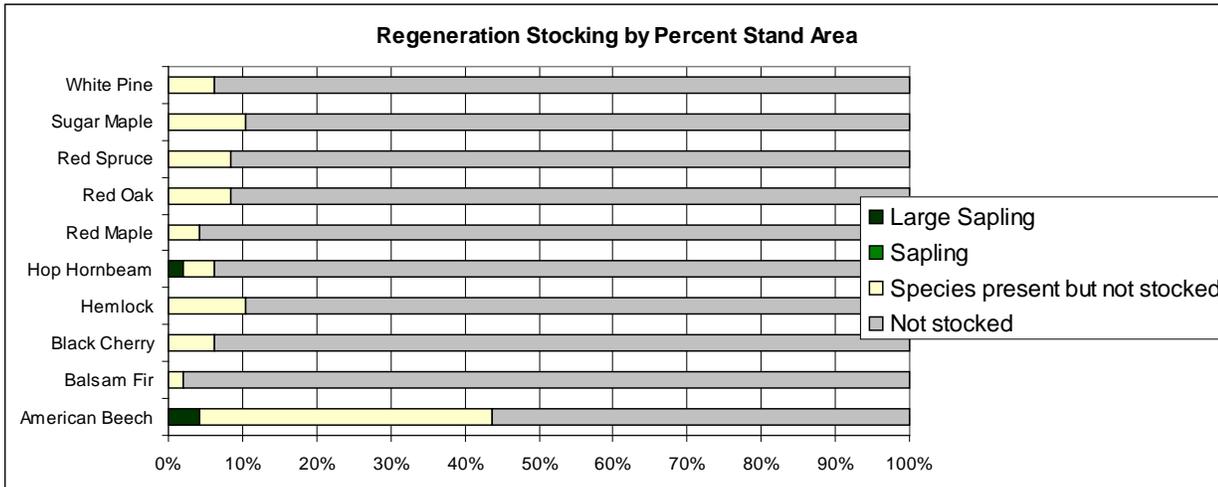
Table 7.3: Stand volume by species and product per acre values.

Graph 7.1a and 7.1b: 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. 7.1b provides a close-up of the breakdown in the larger diameter classes.

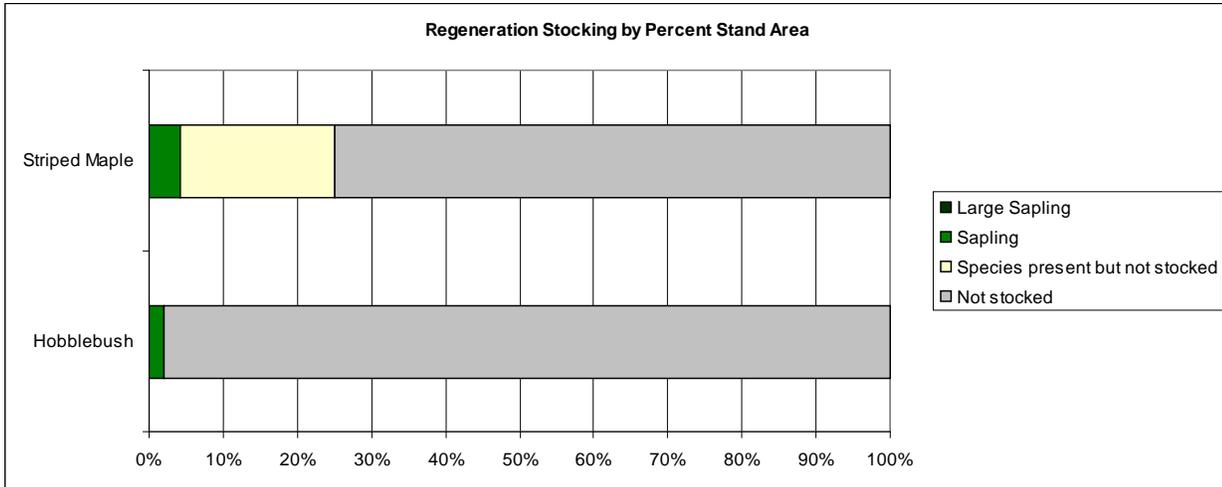




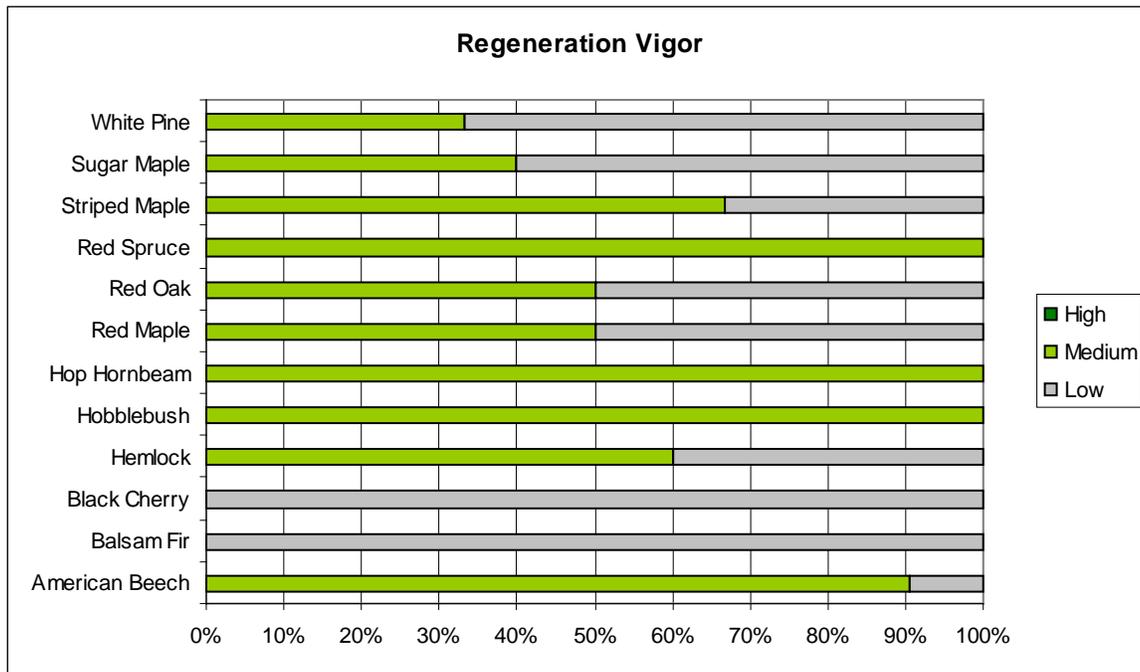
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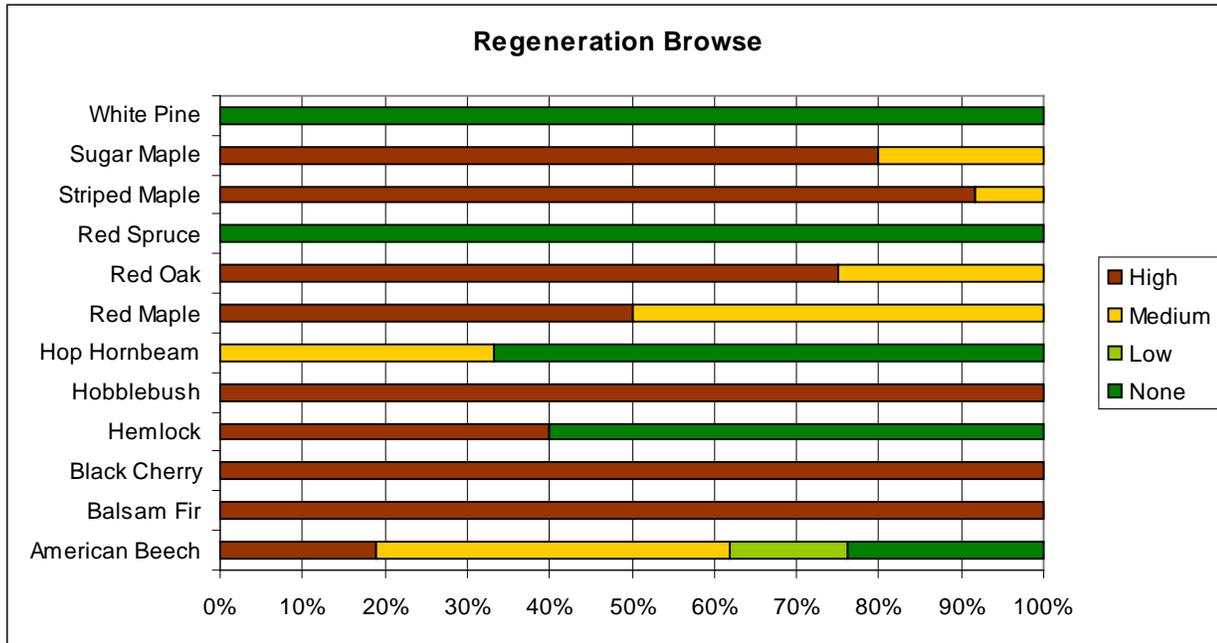
Graph 7.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter (Large Sapling), 5 stems between 3 and 5 feet tall (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 7.4: Vigor of all regeneration and shrub species.



Graph 7.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Multiple age management
Harvest Entry:	20 years
Products:	Hardwood logs and pulp/firewood
Desired Composition:	Manage towards natural community types
Crop tree target diameter:	Oak 20" Sugar maple 18"

Operational Considerations

Operability:	Operable
Seasonal limitations:	Winter only to protect shallow soils
Terrain:	Some steep sections (but most are in "ecological reserve") Truck access to eastern half of tract on reservoir access road, no landings currently exist. Interior access to northern half requires avoiding wetland complex associated with Whitewater Brook and reservoir, must go north around reservoir
Access and landing area:	
Access distance:	1/2 mile
General maintenance:	No landing, truck access good
Brook-wetland crossings/buffer requirements:	Avoid wetland complex associated with Whitewater Brook, need to cross the brook in at least 1 place, avoid vernal pools in western half of stand.

STAND SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 7 includes the hardwood dominated stands on the forest. Red oak dominates, followed by American beech. Sugar maple and yellow birch are also present in lesser amounts. White pine is scattered about, and hemlock and spruce can be found in the understory. The northern height of land is likely a red oak-pine rocky ridge natural community type. The Natural Communities of New Hampshire book has to say about this community type: "This community characterized by a scattered, moderately short or stunted tree canopy of red oak, a significant short shrub layer, and a usually sparse to moderately dense herb layer. Rock exposures generally cover 25-50% of the ground surface. These communities are fire-prone, and many have fire histories. Fires may be important for regenerating oak on these sites over the long-term and plays an important role in maintaining the structure, composition, and physical features of this community. The glade-like character and ridgeline positions often create good views at these sites, and they are therefore popular hiking destinations." It is recommended that this northern section be designated as an "Ecological Reserve" with no active management and no motorized recreation. This area would be a good destination for a new non-motorized recreation trail.

The eastern section of the stand is more likely to be the hemlock –beech-oak-pine with a bit of the oak-pine forest at the height of land. This height drops to a wetland community in Stand 1. This area is heavily used in the winter by both deer and moose as evidenced by the abundance of deer and moose beds found during the December 2007 inventory. The southeast height of land and the adjacent area in Stand 1 is recommended to be designated as an "Ecological Reserve" with no active management and no motorized recreation. Additionally, this area would serve as an interesting route for non-motorized recreational trail linked through Stand 1 by the wetland, and up through the hardwoods to the height of land where a potential vista could be opened up.

The long term goal for the remainder of the stand is to manage for multiple age-classes of trees well suited to the site, favoring red oak.

Silviculture: The focus of management here is to improve the growth on the best stems and create openings for regeneration to become established in the areas outside of the "Ecological Reserve". This will be accomplished by a mix of thinning out some area of higher quality stems, removing groups of mature, low quality or diseased stems and by releasing individual crop trees favoring quality hardwoods. Attempt to release 15-20 crop trees per acre on at least two sides. All treatments should be accomplished by removing the poorest quality and diseased individuals.

Priority: Medium

7b 2015: Reduce overall basal area to approximately 90 square feet through:

- **Single tree and Group selection:** Single tree selection to capture value on mature or high risk trees. Group selection up to ½ acre trees to remove pockets of poor quality stems and create conditions for successful regeneration.
- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.

Stand 8 White Pine 3-4A

12.1 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-beech-oak-pine
 Past Management History: No recent management
 Approximate Age of Dominant Trees: 50 years old
 Stand Health: Fair to poor
 Insects/Damage/Disease: White pine blister rust, red rot, presence of invasive exotic shrub: honeysuckle

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Poor
 Soils: Lyman-Monadnock rock outcrop complex, Bernardston stony silt loam, Lyme-Moosilauke stony loams
 Drainage: Moderately well-drained
 Terrain: Moderate slope
 Aspect: South, southeast
 Elevation: 1,040-1,120'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	46.2	19.1	19.1	84.4
12-18"	17.0	6.2	13.3	36.5
>18"				
Grand Total	63.2	25.3	32.4	120.8

Table 8.1: 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"		93.1	24.9		118.0
12-18"		6.2		7.2	13.5
>18"					
Grand Total		99.3	24.9	7.2	131.5

Table8.2: Standing down logs per acre by size and decay class.

WILDLIFE HABITAT

Forest type: White pine
 Vertical diversity: Low
 Vegetative diversity: Low
 Hard mast: Pine
 Soft mast:
 Special habitat features: Dense pine stand
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Increase snags and down logs; manage for natural diversity

RECREATION

Recreational features: Portion of ATV trail system
 Recreational infrastructure:
 Aesthetic resources:
 Public access: Open to motorized and non-motorized access on designated trails, foot traffic elsewhere.

SILVICULTURE

Structural and Silvicultural Attributes

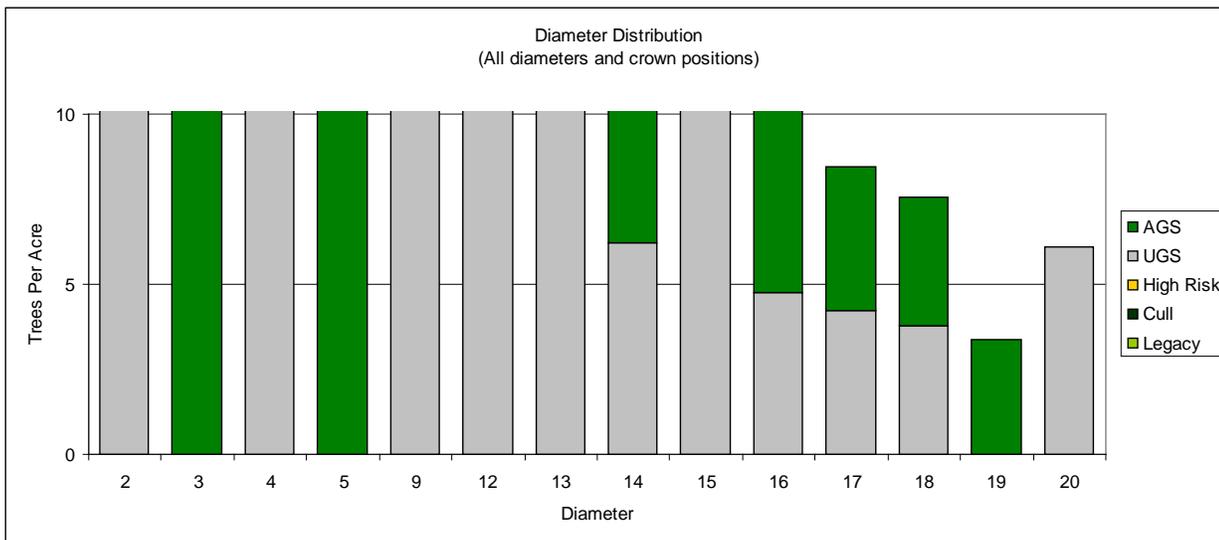
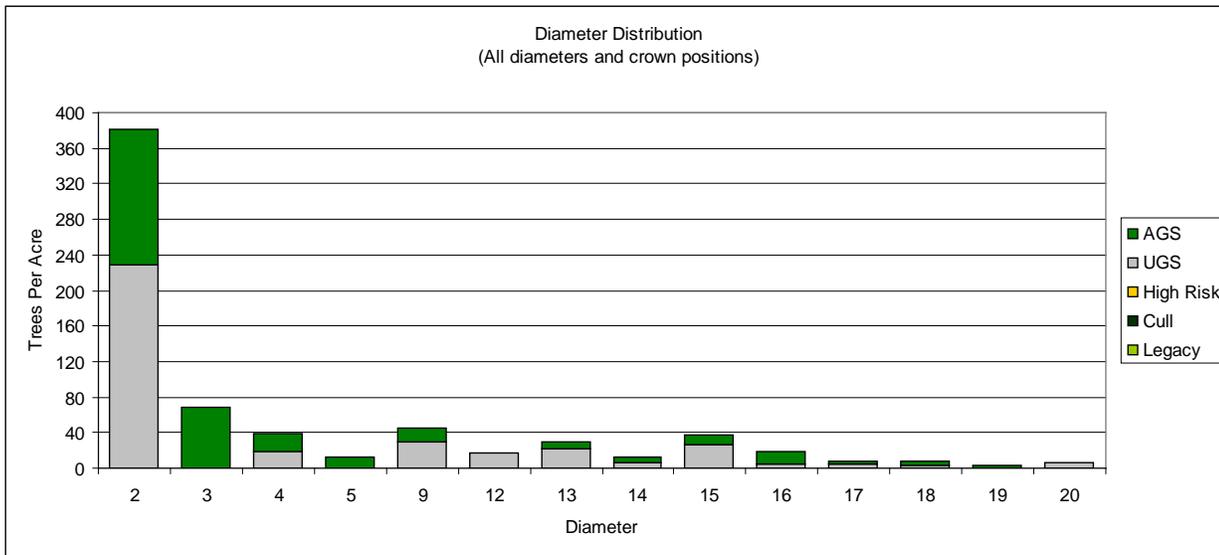
Broad Forest Type: H3-4A
 Size Class: Small sawtimber
 Stand Structure: Evenage
 Crown Closure: 80%
 Total Basal Area Per Acre: 126
 Total Merchantable Basal Area Per Acre: 113
 Total Acceptable Basal Area Per Acre: 53
 Trees Per Acre: 494
 Quadratic Mean Stand Diameter: 6.8
 Percent AGS Sawtimber: 69.4%
 Basal Area of AGS Sawlogs: 28
 Timber Quality: Fair to poor

Forest Composition and volume

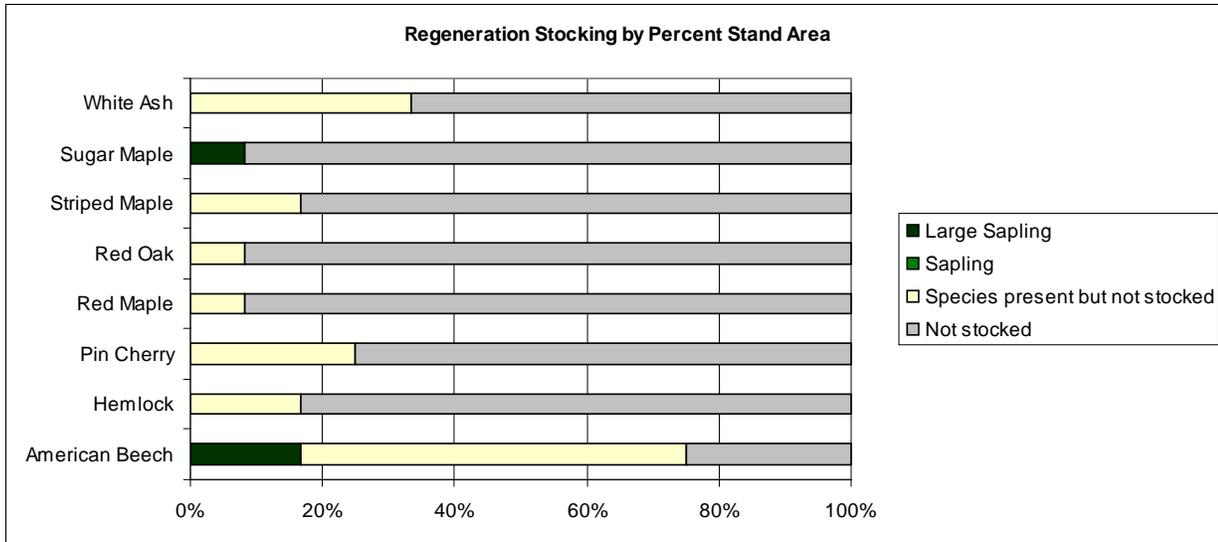
Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
White Pine	100.0%	0	19,819	2,125	39.4	0.0	80.3	0.0	12,459	57%
<i>Total Softwood Per Acre:</i>	<i>100.0%</i>	<i>0</i>	<i>19,819</i>	<i>2,125</i>	<i>39.4</i>	<i>0.0</i>	<i>80.3</i>	<i>0.0</i>	<i>12,459</i>	<i>57%</i>
Stand Volume:		0	239,810	25,713	476	0	972	0	150,749	

Table 8.3: Stand volume by species and product per acre values.

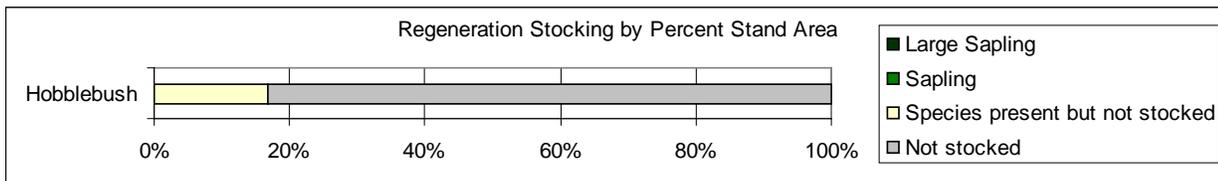
Graph 8.1a and 8.1b: Diameter distribution showing trees per acre on the Y axis, diameter class on the X axis and tree condition. Includes trees in all canopy positions down to 2 inches in diameter. 7.1b provides a close-up of the breakdown in the larger diameter classes.



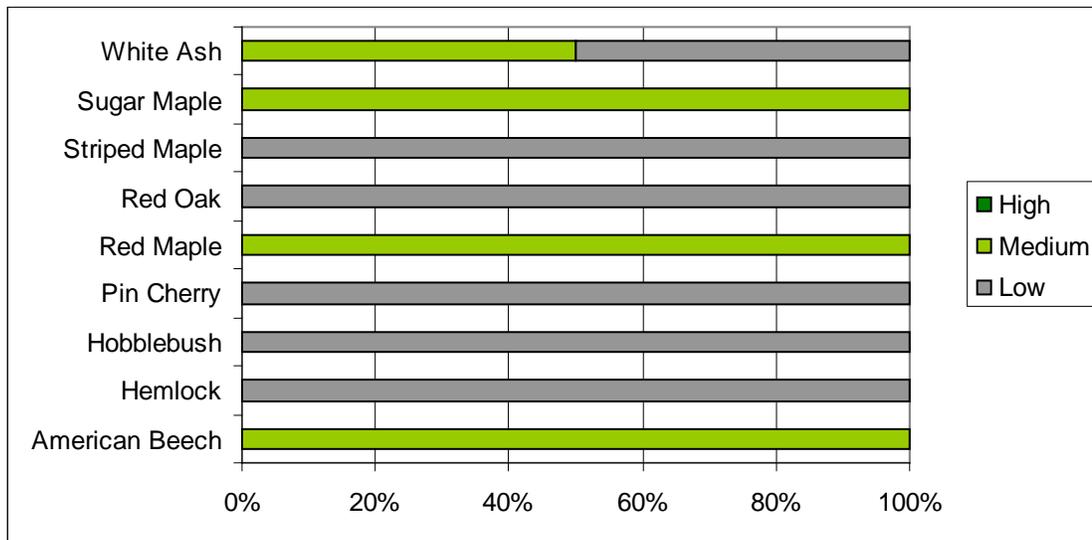
Graph 8.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



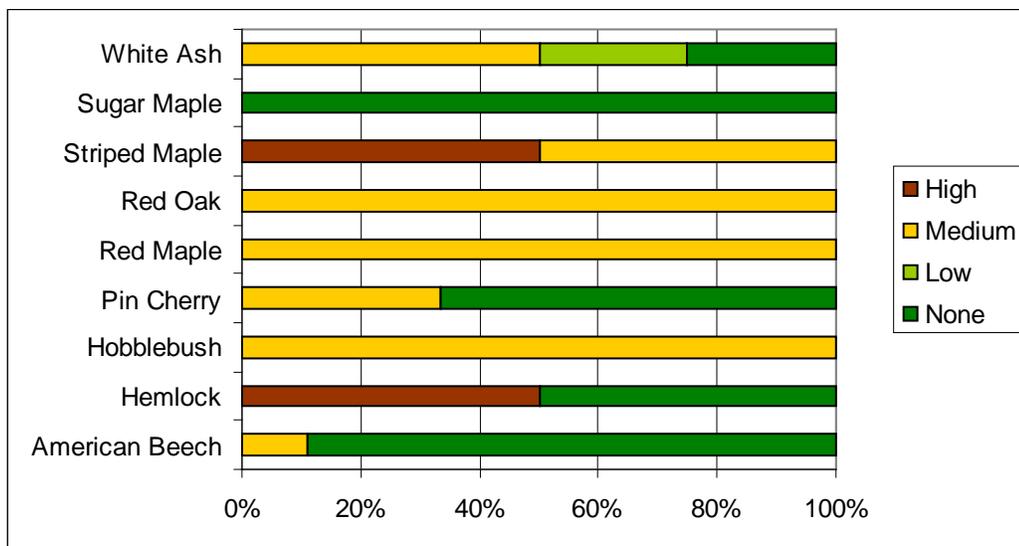
Graph 8.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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 8.4: Vigor of all regeneration and shrub species.



Graph 8.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system:	Even-aged
Harvest Entry:	15 years
Products:	White pine logs and pulp Allow stand to transition to natural community type
Desired Composition:	type
Crop tree target diameter:	White pine 20-22"

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Moderate slope
Access and landing area:	Truck access to eastern half of tract on reservoir access road, no landings currently exist. Interior access to western half requires avoiding wetland complex associated with Whitewater Brook and reservoir, must go north around reservoir
Access distance:	Up to 1 mile
General maintenance:	No landing, truck access good
Brook-wetland crossings/buffer requirements:	Avoid wetland complex associated with Whitewater Brook, need to cross the brook in at least 1 place, avoid vernal pools in western half of stand.

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

Stand 8 is an even-aged stand of almost pure white pine. The stand is severely overcrowded, resulting in the majority of the trees suffering from low vigor and leading to common disease problems such as red rot. White pine blister rust is also present in the stand. There is little to no regeneration and the invasive exotic shrub honeysuckle is present.

The pine likely got its start here after the land was abandoned for agricultural purposes. It is likely pine will stay in the species mix over time, but not to the degree at present without excessive site work. The long term goal of the stand is to convert it to multiple age classes of species indicative to the natural community type. Pine will be favored, but not to the degree of site modification.

Silviculture: The focus of management here is to improve the growth on the best stems, through a combination of thinning from above and below. Reduce overall basal area by approximately 1/3 retaining the best quality, highest vigor, and the most apparent wind-firm stems.

Priority: High

2011: Reduce overall basal area by 1/3 approximately 150 square feet through:

- **Thin:** Combination of thinning from above and below to release best quality, health and vigor trees. Leave trees that appear wind firm, sound and vigorous.

Stand 9 Reservoir Buffer 18.9 acres



Stand Structure



Stand Structure



Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type: Hemlock-white pine forest
 Past Management History: None
 Approximate Age of Dominant Trees: 60-70 years old
 Stand Health: Good
 Insects/Damage/Disease: No serious problems noted

SITE CONDITIONS

NH soil classification: 2A
 Determined by: Soils and field observation
 Tree vigor: Moderate
 Soils: Lyman-Monadnock rock outcrop complex, Borohemists ponded, Dutchess stony silt loam
 Variable: Slopes well-drained, poorly drained near wetland
 Drainage:
 Terrain: Steep slope to gentle terrain
 Aspect: Primarily east and west
 Elevation: 980-1,020'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	12.5			12.5
12-18"	2.7			2.7
>18"				
Grand Total	15.2			15.2

Table 9.1: Standing dead trees per acre by size and decay class.

Down Logs Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"			8.2	8.2
12-18"	3.6			3.6
>18"				
Grand Total	3.6		8.2	11.8

Table 10.2: Standing down logs per acre by size and decay class.

WILDLIFE HABITAT

Forest type: Hemlock dominated
 Vertical diversity: Low
 Vegetative diversity: Medium
 Hard mast: Pine
 Soft mast:
 Special habitat features: Stand is buffer to reservoir and also serves as wildlife corridor
 Snag trees: Few large snags
 Down logs: Few large down logs
 Special wildlife practices: Manage as reservoir buffer, increase large snags and down logs

RECREATION

Recreational features: Good location for Foot path that circumnavigates the reservoir
 Recreational infrastructure: None at present
 Aesthetic resources: Mature mixedwood stand surrounding reservoir
 Public access: Open to foot traffic

SILVICULTURE

Structural and Silvicultural Attributes

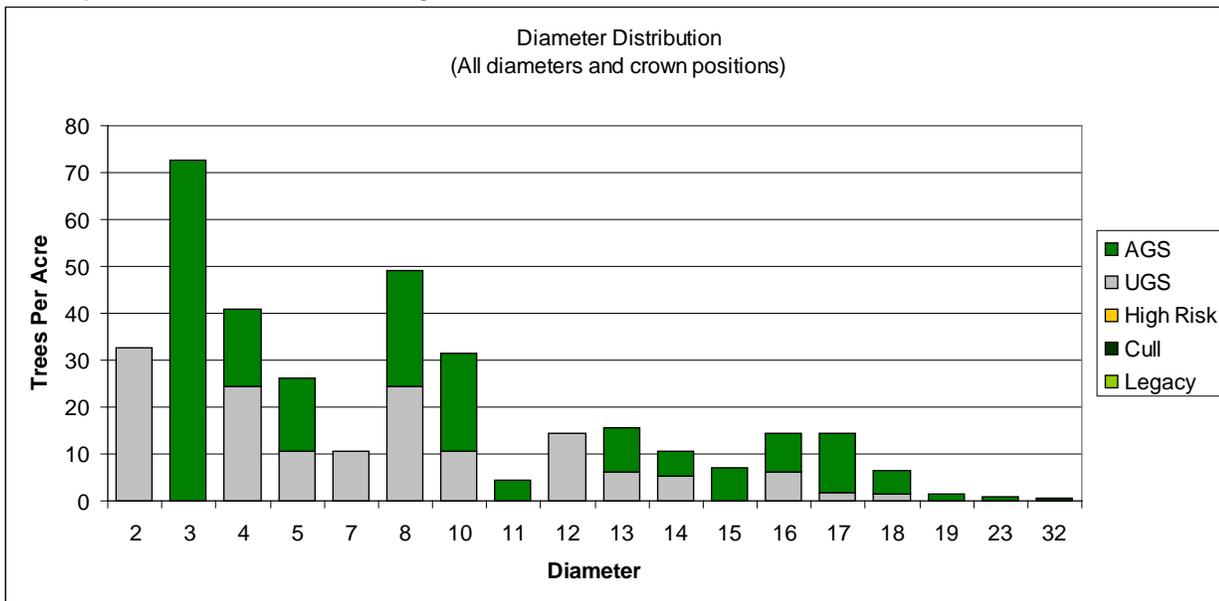
Broad Forest Type: SH4A
 Size Class: Large sawtimber
 Stand Structure: Evenage
 Crown Closure: 90%
 Total Basal Area Per Acre: 160
 Total Merchantable Basal Area Per Acre: 152
 Total Acceptable Basal Area Per Acre: 99
 Trees Per Acre: 354
 Quadratic Mean Stand Diameter: 9.1
 Percent AGS Sawtimber: 89.0%
 Basal Area of AGS Sawlogs: 71
 Timber Quality: Good

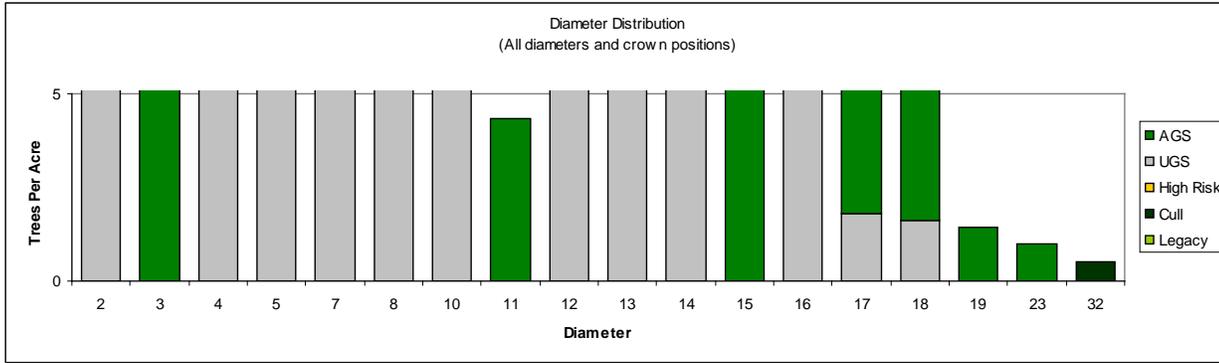
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tire (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
American Beech	1.5%	0	0	0	0.6	0.0	0.6	0.0	0	0%
Black Birch	4.5%	0	0	0	0.5	0.0	0.5	0.0	0	0%
Red Oak	11.6%	0	1,692	395	2.5	0.0	6.3	0.0	2,087	100%
Sugar Maple	7.3%	0	0	0	1.5	0.2	1.7	0.0	0	0%
White Ash	4.0%	0	125	192	1.2	0.0	1.9	0.0	0	0%
Yellow Birch	11.1%	0	125	0	2.4	0.0	2.6	0.0	0	0%
Total Hardwood Per Acre:	39.9%	0	1,941	587	8.8	0.2	13.6	0.0	2,087	100%
Hemlock	46.1%	0	5,413	0	10.6	0.2	20.4	0.0	5,168	95%
Red Pine	7.4%	0	95	0	0.5	0.0	0.7	0.0	95	100%
White Pine	6.5%	0	203	242	3.1	0.0	4.1	0.0	203	46%
Total Softwood Per Acre:	60.1%	0	5,711	242	14.2	0.2	25.2	0.0	5,465	46%
Total Volume Per Acre:	100.0%	0	7,652	829	23	0	39	0	7,552	89%
Stand Volume:		0	144,625	15,672	434	8	734	0	142,732	89%

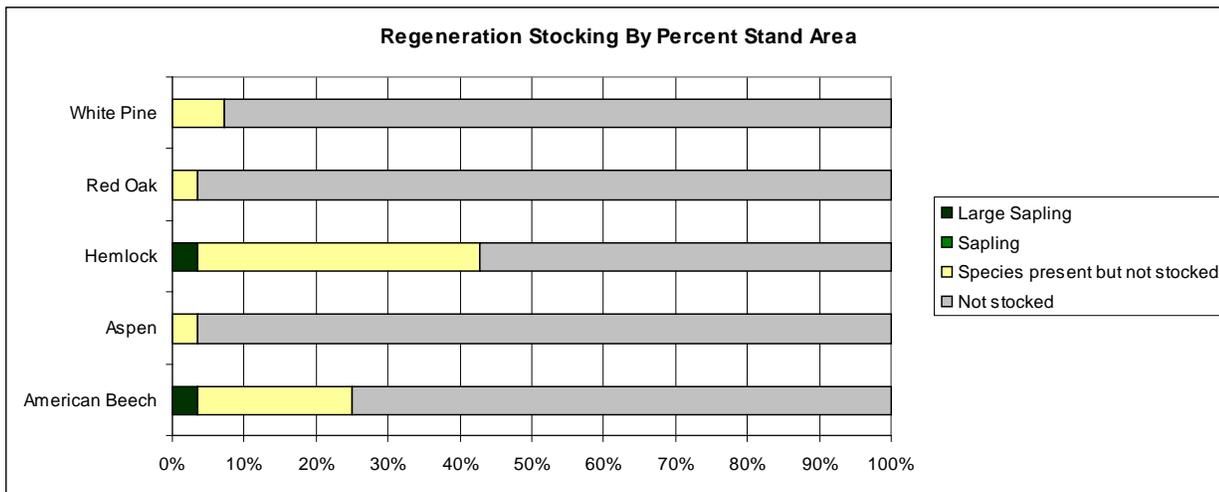
Table 10.3: Stand volume by species and product per acre values.

Graph 10.1a and 10.1b: 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. 10.1b provides a close-up of the breakdown in the larger diameter classes.

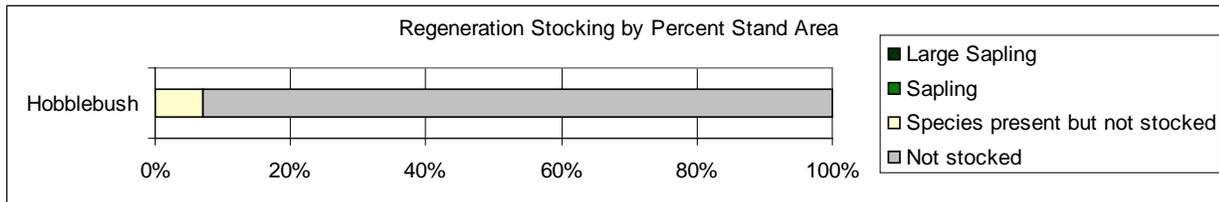




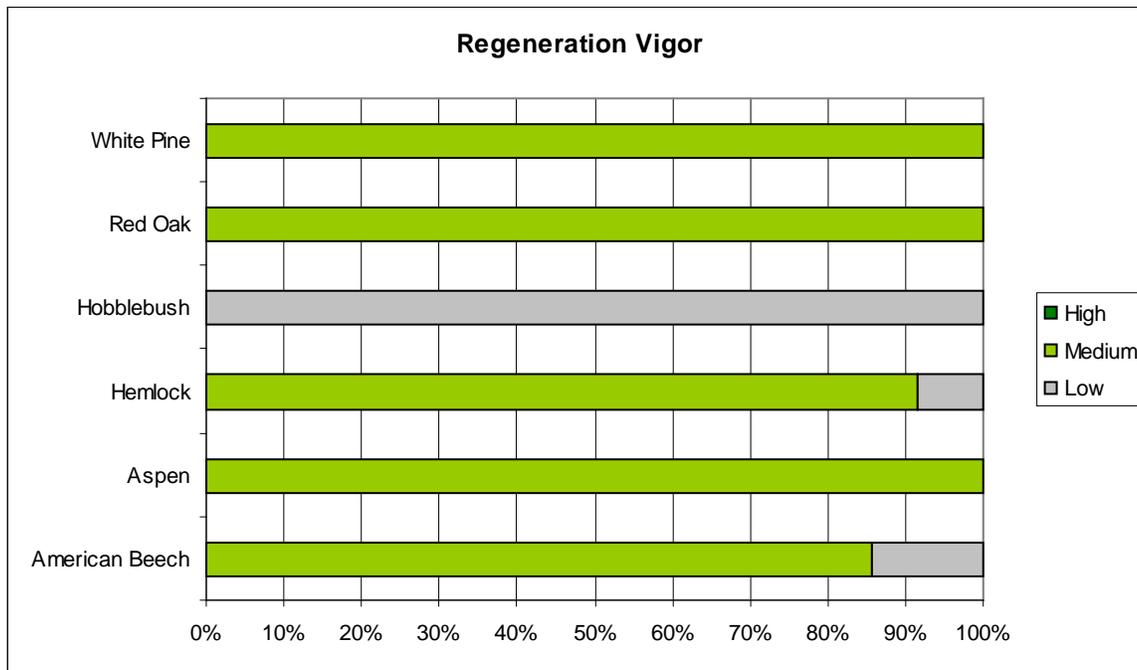
Graph 10.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



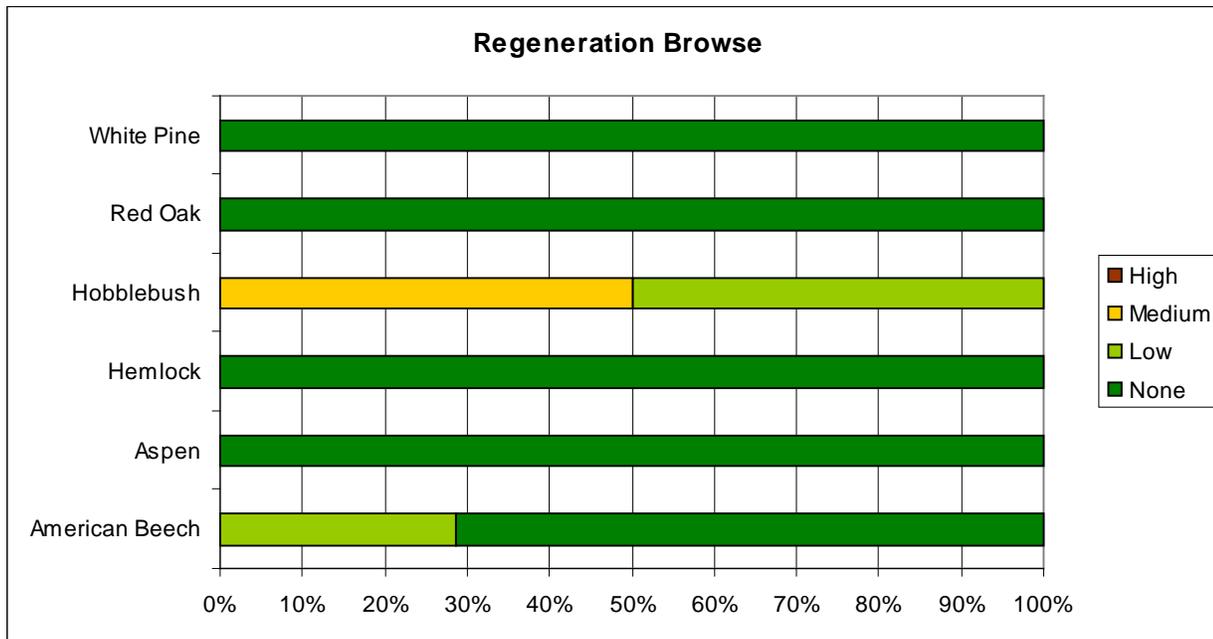
Graph 10.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (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 10.4: Vigor of all regeneration and shrub species.



Graph 10.5: Browse level of all regeneration and shrub species.



Silvicultural Objectives

Management system: Multiple-age (Reservoir Buffer)

Harvest Entry:	20 years
Products:	Hardwood and softwood logs and pulp
Desired Composition:	Maintain forest cover (65-70% at least) for Buffer, Maintain softwood component for wildlife
Crop tree target diameter:	No target diameters, manage for longevity

Operational Considerations

Operability:	Marginally operable
Seasonal limitations:	Winter only with frozen ground and snow cover
Terrain:	Steep slopes
Access and landing area:	Truck access to eastern half of tract on reservoir access road, no landings currently exist. Interior access to western half requires avoiding wetland complex associated with Whitewater Brook and reservoir, must go north around reservoir
Access distance:	Up to 1 mile
General maintenance:	No landing, truck access good
Brook-wetland crossings/buffer requirements:	Avoid wetland complex associated with Whitewater Brook, need to cross the brook in at least 1 place,

STAND SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 9 is a buffer zone around the Whitewater Reservoir intended to protect water quality. It is dominated by large hemlock with some white pine and scattered hardwoods. It also serves as a wildlife corridor around the Reservoir.

Riparian and Stream Ecosystems⁸:

- 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. The Whitewater Reservoir shall have a no-cut zone of 50 feet, increasing where needed within the buffer as terrain dictates—including no-cut zones where slope is greater than 8% and where the soils are wet. Elsewhere within the buffer light single tree selection shall be allowed. No roads or landings shall be created within the buffer. Existing roads to access the reservoir shall be maintained according the New Hampshire BMP's.
- Establish riparian management zones along streams, rivers, ponds, and lakes. 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

⁸ 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

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 should conform to Best Management Practices

**WHITEWATER RESERVOIR
TOTAL FOREST TIMBER AND PULP VOLUME
December, 2007
449 Forested Acres**

Species	Veneer (bf)	Sawlog (bf)	Tielog (bf)	Total BF	Pulp (cfs)	Growing Stock (cfs)	Cull (cfs)	Total Volume in Cords	Percent Cords
<i>Hardwood</i>									
American Beech	0	8,007	2,791	10,797	425	0	24	444	2.5%
Aspen	0	0	0	0	138	0	0	138	0.8%
Bitternut Hickory	0	0	0	0	19	0	0	19	0.1%
Black Birch	0	0	0	0	10	0	0	10	0.1%
Black Cherry	0	7,258	10,749	18,007	37	0	0	71	0.4%
Red Maple	0	91,915	50,109	142,024	1,581	80	35	1,951	11.1%
Red Oak	0	412,144	145,126	557,270	1,085	288	27	2,413	13.8%
Serviceberry	0	0	0	0	0	0	0		
Striped Maple	0	0	0	0	0	0	0	10	0.1%
Sugar Maple	0	29,038	47,137	76,175	311	77	17	541	3.1%
White Ash	0	30,403	19,359	49,762	361	32	0	486	2.8%
White Birch	4,012	31,090	15,052	50,154	493	88	6	682	3.9%
Yellow Birch	0	2,360	0	2,360	130	19	7	160	0.9%
Total Hardwood:	4,012	612,215	290,323	906,549	4,590	584	116	1,879	
<i>Softwood</i>									
Balsam Fir	0	0	0	0	6	0	0	6	0.0%
Hemlock	0	632,016	0	632,016	3,485	217	124	4,904	28.0%
Red Pine	0	174,712	0	174,712	482	0	0	836	4.8%
Red Spruce	0	128,137	4,405	132,542	52	0	0	355	2.0%
Scotch Pine	0	0	0	0	6	0	0	6	0.0%
White Pine	0	925,422	352,234	1,277,656	2,031	18	420	4,482	25.6%
White spruce	0	0	0	0	15	14	0	29	0.2%
Total Softwood:	0	1,860,287	356,639	2,216,926	6,077	249	544	10,618	
Total Volume:	4,012	2,472,502	646,962	3,123,475	10,667	833	660	12,497	

WHITEWATER RESERVOIR FOREST

10-YEAR TREATMENT SCHEDULE

The dates given in this treatment schedule are meant to help prioritize work on the entire Claremont 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 #	Type	Acres	Treatment	Priority	Year
4	RP3-4A	11.8	Thin	Medium-High	2010
3b	SH3-4A	103.1	Single tree and group selection, crop tree release	High	2011
5	HS3-4A	30.0	Single tree and group selection, crop tree release	Low	2011
6	H2A	13.8	Patch cuts	Medium	2011
8	WP3-4A	12.1	Thin	High	2011
2	SH3-4A	41.5	Single tree and group selection, crop tree release	Medium	2014
1	SH3-4A	83.4	Single tree and group selection, crop tree release	Medium	2015
3a	SH3-4A	72.6	Single tree and group selection, crop tree release	High	2015
7b	H3-4A	51.0	Single tree and group selection, crop tree release	Medium	2015
9	SH4A	18.9	Reservoir Buffer	--	--
all			Paint boundary lines		ASAP
all			Reevaluate and update management plan		2017

APPENDIX A: NATURAL COMMUNITY MAP

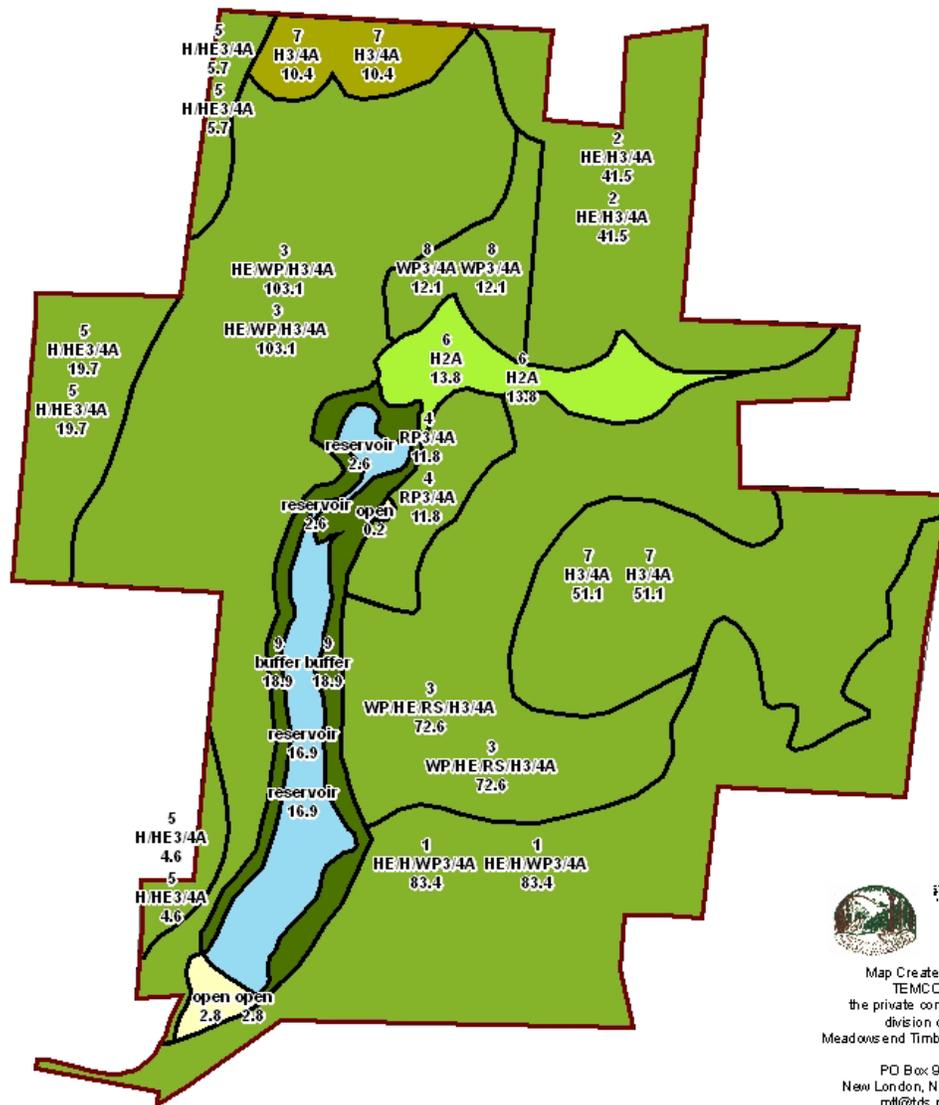
WHITWATER RESERVOIR FOREST

Natural Community Map



Map Notes:
 This is not a survey, nor is it intended for use as a survey. Map boundary data taken from City of Claremont dataset and GPS location of corner and boundary monumentation. The Natural Community delineation is based information from "Natural Communities of New Hampshire", by Daniel E. Sperduto and William F. Nichols, 2004.

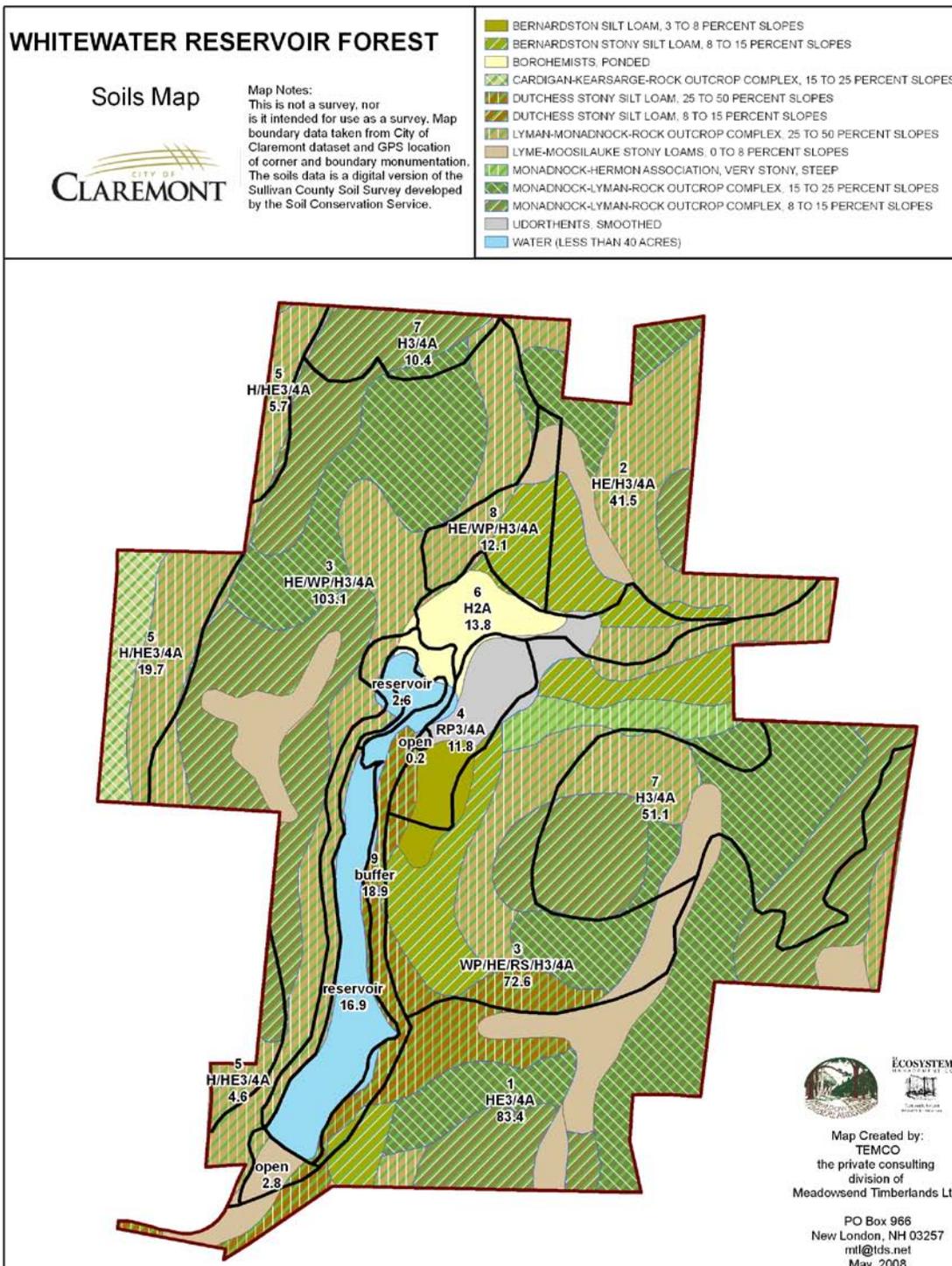
- Hemlock-beech-oak-pine
- Hemlock-white pine
- Open
- Red maple floodplain forest, medium /high variant
- Red oak-pine rocky ridge
- Reservoir



Map Created by:
 TEMCO
 the private consulting
 division of
 Meadowsend Timberlands Ltd.

PO Box 966
 New London, NH 03257
 mt@tds.net
 May, 2008

APPENDIX B: SOILS MAP



APPENDIX C: NEW HAMPSHIRE IMPORTANT FOREST SOIL CLASSIFICATION

Productivity of New Hampshire Forest Soils*

1A: Deeper, loamy soils, moderately to well-drained; prime northern hardwood sites.

1B: Sandy or loamy soils, moderately to well-drained; oak and beech depending on sites.

1C: Outwash sands and gravels; white pine sites.

2A: 1A and 1B soils with limitations, for example, very steep, shallow, or rocky; northern hardwood sites.

2B: Poorly drained soils; spruce/fir sites in northern New Hampshire.

Not considered because they generally rank low in timber productivity, despite often being very high in wildlife ecological value: Muck and peat, rock outcrop, gravel pits, marsh, etc.

**New Hampshire Forest Land Base Study,*