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MOODY PARK
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

Moody Park is managed by Claremont's Department of Parks and Recreation. It was donated to the City on 1916 by William H. Moody as a "public park and recreation ground, to be [enjoyed] for free by the people of Claremont." It is 120[1] acres and includes tennis courts and a playground area near the entrance. Picnic tables are scattered about under the shelter of towering pines and a paved road leads to open area at the height of land.

The forest is a mix of hemlock, white, pine and hardwoods. Gully Brook runs between Maple Avenue and the park, delineating the northern boundary. This brook has several small tributaries, all formed in steep ravines with dense hemlock forest. The terrain immediately levels out at the top of the ravines where the forest changes to landscaped, towering white pine that runs up the middle of the park along the paved road. The forest on either side of the road is a mix of white pine, hemlock and hardwood. Recreational trails provide opportunity for non-motorized recreation including hiking and mountain biking in the summer months and cross country skiing and snowshoeing in the winter. Moody Park is adjacent to other city owned land to the west, the Industrial Road tracts. The recreational trails extend beyond Moody Park to these other holdings, greatly enhancing the recreational opportunities.

1 Mapped acres, 4/2008

Moody Park provides a variety of recreational opportunities to the people of Claremont from Mountain biking on a well-maintained trail system to picnicking under towering pines (left photo). A stone shelter (right photo) is available for use at the height of land, surrounded by grassy open land and fire pits.

Prevalent in the forest is a prolific population of invasive exotic shrubs. Invasive exotic shrubs pose a significant problem to the health and functioning of natural ecosystems. These woody plants, most of which were introduced over 100 years ago as landscaping plants, are able to outcompete native vegetation and can take over the forest understory. The plants are typically aggressive, hardy, and prolific, all characteristics that make them excellent candidates for landscaping. Some were even introduced for improving wildlife habitat as they produce copious amounts of berries. These berries are spread throughout the forest in the scat of the birds and mammals that eat them. The berries remain in the soil (some remain viable for many years) and will germinate under the right conditions. The worst offenders include exotic honeysuckles (*Lonicera* sp.), barberry (*Berberis thunbergii*), and common and glossy buckthorn (*Rhamnus cathartica* and *Rhamnus frangula*). Eradicating existing populations of invasive exotic shrubs is nearly impossible. Controlling their spread and reducing their numbers to the point that native vegetation has a chance is possible, but not without significant effort, time, and money.


Exotic honeysuckle (left photo) is prevalent in Moody Park, taking over the understory of the forest and outcompeting native trees, shrubs, and herbaceous plants. Barberry, another problem species, is also present. Individual shrubs such as the one in the right photograph can spread to form dense thickets when given enough sunlight.

Invasive exotic shrubs pose specific problems for forest managers. Forest management typically involves making openings in the forest thought thinnings or regeneration cuts, creating the same conditions invasive exotics thrive in. Current techniques to control invasive exotics are evolving to be more direct and efficient. The healthy functioning of Moody Park as a forest ecosystem is dependent on addressing this significant problem.

Woodlot History

At the time this land was donated to Claremont, in 1916, it was some of the best agriculture land William H. Moody owned. At than point in time, there was a clear view of Mt. Ascutney from the height of land. Since then, it has become reforested and has seen little active management. It was surveyed in 1917 by E.S. Atchinson and E.C. Peck. A general plan was created for the park by Arthur A. Shurtleff, a landscape architect from Boston, Massachusetts, suggesting locations for potential views, road extensions, and shelter sites. Prior to being donated to the city, the land was primarily used for agriculture.

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 Moody Park

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 non-motorized sustainable *recreation* opportunities such as 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

Wildlife:

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

Water Quality:

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

4 GEOLOGIC ATTRIBUTES

Topography and Aspect

Moody Park ranges from 520 to about 760 feet in elevation. Except for the steep ravines and gullies associated with Gully Brook, the terrain is gentle, with a northwest facing aspect.

Brooks, Ponds, and Wetlands

Aside from Gully Brook that runs along the northern boundary of the park and the small tributaries draining into, Moody Park contains no other significant water features. Small seepy areas exist throughout the forest though, providing important habitat for many amphibians and drinking sites for many birds and small mammals.

Recommended actions to improve and manage the wetland and water resource of Moody Park[2]:

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.
- 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.

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

- 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.
- 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 a mixture of moderately well drained silt loam, stony silt loam, and loamy sand soils. The exception is a small amount of Stissing stony silt loam along the eastern boundary that is poorly drained. Windsor loamy sand occupies the steep ravine along the brook. The remainder of the forest is made up of Bernardston silt loam and stony silt loam, Cardigan-Kearsarge rock outcrop complex, and Pittstown silt loam and stony silt loam. See Appendix B for a map of the soil types and descriptions.

Recommended actions to improve and manage the soil resource of Moody Park[3]:

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 COMMUNITIES[4]

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

"Just as individual organisms can be classified into species, plant assemblages can be

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

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

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

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

Determining natural community types can be a challenge because it is uncommon to find land that has not been influenced by human intervention. Past agricultural and silvicultural practices often change the plant communities that you would find on any given acre naturally. Identifying natural communities then becomes a process of understanding the past management activities, the physical conditions of the site, and the plant communities currently found there and determining to the best of our ability what community would occupy that site without human intervention. 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 found in Moody Park is Hemlock-beech-oak-pine. This is a common, broadly defined community occupying glacial till and terrace soils of low to mid elevations in central and southern New Hampshire. In Moody Park, this community grades into Hemlock-white pine forest on the slopes of the ravines associated with Gully Brook. This is also a fairly common community type, and has been known to host 200 year old+ hemlock and white pine, an atypical species association due to its longevity. In other words, forest types typically change more frequently. It has a sparse understory and is commonly found along steep river banks. See Appendix A for a map of the natural community types found in Moody Park.

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 Moody Park demands *adaptive management*. All attempts will be made on the management level to identify unique areas, learn what makes them

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

unique, how to best manage them and most importantly, refine the management of these areas as the knowledge base grows.

6 WILDLIFE HABITAT CONDITIONS

Moody Park provides a variety of habitats for wildlife, but due to it's proximity to urban land, the wildlife expected to be found there is limited to birds, small mammals and amphibians. White tail deer and coyotes are likely the largest mammal to frequent Moody Park. Though not impossible, it's not likely larger mammals such as moose and black bear would pass through. The park is bordered by undeveloped forestland to the west and open pasture to the south. The forestland on Moody Park is fairly dense, providing decent shelter. Red oak, which is 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. The adjacent open agricultural land to the north provide grassy, open habitat utilized characteristically by small rodents, which in turn attract predator species such as red fox, coyote, hawks and owls. Turkeys are also abundant on the property. There is limited wetland habitat. What exists is primarily forested seepy areas, which nonetheless provide important habitat. Wetlands such as these provide an important source of food in early spring as they tend to be of the first places to "green up".

The forestland in Moody Park is fairly dense, offering little in the form of browse, an integral food source for many herbivorous mammals and some birds, including primarily white tailed deer, grouse, and hare. In the absence of significant disturbance, as the forests found here mature less food in the form of browse will be available. Forest management objectives will integrate actions that improve wildlife habitat found here, including attempt to mimic natural disturbances that will help to create and maintain young tree and shrub growth for browse opportunity and release of individual trees possessing important habitat features such as hard mast from oaks, cavity and snag trees and trees with biological legacy value.

Invasive exotic shrubs pose a significant problem for managing quality wildlife habitat. Not only do they outcompete native vegetation as described earlier, some of them, buckthorn particularly, produce fruit that actually act as a type of laxative (hence the Latin name for buckthorn: *Rhamnus cathartica)* and pass directly though the animal that eats it without providing any nutritional value.

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, two wildlife habitat types are found in Moody Park: Appalachian-Oak-Pine (found on the northern half of the park) and Hemlock-Hardwood-Pine (found on the southern half of the park). A summary of these habitat types and the

wildlife species found there is in Appendix B of the Master Plan.

Recommended actions to improve and manage the wildlife habitat of Moody Park[5]:

Snags, cavity trees, and down logs:

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

Habitat Connectivity:

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

Deer Wintering Areas:

- Identify dense stands of mature softwood as potential DWAs, particularly in riparian ecosystems.
- Whenever possible, schedule harvests in DWAs are during December through April.
- Protect advance conifer regeneration during timber-harvesting operations.
- When conducting harvests in coniferous forest adjacent to watercourses, maintain an unbroken conifer canopy along shorelines to protect riparian travel corridors.
- When planning harvests within any DWA, (strive to) maintain a closed-canopy coniferous overstory over at least 50 percent of the area at any given time. Avoid constructing major haul roads within DWAs.

Vernal Pools:

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

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

drainage patterns within the pool watershed.
- Whenever possible, conduct harvests when the ground is frozen or snow covered.

7 RECREATIONAL and EDUCATIONAL OPPORTUNITIES

Recreation

Moody Park is first and foremost an important recreational resource for the people of Claremont. It provides ample opportunity for family outings and non-motorized recreation. It is an especially valued resource given it's location in a highly populated area of Claremont.

The extensive trail network through the forest provides opportunity for non-motorized recreation including walking, hiking, mountain biking, cross county skiing and snowshoeing. The trail system is part of a larger network extending beyond Moody Park to adjacent city-owned lands. The trails on Moody Park in general are fairly well-maintained, but some are better established than others. There are small and desirable foot traffic trails that are not delineated in the cities GIS database that would benefit from proper establishment and regular maintenance. *Best Management Practices* provide trail construction and maintenance guidelines that will help prevent soil erosion. Another excellent resource for trail maintenance is a book produced for the Student Conservation Association called *Lightly on the Land*, *The SCA Trail-Building and Maintenance Manual* by Robert C. Birkby. 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.

In addition, Moody Park provides lovely picnic opportunities both under the shelter of the towering pines at the north end of the park and in the open area at the height of land. The city may consider building more shelters for picnickers in this area, especially along the access road, and incorporate connector trails to the trail system.

Recommended Actions to Improve and Manage the Recreational Resource of Moody Park:

- **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 a 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 non-motorized use. Prohibit ATV and**

snowmobile use.
  - Post a map of the trails and allowed uses.
- **Locate and maintain trails to prevent erosion**[6]
- **Locate trails** so they avoid sensitive areas or valuable wildlife habitat such as vernal pools and deer wintering areas.
- **Create additional picnic tables and shelters along access road**
- **Link picnic shelters to trail system**
- **Create additional trails** linked to adjacent Industrial Area Lot
- **Open up view of Mt. Ascutney for vista opportunity**

Education

Educational opportunities are ample in Moody Park. Its close proximity to local school systems would make it an ideal destination for outdoor classroom activities. Forest management operations, including improving the recreational resource, will also 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 Moody Park Forest:

- **Encourage local schools/clubs/etc. to utilize this valuable resource**
- Prior to any forest management activities, **promote and present workshops** inviting the public to come learn about management activities in Moody Park
- **Create educational kiosk and signage** about Moody Park and management philosophy and activities

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)

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

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

Forest Inventory

An inventory was conducted in December, 2007 consisting of 39 sample points. Data was collected as outlined in the Claremont Master Plan.

Age and Age Class Distribution

As with most forests in New England, Moody Park is largely even-aged, with the bulk of the trees getting their start after the abandonment of agriculture here early last century. That said, different species and individuals within the same species grow faster and mature at different rates than others. White pine, a fast growing tree can get to quite a large size, compared to a hemlock of the same age. White birch, another fast growing tree, doesn't get as large as white pine and in addition, matures at an earlier age. So, variability exists within an evenaged forest, providing opportunity to manage for multiple age classes and diversify the forest structure, providing better wildlife habitat, continuous forest cover, and relatively less intensive silvicultural management. In general, Moody Forest is dominated by 60-70 year old white pine, hemlock and red oak in the overstory. Younger trees, often clusters of pole-sized hardwood species, can be found in pockets where past harvesting or natural disturbances, such as blow down, created openings.

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 Moody Park Forest falls at the low extent of this range.

Tree Quality and Tree Health

Overall tree quality on the Moody Park Forest is generally fair. A large percentage of the stocking includes maturing and over mature white pine. The quality of the pine varies, from some little to no value "wolf pine" that are crooked, multi-stemmed, and branchy to some fairly decent quality, straight stemmed individuals. Given the age and average diameter of the pine, red rot (a common decay fungus in white pine, typically affecting the main stem) is likely widespread. A full 1/3 of the pine sawtimber volume falls in Stand 1, the open picnic area. This volume may or may not be saleable due to where it is located. Many mills rightly so are wary of purchasing logs that potentially could have nails or other metal objects in them. Red oak, second only to pine in volume, is of fair quality, similar to the pine ranging from little to no value to decent quality. Hemlock, ranking a distant third of the dominant speces, is of average quality. The remainder of the volume is a mix of species, with some maturing but fair quality white birch and average quality red maple, sugar maple and white ash.

The most pressing health concern involves the red rot 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. These diseases and insect damage alone do not signal the need for treatment, but should one occur high priority should be given to improving stand quality and health by removing trees with signs of the above mentioned diseases and damage.

Forest Management Approach

Management on the Moody Park forest will closely integrate other objectives including recreation and education, and 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, 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 Moody Park 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 Moody Park forest mainly occupies the steep banks leading down to Gully Brook and will be 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		

White Pine Silviculture

White pine, is found throughout Moody Park 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. 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 ten 10%. Therefore, heat and space is critical. Once the seed germinates rapid and vigorous taproot development occurs. This root growth contributes to another challenge of oak management, where it causes very slow initial shoot development and competition for light from other species is very common. Thus, achieving lasting regeneration success of oak, weeding of interfering species is often a requirement. The success of regenerating oak is highly dependent on the combination of the availability of viable seed, soil scarification, adequate light levels, implementation of weeding applications and seed distribution by wildlife.

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

Access

Road access to the Moody Park Forest is very good, with a central road leading to the height of land, and a side road leading into the Industrial Lands to the West. 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.

Operability

The terrain and ground conditions on this tract in general do not limit operability with the exception of the steep banks leading down to Gully Brook. These steep slopes will only receive light management where operability is possible. Timber management in this area is not of highest priority and will not override wildlife, recreation, or soil and water protection objectives. Winter harvesting on frozen ground with good snow cover will provide the best protection for the soils found in Moody Park. But, given the unreliability of winter conditions, operations may occur during the summer in dry periods as long as wet areas are avoided or tracked with equipment that minimizes impacts 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.

Boundary Delineation

The Moody Park forest boundary is in variable condition and includes approximately 1.5 miles of maintainable boundary line (of this 1.5 miles, .5 are shared with other Claremont owned forestland-the Industrial Lots). 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 all boundary corners be monumented with City of Claremont signs.

FOREST DATA

Stand 1 White Pine 4-5A 23.1 acres


Stand Structure


Stand Structure


Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine
Past Management History:	Picnic area
Approximate Age of Dominant Trees:	60-70 years old
Stand Health:	Fair
Insects/Damage/Disease:	Some structural problems in the pine, presence of common diseases including red rot

SITE CONDITIONS

Site class:	1B
Determined by:	Soils and field observation
Tree vigor:	Medium to poor
Soils:	Windsor loamy sand, Bernardston stony silt loam, Bernardston silt loam
Parent material:	Glacial till
Drainage:	Well drained
Terrain:	Level to Gentle Slope
Aspect:	Northwest
Elevation:	540-720’

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"			20.4	20.4
12-18"				
>18"				
Grand Total			**20.4**	**20.4**

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"	7.3			7.3
12-18"				
>18"				
Grand Total	**7.3**			**7.3**

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

WILDLIFE HABITAT

Forest type:	Pine
Vertical diversity:	Low
Vegetative diversity:	Low
Hard mast:	Pine
Soft mast:	None
Special habitat features:	
Snag trees:	Few large
Down logs:	Few large
Special wildlife practices:	Consider leaving a few limbed, sound stems approximately 20-25 feet tall for songbird and small mammal habitat. These snags could be incorporated into an educational signage system expounding on the benefits of incorporating natural systems into our highly manicured environments such as this picnic area.

RECREATION

Recreational features:	Picnic area, walking trails
Recreational infrastructure:	Picnic tables
Aesthetic resources:	Towering pines
Public access:	No motorized traffic allowed on trails, cars allowed to height of land during summer operation

SILVICULTURE

Structural and Silvicultural Attributes

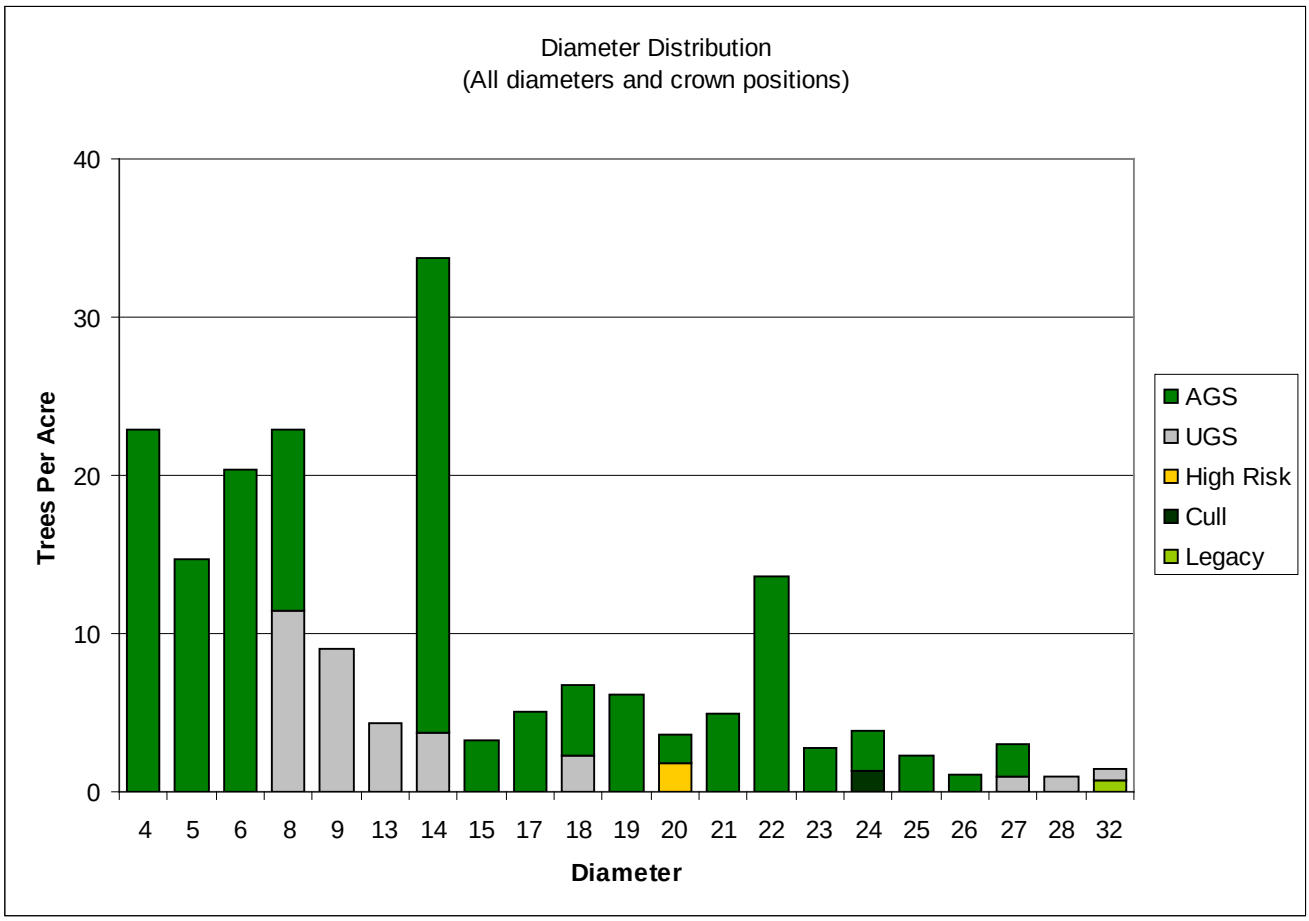
Broad Forest Type:	S4-5A
Size Class:	Large sawtimber
Stand Structure:	Evenage
Crown Closure:	90%
Total Basal Area Per Acre:	208
Total Merchantable Basal Area Per Acre:	206
Total Acceptable Basal Area Per Acre:	164
Trees Per Acre:	187
Quadratic Mean Stand Diameter:	14.3
Percent AGS Sawtimber:	93.5%
Basal Area of AGS Sawlogs:	152
Timber Quality:	Poor

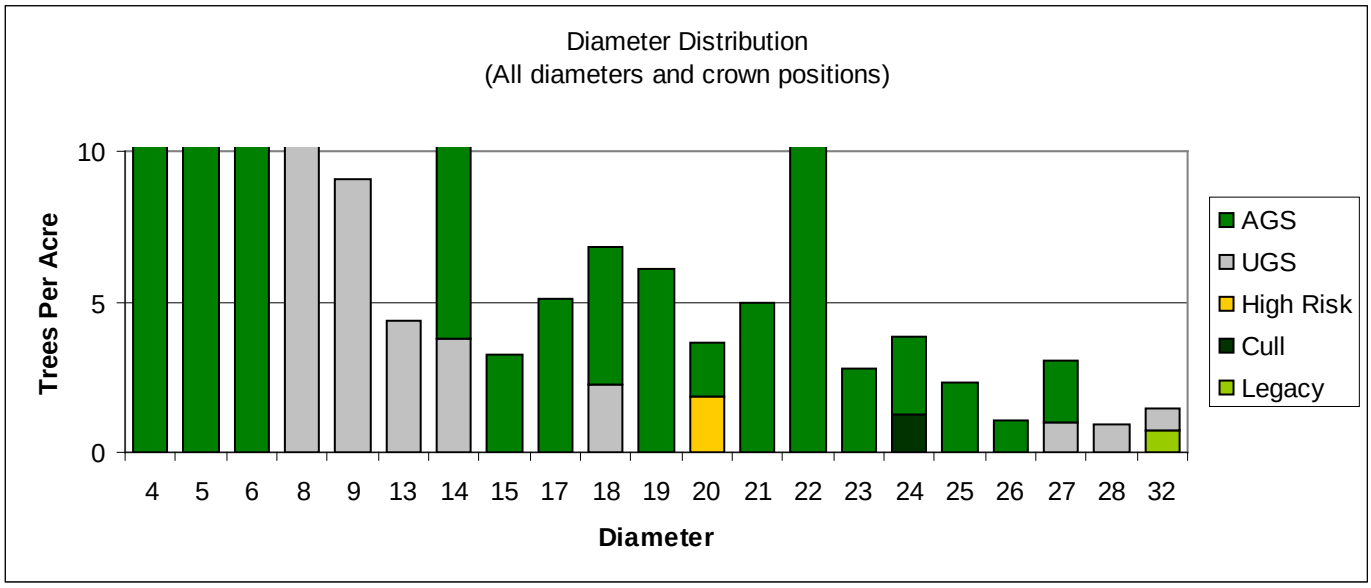
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
Black Birch	13.7%	0	0	0	0.0	0.5	0.5	0	0	0%
Red Maple	20.8%	0	485	259	3.4	0.0	5.4	0	602	81%
Red Oak	13.8%	163	4,104	964	5.6	0.0	16.7	0	5,093	97%
Sugar Maple	14.0%	0	995	668	3.4	0.0	6.3	0	1,663	100%
White Birch	2.5%	0	326	0	0.5	0.0	1.1	0	326	100%
Total Hardwood Per Acre:	*64.8%*	*163*	*5,910*	*1,891*	*12.9*	*0.5*	*30.0*	*0*	*7,683*	96%
Hemlock	5.0%	0	509	0	1.1	0.0	2.0	0	509	100%
White Pine	30.2%	0	9,418	4,802	14.6	0.0	40.8	594	13,036	100%
Total Softwood Per Acre:	*35.2%*	*0*	*9,928*	*4,802*	*15.7*	*0.0*	*42.8*	*594*	*13,546*	100%
Total Volume Per Acre:	100.0%	163	15,837	6,693	29	1	73	594	21,229	94%
Stand Volume:		3,767	365,845	154,610	662	12	1,683	13,729	490,395	

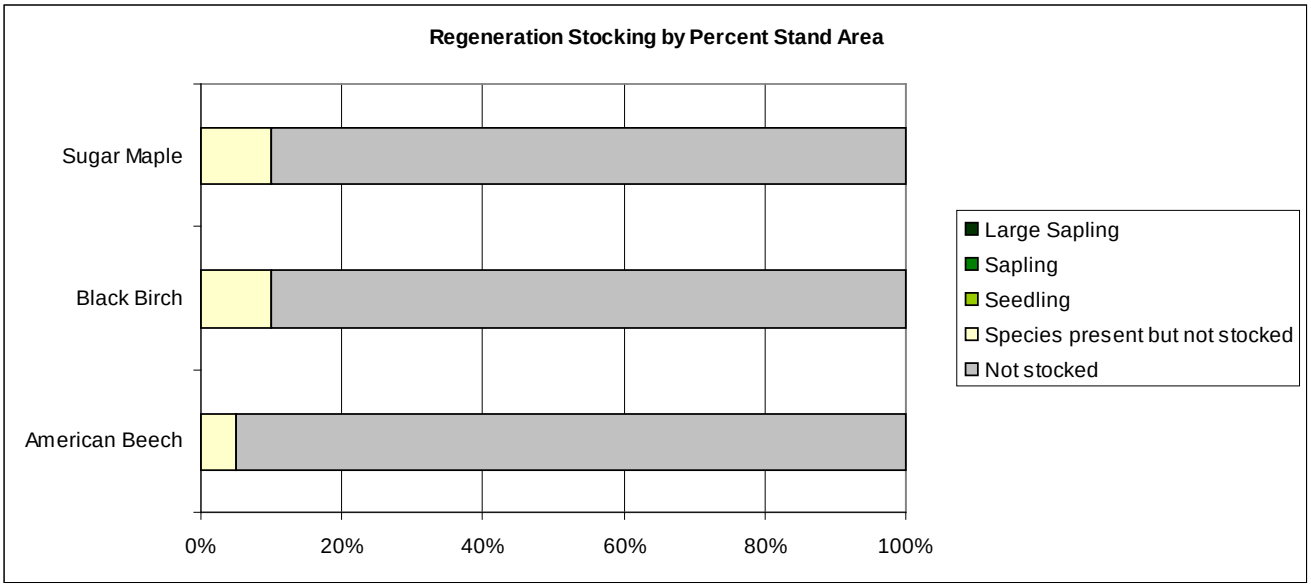
Table 1.3: Stand volume by species and product per acre values.

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.

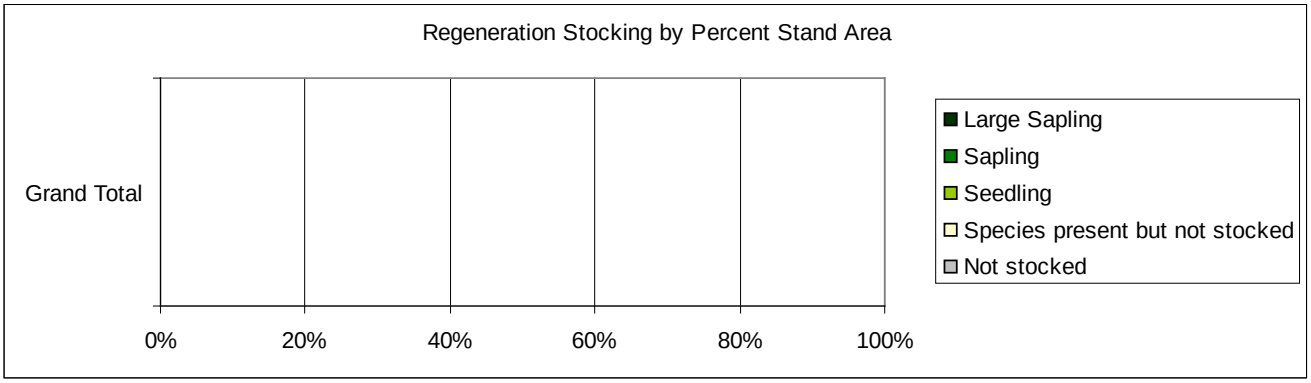




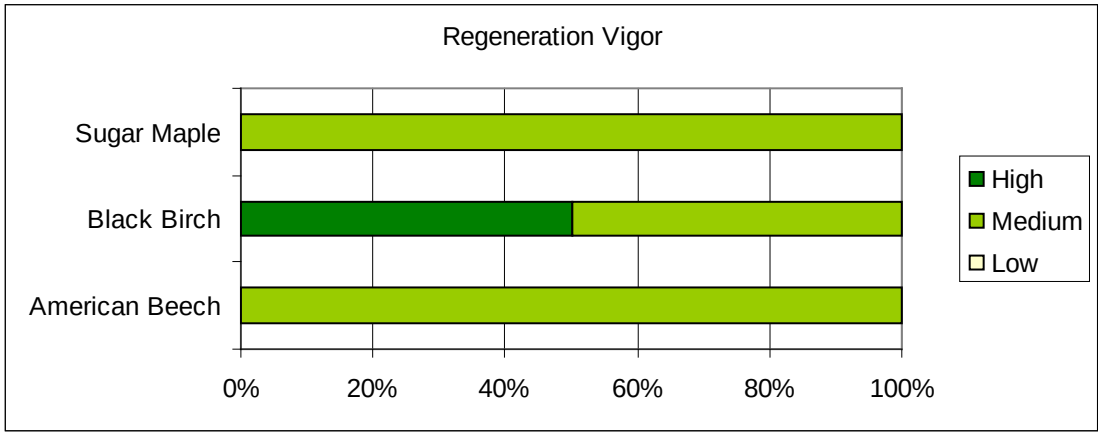
Graph 1.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less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



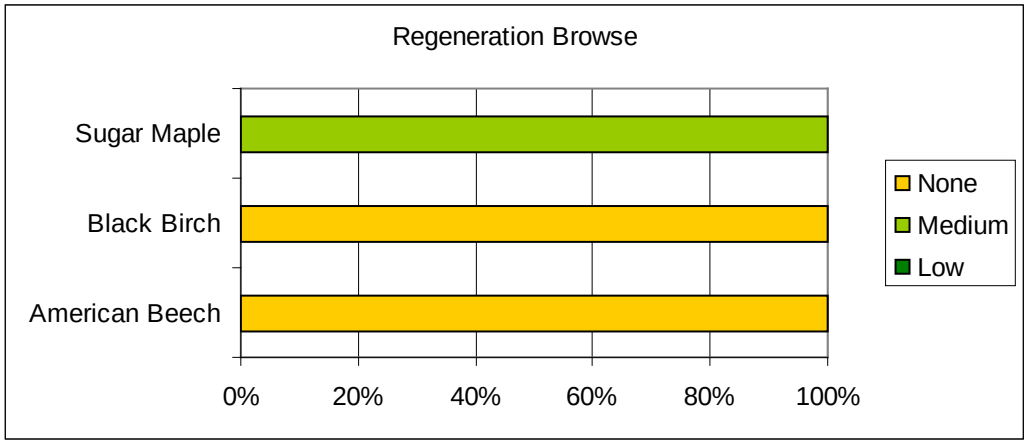
Graph 1.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered “stocked” if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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:	Even-aged
Harvest Entry:	As needed
Products:	Possibly pine sawlogs and pulp
Desired Composition:	Maintain pine
Crop tree target diameter:	White pine +24”

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Level to gentle slope
Access and landing area:	Good access, landing in old ball field to west of stand
Access distance:	Short
General maintenance:	None required
Brook-wetland crossings:	None required

STAND 1 SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 1 is the white pine picnic area. The primary objective for this stand is to maintain the recreational and aesthetic components. In general there are many pines that should be removed to improve growth on the best health and vigor stems. Approximately 1/3 to 1/4 of the existing trees should be removed, mostly smaller, suppressed intervals but also including any large overstory trees with structural defects.

The long-term goal of management in this stand is to maintain the towering pine component. This will likely require under planting of pine in openings as mature, damaged, or diseased individuals are removed. The City might consider planting other species as well, such as the disease resistant American elm, as a tribute to this great tree that used to line our city streets. A mixed stand will be more resistant to disease and natural disturbance regimes than a monoculture of pine.

Silviculture: The focus of management here is to improve the growing conditions for the healthiest and most vigorous trees, and to plant white pine and/or diseases resistant American elm in openings that are made as dominant trees are removed.

Priority: High

2009 (As Needed):

- **Thinning (Cleaning):** Remove trees that are structurally unsound, diseased, damaged or of low vigor. Between 1/3 and ¼ of the current tress should be removed to provide better growing conditions for the dominant residual trees.
- **Plant:** Plant white pine and disease resistant American elm in openings where large dominant trees were removed.

Stand 2 White Pine 4C Hardwood/Hemlock 2-3B 62.7 acres


Stand Structure


Stand Structure


Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-beech-oak-pine
Past Management History:	Old harvest +25 years ago
Approximate Age of Dominant Trees:	60-70 years old
Stand Health:	Fair
Insects/Damage/Disease:	Red rot and white pine blister rust in pine, presence of invasive exotic species: honeysuckle, buckthorn, barberry

SITE CONDITIONS

Site class:	1B
Determined by:	Soils and field observation
Tree vigor:	Medium
Soils:	Windsor loamy sand, Pittstown stony silt loam, Bernardston stony silt loam, Bernardston silt loam, Cardigan-Kearsarge rock outcrop complex, Stissing stony silt loam
Parent material:	Glacial till
Drainage:	Moderately well drained with some wet areas
Terrain:	Gentle slope
Aspect:	Northwest
Elevation:	540'-760'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	2.6	6.9	7.1	16.6
12-18"	5.3	5.0	1.6	11.9
>18"	1.7	0.3	1.6	3.6
Grand Total	**9.6**	**12.2**	**10.3**	**32.1**

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"	13.3	19.3		32.6
12-18"	4.4	4.2	1.0	9.6
>18"			0.4	0.4
Grand Total	**17.7**	**23.6**	**1.4**	**42.6**

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

WILDLIFE HABITAT

Forest type:	Mixed forest
Vertical diversity:	Medium
Vegetative diversity:	Medium
Hard mast:	Oak, pine, hophornbeam
Soft mast:	Some *Rubus* sp.
Special habitat features:	Mixed forest with some large super canopy trees; shrubby forested wetland area
Snag trees:	Good, would benefit from more large snags
Down logs:	Good, would benefit from more large down logs
Special wildlife practices:	Maintain some super canopy trees, perch sites, protect wetland area

RECREATION

Recreational features:	Non-motorized trails
Recreational infrastructure:	Some trail blazing
Aesthetic resources:	Large pine, oak and white birch scattered through stand
Public access:	Open to foot traffic

SILVICULTURE

Structural and Silvicultural Attributes

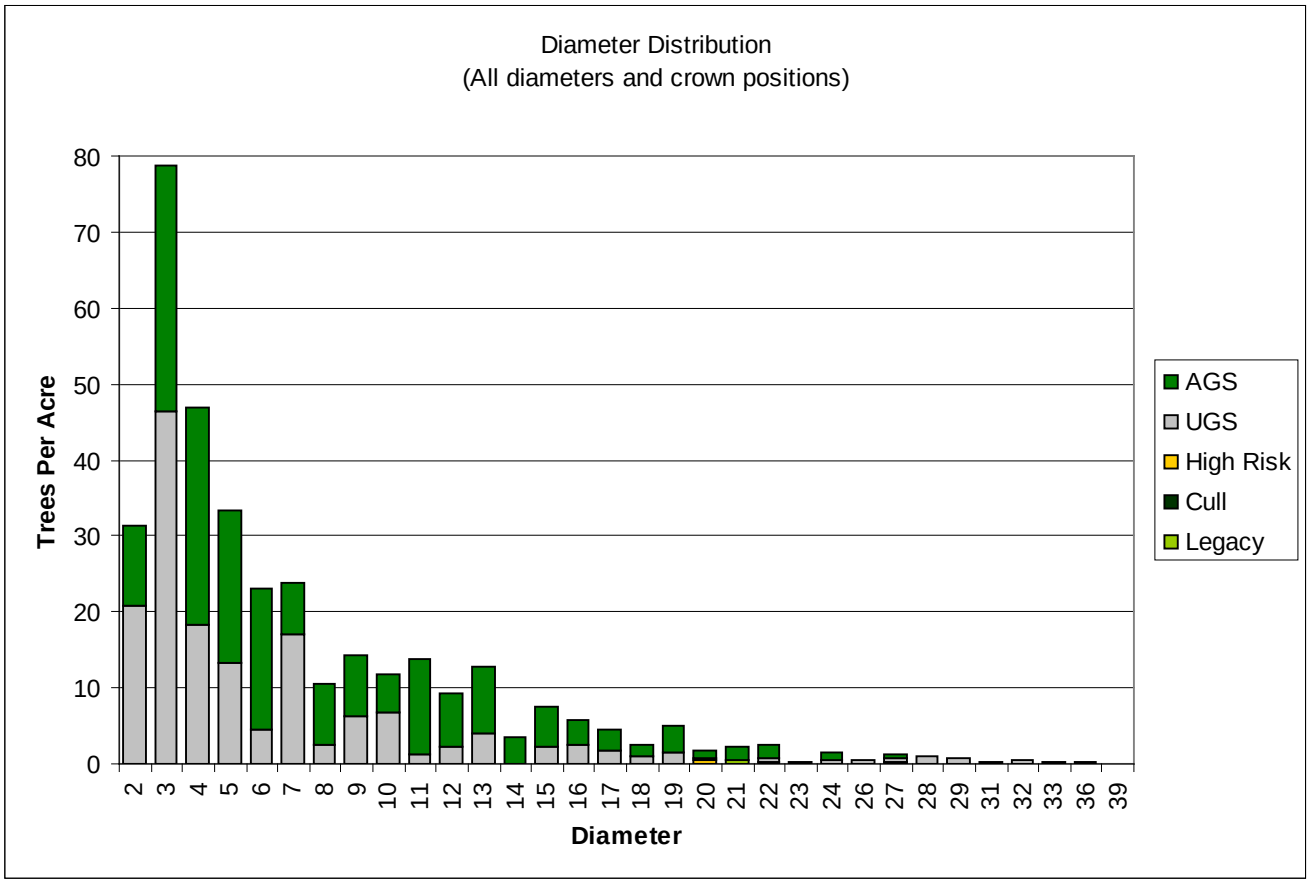
Broad Forest Type:	SH3-4B
Size Class:	Polesize to Large sawtimber
Stand Structure:	Evenage
Crown Closure:	85%
Total Basal Area Per Acre:	155
Total Merchantable Basal Area Per Acre:	146
Total Acceptable Basal Area Per Acre:	89
Trees Per Acre:	351
Quadratic Mean Stand Diameter:	9.0
Percent AGS Sawtimber:	62.7%
Basal Area of AGS Sawlogs:	67
Timber Quality:	Fair

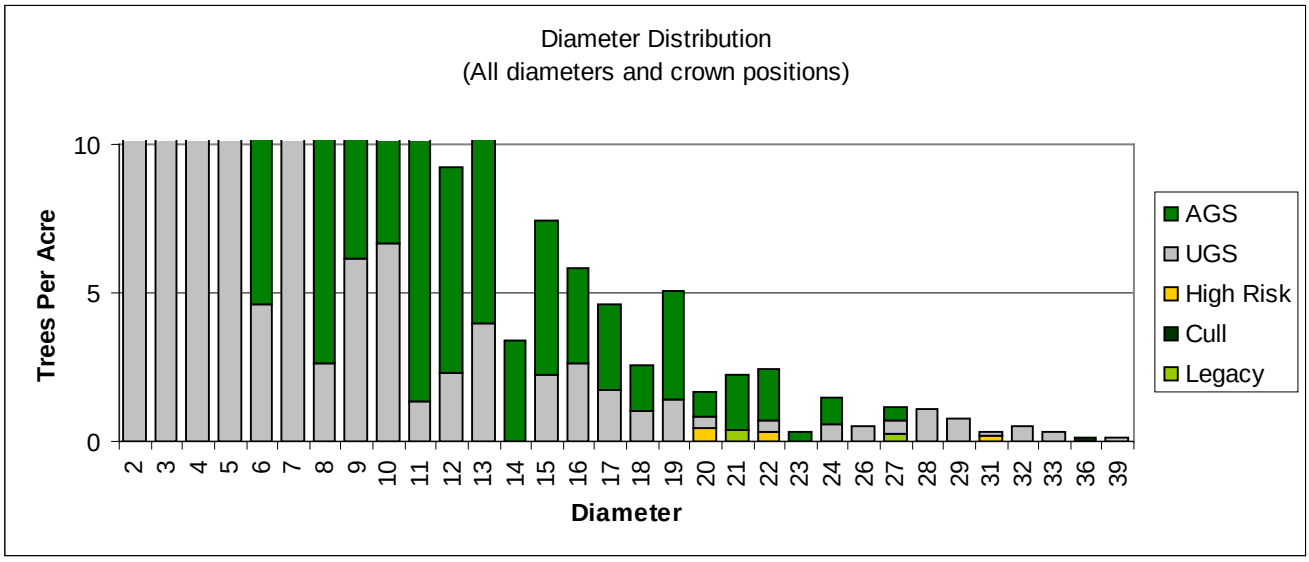
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
Aspen	11.2%	0	329	0	3.6	0.1	4.4	0	286	87%
Hop Hornbeam	0.7%	0	0	0	0.1	0.0	0.1	0	0	0%
Other Hardwood	0.6%	0	0	0	0.0	0.0	0.2	0	0	0%
Red Maple	21.0%	0	460	403	3.3	0.2	5.1	0	764	89%
Red Oak	4.4%	0	977	305	0.9	0.0	3.2	0	1,168	91%
Sugar Maple	10.5%	0	195	135	1.2	0.2	2.1	0	294	89%
White Ash	8.3%	0	1,207	180	2.4	0.0	4.9	0	1,202	87%
White Birch	1.3%	0	0	0	0.4	0.1	0.6	0	0	0%
Yellow Birch	2.9%	0	0	0	0.0	0.1	0.1	0	0	0%
Total Hardwood Per Acre:	*60.8%*	*0*	*3,169*	*1,022*	*12.1*	*0.8*	*20.6*	*0*	*3,713*	89%
Hemlock	17.3%	0	277	0	2.0	0.0	2.5	0	277	100%
White Pine	21.9%	0	4,565	2,754	6.9	0.0	21.6	700	3,397	46%
Total Softwood Per Acre:	*39.2%*	*0*	*4,842*	*2,754*	*8.9*	*0.0*	*24.0*	*700*	*3,674*	63%
Total Volume Per Acre:	100.0%	0	8,011	3,776	21	1	45	700	7,388	63%
Stand Volume:		0	502,288	236,764	1,315	52	2,799	43,866	463,210	

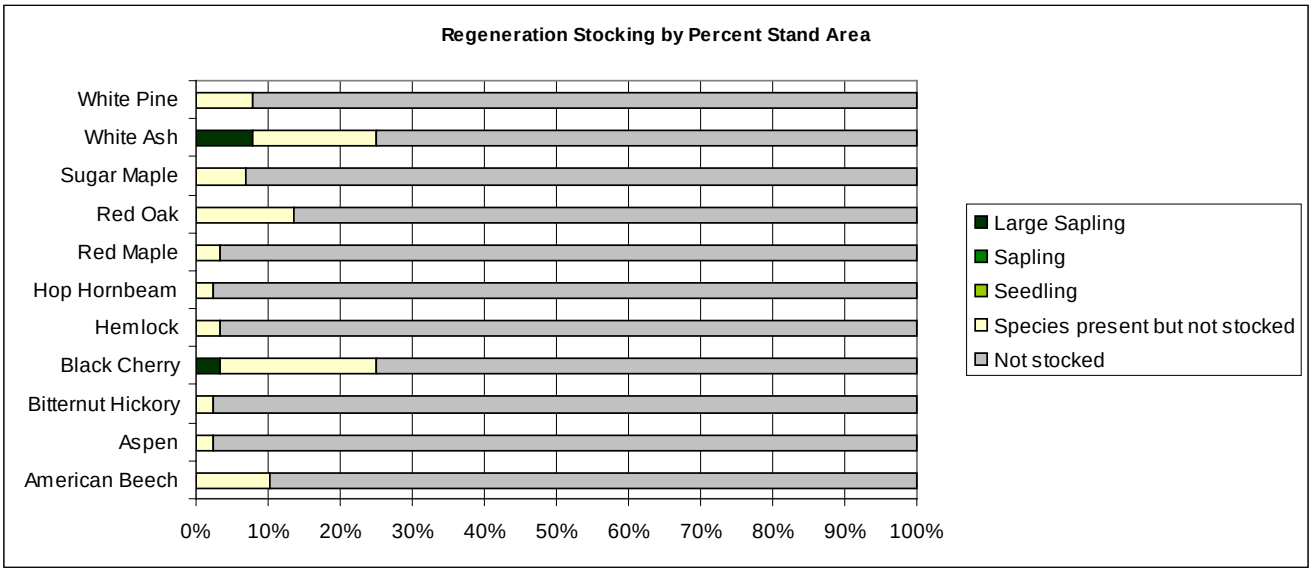
Table 2.3: Stand volume by species and product per acre values.

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.

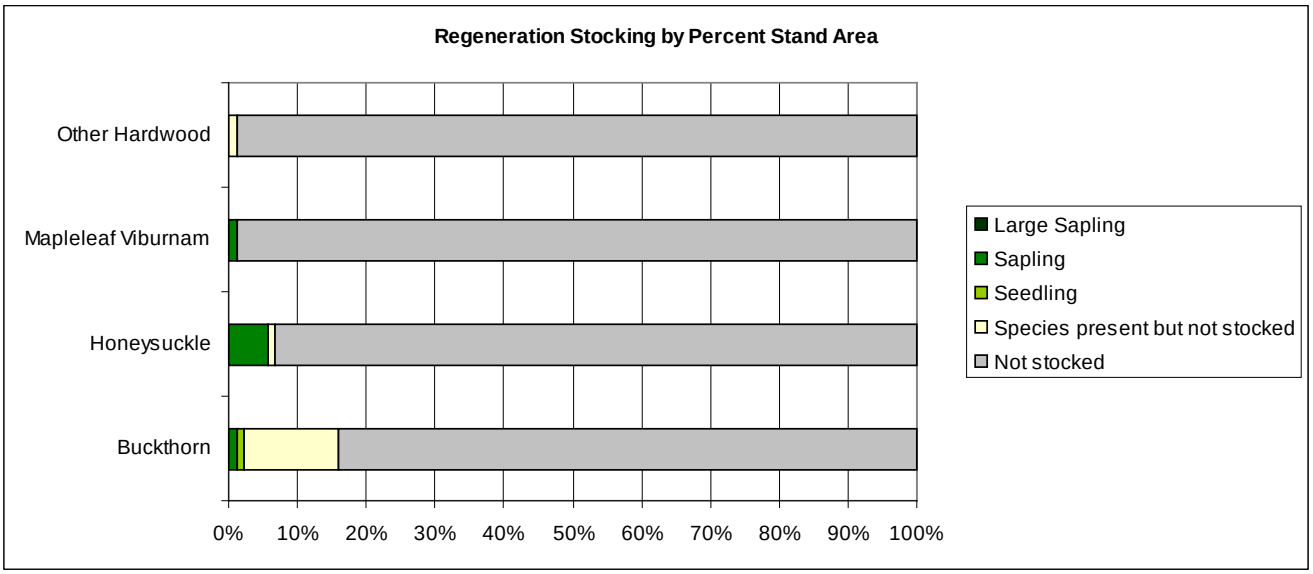




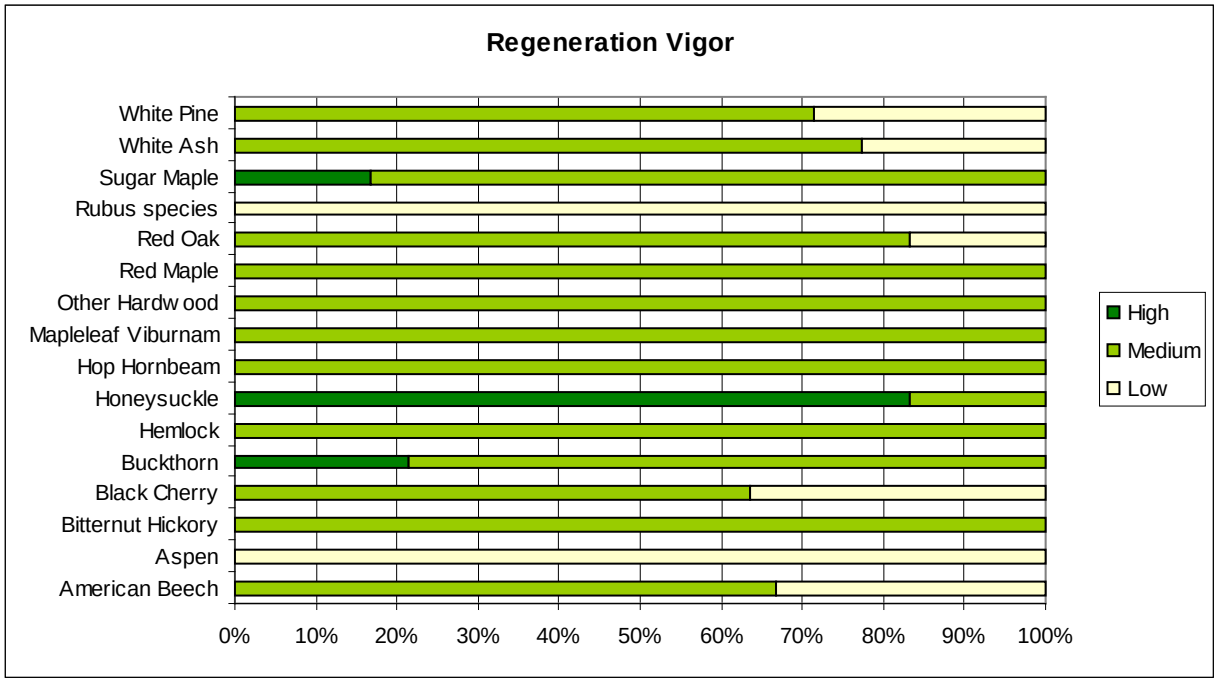
Graph 2.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less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



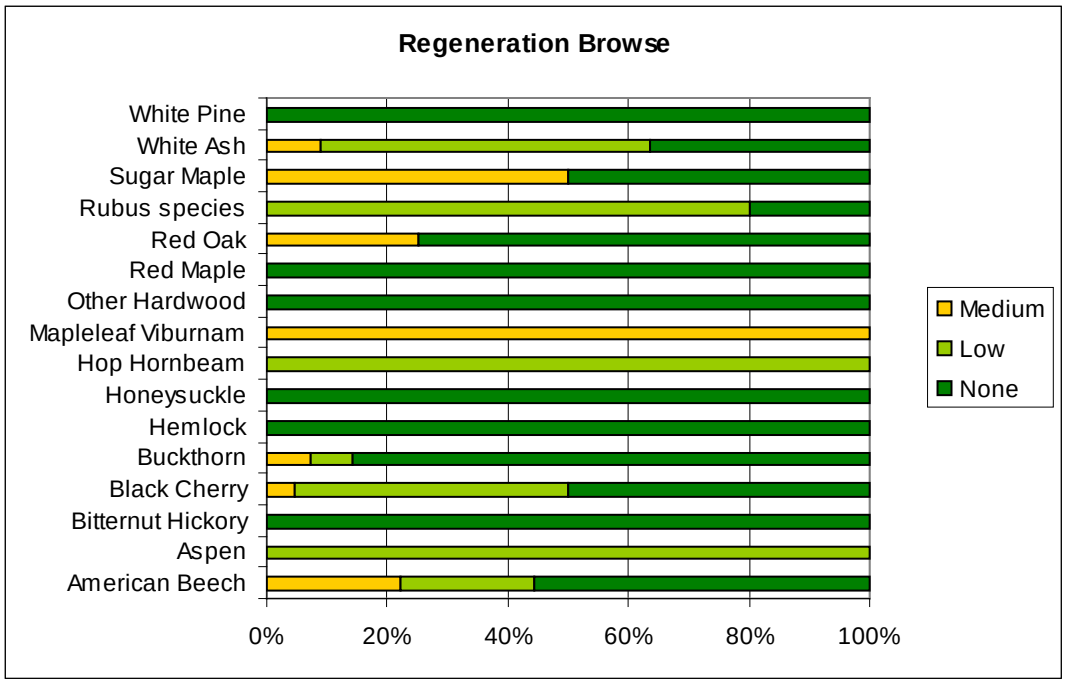
Graph 2.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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:	15-20 years	
Products:	Pine sawlogs and pulp, hardwood sawlogs and pulp/firewood	
Desired Composition:	Manage towards natural community type, favor quality white pine and hardwood	
Crop tree target diameter:	White pine 20-22”	Red oak 20”
	White ash 18-20”	Red maple 18”

Operational Considerations

Operability:	Operable
Seasonal limitations:	Avoid spring and fall mud season
Terrain:	Gentle slope
Access and landing area:	Use old ball field near western boundary for landing, access existing
Access distance:	1/3 mile at most
General maintenance:	Good condition
Brook-wetland crossings:	1 small stream in eastern half

STAND 2 SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 2 contains the bulk of the forestland on Moody Park. It is a mix of hardwoods with some white pine and scattered hemlock. There is a substantial volume of pine, red oak, and white ash of varying quality. Pine totals approximately 4,500 feet of sawtimber per acre with oak and ash at approximately 1,000 feet per acre each. This is a fairly good site for growing quality hardwood trees; the soil is fairly mesic and in places enriched. Maidenhair fern, an indicator of rich sites, was noted in several places in this stand. Likely the stand is actually a mix of two natural community types, the more common hemlock-beech-oak-pine type with pockets of hemlock-beech-northern hardwood forest in the richer areas, but is too intertwined to delineate.

This stand is becoming multiple aged, with pockets of younger, pole-sized trees mixed throughout. Recent wind events in the summer of 2007 and prior have created additional small openings in which ideally new trees will become established. There is a diverse but fairly sparse population of native tree regeneration present dominated by white ash and black cherry. Unfortunately, there also is a significant presence of invasive exotic shrubs which impede natural regeneration. Honeysuckle, barberry, and buckthorn are all present throughout this stand and are able to out-compete native regeneration when openings in the forest canopy rare made. An aggressive approach to managing these nuisance species is necessary for the successful management of this stand as a natural ecosystem.

At present, this stand would benefit from a combination of improvement thinning, crop tree release, and group selection to release pockets of desirable regeneration. Prior to any active cutting, the invasive exotic species in the harvest area should be treated according to recommendation is Appendix D of the Master Plan. Given the urban setting in which Moody Park falls, it is an ideal place to perform educational workshops for the public to introduce the concept of active forest management on Claremont’s forestlands. Several workshops should be organized, an introductory one before any

work has begin, one during mid-operation to showcase the job being carried out, and one after the job is done highlighting such things as putting skid roads to bed, recreational trail maintenance, and the general effect of a silvicultural treatment. Carrying out the silviculture with a horse-logging operation should be considered, as it likely would draw interest from the general public. If horse logging is not possible, a small mechanical operation would be another interesting angle, especially one with a forwarder to carry logs out of the forest.

The long-term goal of management in this stand is to continually develop multiple age classes of quality sawtimber trees of species well suited to the site, improve wildlife habitat, and provide for recreational opportunity. This will require an intensive invasive exotic shrub control program. The multiple age classes will exist primarily as pockets of similarly aged trees mixed throughout the stand. This multiple-age composition will provide a diversity of forest structure beneficial to wildlife and will provide opportunity for a mix of silvicultural operations. The current species composition reflects the natural species mix, but over time likely the hardwood will make up a greater part of the composition especially in the richer pockets.

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, harvesting mature trees, removing groups of 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. Successful treatment will release the best growing stock while improving the AGS to UGS ratio.

Priority: Medium

2014: Reduce overall basal area by 1/3 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.
- **Improvement thinning:** Light thinning in areas of dense stocking to improve growth on the healthiest, best quality and vigor trees.
- **Crop tree release** on the best quality and vigor stems. Strive to release 15-20 crop trees on at least 2 sides per acre.
- **Invasive Species Control:** Prior to any harvest activity in this stand, invasive species control work is highly recommended. Control of invasives is neither simple, nor inexpensive, yet any silvicultural entry without prior invasive species control will only make the situation worse. See Appendix D of the Master Plan for more detailed information on control techniques. Cost share monies may be available for this type of treatment.

Stand 3 Hemlock/White Pine/Hardwood 4A 23.3 acres


Stand Structure


Stand Structure


Forest Canopy

GENERAL ATTRIBUTES

Natural Community Type:	Hemlock-white pine
Past Management History:	No recent management
Approximate Age of Dominant Trees:	70-80 years old
Stand Health:	Fair
Insects/Damage/Disease:	Presence of invasive exotic shrub: buckthorn

SITE CONDITIONS

Site class:	2A
Determined by:	Soils and field observation
Tree vigor:	Medium
Soils:	Windsor loamy sand
Parent material:	Glacial till
Drainage:	Moderately well-drained
Terrain:	Steep slope
Aspect:	Northwest
Elevation:	520'-540'

Snags Per Acre

DBH Class	Moderately punky	Punky throughout	Sound	Grand Total
<12"	5.1			5.1
12-18"	3.1			3.1
>18"		1.7	2.4	4.1
Grand Total	**8.2**	**1.7**	**2.4**	**12.2**

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"	6.1			6.1
12-18"	4.2	6.1		10.4
>18"				
Grand Total	**10.4**	**6.1**		**16.5**

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

WILDLIFE HABITAT

Forest type:	Hemlock-white pine
Vertical diversity:	Low
Vegetative diversity:	Medium
Hard mast:	Pine, oak
Soft mast:	
Special habitat features:	Dense softwood stand adjacent to Gully Brook, likely serves as a wildlife corridor
Snag trees:	Good
Down logs:	Need more large down logs
Special wildlife practices:	Maintain dense softwood cover, increase undergrowth, maintain corridor

RECREATION

Recreational features:	Foot paths
Recreational infrastructure:	Some blazing
Aesthetic resources:	Large hemlock and white pine, dense softwood stand, deep gully
Public access:	Open to foot traffic

SILVICULTURE

Structural and Silvicultural Attributes

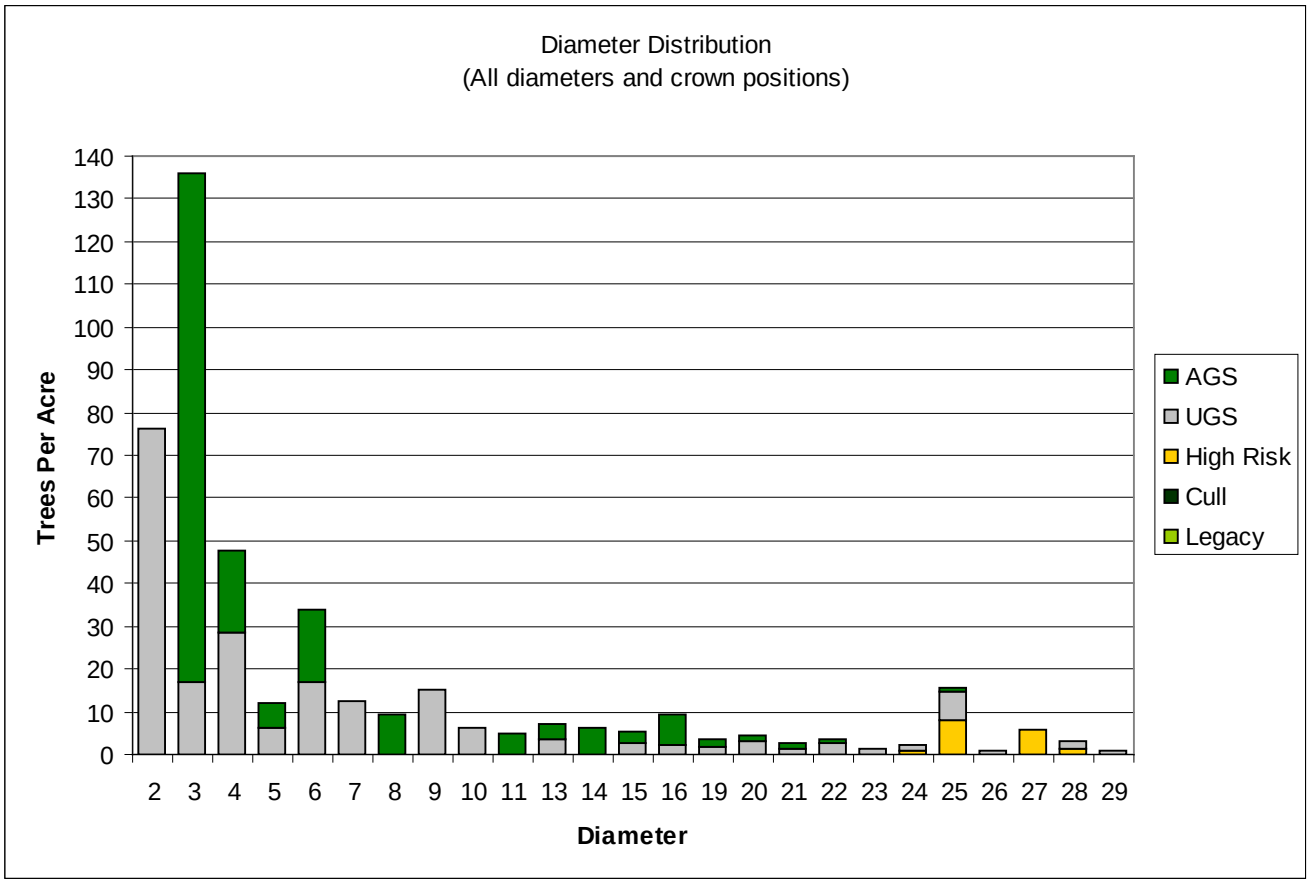
Broad Forest Type:	SH4A
Size Class:	Large sawtimber
Stand Structure:	Evenage
Crown Closure:	90%
Total Basal Area Per Acre:	214
Total Merchantable Basal Area Per Acre:	202
Total Acceptable Basal Area Per Acre:	58
Trees Per Acre:	427
Quadratic Mean Stand Diameter:	9.6
Percent AGS Sawtimber:	25.7%
Basal Area of AGS Sawlogs:	43
Timber Quality:	Fair

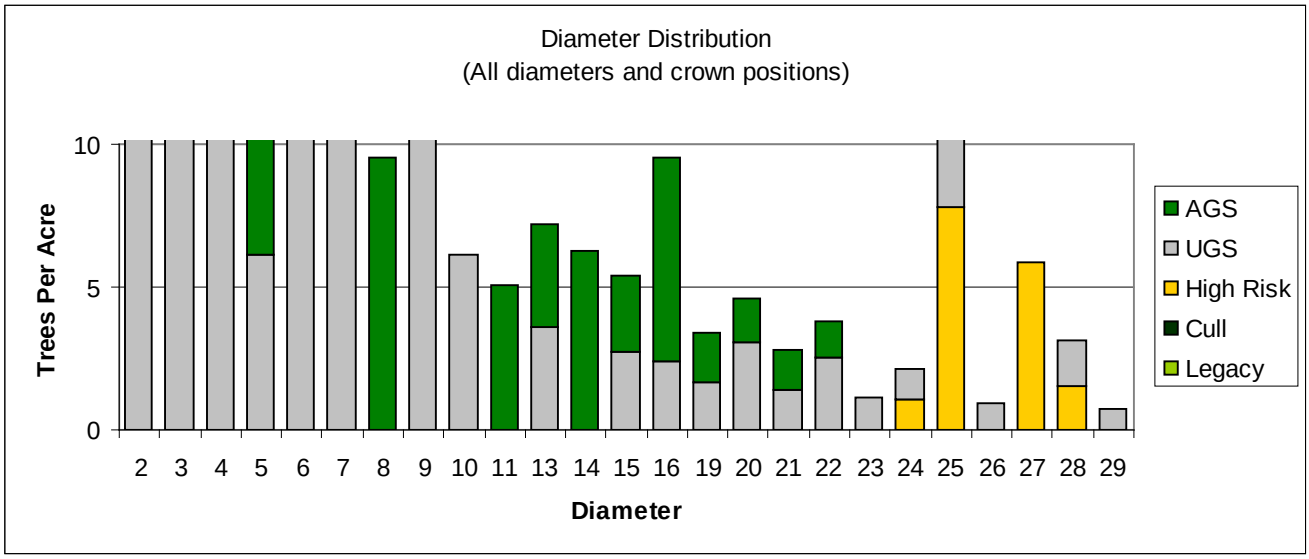
Forest Composition and volume

Species	% TPA	Veneer (bf)	Sawlog (bf)	Pallet/Tie (bf)	Pulp (cd)	Growing Stock (cd)	Total Cords	High Risk	AGS Saw	% AGS Saw
Red Maple	21.1%	0	119	0	2.4	0.7	3.3	0	119	100%
Red Oak	4.1%	135	540	191	1.6	0.0	3.1	526	264	30%
White Birch	2.3%	0	150	115	0.3	0.0	0.8	0	0	0%
Total Hardwood Per Acre:	*27.6%*	*135*	*809*	*306*	*4.4*	*0.7*	*7.3*	*526*	*383*	31%
Hemlock	28.8%	0	945	0	6.4	0.3	9.2	0	945	100%
White Pine	43.6%	0	20,544	4,215	18.9	0.0	61.3	8,105	5,587	23%
Total Softwood Per Acre:	*72.4%*	*0*	*21,488*	*4,215*	*25.3*	*0.3*	*70.5*	*8,105*	*6,531*	25%
Total Volume Per Acre:	100.0%	135	22,297	4,521	30	1	78	8,631	6,914	26%
Stan d Volume:		3,745	617,623	125,237	823	26	2,155	239,074	191,516	

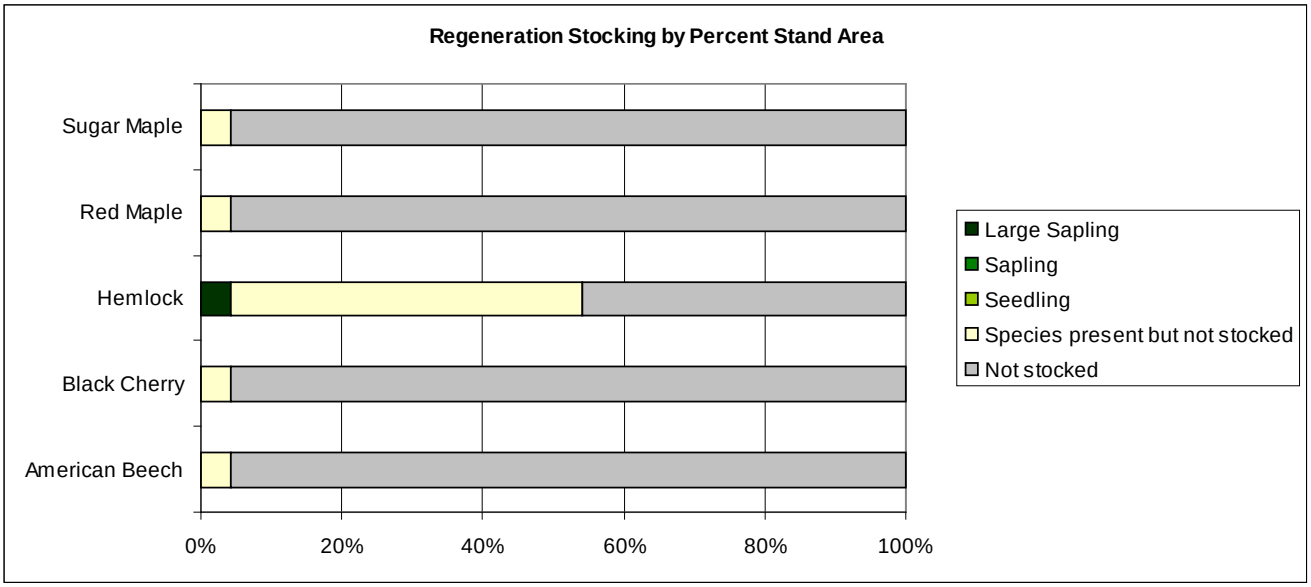
Table 3.3: Stand volume by species and product per acre values.

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.

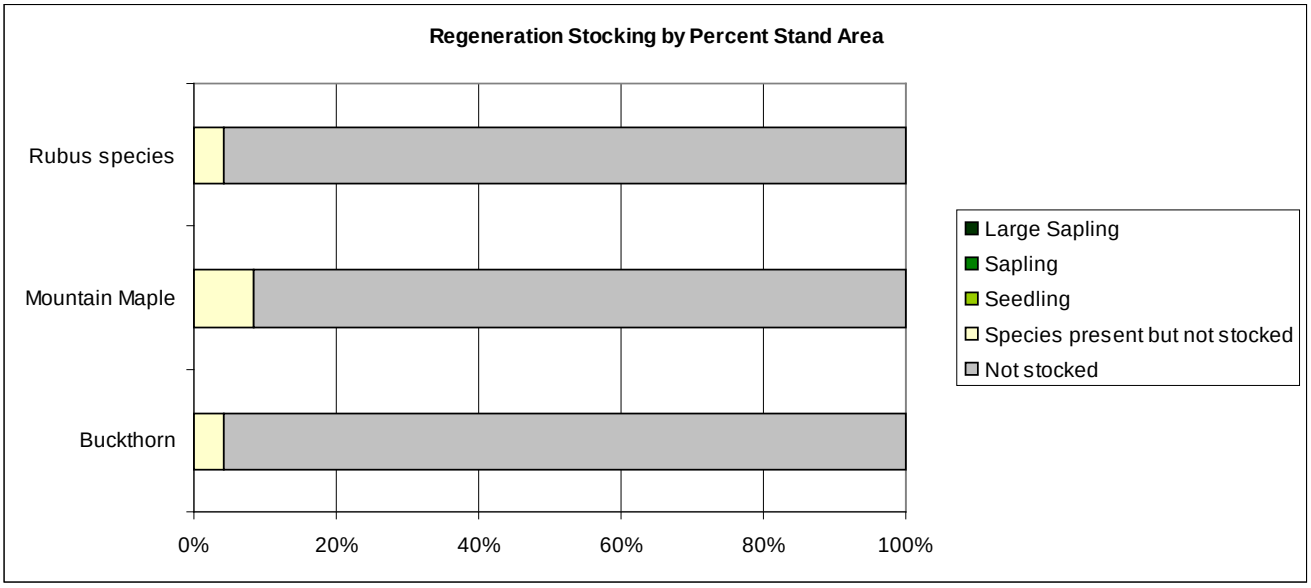




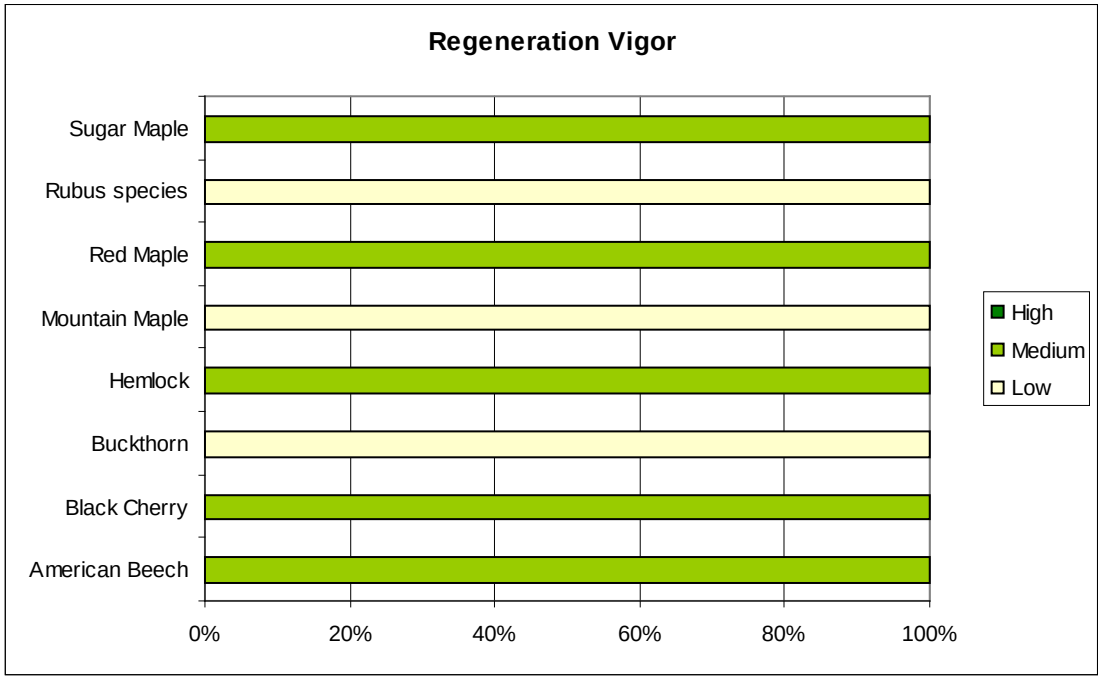
Graph 3.2: Regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), or 25 seedlings less 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.



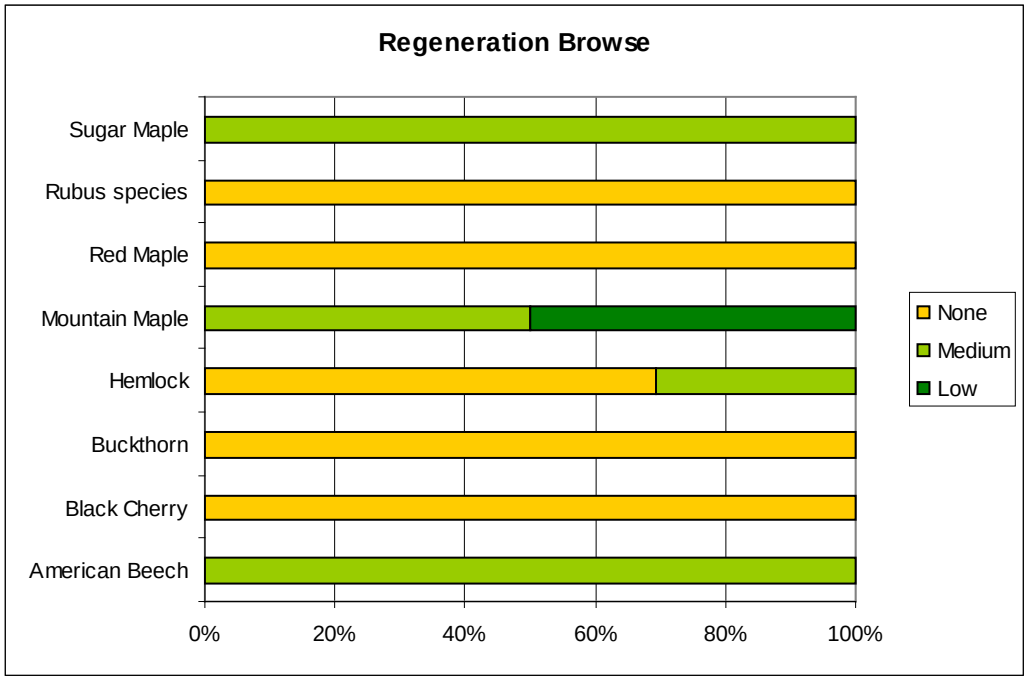
Graph 3.3: Shrub and competing species regeneration stocking by percent of stand, species and stocking class. The species is considered "stocked" if it meets at least one of three stocking levels including 2 stems between 0.5 and 1.5 inches diameter(Large Sapling), 5 stems between 3 and 5 feet tall (Sapling), 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:	20 years
Products:	Hemlock and pine sawlogs and pulp, varying quality
Desired Composition:	Maintain natural community type, favor white pine and hemlock
Crop tree target diameter:	White pine 22-24” Hemlock 22-24”

Operational Considerations

Operability:	Marginally operable
Seasonal limitations:	Winter only on frozen ground to protect soils on steep slopes
Terrain:	Steep slopes
Access and landing area:	Landing in old ball field, access good
Access distance:	1/3 mile
General maintenance:	None required
Brook-wetland crossings:	Small streams

STAND 3 SUMMARY AND 10-YEAR MANAGEMENT SCHEDULE

Stand 3 is the steep, dense hemlock and white pine forest on the banks of Gully Brook. It is a beautiful forest with many large white pine and hemlock throughout. Likely it is used as a wildlife

corridor, as many deer trails were noted on the slopes during the inventory. The main objective of this stand is to protect the slopes from erosion into Gully Brook, protect the wildlife corridor, provide recreational opportunity, and lower priority timber management.

This stand has a high volume of white pine, varying widely in timber quality and health. The regeneration is minimal, mostly consisting of shade-tolerant hemlock found sparsely throughout the stand.

The long-term goal of management in this stand is to maintain softwood canopy cover to protect the steep slopes and the water quality in Gully Brook, and to continually develop multiple age classes of quality sawtimber trees of species well suited to the site, improve wildlife habitat, and provide for recreational opportunity. The multiple age classes will exist primarily as small pockets of similarly aged trees mixed throughout the stand. This multiple-age composition will provide a diversity of forest structure beneficial to wildlife and will provide opportunity for a mix of silvicultural operations. The current species composition reflects the natural species mix.

Silviculture: The focus of management here is to maintain 70% canopy cover while improving the growth on the best stems and create openings for regeneration to become established. This will be accomplished primarily by single tree and small group openings.

Priority: Medium

2014: Reduce overall basal area to approximately 150 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.

MOODY PARK FOREST
TOTAL FOREST TIMBER AND PULP VOLUME
December, 2007

114 Forested Acres

Species	Veneer (bf)	Sawlog (bf)	Tielog (bf)	Total BF	Pulp (cds)	Growing Stock (cds)	Cull (cds)	Total Volume in Cords	Percent Cords
Hardwood									
Aspen	0	20,641	0	*20,641*	228	8	0	*275*	*4.1%*
Black Birch	0	0	0	*0*	0	12	0	*12*	*0.2%*
Hop Hornbeam	0	0	0	*0*	6	0	0	*6*	*0.1%*
Other Hardwood	0	0	0	*0*	0	0	10	*10*	*0.2%*
Red Maple	0	43,332	31,272	*74,604*	355	31	15	*535*	*8.1%*
Red Oak	7,513	171,035	46,649	*225,197*	233	0	52	*672*	*10.1%*
Sugar Maple	0	35,210	23,881	*59,092*	154	15	0	*275*	*4.1%*
White Ash	0	75,691	11,255	*86,947*	153	0	0	*308*	*4.6%*
White Birch	0	11,671	3,193	*14,864*	47	8	3	*86*	*1.3%*
Yellow Birch	0	0	0	*0*	0	8	0	*8*	*0.1%*
Total Hardwood:	7,513	357,580	116,250	481,345	1,176	82	80	*2,187*	
Softwood									
Hemlock	0	55,323	0	*55,323*	327	7	27	*458*	*6.9%*
White Pine	0	1,072,853	400,360	*1,473,213*	1,295	0	264	*3,992*	*60.1%*
Total Softwood:	0	1,128,176	400,360	1,528,536	1,622	7	291	*4,450*	
Stand Total:	7,513	1,485,756	516,610	2,009,881	2,798	89	371	*6,637*	

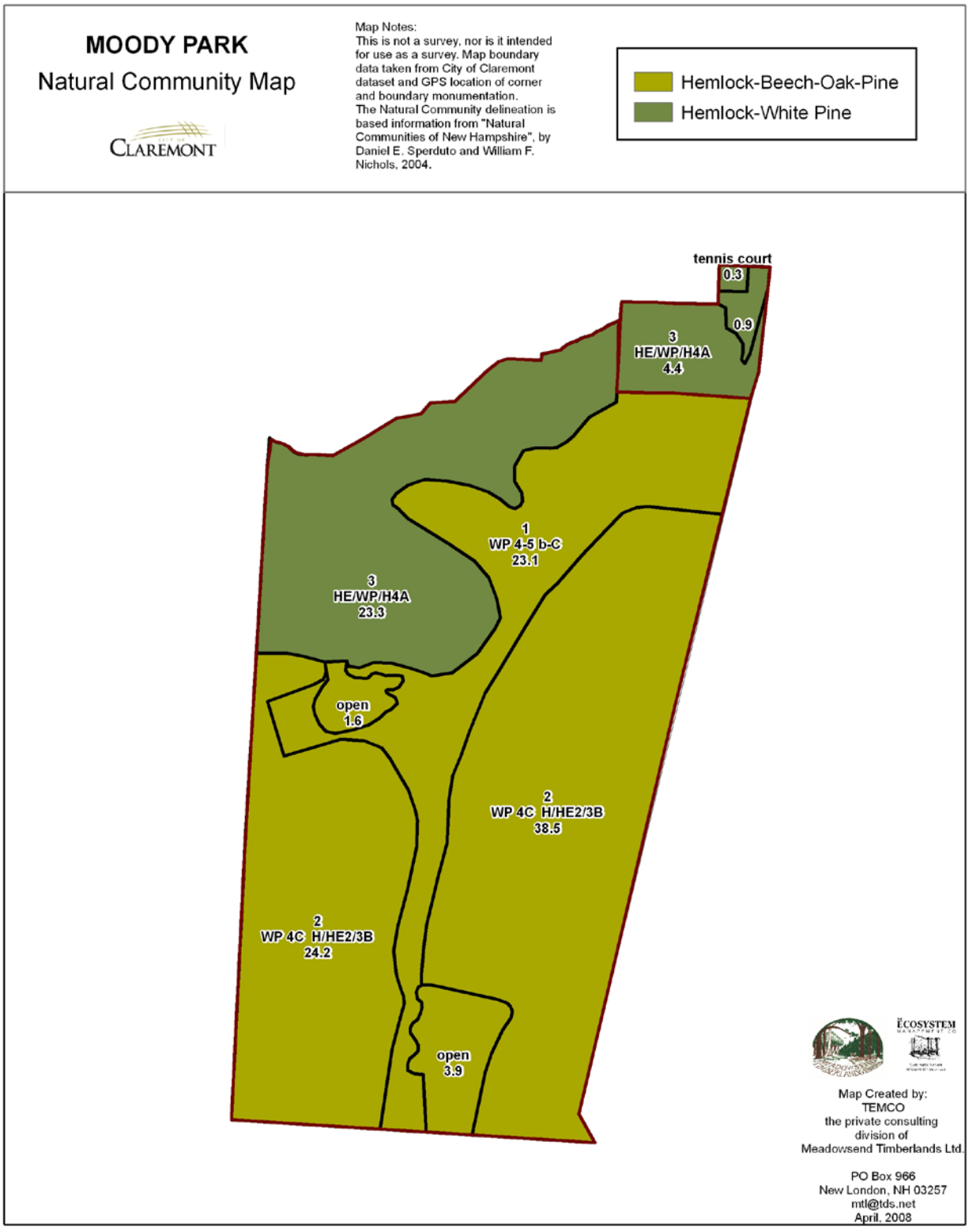
MOODY PARK FOREST

10-YEAR TREATMENT SCHEDULE

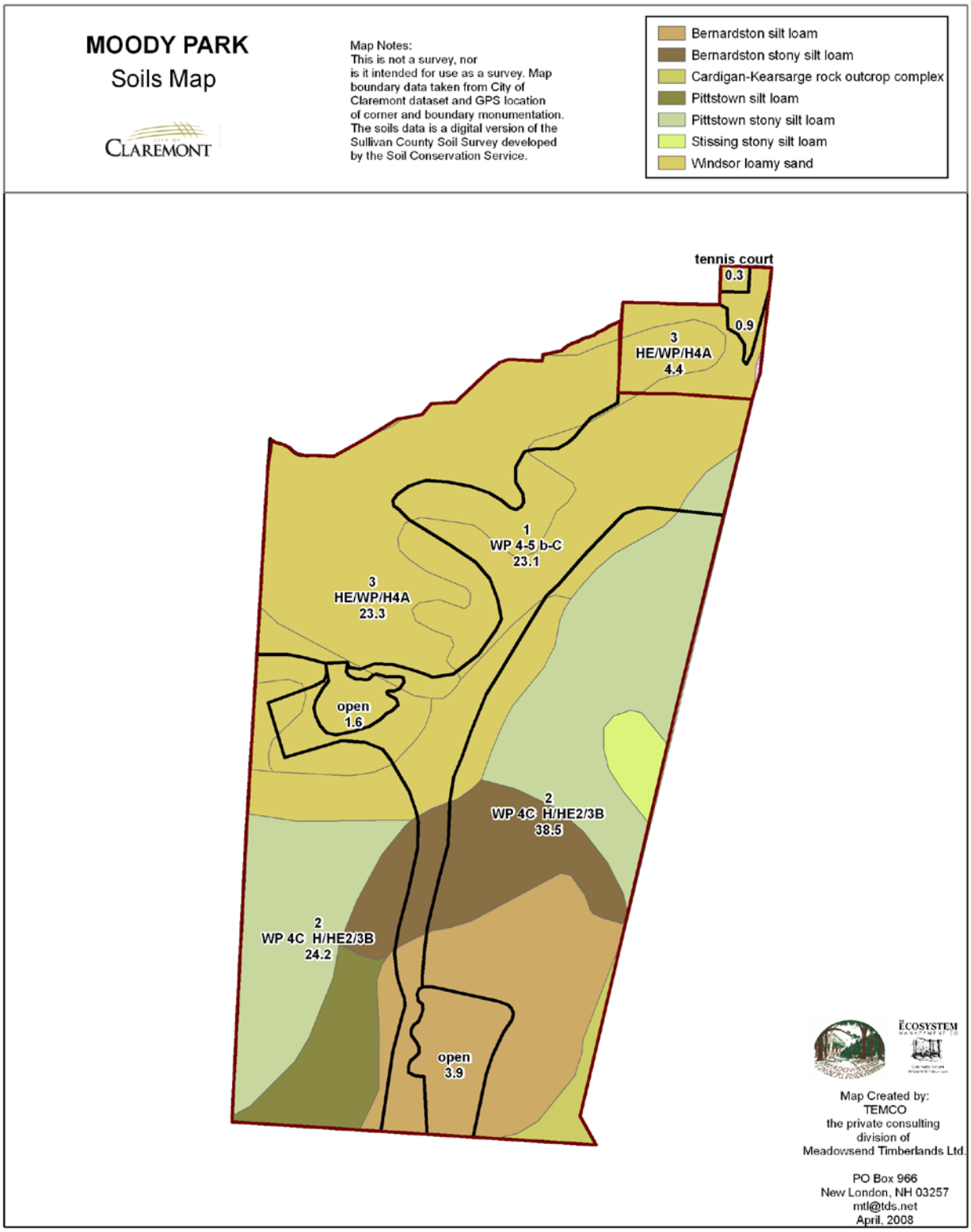
The dates given in this treatment schedule are meant to help prioritize work on the entire Claremont ownership. It is meant to be flexible and may change due to weather and market conditions or to unforeseen opportunities and access issues. The treatment activities may change due to the same reasons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

Stand #	Type	Acres	Treatment	Priority	Year
1	**WP4-5A**	**23.1**	Thinning; Plant	**High**	**2009 (As needed)**
2	**WP4C H/HE 2-3B**	**67.2**	Single tree; Group Selection; Improvement thinning; Crop Tree Release	**Medium**	**2014**
3	**HE/WP/H4A**	**23.3**	Single tree; Group Selection	**Medium**	**2014**
all			Blaze and paint property boundary lines		**ASAP**
all			Reevaluate and update management plan		**2018**

APPENDIX A: NATURAL COMMUNITY MAP


MOODY PARK
Natural Community Map
CLAREMONT
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
tennis court
0.3
0.9
3
HE/WP/H4A
4.4
1
WP 4-5 b-C
23.1
3
HE/WP/H4A
23.3
open
1.6
2
WP 4C H/HE2/3B
38.5
2
WP 4C H/HE2/3B
24.2
open
3.9
Map Created by:
TEMCO
the private consulting division of
Meadowsend Timberlands Ltd.
PO Box 966
New London, NH 03257
mtl@tds.net
April, 2008

APPENDIX B: SOILS MAP


MOODY PARK
Soils Map
CLAREMONT
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 soils data is a digital version of the
Sullivan County Soil Survey developed
by the Soil Conservation Service.
Bernardston silt loam
Bernardston stony silt loam
Cardigan-Kearsarge rock outcrop complex
Pittstown silt loam
Pittstown stony silt loam
Stissing stony silt loam
Windsor loamy sand
tennis court
0.3
0.9
3
HE/WP/H4A
4.4
1
WP 4-5 b-C
23.1
3
HE/WP/H4A
23.3
open
1.6
2
WP 4C H/HE2/3B
38.5
2
WP 4C H/HE2/3B
24.2
open
3.9
Map Created by:
TEMCO
the private consulting
division of
Meadowsend Timberlands Ltd.
PO Box 966
New London, NH 03257
mtl@tds.net
April, 2008

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, 2000*

APPENDIX D:

NH WILDLIFE ACTION PLAN HAPITAT TYPES