

# **FINAL REPORT**

Forest Management Plan  
Four Parcels  
Hampden, ME

*Prepared For*

Town of Hampden

*August 10, 2007*

August 10, 2007

Susan M. Lessard  
Town Manager  
Town of Hampden  
106 Western Avenue  
Hampden, ME 04444

Re: **Timber Inventory and Management Plan**

Dear Ms. Lessard:

We completed the inventory and management plan for four timberland parcels in Hampden. Our findings and recommendations are included in the enclosed report.

Please review the information and let me know if you have any questions.

It has been a pleasure working for the Town of Hampden and if we can be of service to you in the future please do not hesitate to contact us.

Sincerely,

Prentiss & Carlisle  
Management Co., Inc.

A handwritten signature in black ink that reads "Daniel J. McConville". The signature is written in a cursive style with a large initial 'D'.

Daniel J. McConville

Project Forester/Analyst  
License F13409

## General Property Information and Plan Summary

|  |  |
|--|--|
| <b>Landowner:</b>                                    | Town of Hampden, 106 Western Ave., Hampden, Maine  |
| <b>Plan Preparer(s):</b>                             | Daniel J. McConville (FI 13409)  |
| <b>Date of Report:</b>                               | August 10, 2007;   |
| <b>Date of Last Inspection:</b>                      | May 23, 2007;  |
| <b>Planning Period:</b>                              | June 1, 2007 – May 31, 2017  |
| <b>Town and County:</b>                              | Hampden, Penobscot County  |
| <b>Tax Map and Lot:</b>                              | NA   |
| <b>Parcel Location:</b>                              | Included in parcel-level sections  |
| <b>Scope:</b>  | <p>Evaluation of four parcels as to how each can be used to meet the Town's overall objectives and develop a set of specific recommendations for each. Work includes:</p> <ul style="list-style-type: none"><li>• Parcel inspections of infrastructure, timber and non-timber resources;</li><li>• Timber inventory to calculate merchantable volume by product and species (82 variable radius plots).</li><li>• Development of stand and stock tables;</li><li>• Growth and yield modeling of each stand type;</li><li>• Non-timber resource research;</li><li>• Preparation of management;</li><li>• Various maps (timber type, inventory plot locations, MNAP, location, etc.)</li><li>• No deed research or title review was done to verify ownership or acreage</li><li>• We did not perform a complete assessment of the presence of wetlands, vernal pools, endangered or threatened species, or habitats. We requested this information from the Maine Natural Areas Program but do not warranty its completeness</li></ul> |
| <b>Town-Level Objectives:</b>                        | <ol style="list-style-type: none"><li>1. Preserve open space</li><li>2. Provide a variety of active and passive public recreation opportunities</li><li>3. Maintain habitats and ecosystems</li><li>4. Protect water quality</li><li>5. Demonstrate good forest stewardship</li></ol>  |
| <b>(Parcel-level objectives described in report)</b> |  |
| <b>Recommendations:</b>                              | <ol style="list-style-type: none"><li>1. Dorothea Dix: improve value for passive recreation by thinning forest and clearing dead and dying trees that pose risk hazard; improve walking trails and water drainage</li><li>2. L.L. Bean: Develop as demonstration forest <b>or</b> recreation park or combination; harvest stands to improve health and generate income to offset costs for demonstration forest or recreation park</li><li>3. Main Rd. South: Consider area east of pipeline for new school or school expansion; residual area ideal for mix of education and recreation; harvest area west of pipeline to improve health; install bridge across Reeds Brook, repair brook banks, install proper drainage</li><li>4. Kennebec Rd.: Consider trading for higher conservation-value land</li></ol>   |

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## 1 Introduction

This land-use assessment and forest management plan was prepared at the request of the Town of Hampden for four parcels that total ± 325 acres in Hampden, Penobscot County, Maine (Table 1.1). This plan was prepared on August 10, 2007 by Dan McConville (license #FI 13409) of Prentiss & Carlisle Management Company (107 Court St., Bangor, ME; 207-942-8295) for the planning period of 2007-2017.

**Table 1.1. Location description of four parcels.**

| Parcel Name       | Location   | Map & Lot                            | GIS Gross Acres | GIS Forested Acres |
|-------------------|--|--------------------------------------|-----------------|--------------------|
| Dorothea Dix Park | Route 1A 3/10 mi. north of Hopkins Rd. on east side  | 45-014                               | 23              | 20                 |
| LL Bean           | Route 202 half mile northeast of Cold Brook Rd. on north side                                | 10-0-056-2                           | 219             | 197                |
| Kennebec Road     | Kennebec Rd. and railroad (snow dump) between Back Winterport Rd. and railroad on north side | 06-026                               | 20              | 19                 |
| Main Rd. South    | End of Liberty Ave. off of Constitution Ave.   | 06-A-064<br>06-0-042-A<br>06-0-042-B | 63              | 55                 |
| <b>Total</b>      |  |                                      | <b>325</b>      | <b>291</b>         |

## 2 Purpose

The purpose of this assignment is to (1) present an objective assessment and analysis of the subject parcels to assist the Town with understanding how these parcels can be used to meet their land-use goals within the context of comprehensive planning, and (2) provide recommendations for achieving these goals, also in the context of the Comprehensive Plan. The overall objective of this assignment is to assess whether these parcels can be used to achieve the Town's goals for open-space, recreation and timberland, and to make recommendations for attaining these goals. The parcels have been assessed to determine how well they can serve as areas for:

1. Preserving open space
2. Providing public recreation opportunities
3. Maintaining the habitats and ecosystems that large parcels provide
4. Protecting water quality
5. Demonstrating good forest management

Each tract is described individually in this report and assessed for how well it can serve these broad objectives with a set of recommendations for achieving both the specific and broader goals.

### 3 Scope

The primary data supporting these findings and recommendations are the inventory and analysis, photo-interpretation, the comments and observations from experienced foresters, and from communications with Town officials. In addition, some of the sources of data, particularly the non-timber resource information come from the State of Maine. For example, the review for endangered or threatened species or habitats comes from the Maine Natural Areas Program. We make no warranty as to the accuracy or completeness of the assessment completed by the Maine Natural Areas Program.

All of this information has been analyzed to describe the timber quantity and quality, infrastructure (access to and within the property), the water resource, soils, and the forest as habitat for wildlife, and make recommendations for protecting or enhancing these values.

The sources of data and products and services compiled and provided by Prentiss & Carlisle Management Co. are listed below:

- Comparative assessment of each of the four parcels with respect to how each can contribute to the Town's overall goals
- Forest management plans for each parcel
- Property map showing roads, forest types, elevation, and water (forest type map, 1 cruise map; 20 chains/inch, approx. 36" x 34")
- Timber inventory and stand and stock tables
- Summary of timber volume by product and species
- Silvicultural recommendations
- Sustainable harvest level recommendations
- Growth estimates derived from growth and yield modeling software
- General field inspection of the property including the timber quality, past harvesting, non-timber resources, and condition of the boundary lines
- Soil type map from data collected by the Maine Natural Resources Conservation Service (NRCS)
- Map of the Habitats of Management Concern (acquired from Maine Natural Areas Program) detailing areas of ecological importance

## 4 Summary

Each of the four parcels was evaluated to determine how well each can be used to meet the Town's broad multiple-use objectives, which were:

1. Preserve open space
2. Provide a variety of active and passive public recreation opportunities
3. Maintain habitats and ecosystems
4. Protect water quality
5. Demonstrate good forest management

Several attributes were evaluated and are described in this report to assess the relative value of each parcel in the context of the Town's broad objectives. These attributes were: location (proximity to residential areas and noise pollution), size, and quality, quantity and diversity of natural resources (timber, water, habitat, soils and topography).

Based on this assessment, we ranked each parcel as to how well it can contribute to the Town's objectives (Table 4.1). It is important to remember, however, that an individual parcel need not necessarily have a high value for every objective. For example, Dorothea Dix Park has high value for preserving open space and as a place for passive public recreation. However, because of its relatively small size and the rules and regulations of the Park (as described in the Dorothea Dix Park ordinance), it is not a practical location for snowmobiling and ATV use. Thus, one should not evaluate each parcel based on the sum of the rankings for each attribute. Instead, parcels should be evaluated based on their collective contribution to the Town's objectives. That said, clearly some parcels are more valuable than others. We recommend that the Town consider selling or trading lower value parcels for parcels that have the attributes more in line with the objectives. For example, the Kennebec Road parcel, which is adjacent to the town snow dump, should be carefully analyzed in terms of its values. It has relatively little value in timber, habitat, recreation, and as a place to protect water quality. Its only virtue in the context of the Town's objectives is that it is open space—that is, it is not developed. Despite its relatively low value for meeting the Town's objectives it may be valuable for development. It has about 1,500 feet of frontage on Kennebec Road and is 20 acres in size. The town might consider trading or selling this parcel to acquire a parcel that perhaps has less economic value per acre but has considerably more value in terms of the Town's objectives.

We believe the highest and best uses for these parcels in the context of the Town's goals are:

1. Dorothea Dix – Traditional park with natural areas used as arboretum
2. LL Bean – Woodlot with support of current recreation (snowmobile, walking, etc.)
3. Main Rd. South – Use at least part of tract for outdoor classroom for schools
4. Kennebec Rd. – Sell or trade for more valuable land (in terms of recreation or timber)

**Table 4.1. Rank of four parcels of their relative contribution to Town objectives**

| Category                                   | Attribute   | Dorothea Dix   | L.L. Bean   | Main Road South  | Kennebec Rd   |
|--|---|--|---|--|---|
| <b>Preserve open space</b>                 | Overall rank  | 4  | 1   | 3  | 2   |
|  | Comments  | Narrow parcel, not in danger of losing park status                                       | Large area to preserve  | No rd frontage, good candidate for school expansion                              | High visibility from major road                                 |
| <b>Recreation</b>                          | <i>Passive Recreation</i>                                 | 1  | 2   | 3  | 4   |
|  | Walk  | 1  | 3   | 2  | 4   |
|  | Jog   | 3  | 1   | 2  | 4   |
|  | View nature   | 1  | 2   | 3  | 4   |
|  | X-Country ski   | 4  | 1   | 2  | 3   |
|  | Proximity to housing                                      | 1  | 4   | 2  | 3   |
|  | Presence of big trees                                     | 1  | 2   | 3  | 4   |
|  | Aesthetic value   | 1  | 2   | 3  | 4   |
|  | Quietness   | 2  | 4   | 1  | 3   |
|  | Comments  | Underutilized but high potential value for passive rec.                                  | High traffic noise not conducive to passive rec.                            | Quieter setting than other tracts; good location relative to residential areas   | Small, high noise, brushy                                       |
|  | <i>Active Recreation</i>                                  | 4  | 1   | 2  | 3   |
|  | Hunt (bow)  | 4  | 1   | 2  | 3   |
|  | Snowmobile  | 4  | 1   | 2  | 3   |
|  | ATV   | 4  | 1   | 2  | 3   |
|  | Mountain Bike   | 4  | 1   | 2  | 3   |
| Comments                                   | Small size and park ordinance limit active rec. potential | Noisy parcel ideal for motorized vehicles  | Existing snowsled/ATV trails; lot of public use                             | Small size and lack of existing trails   |   |
| <b>Habitat/ Ecosystems</b>                 | Overall   | 3  | 1   | 2  | 4   |
|  | Diversity of forest structure                             | 3  | 1   | 2  | 4   |
|  | Diversity of soils/topography                             | 3  | 1   | 2  | 4   |
|  | Wildness of adjacent land                                 | 4  | 1   | 2  | 3   |
|  | Abundance of wetlands                                     | 4  | 1   | 2  | 3   |
|  | Likelihood of vernal pools                                | 3  | 1   | 2  | 4   |
|  | Comments  | Value for wildlife that don't require large areas (i.e. songbirds)                       | Large size makes it possible to manage for wildlife that require more space | Second largest; also valuable for wildlife that require more space, such as deer | Small, no forest diversity                                      |
| <b>Water Quality</b>                       | Overall   | 1  | 3   | 2  | 4   |
|  | Abundance of water features                               | 1  | 3   | 2  | 4   |
|  | Importance to watershed integrity                         | 1  | 3   | 2  | 4   |
|  | Comments  | Brook, pond, Penob. R.   | Few seasonal brooks   | Reed Brook flows to Penobscot and needs protection                               | Little importance to watershed                                  |
| <b>Demonstration of forest stewardship</b> | Overall   | 3  | 2   | 1  | 4   |
|  | Diversity of tree species composition                     | 2  | 1   | 3  | 4   |
|  | Diversity of age structure                                | 3  | 1   | 2  | 4   |
|  | Location  | 2  | 3   | 1  | 4   |
|  | Potential for timber income                               | 3  | 1   | 2  | 4   |
|  | Comments  | Needs harvest but unlikely to harvest again; more value as arboretum & park than woodlot | Best place for woodlot; large enough to generate timber income              | Excellent location for demonstration forest; existing beaver demo area nearby    | Too small for woodlot; poor soils, little age/species diversity |

## 5 Dorothea Dix Park

### 5.1 Plan Summary

Dorothea Dix Park is located on the east side of Route 1A approximately 3/10<sup>th</sup> mile north of Hopkins Road. The parcel was granted to the Town from the State several years ago to be managed as a park. The parcel will continue to be actively managed as a park and no other use was considered. However, we have made recommendations as to how to better manage the park to meet the Town's broad objectives. The park is about 23 acres and stretches from Route 1A to the Penobscot River. It is rectangular in shape and about ½ mile long (from Route 1A to the river) by 360' wide.

The park is relatively open near the entrance but is densely forested beyond the first 200 feet. Beginning in the entrance area, an old gravel road serves as a walking trail and extends to a field approximately 2,000 feet from the parking area. Beyond the entrance area, the park is underutilized for recreation at the present time. Upgrading the trails, fixing some drainage issues, and removing the over-mature and dead trees would greatly increase the utility of the park while leaving it in a more natural state. An alternative option is to thin the dead and dying trees and create 2-3 semi-cleared areas approximately 1-3 acres in size to serve as picnic areas.

Given these options, the Town should consider whether to manage the park in a more natural state or to create a more park-like setting. If managed in a more natural state, we recommend harvesting the dead and dying trees that present a hazard to visitors and to improve the health of the forest by creating more growing space for better quality trees. We recommend hiring a contractor to clean out the dead, dying, and poor quality trees. Live and dead wood could be sold to offset the cost of the work.

An alternative option to managing the park in a more natural state is to both thin the forest as described above and create 2-3 partially cleared areas approximately 1-3 acres in size through the park. These partial clearings should retain the best quality oak and sugar maple trees but remove the remaining trees. By opening up the parcel in this way, it will be more inviting and thereby increase its utility as a park. Having areas separated by forested buffers but connected by trails will allow more visitors to enjoy the park while seeming less crowded.

There are some valuable non-timber attributes within the park that should be maintained or enhanced. An old gravel road serves as a walking trail and extends from the parking area eastward through most of the property. The trail needs to be improved by installing proper drainage and adding gravel. We recommend creating additional trail where possible to make one or two loops, rather than a single back and forth trail.

A brook meanders through the northern boundary about midway through the park and opens to an attractive pond. The pond was created by a failed wooden box culvert that had previously allowed water

to pass beneath the road but is no longer functional. The pond and trail/road could be maintained by carefully placing a culvert so that the bottom of the pipe is at the desired elevation of the pond. There are at least two springs that feed a wetland on the south side of the road across from the pond. Care should be taken when harvesting to avoid interrupting water flow above the springs.

At the easternmost point on the property there is a spectacular overlook on the bluff along the Penobscot River that could serve as a scenic overlook. The area is dominated by large pines, some of which are dying and present a hazard. This area is difficult to access as there is no trail to the bluff, and the downed trees make it difficult to get to the edge of the bluff. The area to and along the bluff should be carefully harvested to remove hazard trees and the trail could be extended to an area along the bluff. Zoning regulations require that a permit is obtained for timber harvesting within 250 feet of the river.

The forest was established approximately 125 years ago, likely the result of farm field abandonment. Little harvesting has been done since that time. There are approximately 40 cords per acre of merchantable volume, 85 percent of which is composed of white pine, oak, and maple (red and sugar). Although the volume is high, the quality and health of the trees is fair to poor. The oak is the healthiest component in this forest and should be maintained by carefully thinning around the best individuals. The sugar maple, white ash, and hemlock are generally healthy and should be retained. Much of the pine has considerable rot but should continue to live for many more decades. Most of the spruce, fir, cedar, and red maple is dead, dying or in poor health. In addition to the 40 cords per acre of live merchantable trees, there is about 2-4 cords per acre of standing or recently fallen dead trees. While the dead trees are valuable for biodiversity some present a hazard to visitors.

There are three stands in the parcel (from west to east):

1. H4B (4 acres)—mature stand composed primarily of hardwood species; sugar maple (37%), red maple (35%), red oak (15%), black cherry (8%), other hardwoods (2%) and balsam fir (3%); trees are generally 50-75' tall, 5-26" dbh; canopy closure is 60-79 percent and average DBH (QMD) = 10.6".
2. HS4B (11 acres)—mature stand composed primarily of mixedwood species; red oak (33%), white pine 26%), red maple (17%), spruce (6%), balsam fir (5%) cedar (5%), and white ash (3%); trees are generally 50-75' tall, 5-26" dbh; canopy closure is 60-79 percent and average DBH (QMD) = 10.5".
3. P4B (4 acres)—mature stand composed primarily of white pine (90%) with minor components of hemlock (5%), spruce (3%) and cedar (2%); trees are generally 70-110' tall, 15-35" dbh; canopy closure is 60-79 percent and average DBH (QMD) = 18.5".

We recommend harvesting about 35 percent of the live merchantable volume, exclusive of creating cleared areas. This would leave a residual volume of about 26 cords per acre. If the Town wishes to create 2-3 semi-cleared areas, we recommend locating these in the hardwood and mixedwood stands, leaving the best quality oaks at a 30-40 foot spacing. Dead trees that pose a hazard should be removed.

This will leave a sufficient number of standing dead trees that do not pose a hazard and that will serve as important wildlife habitat.

In the hardwood and mixedwood stands, we recommend harvesting 35-45 percent of the standing live merchantable volume using a crop-tree approach. The silviculture objectives are designed to move these stands to oak/sugar maple stands, which are long-lived, with a relatively high resistance to disease and insect problems, and are generally wind-firm. In this approach, the best quality leave trees should be selected and identified with flagging and trees competing with the crop trees should be marked to cut. We recommend selecting the best quality oak and sugar maple as the primary crop trees. In areas with low sugar maple and oak stocking, we recommend selecting the best quality red maple as the crop trees. Crop trees should be spaced so that crowns have sufficient room to expand. The total harvest in these stands should be approximately 188 cords.

In the mature pine stand, we recommend a light crown thinning designed to remove pines with inferior crowns. The thinning should not exceed 30-35 percent removal. Exceeding that level will increase the risk of future blowdown. Trees that should be marked for removal include individuals with poor crown form, insufficient live crown ratio, and generally poor quality trees that appear likely to die in the next 10 years due to competition. The total removal in the pine stand should be about 80 cords.

The soils are generally well-drained and productive but are prone to erosion. Given the soils, the slope of the property and the brook and springs, erosion control measures should be installed. Rain water currently runs down the trail from the parking area and shows obvious signs of erosion. Water bars and culverts should be installed to redirect water away from the trail.

Finally, extensive areas of the forest floor are covered with honeysuckle, an invasive-exotic species that is very difficult to control. Honeysuckle impedes the regeneration and growth of more desirable species, such as oak seedlings in two ways: it produces allelopathic chemicals that enter the soil and inhibit the growth of other plants, and it produces a dense canopy that prevents other tree and plant germinants from growing. We recommend controlling honeysuckle through a combination of mechanical and chemical methods. An advantage to chemically treating honeysuckle is that it is one of the first species to leaf-out in the spring and the last to drop its leaves fall. As such, a foliar application of Glyphosate, the active ingredient in Roundup Ultra during the fall after other hardwoods have dropped their leaves will minimize the damage to other species. Bags can be placed over non-target species to further minimize damage. A second treatment should be planned the following year to kill seedlings that grow from seed held in the soil.

## 5.2 Management Objectives and Recommendations

The objectives for the Dorothea Dix Park are:

1. Enhance passive recreation opportunities
2. Maintain and enhance the health and productivity of the forest
3. Protect and maintain biodiversity
4. Protect water quality within the watershed

### 5.2.1. Enhance passive recreation opportunities

The primary goal for the Park is to enhance “passive” recreation activities. Most active recreational activities, such as the use of motorized vehicles and bicycles, and camping and hunting are prohibited by park ordinance. Management recommendations, therefore, are geared towards enhancing permissible activities such as picnicking and walking. At the present time, the park is underutilized primarily due to its appearance from the entrance. From the entrance area, the park seems to include only the cleared area in front (approximately 1-2 acres) and the forested area may seem unsafe to many young families. To increase recreational use of the property we recommend:

- Harvesting dead and dying trees to open up the forest canopy to provide more space for the best trees and to create a more inviting setting
- Widening and resurfacing the main trail so that it is easier for walking and can support an ambulance
- Creating additional trails including a trail loop connected to the existing trail and a trail extension to the bluff overlooking the river—a single dead-end trail is less appealing than a loop trail
- Removing much of the dead and dying debris from the forest floor
- Creating 2 or 3 semi-cleared openings in the forest to serve as picnic areas

### 5.2.2. Maintain and enhance the health and productivity of the forest

There are serious forest health issues that threaten the sustainability of the forest (detailed in section 5.3.2). We recommend removing dead and dying trees and reallocating growing space to the healthiest trees. We recommend cutting about 270 cords, or 34 percent of the living merchantable volume to increase the health and productivity of the forest. This excludes volume harvested in the semi-cleared openings recommended for enhancing recreation opportunities. The forest management goals call for maintaining the forest in a late-successional state, dominated by large, mature oaks and white pine. These goals are different from what would be recommended for an oak-pine type in a timberland parcel where we would recommend some level of regeneration cuts to promote oak germination and growth.

### 5.2.3. Protect and maintain biodiversity

Biodiversity is the variety of life in all its forms, levels and combinations, and includes ecosystem diversity, species diversity, and genetic diversity. Given the relatively small size of the parcel and its requirements for public use, both the extent and scale at which it can be used to protect biodiversity is limited.

Nevertheless, there are actions that can be done to improve habitat for plants and animal, such as:

- Identifying, mapping and monitoring interesting plants and animals in the park by organizing volunteer efforts. These can be rare or endangered or popular species.
- Reducing or eliminating (if possible) honeysuckle to create growing space for a greater variety of endemic plants
- Leaving some of the non-hazardous standing dead trees to serve as cavity trees for birds and other wildlife
- Protecting the pond and wetland from invasive plants and foot traffic
- Improving water drainage by installing culverts and water bars to stop erosion problems

### 5.2.4. Protect water quality within the watershed

Water bodies in the surrounding area are a tremendous asset for the Town and surrounding area, both for biodiversity and recreation. The property lies in the Penobscot River Watershed, which drains approximately 8,570 square miles of area and covers several towns. The property has approximately 500 feet of frontage on the Penobscot River, the main stem of the drainage system. The river is tidal from Bucksport to Veazie and brackish to Hampden.

The Penobscot River is home to both freshwater and sea-run fish species. Freshwater species include smallmouth bass, white perch and pickerel, and sea-run fish include Atlantic salmon, alewives, American shad, American eel, sea lamprey, and striped bass. The most important fish on this list is the federally-listed endangered Atlantic salmon. The historic salmon run in the Penobscot River was 50,000 or more fish. Today, the run is estimated at 1,000-4,000 adults, which is largest Atlantic salmon run remaining in the United States. The critical issues related to salmon habitat in the Penobscot River in Hampden are passageway to and from spawning areas.

Actions within the watershed can affect the water quality downstream. The brook that runs through the parcel eventually drains into the Penobscot River south of the parcel boundary. As such, it is important that water quality is protected in the brook because it in turn affects aquatic habitat in the river. Harvesting near the brook, if not done carefully can lead to sedimentation. Sedimentation can decrease water quality and negatively impact salmon and other native fish habitat. As recommended in previous sections, we suggest that logging contractors strictly adhere to BMPs and state regulations pertaining to harvesting near brooks, minimize crossings of brooks when legally permissible, and leave sufficient shade within a buffer around the brook.

Water resources are regulated by a variety of Federal, State and local laws, such as the Clean Water Act (Federal), Natural Resources Protection Act (State), Land Use Regulation Commission (LURC, State – unorganized towns), Dept. of Environmental Protection (DEP, State – organized and unorganized towns), Protection and Improvement of Waters Act (State) and local ordinances. There is no “one-size fits all” recommendation to manage riparian areas. Tree stocking and shade retention, buffer and filter strips, are currently regulated under both LURC and DEP rules and regulations. At a minimum, you must adhere to all Federal, State and local laws in applying protection to riparian areas. BMPs have been established to provide a number of protection measures to meet water quality standards and protect wildlife habitat that often are more restrictive than laws. We recommend you use a particular BMP or combination of BMPs as appropriate given site-specific conditions. The recommendations made within this plan are designed to minimize stream crossings by logging equipment.

### 5.3 Property Description

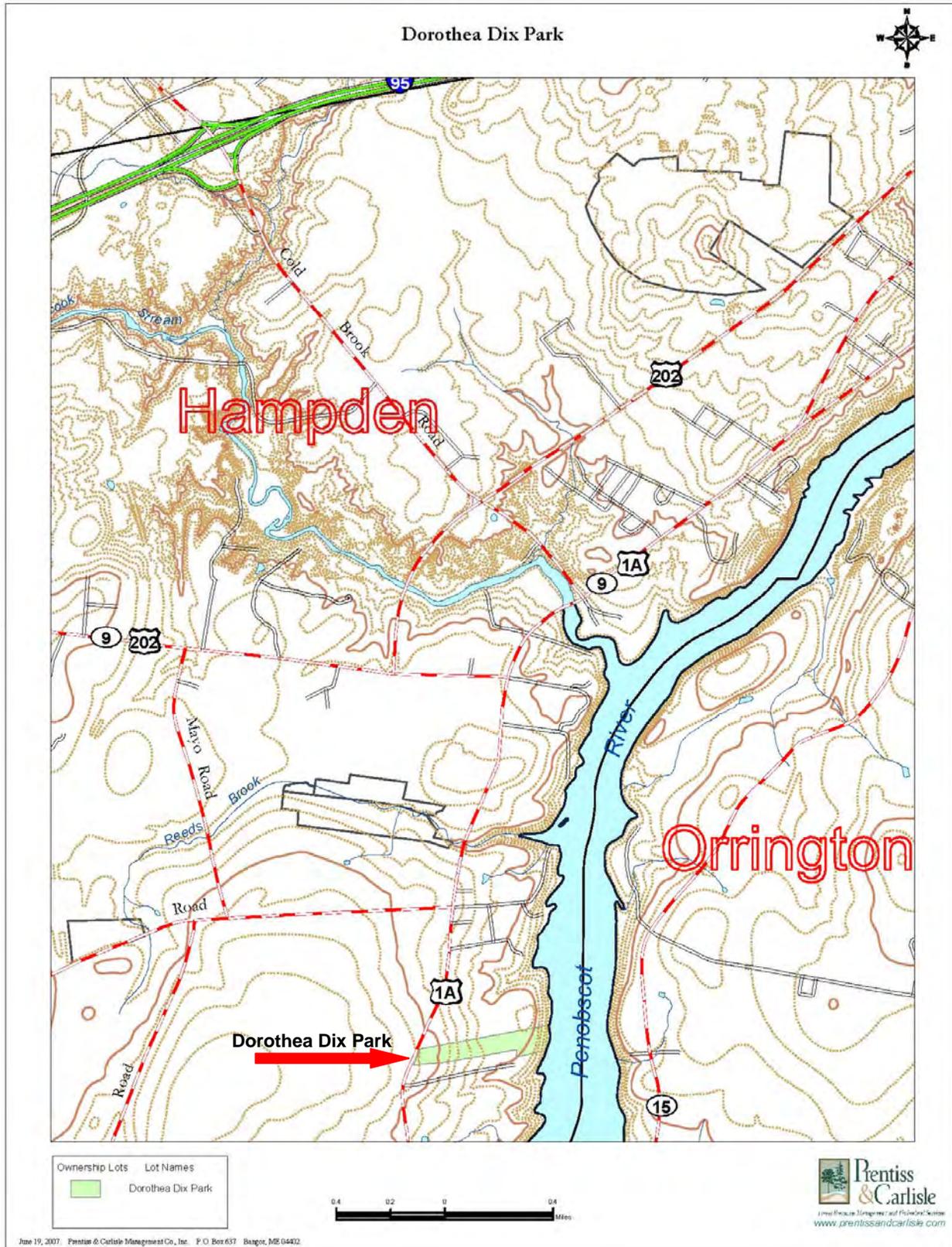
#### 5.3.1. Acreage and Location

Dorothea Dix Park is located on Route 1A approximately 3/10<sup>th</sup> of a mile north of Hopkins Road (Figure 5.1). The property is roughly rectangular in shape and extends from Route 1A east to the banks of the Penobscot River. We estimated the gross GIS acreage to be 23 acres based on information provided by the Town. The forested acres, conventionally defined as the acreage available for harvesting trees (i.e. accessible, productive, and harvesting is not prohibited) was estimated to be 20 acres. Acreage estimates are not the result of a survey but represent the best available information. The acreage calculations by type are shown in Table 5.1.

**Table 5.1. Acreage by forest and non-forest categories**

| Category                    | Broad Type    | Acreage Class | Acres     |
|-----------------------------|---------------|---------------|-----------|
| Forested Acres              | Softwood      | P4B           | 5         |
|                             |               |               | 5         |
|                             | Mixedwood     | HS4B          | 11        |
|                             |               |               | 11        |
|                             | Hardwood      | H4B           | 4         |
|                             |               |               | 4         |
| <b>Total Forested Acres</b> |               |               | <b>20</b> |
| Non-Forest                  | Water         |               | <1        |
|                             | Wetland       |               | 2         |
|                             | Roads/Parking |               | 1         |
| <b>Total Non-Forest</b>     |               |               | <b>3</b>  |
| <b>Grand Total</b>          |               |               | <b>23</b> |

Figure 5.1. Location map



### 5.3.2. Forest Age/Disturbance History

The forest was likely pasture (or farm fields) abandoned about 125 years ago and has maintained an even-aged structure. Most of the pine trees have large limbs, which are typical of old-field succession. The primary disturbances appear to be natural mortality related to age and competition, especially among shorter-lived species. Many of the shorter-lived species, such as cherry and white birch likely have died over the past fifty years. Standing dead and nearly dead birch and cherry can be found throughout the hardwood and mixedwood stands. In addition, many of the large spruce, which are considered a long-lived species, are standing dead or dying. There are signs of recent cutting throughout the parcel. Apparently, the Boy Scouts have removed some dead and dying trees. It is possible that similar cutting has taken place over the past 75-100 years.

### 5.3.3. Soils/Topography

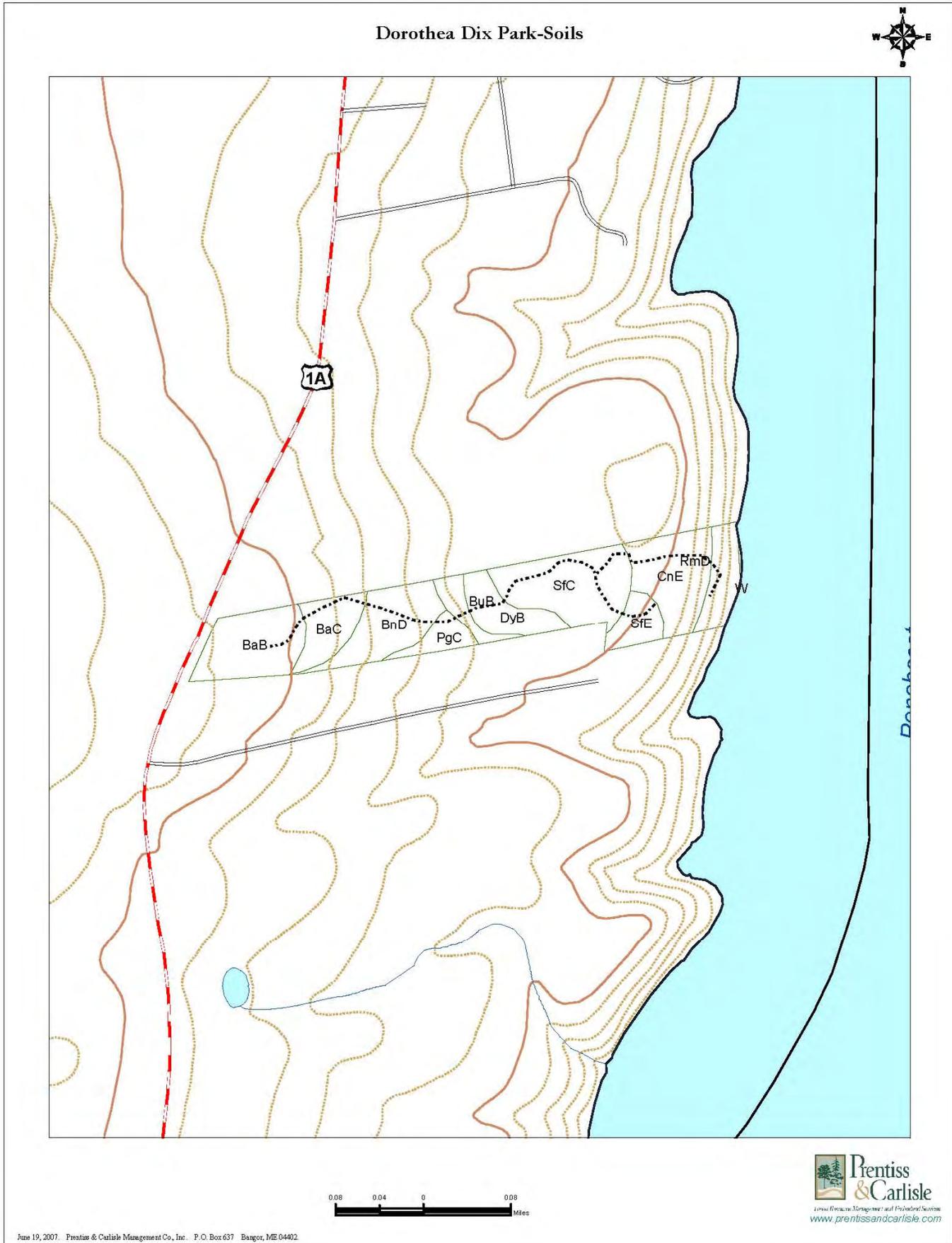
The topography is characterized by a gradual downward slope from Route 1A to a bluff approximately 30 feet above the Penobscot River. Along this elevation gradient the species mixture changes from pure hardwood, to mixed wood, to softwood from the high to low point. A brook runs through the property from the north nearly bisecting the property. An old gravel road has created a wetland on either side where the road crosses the brook in an area of poorly and somewhat poorly drained soils. A few woodland seeps feed the stream from different locations and an aquifer adjacent to an old gravel pit provides additional water to the brook.

The soils are generally rich and well-drained throughout. Seven soil series dominate the property (shown in Table 5.2). While drainage is good in most cases, these soils are all highly erodible with the exception of Dixmont. Drainage around trails, the parking area, and roads should be carefully designed to prevent erosion.

**Table 5.2. Acreage by soil series and forest type**

| <b>Broad Type</b>            | <b>Drainage Class</b>   | <b>Wetland</b> | <b>H4B</b> | <b>HS4B</b> | <b>P4B</b> | <b>Other</b> | <b>Grand Total</b> |
|------------------------------|-------------------------|----------------|------------|-------------|------------|--------------|--------------------|
| Rockland Thorndike material  | Excessively drained     |                |            |             | 1.6        |              | <b>1.6</b>         |
| Buxton silt loam             | Somewhat poorly drained | 0.1            |            | 0.7         |            |              | <b>0.8</b>         |
| Dixmont very stony silt loam | Somewhat poorly drained | 0.7            |            | 1.1         |            |              | <b>1.8</b>         |
| Bangor silt loam             | Well drained            |                | 3.8        | 4.0         |            | 0.7          | <b>8.5</b>         |
| Colton gravelly sandy loam   | Well drained            |                | 0.3        | 0.8         | 2.4        |              | <b>3.5</b>         |
| Plaisted gravelly loam       | Well drained            |                |            | 1.0         |            |              | <b>1.0</b>         |
| Stetson-Suffield Complex     | Well drained            | 0.1            |            | 3.6         | 0.6        | 1.3          | <b>5.6</b>         |
| <b>Grand Total</b>           |                         | <b>0.9</b>     | <b>4.1</b> | <b>11.2</b> | <b>4.6</b> | <b>2.0</b>   | <b>22.8</b>        |

Figure 5.2. Soils map



#### 5.3.4. Water Resources

The property has approximately 500 feet of frontage on the Penobscot River. The river is tidal from Bucksport to Veazie and brackish to Hampden. A brook enters the property along the north boundary and widens into a small pond where it meets the old road and current path. It continues through an old box culvert (that needs replacement) and exits through the south boundary heading towards the Penobscot River. There are at least two springs that feed a wetland on the south side of the road across from the small pond.

#### 5.3.5. Boundary Lines

By state law it is the responsibility of the landowner to ensure the boundary lines are properly maintained when harvesting more than 10 acres near a boundary. Lines should be identified and clearly marked with paint and updated when appropriate. Special consideration should be made when harvesting 10 or more acres within 200' of an adjacent owner. A forester should re-paint these lines if they are not clearly visible prior to any harvesting. In cases where lines are no longer visible, a surveyor may be required to re-establish the lines. Property line trees can not be harvested without first obtaining permission from abutting landowner.

The boundary lines appear to be adequate at this time but they should be periodically inspected and updated if necessary. It is much less expensive to renew lines than it is to re-establish lines using a survey. A rock wall along the northern boundary serves as an adequate line. Relatively new flagging can be found along much of the lines.

#### 5.3.6. Forest Cover Types

We used aerial photo-interpretation (true-color contact prints taken by James W. Sewall in April 2006) to determine the productive forest acres and the acres by each forest and non-forest type within the ownership boundary (Figure 5.3). Photo-interpretation was ground-truthed and changed if necessary.

The typing scheme consists of a broad species grouping (H, HS, M, SH, S, C, P, PO), a size class (R, 1-4), and a canopy closure class (A-D). H, M, and S indicate hardwood, mixedwood, and softwood, respectively. C, P and PO designate a stand dominated by cedar (C), pine (P) or poplar [(PO); aspen or balm-of-Gilead]. A single H or S indicates this type comprises 75 percent or more of the volume. For HS or SH types, the first letter indicates the more dominant type. M is used if it cannot be discerned which group is more dominant. An "S" at the end of the type name indicates that the site is wet (i.e. CS3A and SH3CS). The size classes indicate the following:

- R = regeneration, or trees 5' tall or less
- 1 = saplings 1-3" DBH, or about 5-20' tall
- 2 = larger saplings/small polesize trees about 3-5" DBH and 20-40' tall
- 3 = polesize trees, 20-55' tall and 5-9" DBH
- 4 = sawlog size trees, 55'+ tall and 10"+ DBH

The canopy closure classes are:

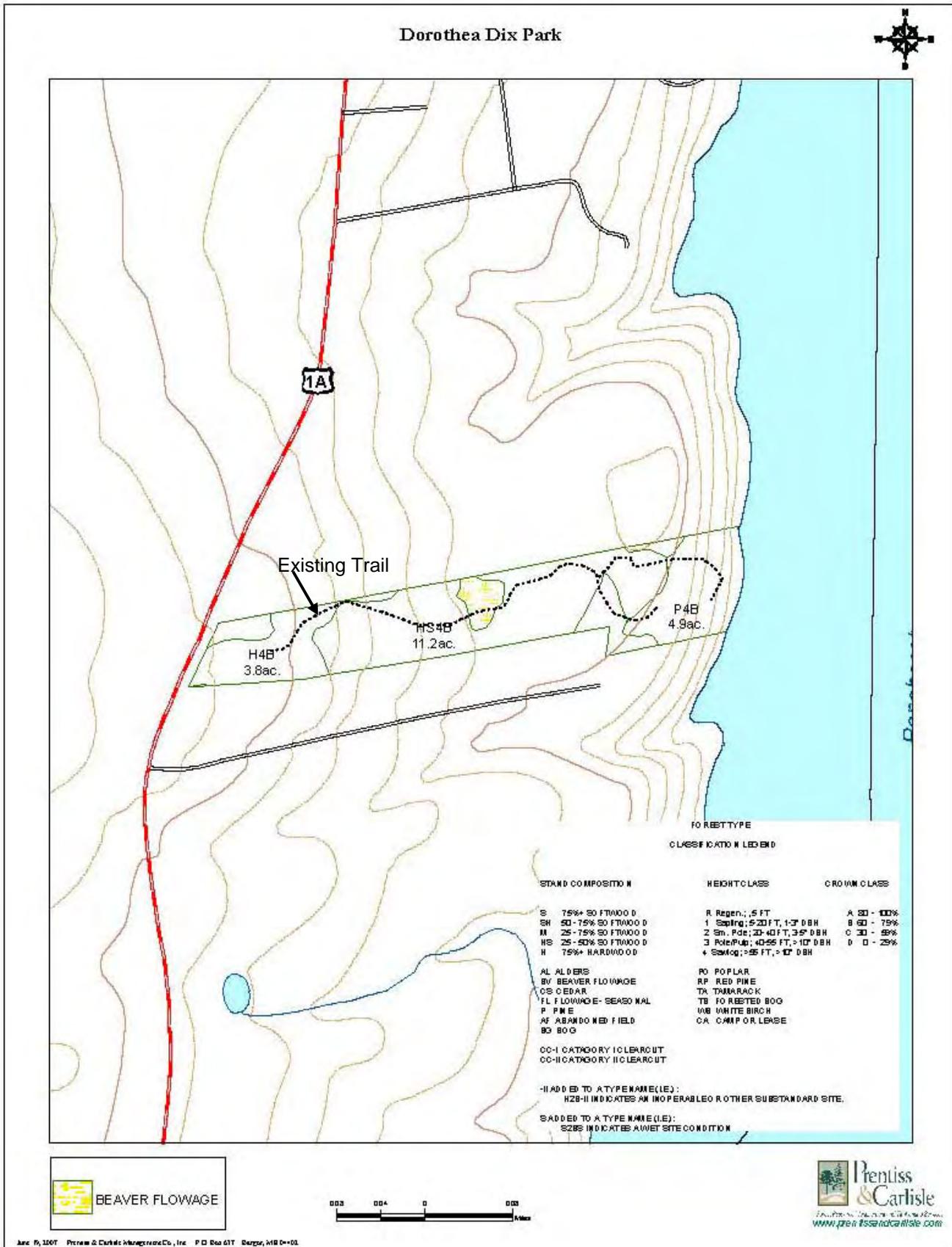
- A = 80 percent or greater
- B = 60-79 percent
- C = 30-59 percent
- D = 0-29 percent

In all we had 3 distinct forest types, which are described in greater detail in the "Detailed Stand Information" section (Table 5.3).

**Table 5.3. Stratification in inventory process showing the forest types that were combined to determine volumes by strata**

| Strata       | Forest Types | Acres     | Plots     |
|--------------|--------------|-----------|-----------|
| H4B          | H4B          | 4         | 2         |
| HS4B         | HS4B         | 11        | 8         |
| P4B          | P4B          | 5         | 3         |
| <b>Total</b> |              | <b>20</b> | <b>13</b> |

Figure 5.3. Type map for property showing forest types delineated from aerial photos and site inspection



### 5.3.7. Timber Volume and Quality

As part of this plan, we completed a timber inventory of the property in May 2007. We installed 13 plots along a grid. The inventory data were stratified according to the forest types developed from the photo-interpretation and ground checking. Across all forested acres, we estimate there are 791 cords of merchantable wood, which equates to 39.6 cords per forested acre  $\pm$  7.6 percent (Table 5.4).

Volume by product is shown in Table 5.5. Approximately 46 percent of the volume is pulp and 11 percent is growing stock (including boltwood), and 42 percent in sawlog volume (including pallet). Pulp volume is wood that cannot be merchandized as sawlogs now or in the future. This includes smaller trees with poor form and large sawlog-size trees that because of stem defects such as rot, seams or excessive branchiness can only be merchandized as pulpwood. These trees occupy valuable space in the forest that could otherwise be used to grow more valuable trees. The “growing stock” portion of volume is comprised of trees that meet sawlog quality specifications but are undersized. Sawlog volume meets the current specifications for logs in regional markets (See product specifications in Appendix).

**Table 5.4. Summary statistics for the Dorothea Dix inventory**

| Forest Type  | Acres     | Plots (#) | Mean         | Standard Deviation | Standard Error | Std Error as a Pct. Of the Mean | Unless a 1 in (N) chance has occurred in sampling, the true mean is with the interval below. |              |              |              |      |
|--------------|-----------|-----------|--------------|--------------------|----------------|---------------------------------|--|--------------|--------------|--------------|------|
|              |           |           |              |                    |                |                                 | N = 10   |              | N = 20       |              |      |
| H4B          | 4         | 2         | 31.23        | 0.00               | 0.00           | 0.00                            | 0.00   | 0.00         | 0.00         | 0.00         | 0.00 |
| HS4B         | 11        | 8         | 35.78        | 10.82              | 3.83           | 10.69                           | 28.53  | 43.03        | 26.73        | 44.83        |      |
| P4B          | 5         | 3         | 54.53        | 14.97              | 8.64           | 15.85                           | 29.30  | 79.76        | 17.34        | 91.71        |      |
| <b>Total</b> | <b>20</b> | <b>13</b> | <b>39.56</b> | <b>0.00</b>        | <b>3.02</b>    | <b>7.62</b>                     | <b>34.18</b>   | <b>44.93</b> | <b>32.99</b> | <b>46.13</b> |      |

**Table 5.5. Volume by product and species**

|                | Veneer (mbf) | Sawlogs (mbf) | Pallet (mbf) | Boltwood (cords) | Growing       |                  | Total (cords) |
|----------------|--------------|---------------|--------------|------------------|---------------|------------------|---------------|
|                |              |               |              |                  | Stock (cords) | Pulpwood (cords) |               |
| W Pine         | 0            | 41            | 0            | 0                | 6             | 259              | 348           |
| Spruce         | 0            | 6             | 0            | 0                | 8             | 8                | 30            |
| Fir            | 0            | 2             | 0            | 0                | 17            | 3                | 25            |
| Hemlock        | 0            | 4             | 0            | 0                | 3             | 0                | 13            |
| Cedar          | 0            | 2             | 0            | 0                | 3             | 19               | 26            |
| Sugar Maple    | 3            | 8             | 5            | 8                | 8             | 14               | 64            |
| Red Maple      | 0            | 13            | 9            | 0                | 20            | 44               | 112           |
| White Ash      | 0            | 5             | 0            | 0                | 0             | 1                | 12            |
| Oak            | 19           | 31            | 5            | 0                | 12            | 17               | 149           |
| Cherry         | 3            | 1             | 0            | 0                | 0             | 2                | 10            |
| Other Hwd      | 0            | 0             | 0            | 0                | 3             | 0                | 3             |
| <b>Tot Swd</b> | <b>0</b>     | <b>55</b>     | <b>0</b>     | <b>0</b>         | <b>37</b>     | <b>289</b>       | <b>442</b>    |
| <b>Tot Hwd</b> | <b>25</b>    | <b>58</b>     | <b>19</b>    | <b>8</b>         | <b>43</b>     | <b>78</b>        | <b>350</b>    |
| <b>Tot All</b> | <b>25</b>    | <b>113</b>    | <b>19</b>    | <b>8</b>         | <b>80</b>     | <b>367</b>       | <b>792</b>    |

### 5.3.8. Species Composition

Approximately 56 percent of the volume is in softwood species (white pine, balsam fir, red spruce, and cedar), and the remaining 44 percent is in hardwood trees (oak, sugar and red maple). In comparison, the statewide average volume (2002) was 16.0 cords per forested acre, of which, approximately 44 percent is in hardwood species. Thus, this forest has substantially more volume than the state average but is typical in terms of softwood to hardwood ratio.

**Table 5.6. Merchantable volume (cord) by diameter class and species**

| DBH      | W Pine | Spruce | Fir | Hem-<br>lock | Cedar | Sugar<br>Maple | Red<br>Maple | White<br>Ash | Oak | Cherry | Other<br>Hwd | Tot<br>Swd | Tot<br>Hwd | Tot All |
|----------|--------|--------|-----|--------------|-------|----------------|--------------|--------------|-----|--------|--------------|------------|------------|---------|
| 5        | 2      | 0      | 3   | 0            | 0     | 5              | 4            | 0            | 0   | 0      | 3            | 5          | 11         | 16      |
| 6        | 4      | 0      | 6   | 0            | 0     | 0              | 9            | 0            | 0   | 0      | 0            | 11         | 9          | 20      |
| 7        | 0      | 10     | 10  | 0            | 6     | 0              | 0            | 0            | 0   | 0      | 0            | 26         | 0          | 26      |
| 8        | 0      | 5      | 5   | 0            | 4     | 0              | 0            | 0            | 7   | 0      | 0            | 15         | 7          | 22      |
| 9        | 0      | 0      | 0   | 0            | 4     | 0              | 0            | 0            | 0   | 0      | 0            | 4          | 0          | 4       |
| 10       | 5      | 5      | 0   | 13           | 0     | 6              | 11           | 0            | 5   | 0      | 0            | 23         | 23         | 46      |
| 11       | 11     | 0      | 0   | 0            | 5     | 7              | 5            | 0            | 0   | 0      | 0            | 16         | 12         | 28      |
| 12       | 18     | 0      | 0   | 0            | 0     | 0              | 17           | 0            | 7   | 0      | 0            | 18         | 23         | 41      |
| 13       | 0      | 0      | 0   | 0            | 0     | 0              | 13           | 0            | 13  | 0      | 0            | 0          | 26         | 26      |
| 14       | 34     | 8      | 0   | 0            | 0     | 11             | 6            | 0            | 7   | 0      | 0            | 42         | 23         | 65      |
| 15       | 10     | 0      | 0   | 0            | 6     | 0              | 0            | 0            | 6   | 0      | 0            | 16         | 6          | 22      |
| 16       | 0      | 0      | 0   | 0            | 0     | 0              | 24           | 0            | 0   | 0      | 0            | 0          | 24         | 24      |
| 17       | 6      | 0      | 0   | 0            | 0     | 0              | 6            | 0            | 12  | 0      | 0            | 6          | 18         | 25      |
| 18       | 9      | 0      | 0   | 0            | 0     | 0              | 7            | 0            | 6   | 10     | 0            | 9          | 23         | 32      |
| 19       | 23     | 0      | 0   | 0            | 0     | 9              | 0            | 0            | 7   | 0      | 0            | 23         | 15         | 39      |
| 20       | 40     | 0      | 0   | 0            | 0     | 9              | 0            | 6            | 7   | 0      | 0            | 40         | 22         | 62      |
| 21       | 0      | 0      | 0   | 0            | 0     | 0              | 0            | 6            | 0   | 0      | 0            | 0          | 6          | 6       |
| 22       | 15     | 0      | 0   | 0            | 0     | 0              | 5            | 0            | 22  | 0      | 0            | 15         | 27         | 42      |
| 23       | 15     | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 6   | 0      | 0            | 15         | 6          | 21      |
| 24       | 31     | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 12  | 0      | 0            | 31         | 12         | 43      |
| 25       | 9      | 2      | 0   | 0            | 0     | 8              | 0            | 0            | 0   | 0      | 0            | 10         | 8          | 19      |
| 26       | 22     | 0      | 0   | 0            | 0     | 9              | 0            | 0            | 21  | 0      | 0            | 22         | 30         | 52      |
| 27       | 22     | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 22         | 0          | 22      |
| 28       | 0      | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 6   | 0      | 0            | 0          | 6          | 6       |
| 29       | 8      | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 6   | 0      | 0            | 8          | 6          | 14      |
| 30       | 8      | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 8          | 0          | 8       |
| 32       | 30     | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 30         | 0          | 30      |
| 33       | 7      | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 7          | 0          | 7       |
| 34       | 6      | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 6          | 0          | 6       |
| 35       | 13     | 0      | 0   | 0            | 0     | 0              | 0            | 0            | 0   | 0      | 0            | 13         | 0          | 13      |
| 36       | 0      | 0      | 0   | 0            | 0     | 0              | 5            | 0            | 0   | 0      | 0            | 0          | 5          | 5       |
| Tot 5-9" | 6      | 15     | 24  | 0            | 14    | 5              | 13           | 0            | 7   | 0      | 3            | 61         | 27         | 88      |
| Tot 10"+ | 342    | 15     | 0   | 13           | 11    | 59             | 99           | 12           | 143 | 10     | 0            | 380        | 321        | 704     |
| Tot All  | 348    | 30     | 24  | 13           | 25    | 64             | 112          | 12           | 150 | 10     | 3            | 441        | 348        | 792     |

## 5.4 Recommended Projects

### 5.4.1 Timber Harvesting

Forests are inherently dynamic, continuously changing over time. The park regenerated from an abandoned old-field about 125 years ago and has gone through several stages of succession. Currently, longer-lived and more shade tolerant species—primarily sugar maple, oak, and pine—are becoming the dominant tree species in the forest, replacing shorter-lived and shade tolerant species such as white birch, black cherry, and balsam fir that dominated the forest for the first 75 years. The change in species composition will continue to occur naturally in the absence of active forest management. However, the result may not be consistent with the goals for the park.

For the park, the goal is to create a more stable forest structure that is less prone to disturbances from insects, disease, and wind. Given these criteria, the ideal forest structure for the park should be a single canopy of well-spaced, large, healthy trees composed of long-lived and relatively disease and insect resistant species. The question is whether to let nature take its course, and essentially do nothing, or to actively manage forest structure to achieve the desired outcome.

Currently, the forest is in an overstocked condition, meaning there are too many trees competing for too few resources (i.e. light, above and below-ground space, nutrients, and water). Either by virtue of location, genetic characteristics or chance, some individual trees are able to capture more of the limited resources than neighboring trees. This process has led to rapid decline in health of trees unable to compete, and to a lesser extent has taken a toll on trees that are “winning” the competition for resources. For example, trees competing for light will change their growth habits and put more energy into height growth at the expense of stem diameter growth and root growth. Exacerbating this problem, the foliage in the lower part of the tree crown is unable to survive because of low light conditions in the lower canopy. The net effect of this is a decrease in live crown ratio (proportion of crown length to stem length), an increase in the height to diameter ratio, and an increase in the shoot to root ratio for individual trees. The combination of these three factors leads to a gradual decline in the health of trees, for both the winners and losers of the competition for limited resources and makes them susceptible to mortality from insect and disease and wind.

Given the current forest condition and goals for the park, we believe active timber management is the correct approach. Through active timber management we can better control mortality, and in turn control the resulting species composition, structure and health of the forest. In addition, harvesting trees now that have been weakened by competition will lessen the negative impacts of competition on the better quality trees. If we wait a decade or more for these weakened trees to die naturally, the surviving trees will be in a weaker state than if we remove the poor quality trees through harvesting. The natural process will lead

to greater mortality in the overstory and open up growing space to regenerate a new cohort of trees in the understory. Over time, the forest will become multi-aged with trees in two or more age classes. While this is an appropriate structure in many cases, it is not appropriate for the park, because it will be too dense to walk or see through, limiting aesthetic and recreational value.

The challenge for timber harvesting is to remove enough trees to improve the health of residual trees but not open up the forest too much so that it leads to regeneration in the understory. To achieve this end, we recommend harvesting about 250-350 cords, about 32-44 percent of the standing live merchantable tree volume. This is a relatively low harvest removal for a forest that averages about 40 cords per acre. The reason for the light harvest recommendation is that the goal is improve the health of the mature trees and inhibit regeneration, thereby creating a more stable forest. Also, it is better to err on the side of light harvest rather than heavy. Additional harvesting can be done in the future if needed.

#### **Silviculture Recommendations**

We recommend crop-tree thinning for the hardwood (H4B) and mixedwood (HS4B) stands. A forester should flag the best quality trees to leave in the stand and compute the standing volume of these trees. The forester should select the best quality oak, sugar maple, and white ash trees as crop trees. In areas where these species do not exist, the forester should select the best quality red maple as a crop tree. If there are neither ash, oak, nor maples, then the forester should select a different species. Crop tree selection should be based on species and tree health (as indicated by tree crown conditions) and wildlife considerations. It is important to note that crop trees should not necessarily be analyzed in terms of economic value as it is not the goal of the Town to maximize the economic value of the timber component of the park. As such, the forester may select a tree with less than ideal stem form as a crop tree over a more valuable stem if he or she believes the less valuable tree is healthier and will hold up to wind forces better. Moreover, we recommend flagging some cull trees as crop trees to serve wildlife. These are trees that are very large in diameter and have large live limbs and expansive crowns.

Crop trees should be well-spaced and without any sizable gaps. The spacing of crop trees should be relative to their size; for example, small crop trees should be more closely spaced than large crop trees. Generally, the spacing should be between 18 and 30 feet between crop trees. There will be situations when large oak trees or possibly high quality sugar maple trees will not be chosen as crop trees but instead will be harvested. These trees should be harvested if they are too close to better quality trees or if the forester believes they should be cut to improve the residual spacing of crop trees. All crop trees should be flagged and measured to estimate the residual post-treatment volume. After the forester is confident that the residual volume will fall within the desired target, all non-crop trees should be painted for removal.

For the pine stand, we recommend a very light thinning designed to remove only the pine that are likely to die over the next 10 years. These are the pine with very poor crowns in the intermediate and overtopped crown classes. We recommend limiting the harvest to less than 33 percent. Additionally, much of this stand is within 250' of the Penobscot River and therefore subject to shoreland protection zoning. A permit must be obtained prior to any harvesting within 250' of the river. Also, it is important that the Town or forester first check to find out if there are any known bald eagle sites in the area and carefully inspect the area for unreported sites along the Penobscot River. If a nest is found, there should be no harvesting near the nest.

#### **Wildlife Recommendations**

Often aesthetic and recreation goals run counter to wildlife goals. For example, while large standing dead trees are valuable for wildlife they may pose a hazard to visitors, and a well-manicured and clean forest may be more attractive to many visitors but a forest sanitized and devoid of any down or standing dead trees is of little benefit to wildlife. The challenge here is to accommodate both interests as best as possible. To meet that end, we recommend removing all standing dead trees that pose a risk to people but leaving those that are less of a risk. We also recommend picking up recently dead trees that are relatively sound but small in diameter. There is little wildlife value in downed trees that are less than 10" in diameter. We recommend leaving a buffer around the pond and leaving most if not all of the dead trees standing around the pond. In our visits to this area in the spring we noted an abundance of songbirds using the area around the wetland, and particularly the standing dead trees around it. These are very important for songbirds, and we believe the park can serve as songbird habitat despite its small size.

#### **Harvest Equipment and Timing**

We recommend a hand-crew and small cable skidder is used for harvesting. We considered a cut-to-length system (processor) but concluded it would not be appropriate for the site and large trees that will be removed. Harvesting should be done during a dry period in the summer or in the winter, and scheduled for 2008 or 2009.

#### **Estimated Volume Removal**

We recommend a harvest removal in the range of 250-350 cords. This range will provide the forester some options in terms of creating semi-cleared areas as authorized by the Town, an allowance for adjusting the prescriptions based on the condition of the forest at the time of harvest, and some room for differences in actual versus predicted volume. The estimated volume removed by species and product reflects the inventory estimates predicted from the sampling and silviculture prescriptions (Table 5.7).

**Table 5.7. Estimate volume removal by species and broad product class**

| <b>Species</b> | <b>Log (MBF)</b> | <b>Hygrade (cords)</b> | <b>Pulp (cords)</b> | <b>Total (cords)</b> |
|----------------|------------------|------------------------|---------------------|----------------------|
| Balsam Fir     | 0.0              | 19.8                   | 5.0                 | 24.8                 |
| Black Cherry   | 7.8              | 0.0                    | 2.0                 | 19.1                 |
| Cedar          | 2.1              | 0.0                    | 21.6                | 26.3                 |
| Hemlock        | 4.2              | 3.5                    | 0.0                 | 12.6                 |
| Other Hwd      | 0.0              | 0.0                    | 2.5                 | 2.5                  |
| Red Oak        | 1.9              | 1.1                    | 5.2                 | 10.5                 |
| Red Maple      | 6.4              | 4.7                    | 22.0                | 40.7                 |
| Spruce         | 5.8              | 8.1                    | 8.0                 | 28.8                 |
| Sugar Maple    | 0.3              | 0.9                    | 4.3                 | 5.9                  |
| W Ash          | 0.0              | 0.0                    | 0.4                 | 0.4                  |
| W Pine         | 11.4             | 0.0                    | 68.8                | 94.0                 |
| <b>Total</b>   | <b>39.8</b>      | <b>38.2</b>            | <b>139.9</b>        | <b>265.7</b>         |

#### 5.4.2. Trail Maintenance and Construction

The Town wishes to increase the utility of the existing trail by widening and extending the existing trail. We recommend that the trail is extended as close as possible to the Penobscot River; that the design of the new trail include one or two loops if possible rather than the existing single back and forth trail. We recommend that the town works with the forester to lay out the trail. The trail could be used for yarding harvested wood from the forest to the road, so it is important that the layout be planned in conjunction with the harvesting.

The existing wooden box culvert that runs beneath the trail is no longer working and needs to be replaced. It is allowing water to run over and pool on the trail causing erosion. Near the top of the trail, runoff from the parking area moves down the trail and is causing erosion. Water bars and runoff ditches should be installed to reduce erosion.

#### 5.4.3. Reduce or Eliminate Honeysuckle

Honeysuckle, an invasive exotic shrub species has proliferated beneath the canopies in the hardwood and mixedwood stands. It is reducing the diversity of understory vegetation by out-competing other tree and herbaceous species and is therefore negatively impacting biodiversity. Honeysuckle impedes the regeneration and growth of more desirable species, such as oak seedlings in two ways: it produces allelopathic chemicals that enter the soil and inhibit the growth of other plants, and it produces a dense canopy that prevents other tree and plant germinants from growing. In addition, it reduces the use of the forest making walking difficult off the trail.

We recommend controlling honeysuckle through a combination of mechanical and chemical methods. An advantage to chemically treating honeysuckle is that it is one of the first species to leaf-out in the spring and the last to drop its leaves fall. As such, a foliar application of Glyphosate, the active ingredient in Roundup Ultra during the fall after other hardwoods have dropped their leaves will minimize the damage to other species. Bags can be placed over non-target species to further minimize damage. A second treatment should be planned the following year to kill seedlings that grow from seed held in the soil. We recommend treating the honeysuckle after the timber harvesting.

## 5.5 Detailed Stand Information

Three stand types were identified and described: H4B, HS4B, and P4B.

### 5.5.1. Stand Type: H4B

The H4B type is composed of sawlog-size hardwood trees dominated by maples (sugar and red) and red oak. The basal area of the merchantable trees is 112.5 square feet per acre and the density is 183 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 10.6". We recommend removing dead and dying trees throughout this stand to create more growing space for the healthiest, long-lived species—primarily red oak and sugar maple.

**Table 5.8. Stand Attributes for H4B type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 4 acres  |
| Composition/ structure              | Composed primarily of hardwood species; sugar maple (37%), red maple (35%), red oak (15%), black cherry (8%), other hardwoods (2%) and balsam fir (3%); trees are generally 50-75' tall, 5-26" dbh; canopy closure is 60-79 percent . QMD = 10.6". |
| Age/history                         | Approximately 125 years old; likely regenerated from field abandonment   |
| Stand health                        | Okay—some recent mortality due to suppression and overmaturity—shorter-lived species should be thinned to reduce over-crowding   |
| Stand volume                        | 31.1 cords/acre  |
| Stand stocking                      | Overstocked  |
| Stand quality                       | Good; approximately 79 percent of volume in growing stock or sawlogs; most rough and rotten volume is due to issues mentioned in "stand health" section  |
| Growth rate                         | Fair; 10-year PAI is 0.28 cds/ac/yr  |
| Project Recommendations             | Thin 35-45% of volume to favor oak and healthy sugar maple   |
| Long range silvicultural objectives | Move towards oak/sugar maple dominance and eliminate short-lived species   |

**Table 5.9. Product Table for H4B stand showing volume by species and product.**

|              | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|--------------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| Balsam Fir   | 0               | 0                | 0               | 0                   | 1.05                        | 0                   | 1.05             |
| Total Swd    | 0               | 0                | 0               | 0                   | 1.05                        | 0                   | 1.05             |
| Sugar Maple  | 0.78            | 1.92             | 1.17            | 0.32                | 0                           | 2.97                | 11.5             |
| Red Maple    | 0               | 0.6              | 1.98            | 0                   | 2.86                        | 2.6                 | 11.08            |
| Red Oak      | 1.3             | 0.64             | 0               | 0                   | 0                           | 0.45                | 4.55             |
| Black Cherry | 0.68            | 0.25             | 0               | 0                   | 0                           | 0.51                | 2.41             |
| Other Hwd    | 0               | 0                | 0               | 0                   | 0.63                        | 0                   | 0.63             |
| Total Hwd    | 2.76            | 3.4              | 3.15            | 0.32                | 3.49                        | 6.54                | 30.18            |
| Total All    | 2.76            | 3.4              | 3.15            | 0.32                | 4.54                        | 6.54                | 31.23            |

### 5.5.2. Stand Type: HS4B

The HS4B type is a mixedwood type with 58 percent hardwood and 42 percent softwood species. It is composed of sawlog-size hardwood trees dominated by maples (sugar and red) and red oak. The basal area of the merchantable trees is 131.3 square feet per acre and the density is 219 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 10.5". We recommend moving this stand to a hardwood dominated stand with oak and sugar maple as the major components. We recommend harvesting all of the softwood and only the poorest quality red maple.

**Table 5.10. Stand Attributes for HS4B type.**

| Attribute                           | Description   |
|-------------------------------------|---|
| Stand area                          | 11 acres  |
| Composition/ structure              | Composed primarily of mixedwood species; red oak (33%), white pine 26%), red maple (17%), spruce (6%), balsam fir (5%) cedar (5%), and white ash (3%); trees are generally 50-75' tall, 5-26" dbh; canopy closure is 60-79 percent . QMD = 10.5". |
| Age/history                         | Approximately 125 years old; likely regenerated from field abandonment  |
| Stand health                        | Poorer than H4B—high mortality in large spruce and fir due to overmaturity—shorter-lived species should be thinned to reduce over-crowding  |
| Stand volume                        | 35.8 cords/acre   |
| Stand stocking                      | Overstocked in places, although some new gaps being created by dying softwood   |
| Stand quality                       | Fair; approximately 58 percent of volume in growing stock or sawlogs; most rough and rotten volume is due to issues mentioned in "stand health" section   |
| Growth rate                         | Average; 10-year PAI is 0.41 cds/ac/yr  |
| Project Recommendations             | Harvest the softwood and some of the red maple to favor oak and healthy sugar maple   |
| Long range silvicultural objectives | Move towards oak/sugar maple dominance and eliminate softwood   |

**Table 5.11. Product Table for HS4B stand showing volume by species and product.**

|             | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-------------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine      | 0               | 0.34             | 0               | 0                   | 0.56                        | 8.07                | 9.34             |
| Spruce      | 0               | 0.33             | 0               | 0                   | 0.74                        | 0.46                | 2.01             |
| Balsam Fir  | 0               | 0.16             | 0               | 0                   | 1.15                        | 0.3                 | 1.87             |
| Cedar       | 0               | 0                | 0               | 0                   | 0.28                        | 1.5                 | 1.78             |
| Tot Swd     | 0               | 0.84             | 0               | 0                   | 2.72                        | 10.32               | 15               |
| Sugar Maple | 0               | 0                | 0               | 0.65                | 0.75                        | 0.23                | 1.63             |
| Red Maple   | 0               | 0.94             | 0.13            | 0                   | 0.76                        | 3.06                | 6.12             |
| W Ash       | 0               | 0.46             | 0.02            | 0                   | 0                           | 0.12                | 1.11             |
| R Oak       | 1.28            | 2.54             | 0.49            | 0                   | 1.1                         | 1.42                | 11.93            |
| Tot Hwd     | 1.28            | 3.94             | 0.64            | 0.65                | 2.61                        | 4.83                | 20.78            |
| Total:      | 1.28            | 4.77             | 0.64            | 0.65                | 5.33                        | 15.15               | 35.78            |

### 5.5.3. Stand Type: P4B

The P4B type is dominated by large, mature white pine. The basal area of the merchantable trees is 170 square feet per acre and the density is 91 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 18.5". We recommend a very light thinning designed to remove only the pine that are likely to die over the next 10 years. These are the pine with very poor crowns in the intermediate and overtopped crown classes. We recommend limiting the harvest to less than 33 percent. Additionally, much of this stand is within 250' of the Penobscot River and therefore subject to shoreland protection zoning. A permit must be obtained prior to any harvesting within 250' of the river.

**Table 5.12. Stand Attributes for P4B type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 11 acres   |
| Composition/ structure              | Composed primarily of white pine (90%) with minor components of hemlock (5%), spruce (3%) and cedar (2%); trees are generally 70-110' tall, 15-35" dbh; canopy closure is 60-79 percent . QMD = 18.5".     |
| Age/history                         | Approximately 125 years old; likely regenerated from field abandonment   |
| Stand health                        | Fair—many of the large pine are hollow for the first 16' of stemwood; mortality present in intermediate and overtopped pine due to overcrowding; smaller pine should be thinned to reduce future mortality |
| Stand volume                        | 54.5 cords/acre  |
| Stand stocking                      | Good   |
| Stand quality                       | Poor; 64% of volume is pulp, primarily due to rot; additional volume (not merchantable) was tallied as cull due to excessive rot   |
| Growth rate                         | Average; 10-year PAI is 0.41 cds/ac/yr   |
| Project Recommendations             | Thin pine with poor crowns to capture merchantable volume before it dies and to prevent hazard trees   |
| Long range silvicultural objectives | Allow trees with best crowns to grow; inhibit regeneration by selectively removing poor quality trees without creating large gaps  |

**Table 5.13. Product Table for P4B stand showing volume by species and product.**

|           | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-----------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine    | 0               | 7.36             | 0               | 0                   | 0                           | 34.06               | 49.1             |
| Spruce    | 0               | 0.43             | 0               | 0                   | 0                           | 0.58                | 1.57             |
| Hemlock   | 0               | 0.83             | 0               | 0                   | 0.7                         | 0                   | 2.57             |
| Cedar     | 0               | 0.42             | 0               | 0                   | 0                           | 0.41                | 1.29             |
| Total Swd | 0               | 9.03             | 0               | 0                   | 0.7                         | 35.05               | 54.53            |
| Total:    | 0               | 9.03             | 0               | 0                   | 0.7                         | 35.05               | 54.53            |

## 6 LL Bean Tract

### 6.1 Plan Summary

The LL Bean tract is located on the north side of Route 202 approximately 1.3 miles northeast of the Coldbrook Road/Route 202 intersection. The tract contains about ¼ mile of frontage on Route 202, and is about 218 acres in size with 194 acres classified as forested. The parcel was owned by the US Government and served as a military installation until 1981. During that time, the primary management objective at that time was to support military training. Clearcutting was used to keep trees and brush from obscuring radar visibility from the training facility. In 1981, the parcel was granted to Ernest Sprowl and Salvatore Messina, who then transferred it to L.L. Bean, Inc. in 1989. In 2004, L.L. Bean granted the property to the Town of Hampden. It is unclear whether the tract was harvested from 1981 through 2004.

Based on our assessment, we believe this tract can be used to meet all of the Town's goals, which are; preserving open space, providing public recreation opportunities, maintaining habitats and ecosystems, protecting water quality and demonstrating good forest management. The objectives for this tract are:

1. Develop active recreation opportunities including recreation trails
2. Improve the aesthetic quality of the property
3. Improve wildlife habitat and biodiversity
4. Realize a positive financial return through careful timber harvests

At 218 acres, the L.L. Bean tract is the largest contiguous timberland tract owned by the Town and the best of the four parcels for timber management. It is also well-located for recreational use (ATV, snowmobile, hiking trails, ski trails) given its frontage on Route 202. There is an extensive trail system throughout the property that should be improved and enlarged to accommodate the planned recreational activities. The parcel would not serve as a peaceful "wilderness" setting because traffic noise is very high from both I-95 and Route 202.

The forest contains three broad age/structural classes. There are 79 acres that apparently regenerated following clearcuts about 30 years ago and comprise the youngest age class. These stands are beginning to produce merchantable size trees (5"+ dbh), will grow rapidly over the next 10-20 years and can be commercially thinned in the next 10-20 years. There are about 70 acres of mature stands that should be harvested within the next 10 years. These stands regenerated 45-70+ years ago resulting from commercial clearcuts. Most of these stands contain residual trees that were not merchantable during the commercial clearcut. We recommend treating these stands within the next 10 years to improve species composition and quality. Last, there are about 45 acres that contain two distinct age classes, with an overstory that is 70+ years old over a younger age class that is about 30 years old. These stands can be harvested within the next decade.

The most challenging aspect of managing this forest is in improving stands that have been degraded due to extensive clearcutting and aggressive harvesting. Mixedwood stands that were clearcut have grown back to pure aspen and aspen/red maple stands, while spruce dominated stands have re-grown to fir, red maple and aspen stands. The change in species composition is typical following aggressive harvesting; mature stands comprised primarily of long-lived shade tolerant or intermediate species are clearcut and regenerate as intolerant stands (i.e. aspen, white birch), or intermediate or tolerant stands comprised of short-lived species (i.e. balsam fir and red maple), or a mix of these types. If left alone, the intolerant stands would eventually be replaced by intermediate and shade tolerant species that are longer-lived (i.e. spruce, red oak, white pine, sugar maple).

The key to forest management on this parcel is to use carefully planned harvesting to accelerate the process of succession and thereby move stands of intolerant and or short-lived species to stands of intermediate/tolerant long-lived species more rapidly than what would occur naturally. Harvest prescriptions should be geared towards altering the current species composition by targeting aspen, white birch, and balsam fir for removal and favoring desirable species (Table 6.1). In addition, poor quality red maple, pine, hemlock, and cedar should be removed.

The change in species composition and quality can take 2-3 entries on a 15-year basis (i.e. 30-45 years) before a marked change in composition and quality is realized. The long-term silviculture strategy is to maintain each stand in an uneven-age state by conducting periodic partial harvests on a 10-20 year interval with the goal of growing large diameter sawlogs.

In total, we recommend harvesting about 860 cords of roundwood, primarily from the SH3A, SH3B, P4D/M2A, S4D/S2B, and P4B stands in the next 5 years. Combined, these types represent 115 acres for an average removal of 7 cords/acre. The P4B and SH3A stands are uniformly well-stocked, at an economically optimal stage for commercial harvesting and will support a higher average removal rate. The HS3B, P4D/M2A, and S4D/S2B stands, however, are marginal in terms of economic operability and highly variable in stocking. Harvesting should not be prescribed uniformly throughout these marginal stands but should vary depending on small-scale stocking, species composition and stand structure. Some areas should be treated with overstory removal, improvement thinning, and group selection while other areas should be left unharvested. Areas treated in these marginal types will have one or more of the following criteria: (1) a higher volume than the average for the type, (2) more trees at risk of dying in the near future, and (3) the presence of good quality spruce, oak, maple or pine (regeneration or pole-size) that could respond to thinning neighboring poor quality trees. These criteria should be assessed on the ground in the harvest planning phase.

**Table 6.1. Species desirability and silvical characteristics for softwood and hardwood (next page) species**

| Broad Type | *Desirability | Species    | Habitat  | Shade Tolerance | Practical Lifespan (yrs) | Insects/Disease  | Size                        | Comments  |
|------------|---------------|------------|--|-----------------|--------------------------|--|-----------------------------|---|
| Softwood   | high          | Red spruce | Fair sites--competes best on poorer drained/shallow soils  | Tolerant        | 250-350                  | Few chronic issues; susceptible to spruce budworm especially when associated with fir  | 15-24" DBH;<br>60-75' tall  | Economically valuable, long lifespan and shade tolerance provide many options for forest management and make red spruce a highly desirable tree   |
|            | high          | White pine | Fair to good sites--occupies deeper better drained soils than spruce, fir, and cedar   | Intermediate    | 200-400                  | Regeneration prone to pine weevil if grown in open conditions but can be reduced if regenerated under a partial canopy; relatively few other issues  | 20-40" DBH;<br>60-120' tall | Economically valuable, long lifespan, good wildlife tree as a perch for raptors, cavity tree for birds and mammals and coarse woody debris for denning; highly desirable tree given the objectives for this forest  |
|            | neutral       | Hemlock    | Fair to good sites--associated with spruce and pine; typically occupies sites with better drainage than spruce and fir         | Very tolerant   | 300-400                  | Large trees prone to red-heart rot, which limits the economic value of stems but increases wildlife value for denning  | 18-33" DBH;<br>50-75' tall  | Relatively low economic value for softwood species, long lifespan and shade tolerance provide many options for forest management; grows large and is valuable as a cavity tree (standing and down) for wildlife   |
|            | neutral       | Cedar      | Poor to fair sites--associated with spruce and pine; typically occupies sites with a little better                             | Tolerant        | 150-350                  | Prone to heart rot   | 10-20" DBH;<br>40-60' tall  | Low economic value because of rot and poor form; good cavity tree for birds   |
|            | low           | Balsam fir | Fair to good sites; generally outcompetes spruce on slightly better drained (somewhat poorly drained), deeper and richer sites | Tolerant        | 70-150                   | Chronically prone to spruce-fir fungi butt rot complex that causes rot at the base of the stem that spreads upwards and leads to winthrow; rot occurs rapidly and generally in trees > 8" DBH; major host for spruce-budworm | 10-20" DBH;<br>60-80' tall  | Grows rapidly, regenerates prolifically, high value for studwood, but difficult to grow for more than 60 years. As such, it is not a good choice as a primary species in an uneven-age forest with the objective of growing large, old sawlog-size trees; some fir component will be present regardless of silviculture. Fir is a good source of cover for snowshoe hare and deer but is a poor source of browse and a last resort for deer/moose |

\*High indicates that management should increase the abundance, neutral indicates no change; low indicates a desire to decrease the abundance

| Broad Type | *Desirability | Species                     | Habitat  | Shade Tolerance | Practical Lifespan (yrs) | Insects/Disease  | Size  | Comments   |
|------------|---------------|-----------------------------|--|-----------------|--------------------------|--|---|--|
| Hardwood   | high          | Red oak                     | Good sites--associated with pine and deeper better drained soils   | Intermediate    | 200-250                  | Few problems   | 20-30" DBH;<br>60-80' tall  | Although less economically valuable on a per board foot basis than sugar maple, oak tends to grow large and straight and produces a high sawlog to pulpwood ratio and is very valuable; acorns are an excellent food source for wildlife                         |
|            | high          | Sugar maple                 | Good to excellent sites--associated with yellow birch and white ash  | Very tolerant   | 150-250                  | Sugar maple borer generally not an issue in Eastern Maine; Eutypella canker less of a problem than with red maple  | 20-30" DBH;<br>60-80' tall  | High economic value for sawlog quality trees; less prone to diseases and stem form problems than red maple; can be regenerated in single-tree gaps because of shade tolerance; long-lived and grows large; regeneration is a good source of browse for wildlife. |
|            | high          | Yellow birch                | Good sites--associated with sugar maple and white ash  | Tolerant        | 150-250                  | Few problems   | 20-30" DBH;<br>60-80' tall  | Economically valuable, relatively resistant to damaging agents, shade tolerant, long-lived and large-growing make yellow birch a valuable species in hardwood and mixedwood stands   |
|            | neutral       | Red maple                   | Fair to good sites--red maple thrives in a wide range of sites and is associated with fir, pine, spruce, white birch and aspen | Tolerant        | 80-130                   | Prone to Eutypella canker, which causes poor stem form and rot reducing the number of sawlog quality trees   | 8-16" DBH;<br>40-65' tall   | Relatively short-lived and shade tolerant; poor stem form and susceptibility to rot and physical wounds reduce the desirability of red maple on lower quality sites  |
|            | low           | White birch                 | Competes well on a wide range of soil and site conditions and is associated with nearly every species on this list             | Intolerant      | 80-130                   | Post-logging decadance, which is mortality due to heavy harvesting around white birch is common in Maine. It is not a recommended tree to leave after a harvest. | 10-20" DBH;<br>50-60' tall  | Low economic value because of rot and poor form; relatively small size, and shade intolerance make white birch a low priority species for this forest  |
|            | low           | Aspen (quaking or bigtooth) | Fair to good sites--occupies deeper better drained soils than spruce, fir, and cedar   | Intolerant      | 60-100                   | Prone to Hypoxylon canker, which effects stem quality; prone to rot in trees > 10" DBH   | 12-20" DBH;<br>60-80' tall (bigtooth generally larger than quaking) | Short-lived species capable of prolific regeneration from seed and root suckering following heavy harvesting; requires nearly full sunlight to regenerate; fast growing and relatively high value for hardwood species   |
|            | low           | Beech                       | Good sites--associated with sugar maple and white ash  | Very tolerant   | ~60 for diseased trees   | Virtually all beech in eastern Maine are infected with beech bark Nectria complex  | 4-8" DBH; 30-50' tall   | Uninfected beech should not be harvested because they produce mast for wildlife and may produce regeneration that are not susceptible to the disease   |

\*High indicates that management should increase the abundance, neutral indicates no change; low indicates a desire to decrease the abundance

## 6.2 Management Objectives and Recommendations

The objectives for the L.L. Bean tract are:

1. Improve the quality of the timber resource
2. Develop active recreation opportunities including recreation trails
3. Improve the aesthetic quality of the property
4. Improve wildlife habitat and biodiversity
5. Realize a positive financial return through careful timber harvests

### 6.2.1. Improve the quality of the timber resource

Improving the quality of the timber resource through active timber management is vital to meeting all of the objectives. A healthy forest is aesthetically pleasing, which is important for recreation; it is beneficial to wildlife because it offers a diversity of forage and shelter; and it produces valuable forest products, which will provide income to the Town to offset costs for developing and maintaining the recreation trail system.

The most effective way to improve the health and productivity of the forest is through prudent harvesting that targets low quality and over-mature trees. Doing so will create the ideal conditions for regenerating high quality trees and valuable tree species, and reduce the forests' susceptibility to damage and mortality.

The forest contains a mixture of young, early successional stands and mature, mid to late-successional stands. The timber management program for this tract is designed to accelerate the development of early-successional stands to more stable late-successional stands. This process will occur in the absence of management but will take several more decades to achieve without active timber management. The management actions described in this plan are designed to move forest structure from short-lived shade intolerant species to longer lived tolerant species that can regenerate and grow from partial harvesting. More tolerant, longer-lived species will provide for a more stable forest that will produce more economically and ecologically valuable species.

### 6.2.2. Develop active recreation opportunities including recreation trails

The L.L. Bean tract is the best timberland property owned by the town for achieving its active recreation goals. The tract is large, already contains some trails, and is well-located for recreational use. Usage of trails is valuable for educational purposes (examining woodlot management and wildlife viewing) and exercise. The types of activities the Town should consider are: snowmobiling, cross-country skiing, running, mountain biking, horseback riding, and ATV riding. Some of these activities may be mutually exclusive so the Town should carefully consider which activities they would like to occur. For example,

ATV use and running and mountain biking is a dangerous mix of activities and snowmobile tracts do not make for good cross-country ski trails.

The town should determine the mix of uses it would like and then design a trail system to meet that use. To do this, we recommend that the Town develop a recreation trail plan that clearly states the goals of the trail system, including the types of recreation that will be permitted, and includes a plan for trail construction and maintenance. Trail design should emphasize loops that lead users back to the starting point without re-tracking ground already covered, thoughtful use-designations, such as snowmobile-only or ski-only in the winter, to keep incompatible uses from occurring on the same trail, and a trail system large enough to accommodate the desired number of users.

#### 6.2.3. Improve the aesthetic quality of the property

The appearance of the forest is an important visual sign of overall health and quality of the forest and forest management. All management activities including timber harvesting and trail development should carefully consider the aesthetic impact of the activity. Harvesting will be designed to minimize the visual impact to visitors. Damage to residual trees, such as scarring and crown breakage should be minimized by using the proper equipment and vigilant oversight. Rutting is unacceptable and if ruts do occur they should be re-graded. Yards should be located to minimize rutting and should be seeded at the end of the harvest. Harvesting should be done in the winter on frozen ground to minimize rutting and soil disturbance.

#### 6.2.4. Improve wildlife habitat and biodiversity

Maintaining biodiversity in the forest is both important in its own right and critical for the long-term production of forest products. Beyond the protection of rare plants and animals, biodiversity provides an important stabilizing mechanism within ecosystems and supports a number of essential functions such as pollination, seed dispersal, the breakdown of nutrients and organic matter, pest control, and other vital processes all of which are critical to the health of the forest.

Through careful planning and management, harvesting timber can be compatible with maintaining biodiversity across this timberland. We believe that the most efficient way to maintain biodiversity across a landscape is to use a combination of a habitat approach, in which broad age-classes are maintained throughout the forest, and stand-level prescriptions that protect or maintain important structure such as snags and den trees for wildlife.

The habitat approach is based on the idea that different species have adapted to a host of conditions including early, mid, and late-successional forests of different sizes and shapes. Even-aged stands created through clearcutting, overstory removal and shelterwood provide early successional habitat. Early

successional habitat is essential for species like snowshoe hare and the predators that rely on snowshoe hare in their diet such as the Canada lynx. Uneven-aged stands created through partial cutting create structure typical of late-successional stands and support species that require this structure. For example, the American pine marten, an animal often referred to as an “umbrella species” for biodiversity that require late-successional habitat, thrives in large areas of trees greater than 30’ tall, with a basal area of 80 ft<sup>2</sup> or more. They are called an umbrella species because the habitat they require is also important for many other similar species. It would not be possible or practical to monitor the population dynamics of every species. Instead, we can try to provide habitat for similar species that have the most restrictive habitat requirements. We call these “umbrella species.” By having at least a portion of your forest in these three different stages you are maintaining an ample supply of habitat for wildlife and plant species that require a broad array of conditions.

Viewing the property from a regional perspective, the surrounding area is a mix of urban, forest, and agricultural use. Nearby private forests are similar in structure to the L.L. Bean tract in its present condition in that they have been aggressively harvested and are in the early to mid-successional stages of development. In the context of these surrounding forests and in light of the other objectives, we recommend to the greatest extent possible managing for mid to late-successional habitat in this forest. That said, there are a number of ecologically important wildlife that cannot be managed for give the location and relatively small size of the tract.

In addition to this habitat approach we have included the results of a survey conducted by the **Maine Natural Areas Program** (MNAP) of important habitat on or near your property. According to their records, there is no documentation of *Rare, Threatened and/or Endangered Plants; Rare and/or Exemplary Natural Communities; or Rare, Threatened and/or Endangered Animals*. The MNAP map indicates there is an area that contains *significant habitat*, shown as a deer wintering area (see attached map “Habitats of Management Concern”). The deer wintering area is on the southern portion of the property and is part of a larger area on the neighboring parcel. Recommendations for managing for deer wintering area include: harvest little or no cedar or hemlock, harvest during the winter to provide browse, use thinning to maintain the overstory cover, attempt to maintain canopy closure at 70 percent or greater that is at least 35’ tall and composed primarily of softwood species. Light thinning can be done and is recommended in deer wintering areas to remove dead and dying trees to improve the health and vigor of the residual stand, which in turn improves the ability of the shelter to reduce snow depths on the ground. In addition, functional travel corridors for deer to adjacent wintering and foraging areas are an important landscape-level consideration.

In addition to maintaining broad age-classes across the forest and protecting rare and endangered species/habitats, it is essential to create or protect important features at a smaller, stand-level scale. The detailed stand-level prescriptions call for:

- retaining vertical structure (having trees of different heights within a stand),
- retaining the natural native species composition,
- maintaining or creating downed woody material, snags and cavity trees,
- ensuring a viable supply of mast (particularly through maintaining oaks that produce a good acorn crop), and
- limiting the disturbance to the forest soils and the forest floor, to reduce potential negative effects on site productivity.

#### 6.2.5. Realize a positive financial return through careful timber harvests

Although monetary gain is not the Town's motivation for managing this parcel it can provide income to help recover the costs of developing and maintaining the recreational plan. Given this objective, we recommend harvesting that targets dead and dying merchantable trees to capture their economic value before it is too late. Also, given the objective of improving the quality of the timber resource through careful harvesting, it would be foolish to not derive income from harvesting.

The financial gain from timber sales is affected by the costs for harvesting and delivering wood to market, the degree to which the wood is properly utilized and marketed, the prices paid at market, and the prevention of theft. Using the proper equipment for the job is critical for reducing harvest costs, optimally utilizing the trees to their highest value, and for meeting the management objectives. It appears that the majority of harvesting in the past has been done with either hand-crews (chainsaw and skidder) or a mechanical system (feller-buncher and grapple skidder). While hand-crews work well in some situations they are not suited for all situations in this forest. A cut-to-length system (processor and forwarder) will result in a greater amount of wood utilized and sold because it is better suited to cutting smaller trees and merchandizing trees to a smaller diameter that would not be economical using a hand-crew or feller-buncher. A processor could be used to work through most of the acreage cutting the dying fir and white birch that would otherwise be left in the forest.

Timber theft is clearly a problem in Maine. To reduce the incidence of theft we recommend hiring a forester to oversee harvesting and ensure that all wood harvested is accounted for.

## 6.3 Property Description

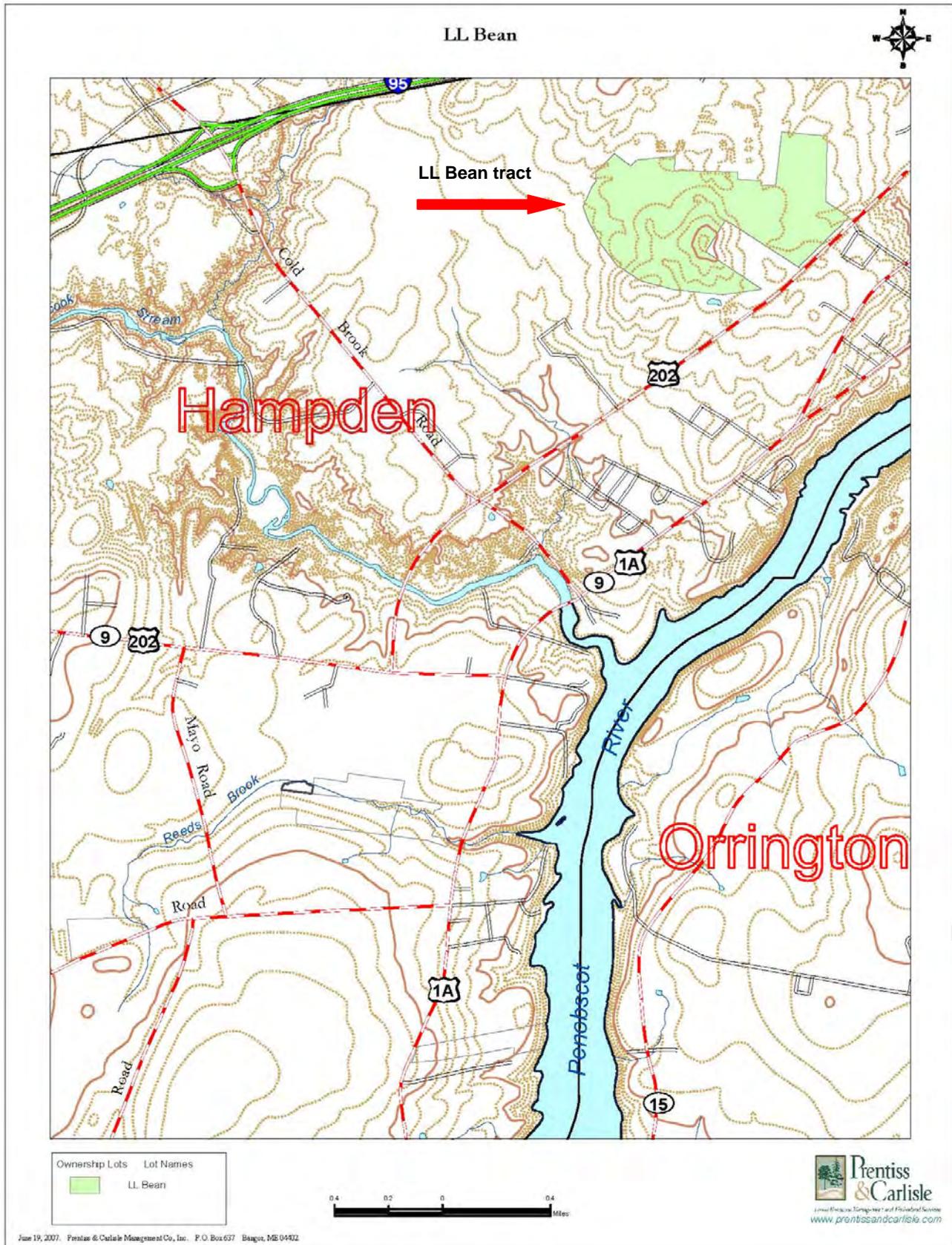
### 6.3.1. Acreage and Location

The L.L. Bean tract is located on the north side of Route 202 approximately 1.3 miles northeast of the Coldbrook Road/Route 202 intersection. The tract contains about ¼ mile of frontage on Route 202. (Figure 6.1). The property is situated between Route 202, I-95 and Coldbrook Road. We estimated the gross GIS acreage to be 218 acres based on information provided by the Town. The forested acres, conventionally defined as the acreage available for harvesting trees (i.e. accessible, productive, and harvesting is not prohibited) was estimated to be 194 acres. Acreage estimates are not the result of a survey but represent the best available information. The acreage calculations by type are shown in Table 6.2.

**Table 6.2. Acreage by forest and non-forest categories**

| Category       | Broad Type   | Acreage Class      | Acres                       |
|----------------|--------------|--------------------|-----------------------------|
| Forested Acres | Softwood     | P4B                | 8                           |
|                |              | S4D/S2B            | 23                          |
|                |              |                    | <u>31</u>                   |
|                | Mixedwood    | HS3B               | 12                          |
|                |              | P4D/M2A            | 22                          |
|                |              | SH2B               | 14                          |
|                |              | SH3A               | 40                          |
|                |              | SH3B               | 10                          |
|                |              | <u>98</u>          |                             |
|                | Hardwood     | H2B                | 53                          |
|                |              | PO2A               | 12                          |
|                |              |                    | <u>65</u>                   |
|                |              |                    | <b>Total Forested Acres</b> |
| Non-Forest     | Water        |                    | <1                          |
|                | Field        |                    | 21                          |
|                | Pipeline ROW |                    | 2                           |
|                |              |                    | <b>Total Non-Forest</b>     |
|                |              | <b>Grand Total</b> | <b>218</b>                  |

Figure 6.1. Location map



### 6.3.2. Forest Age/Disturbance History

The forest is composed of three broad age/structural types:

- (1) young, even-age stands that regenerated from clearcutting about 30 years ago (79 acres);
- (2) mature even-age stands regenerated from heavy harvesting 45-70 or more years ago (70 acres);  
and
- (3) two-age stands that were partially harvested about 30 years ago and contain a 30-year old age-class and a 70+ year old age-class (45 acres).

Much of the heavy harvesting that was done in the mid to late 1970s was clearcutting carried out by the owner at that time, the US government. Clearcutting was used to increase visibility around the training area, possibly for the radar site. At the time the property was owned by the US government (1970s) the forest was likely about 70 years old and likely regenerated from old pasture land likely pasture abandoned around 1900. It cannot be determined if there was active timber harvesting prior to the 1970s. However, it is clear that harvesting during the 1970s had a marked impact on stand structure causing the regeneration of the 79 acres of even-age ~30 year old stands and the partial regeneration of the 70 acres of two-age stands.

### 6.3.3. Soils/Topography

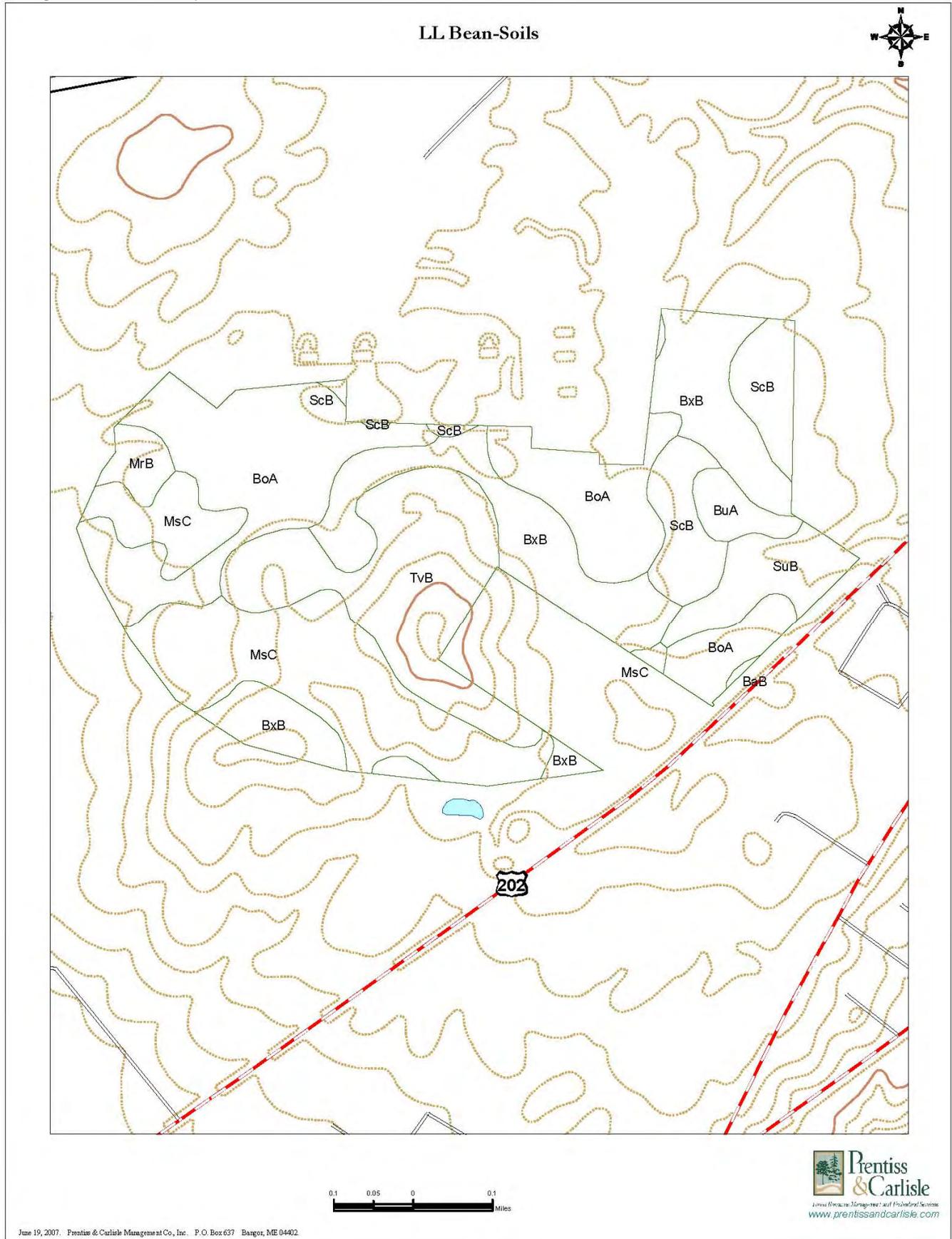
The topography is generally flat throughout the forest with minor topographical relief (2-10 feet). The flat and lowest elevations are generally shallow, organic soils over glacial till that are generally poorly drained. Just a few feet of elevational increase improves the soil depth and drainage to a point where hemlock and pine occur more frequently than fir and spruce. The hardwood dominated stands, which are more an artifact of disturbance history than soils, are found predominantly on the higher elevations. Over time, these will likely go from aspen/white birch stands to pine, fir, and hemlock. As such, it is not accurate to refer to these sites as “aspen”, “birch” or “hardwood” sites.

During our site inspections in April and May, the forest floor was generally wet and many of the trails under a few inches of water. This was consistent with the predominantly poorly drained soils (Table 6.3).

**Table 6.3 Acreage by soil series**

| <b>Broad Type</b>   | <b>Drainage Class</b>   | <b>Total</b> |
|---|-------------------------|--------------|
| Biddeford silt loam, 0-3 percent slopes (BaB)                             | Very poorly drained     | 56           |
| Buxton silt loam, 0-2 percent slopes (BuA)                                | Somewhat poorly drained | 5            |
| Buxton, Scantic, and Biddeford stony silt loams, 0-8 percent slopes (BxB) | Very poorly drained     | 46           |
| Monarda and Burnham extremely stony silt loams, 0-15 percent slopes (MsC) | Very poorly drained     | 45           |
| Monarda and Burnham very stony silt loams, 0-8 percent slopes (MrB)       | Poorly drained          | 4            |
| Scantic silt loam, 0-8 percent slopes (ScB)                               | Poorly drained          | 17           |
| Suffield silt loam, 2-8 percent slopes (SuB)                              | Moderately well drained | 11           |
| Thorndike very stony silt loam, 2-8 percent slopes (TvB)                  | Well drained            | 35           |
| <b>Grand Total</b>  |                         | <b>218</b>   |

Figure 6.2. Soils map



#### 6.3.4. Water Resources

The property has very little water on it. We did not find any sizable brooks or streams although there are a number of small intermittent, unmapped brooks. There is small pond that is partially within the lot and appears to have been an abandoned gravel pit. There is one notable wetland about 1 acre in size in the northwest portion of the property on the H2B stand. These riparian areas are very important for biodiversity.

#### 6.3.5. Boundary Lines

By state law it is the responsibility of the landowner to ensure the boundary lines are properly maintained when harvesting more than 10 acres near a boundary. Lines should be identified and clearly marked with paint and updated when appropriate. Special consideration should be made when harvesting 10 or more acres within 200' of an adjacent owner. A forester should re-paint these lines if they are not clearly visible prior to any harvesting. In cases where lines are no longer visible, a surveyor may be required to re-establish the lines. Property line trees can not be harvested without first obtaining permission from abutting landowner.

The boundary lines appear to be adequate at this time but they should be periodically inspected and updated if necessary. It is much less expensive to renew lines than it is to re-establish lines using a survey. Relatively new flagging can be found along much of the lines.

#### 6.3.6. Forest Cover Types

We used aerial photo-interpretation (true-color contact prints taken by James W. Sewall in April 2006) to determine the productive forest acres and the acres by each forest and non-forest type within the ownership boundary (Figure 6.3). Photo-interpretation was ground-truthed and changed if necessary.

The typing scheme consists of a broad species grouping (H, HS, M, SH, S, C, P, PO), a size class (R, 1-4), and a canopy closure class (A-D). H, M, and S indicate hardwood, mixedwood, and softwood, respectively. C, P and PO designate a stand dominated by cedar (C), pine (P) or poplar [(PO); aspen or balm-of-Gilead]. A single H or S indicates this type comprises 75 percent or more of the volume. For HS or SH types, the first letter indicates the more dominant type. M is used if it cannot be discerned which group is more dominant. An "S" at the end of the type name indicates that the site is wet (i.e. CS3A and SH3CS). The size classes indicate the following:

- R = regeneration, or trees 5' tall or less
- 1 = saplings 1-3" DBH, or about 5-20' tall
- 2 = larger saplings/small polesize trees about 3-5" DBH and 20-40' tall
- 3 = polesize trees, 20-55' tall and 5-9" DBH

4 = sawlog size trees, 55'+ tall and 10"+ DBH

The canopy closure classes are:

A = 80 percent or greater

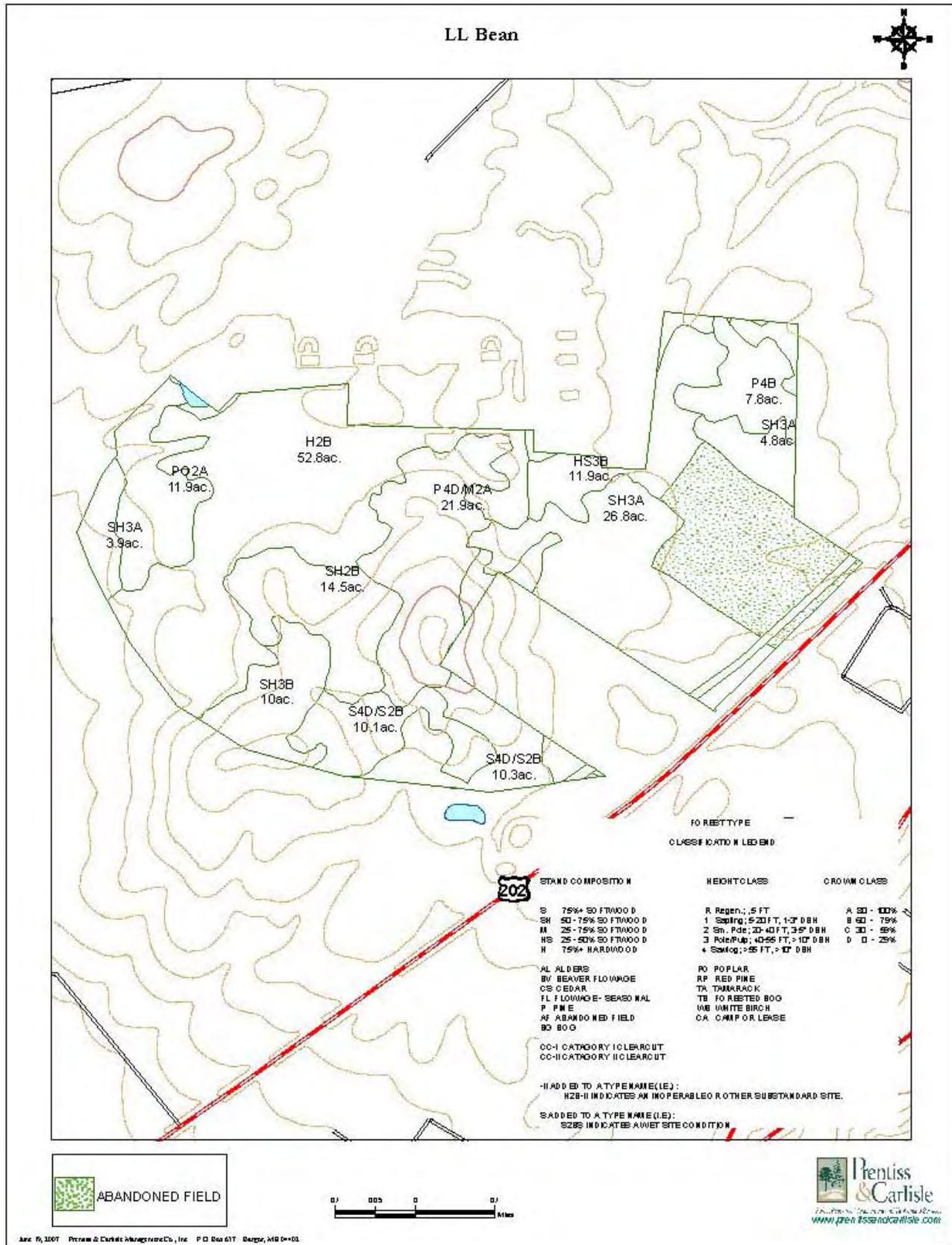
B = 60-79 percent

C = 30-59 percent

D = 0-29 percent

In all we had 9 distinct forest types, which are described in greater detail in the "Detailed Stand Information" section.

Figure 6.3. Type map for property showing forest types delineated from aerial photos and site inspection



### 6.3.7. Timber Volume and Quality

As part of this plan, we completed a timber inventory of the property in May 2007. We installed 39 plots along a grid. The inventory data were stratified according to the forest types developed from the photo-interpretation and ground checking. Across all forested acres, we estimate there are 2,402 cords of merchantable wood, which equates to 12.4 cords per forested acre  $\pm$  10.9 percent (Table 6.4).

Volume by product is shown in Table 6.5. Approximately 38 percent of the volume is pulp and 38 percent is growing stock, and 24 percent in sawlog volume (including pallet). Pulp volume is wood that cannot be merchandized as sawlogs now or in the future. This includes smaller trees with poor form and large sawlog-size trees that because of stem defects such as rot, seams or excessive branchiness can only be merchandized as pulpwood. These trees occupy valuable space in the forest that could otherwise be used to grow more valuable trees. The “growing stock” portion of volume is comprised of trees that meet sawlog quality specifications but are undersized. Sawlog volume meets the current specifications for logs in regional markets (See product specifications in Appendix).

**Table 6.4. Summary statistics for the L.L. Bean inventory**

| Forest Type  | Acres      | Plots (#) | Mean         | Standard Deviation | Standard Error | Std Error as a Pct. Of the Mean | Unless a 1 in (N) chance has occurred in sampling, the true mean is with the interval below. |              |             |              |
|--------------|------------|-----------|--------------|--------------------|----------------|---------------------------------|--|--------------|-------------|--------------|
|              |            |           |              |                    |                |                                 | N = 10   |              | N = 20      |              |
| H2B          | 53         | 10        | 2.96         | 2.89               | 0.91           | 30.82                           | 1.29   | 4.63         | 0.9         | 5.02         |
| HS3B         | 12         | 3         | 16.29        | 16.43              | 9.48           | 58.21                           | 0  | 43.98        | 0           | 57.1         |
| P4B          | 8          | 2         | 41.3         | 0                  | 0              | 0                               | 0  | 0            | 0           | 0            |
| P4D/M2A      | 22         | 5         | 12.85        | 11.82              | 5.29           | 41.14                           | 1.58   | 24.12        | 0           | 27.53        |
| PO2A         | 12         | 3         | 0.71         | 1.23               | 0.71           | 100                             | 0  | 2.78         | 0           | 3.77         |
| S4D/S2B      | 23         | 3         | 10.35        | 6.88               | 3.97           | 38.38                           | 0  | 21.95        | 0           | 27.44        |
| SH2B         | 14         | 2         | 8.18         | 0                  | 0              | 0                               | 0  | 0            | 0           | 0            |
| SH3A         | 40         | 8         | 24.32        | 11.65              | 4.12           | 16.93                           | 16.52  | 32.12        | 14.58       | 34.06        |
| SH3B         | 10         | 3         | 10.3         | 11.16              | 6.44           | 62.58                           | 0  | 29.11        | 0           | 38.02        |
| <b>Total</b> | <b>194</b> | <b>39</b> | <b>12.38</b> | <b>0</b>           | <b>1.35</b>    | <b>10.9</b>                     | <b>10.09</b>   | <b>14.67</b> | <b>9.63</b> | <b>15.14</b> |

**Table 6.5. Volume by product and species**

|              | Veneer (mbf) | Sawlogs (mbf) | Pallet (mbf) | Boltwood (cords) | Growing Stock |            | Total (cords) |
|--------------|--------------|---------------|--------------|------------------|---------------|------------|---------------|
|              |              |               |              |                  | (cords)       | (cords)    |               |
| W Pine       | 0            | 164           | 0            | 0                | 15            | 329        | 681           |
| Spruce       | 0            | 50            | 0            | 0                | 29            | 1          | 147           |
| Fir          | 0            | 12            | 0            | 0                | 123           | 32         | 187           |
| Hemlock      | 0            | 7             | 0            | 0                | 20            | 28         | 65            |
| Cedar        | 0            | 0             | 0            | 0                | 46            | 78         | 124           |
| White birch  | 0            | 0             | 0            | 0                | 128           | 141        | 269           |
| Red Maple    | 0            | 0             | 0            | 0                | 153           | 161        | 314           |
| Aspen        | 0            | 11            | 0            | 0                | 398           | 101        | 523           |
| Oak          | 3            | 10            | 6            | 0                | 0             | 29         | 72            |
| Other Hwd    | 0            | 0             | 0            | 0                | 0             | 20         | 20            |
| <b>Total</b> | <b>3</b>     | <b>253</b>    | <b>6</b>     | <b>0</b>         | <b>913</b>    | <b>921</b> | <b>2,402</b>  |

### 6.3.8. Species Composition

Approximately 50 percent of the volume is in softwood species (white pine, balsam fir, red spruce, hemlock, and cedar), and the remaining 50 percent is in hardwood trees (white birch, red maple, aspen, oak, and other hardwood; Table 6.6). In comparison, the statewide average volume (2002) was 16.0 cords per forested acre, of which, approximately 44 percent is in hardwood species. Thus, this forest has substantially less volume than the state average but slightly more hardwood than average.

**Table 6.6. Merchantable volume (cord) by diameter class and species**

| DBH             | W Pine     | Spruce     | Fir        | Hemlock   | Cedar      | W Birch    | R Maple    | Aspen      | Oak       | Other Hwd | Tot Swd      | Tot Hwd      | Tot All      |
|-----------------|------------|------------|------------|-----------|------------|------------|------------|------------|-----------|-----------|--------------|--------------|--------------|
| 5               | 0          | 0          | 53         | 0         | 0          | 0          | 72         | 100        | 0         | 20        | 53           | 191          | 244          |
| 6               | 0          | 16         | 31         | 0         | 29         | 62         | 63         | 57         | 0         | 0         | 76           | 183          | 258          |
| 7               | 0          | 0          | 49         | 0         | 25         | 54         | 31         | 138        | 0         | 0         | 74           | 223          | 297          |
| 8               | 0          | 20         | 39         | 0         | 0          | 38         | 0          | 51         | 0         | 0         | 58           | 89           | 147          |
| 9               | 15         | 0          | 15         | 15        | 13         | 115        | 20         | 36         | 0         | 0         | 58           | 171          | 228          |
| 10              | 0          | 28         | 0          | 18        | 0          | 0          | 69         | 62         | 0         | 0         | 46           | 131          | 178          |
| 11              | 39         | 28         | 0          | 0         | 40         | 0          | 59         | 17         | 0         | 0         | 107          | 76           | 182          |
| 12              | 20         | 0          | 0          | 0         | 18         | 0          | 0          | 0          | 36        | 0         | 38           | 36           | 74           |
| 13              | 41         | 20         | 0          | 0         | 0          | 0          | 0          | 18         | 0         | 0         | 61           | 18           | 79           |
| 14              | 44         | 0          | 0          | 0         | 0          | 0          | 0          | 24         | 0         | 0         | 44           | 24           | 68           |
| 15              | 58         | 15         | 0          | 14        | 0          | 0          | 0          | 21         | 0         | 0         | 87           | 21           | 109          |
| 16              | 39         | 0          | 0          | 18        | 0          | 0          | 0          | 0          | 0         | 0         | 57           | 0            | 57           |
| 17              | 42         | 21         | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 63           | 0            | 63           |
| 18              | 14         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 14           | 0            | 14           |
| 19              | 35         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 18        | 0         | 35           | 18           | 53           |
| 20              | 67         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 67           | 0            | 67           |
| 21              | 72         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 72           | 0            | 72           |
| 22              | 129        | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 17        | 0         | 129          | 17           | 147          |
| 24              | 24         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 24           | 0            | 24           |
| 28              | 14         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 14           | 0            | 14           |
| 29              | 9          | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 9            | 0            | 9            |
| 30              | 7          | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 7            | 0            | 7            |
| 33              | 12         | 0          | 0          | 0         | 0          | 0          | 0          | 0          | 0         | 0         | 12           | 0            | 12           |
| <b>Tot 5-9"</b> | <b>15</b>  | <b>35</b>  | <b>187</b> | <b>15</b> | <b>66</b>  | <b>269</b> | <b>186</b> | <b>381</b> | <b>0</b>  | <b>20</b> | <b>318</b>   | <b>856</b>   | <b>1,174</b> |
| <b>Tot 10+</b>  | <b>666</b> | <b>112</b> | <b>0</b>   | <b>50</b> | <b>58</b>  | <b>0</b>   | <b>128</b> | <b>142</b> | <b>72</b> | <b>0</b>  | <b>886</b>   | <b>342</b>   | <b>1,228</b> |
| <b>Tot All</b>  | <b>681</b> | <b>147</b> | <b>187</b> | <b>65</b> | <b>124</b> | <b>269</b> | <b>314</b> | <b>523</b> | <b>72</b> | <b>20</b> | <b>1,204</b> | <b>1,198</b> | <b>2,402</b> |

## 6.4 Recommended Projects

### 6.4.1 Timber Harvesting

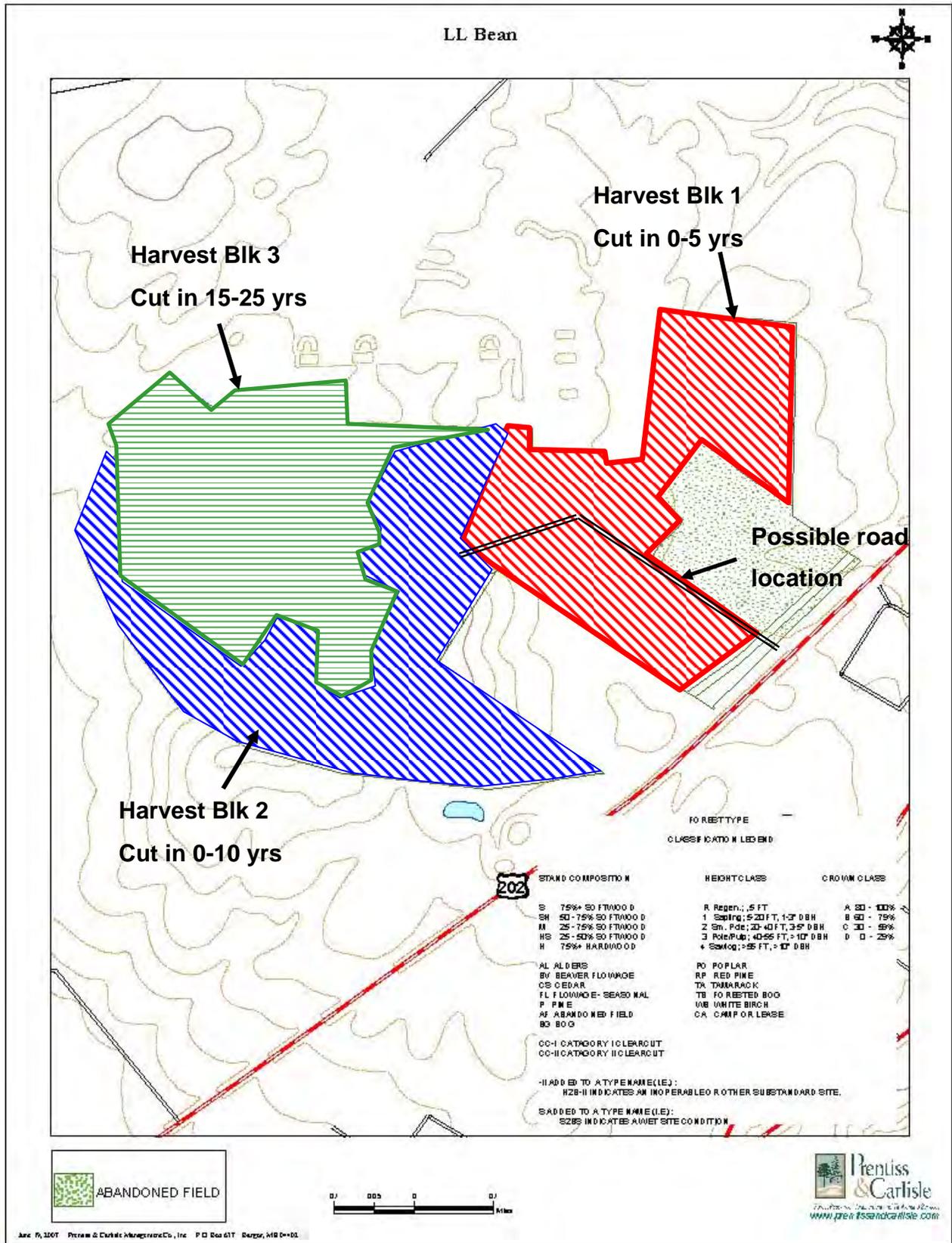
The overall goal for harvesting is to manipulate stand structure and species composition to create a forest structure that will meet the multi-use objectives for this tract. Across the forest, the goals are to create three-age stands dominated by long-lived intermediate shade-tolerant species such as spruce, pine, hemlock, oak, sugar maple, and yellow birch. Such stands will be valuable from an economic, aesthetic and biodiversity perspective.

We recommend partial harvests across 110 of the 194 forested acres that will result in a total harvest of about 839 cords. The harvesting is divided into two harvest blocks (1 & 2; Figure 6.4). Block one is a higher priority than two and should be treated within the next five years. It may be more practical to harvest Block 2 at the same time as Block 1, although from a silvicultural perspective this is not necessary.

**Table 6.7. Projected harvest volumes by harvest block and stand type**

| Harvest Block | Stand       | Acres | Volume (cords/acre) | Volume Cords | Average Removal (cords/acre) | Total Removal (cords) | Percent Removal |
|---------------|-------------|-------|---------------------|--------------|------------------------------|-----------------------|-----------------|
| 1             | P4B         | 8     | 41.3                | 330          | 15                           | 120                   | 36%             |
|               | SH3A (east) | 32    | 24.3                | 768          | 9                            | 284                   | 37%             |
|               | HS3B        | 12    | 16.3                | 194          | 5                            | 60                    | 31%             |
|               | Total       | 52    | 25.1                | 1,292        | 9                            | 464                   | 36%             |
| 2             | P4D/M2A     | 22    | 12.9                | 283          | 6                            | 122                   | 43%             |
|               | SH3A (west) | 4     | 24.3                | 95           | 9                            | 35                    | 37%             |
|               | SH3B        | 10    | 10.3                | 103          | 9                            | 88                    | 85%             |
|               | S4D/S2B     | 23    | 10.4                | 238          | 6                            | 131                   | 55%             |
|               | Total       | 59    | 8.2                 | 480          | 6                            | 375                   | 78%             |
| Grand Total   |             | 110   | 16.1                | 1,773        | 8                            | 839                   | 47%             |

Figure 6.4. Harvest blocks in L.L. Bean tract



### Silviculture Recommendations

Silviculture prescriptions are designed to convert the species composition from short-lived and or shade intolerant trees to longer lived shade tolerant or intermediate tolerant species. In addition, these prescriptions are intended to create three-age stands throughout the forest to meet the Town's various objectives. It will take two to three entries and 30-40 years to convert the forest to the desired species composition and structure.

**Table 6.8. Silviculture prescriptions for stands recommended for harvesting over the next 10 years**

| Stand   | Acres | Volume<br>(cords/ac.) | Percent<br>Removal | Prescription        | Details  | Goal   |
|---------|-------|-----------------------|--------------------|---------------------|--|--|
| P4B     | 8     | 41.3                  | 36%                | Crown Thin          | Harvest suppressed and intermediate pine first and codominants second to achieve a 15-20 foot spacing  | Maintain even-age pine stand but substantially increase average tree diameter  |
| SH3A    | 36    | 24.3                  | 38%                | Improvement<br>Thin | Harvest poor quality trees to create a two-age stand with pine, spruce, and good quality red maple and oak in the overstory, and sufficient growing space for the regeneration of shade tolerant trees | Begin the process of altering single-cohort stand to a three-age stand by removing poor quality trees and undesirable species, thereby creating growing space for regeneration |
| HS3B    | 12    | 16.3                  | 31%                | Improvement<br>Thin | Same as above  | Same as above  |
| P4D/M2A | 22    | 12.85                 | 43%                | Improvement<br>Thin | Target for removal fir, red maple, aspen and poor quality hemlock to favor spruce and pine   | Convert two age class to three age class by thinning the M2A cohort  |
| SH3B    | 10    | 10.3                  | 85%                | Improvement<br>Thin | Harvest fir, white birch, and poor quality red maple   | Improve quality and species composition; initiate regeneration   |
| S4D/S2B | 23    | 10.4                  | 55%                | Improvement<br>Thin | Harvest 5-10" poor quality fir, cedar, red maple and white birch; retain large pine  | Improve quality and species composition; initiate regeneration   |

### Harvest Equipment and Timing

We recommend using a cut-to-length harvest system on the property as it is the best suited to meet the silvicultural objectives. Harvesting should be done in the winter on frozen ground given the wet soil conditions.

#### 6.4.2. Recreation Plan

The Town should form a committee to create a Recreation Plan for this parcel. The first goal should be to determine the mix of uses that will be allowed on the property from the various alternatives (i.e. snowmobile, ATV, hiking, skiing, etc.). Based on the concluded best use(s), the committee should visit nearby recreation areas and determine the trail specifications for the desired use. A trail system should be designed that meets the use requirements. And finally, a construction and maintenance plan should be developed.

## 6.5 Detailed Stand Information

Nine stand types were identified and described: H2B, HS3B, P4B, P4D/M2A, PO2A, S4D/S2B, SH2B, SH3A, SH3B.

### 6.5.1. Stand Type: H2B

The H2B type (53 acres) is composed primarily of 3-5" hardwood trees that are 20-40' tall. It is dominated by aspen with a lesser component of red maple. Red maple trees are generally smaller and regenerated from stump sprouting, while aspen likely regenerated from root suckering following a clearcut that occurred about 30 years ago. There are some residual large white pine trees in the overstory but they are scattered and contribute little to the volume and value and have little affect on the rapidly growing young hardwood trees below. The 10- and 20-year PAI are both 0.95 cords per acre per year. The stand will become financially operable in the next 10-15 years depending on markets and growth rates. The current merchantable volume is 3 cords per acre and is composed of the larger (5-7") aspen. The basal area of the merchantable trees is 16.5 square feet per acre and the density is 99 trees per acre. The total density of all trees is about 2,300 stems per acre. We recommend allowing the stand to grow for another 10-15 years before any harvesting is done.

**Table 6.9. Stand Attributes for H2B type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 53 acres   |
| Composition/ structure              | Composed primarily of aspen (82%), red maple (18%) by density; trees are generally 20-40' tall, 3-5" dbh; canopy closure is 60-79 percent ; QMD = 3.0" |
| Age/history                         | Approximately 30 years old; regenerated from clearcut  |
| Stand health                        | Very good  |
| Stand volume                        | 3.0 cords/acre   |
| Stand stocking                      | Very good  |
| Stand quality                       | Very good  |
| Growth rate                         | Excelent; 10-year PAI is 0.95 cds/ac/yr  |
| Project Recommendations             | None within 10 years   |
| Long range silvicultural objectives | Thin in 10-15 years  |

**Table 6.10 Product table for H2B stand showing volume by species and product.**

|           | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-----------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine    | 0               | 0.18             | 0               | 0                   | 0                           | 0.07                | 0.44             |
| Tot Swd   | 0               | 0.18             | 0               | 0                   | 0                           | 0.07                | 0.44             |
| R Maple   | 0               | 0                | 0               | 0                   | 0                           | 0.26                | 0.26             |
| Aspen     | 0               | 0                | 0               | 0                   | 1.25                        | 1.01                | 2.26             |
| Tot Hwd   | 0               | 0                | 0               | 0                   | 1.25                        | 1.27                | 2.52             |
| Total All | 0               | 0.18             | 0               | 0                   | 1.25                        | 1.34                | 2.96             |

6.5.2. Stand Type: HS3B

The HS3B type (12 acres) is 82 percent hardwood and 18 percent softwood by merchantable volume. It is composed of pole-size aspen and white birch trees beneath large, sawlog-size white pine trees. The basal area of the merchantable trees is 60.0 square feet per acre and the density is 139 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 8.9". We recommend a partial harvest to remove about 1/3<sup>rd</sup> of the volume within the next 10 years. The long-term objective is moving this stand from an aspen dominated stand to a mixedwood stand with components of white pine, spruce, red and sugar maple, and oak. The long-term silviculture goals should foster the growth of longer-lived more shade tolerant species by harvesting aspen and white birch through light partial harvests. The goal is to expedite what would occur naturally (i.e. speed up succession) through careful partial harvests.

**Table 6.11. Stand Attributes for HS3B type.**

| Attribute                           | Description   |
|-------------------------------------|---|
| Stand area                          | 12 acres  |
| Composition/ structure              | Composed primarily of aspen (72%), white pine 18%), and white birch (10%); white pine component is older and larger with trees ranging from 20-35" and generally 60-85' tall; canopy closure is 60-79 percent, and the QMD is 8.9". |
| Age/history                         | Hardwood trees are approximately 45 years old and the pine are 80-100 years old. Hardwood regenerated following a partial overstory removal about 45 years ago  |
| Stand health                        | Generally good; pine have rot within the first 16' of stemwood; aspen is generally healthy  |
| Stand volume                        | 16.3 cords/acre   |
| Stand stocking                      | Very good   |
| Stand quality                       | Excellent; approximately 86 percent of volume in growing stock or sawlogs   |
| Growth rate                         | Fair; 10-year PAI is 0.38 cds/ac/yr   |
| Project Recommendations             | Improvement thinning designed to remove about 30 % of volume  |
| Long range silvicultural objectives | Move towards longer-lived mixedwood species, such as maple, oak, pine and spruce  |

**Table 6.12. Product table for HS3B stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine  | 0               | 0.68             | 0               | 0                   | 0                           | 1.55                | 3.01             |
| Tot Swd | 0               | 0.68             | 0               | 0                   | 0                           | 1.55                | 3.01             |
| W Birch | 0               | 0                | 0               | 0                   | 1.58                        | 0                   | 1.58             |
| Aspen   | 0               | 0.4              | 0               | 0                   | 10.18                       | 0.67                | 11.7             |
| Tot Hwd | 0               | 0.4              | 0               | 0                   | 11.77                       | 0.67                | 13.28            |
| Tot All | 0               | 1.08             | 0               | 0                   | 11.77                       | 2.22                | 16.29            |
| W Pine  | 0               | 0.68             | 0               | 0                   | 0                           | 1.55                | 3.01             |
| Tot Swd | 0               | 0.68             | 0               | 0                   | 0                           | 1.55                | 3.01             |
| W Birch | 0               | 0                | 0               | 0                   | 1.58                        | 0                   | 1.58             |
| Aspen   | 0               | 0.4              | 0               | 0                   | 10.18                       | 0.67                | 11.7             |
| Tot Hwd | 0               | 0.4              | 0               | 0                   | 11.77                       | 0.67                | 13.28            |
| Tot All | 0               | 1.08             | 0               | 0                   | 11.77                       | 2.22                | 16.29            |

### 6.5.3. Stand Type: P4B

The P4B type (8 acres) is dominated by large, mature white pine (75%) with a secondary component of fir (3%), hemlock (4%), red maple (3%), and oak (15%). The basal area of the merchantable trees is 143 square feet per acre and the density is 215 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 11.0", and the merchantable volume is 41 cords per acre.

We recommend harvesting thinning half of the volume within 5 years using crown thinning designed to harvest pine trees with small or poor crowns and reallocate growing space to the healthiest individuals. All of the fir and poor quality oak, hemlock, and red maple should be harvested.

**Table 6.13. Stand Attributes for P4B type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 8 acres  |
| Composition/ structure              | Composed primarily of white pine (75%) with minor components of red oak (15%), hemlock (4%), fir (3%) and red maple (3%); trees are generally 50-70' tall, 5-22" dbh; canopy closure is 60-79 percent . QMD = 11.0". |
| Age/history                         | Approximately 70 years old; undetermined history   |
| Stand health                        | Very good; pine are in excellent health, no remarkable health issues   |
| Stand volume                        | 41.3 cords/acre  |
| Stand stocking                      | Fair—pine are overstocked and in need of thinning  |
| Stand quality                       | Excellent; 74% of volume is classified as growing stock or sawlog  |
| Growth rate                         | Good, although growth is slowing due to overstocking; 10-year PAI is 0.51 cds/ac/yr  |
| Project Recommendations             | Harvest the stand by removing about 40% of volume using crown thinning; remove smaller pine and pine with poor crowns and remove fir, and poor quality red maple, oak, and hemlock                                   |
| Long range silvicultural objectives | Foster the growth of the best quality pine and oak for 30 or more years and then regenerate the stand  |

**Table 6.14 Product table for P4B stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W pine  | 0               | 9.09             | 0               | 0                   | 1.9                         | 9.81                | 30.79            |
| Fir     | 0               | 0                | 0               | 0                   | 1.2                         | 0                   | 1.2              |
| Hemlock | 0               | 0                | 0               | 0                   | 1.84                        | 0                   | 1.84             |
| Tot Swd | 0               | 9.09             | 0               | 0                   | 4.94                        | 9.81                | 33.83            |
| R Maple | 0               | 0                | 0               | 0                   | 1.17                        | 0                   | 1.17             |
| Oak     | 0.39            | 1.29             | 0.73            | 0                   | 0                           | 0.99                | 6.3              |
| Tot Hwd | 0.39            | 1.29             | 0.73            | 0                   | 1.17                        | 0.99                | 7.47             |
| Tot All | 0.39            | 10.38            | 0.73            | 0                   | 6.11                        | 10.8                | 41.3             |

### 6.5.4. Stand Type: P4D/M2A

The P4D/M2A type (22 acres) is a two-aged stand with mature spruce and pine sawlog-size trees above a sapling/pole-size mixedwood age-class. Species composition by merchantable volume is: white pine

(11%), red spruce (7%), balsam fir (12%), hemlock (5%), red maple (14%), and aspen (51%). The older age-class consists of white pine, red spruce and hemlock that are 15-30" in dbh and approximately 80-100 years old. This older, larger cohort comprises only 30 percent of the merchantable volume. The younger cohort consists primarily of 5-10" aspen, fir, and red maple that are about 30-45' tall and about 40 years old. In addition, there is an abundance of 1-4" fir, red maple, and aspen that are sub-merchantable. The total and merchantable basal area are 191 and 57 square feet per acre, respectively. and the density is 215 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) for all trees (including 1-4" dbh) is 3.0" and the merchantable volume is 12.9 cords per acre.

We recommend an improvement thinning to remove poor quality trees within the next 10 years to establish a third age class and improve the quality of the midstory (M2A component). The long-term silviculture goals are to thin the mid-story in about 25-30 years. Understory thinning should target aspen and fir and favor longer-lived species.

**Table 6.15 Stand Attributes for P4D/M2A type.**

| Attribute                           | Description   |
|-------------------------------------|---|
| Stand area                          | 22 acres  |
| Composition/ structure              | Older cohort is 15-30" white pine (11%), spruce (7%) and hemlock (5%); younger cohort is 5-10" aspen (52%), red maple (14%), and fir (12%). |
| Age/history                         | At least two partial harvests over the past 50 years to remove spruce and pine.   |
| Stand health                        | Very good; no remarkable health issues  |
| Stand volume                        | 12.9 cords/acre   |
| Stand stocking                      | Good  |
| Stand quality                       | Excellent; 91% of volume is classified as growing stock or sawlog   |
| Growth rate                         | Good due to abundance of young aspen; 10-year PAI is 0.53 cds/ac/yr and is expected to continue to increase for 30 years.                   |
| Project Recommendations             | Improvement thinning designed to remove poor quality trees and accelerate succession to 3-age stand   |
| Long range silvicultural objectives | Retain most large pine and foster growth of mid-story; thin midstory in 25-30 years   |

**Table 6.16 Product table for P4B/M2A stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine  | 0               | 0.45             | 0               | 0                   | 0                           | 0.55                | 1.35             |
| Spruce  | 0               | 0.43             | 0               | 0                   | 0.02                        | 0                   | 0.95             |
| Fir     | 0               | 0                | 0               | 0                   | 1.52                        | 0                   | 1.52             |
| Hemlock | 0               | 0                | 0               | 0                   | 0                           | 0.66                | 0.66             |
| Tot Swd | 0               | 0.88             | 0               | 0                   | 1.54                        | 1.21                | 4.48             |
| R Maple | 0               | 0                | 0               | 0                   | 1.81                        | 0                   | 1.81             |
| Aspen   | 0               | 0                | 0               | 0                   | 6.56                        | 0                   | 6.56             |
| Tot Hwd | 0               | 0                | 0               | 0                   | 8.37                        | 0                   | 8.37             |
| Tot All | 0               | 0.88             | 0               | 0                   | 9.91                        | 1.21                | 12.85            |

### 6.5.5. Stand Type: PO2A

The PO2A type (12 acres) is a young, vigorous aspen stand that regenerated following a clearcut about 30 years ago. The stand is comprised of 1-5" aspen with very little merchantable volume at this time (<1 cord/acre). The total basal area is 113 square feet per acre and the quadratic mean diameter is 2.3". The predicted growth rates are very high over the next 20 years with PAI estimates of 0.93 and 1.00. These high growth rates are a result of in-growth—small, presently unmerchantable trees growing into merchantable size classes.

There are two possibilities for treating this stand: (1) conduct a semi-commercial thinning within five years or (2) wait 10-20 years to do a commercial thinning. The first option would be designed to reduce stem density and create more growing space for the best quality aspen to increase growth rates. Such a thinning could produce small diameter pulpwood (3-5" dbh trees) and biomass that could be sold to local markets. However, the costs for the operation would be close to the mill sale revenue. This option should be discussed and evaluated on the ground to assess whether it would produce a net loss or gain given the mill and contractor prices at that time. Under current market conditions, the margin is too tight to break even. We do not recommend this option if the net result is a cost to the Town.

**Table 6.17 Stand Attributes for PO2A type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 12 acres   |
| Composition/ structure              | Monoculture of aspen 1-5" dbh and approximately 30 feet tall   |
| Age/history                         | Stand regenerated following a clearcut that occurred about 30 years ago.   |
| Stand health                        | Very good; no remarkable health issues   |
| Stand volume                        | <1 cord/acre   |
| Stand stocking                      | Fair-good—some areas are overstocked and would respond to a semi-commercial thinning   |
| Stand quality                       | Excellent  |
| Growth rate                         | Excellent due to abundance of young aspen reaching merchantable size in the next 10 years; 10-year PAI is 0.93 and is expected to continue to increase to 1.00 cds/ac/yr in the next 10-year period. |
| Project Recommendations             | Semi-commercial thinning to reduce overstocking (only if revenue >= costs) or do nothing depending on economics  |
| Long range silvicultural objectives | Foster the rapid growth of aspen and harvest in 20-30 years  |

**Table 6.18 Product table for P02A stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| Aspen   | 0               | 0                | 0               | 0                   | 0                           | 0.71                | 0.71             |
| Tot Hwd | 0               | 0                | 0               | 0                   | 0                           | 0.71                | 0.71             |
| Tot All | 0               | 0                | 0               | 0                   | 0                           | 0.71                | 0.71             |

### 6.5.6. Stand Type: S4D/S2B

The S4D/S2B type (23 acres) is a two-aged stand with mature spruce and pine sawlog-size trees above a sapling/pole-size softwood age-class. Species composition by merchantable volume is: white pine (24%), red spruce (24%), balsam fir (25%), cedar (7%), white birch (11%), and other hardwood (8%). The older age-class consists of white pine and red spruce 11-22" in dbh and approximately 70-90 years old. This older, larger cohort comprises 48 percent of the merchantable volume. The younger cohort consists primarily of 5-8" fir, cedar and white birch that are about 30-45' tall and about 40 years old. In addition, there is an abundance of 1-4" fir, spruce, cedar and white birch, that are sub-merchantable. The total and merchantable basal area are 122 and 50 square feet per acre, respectively. The density is 2,298 (total) and 163 (merchantable) trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) for all trees (including 1-4" dbh) is 3.1" and the volume is 10.4 cords per acre.

We recommend an improvement thinning designed to remove poor quality trees and accelerate the development of three age classes. The PAI is predicted to be relatively low over the next 10 years (0.28) but increase in the second decade (2017-27 to 0.56 cords/acre/year). The long-term silviculture goals are to remove the overstory and thin the understory in about 10-15 years. Understory thinning should target fir and white birch and favor spruce and pine.

**Table 6.19 Stand Attributes for S4D/S2B type.**

| Attribute                   | Description  |
|-----------------------------|--|
| Stand area                  | 23 acres   |
| Composition/ structure      | Two-age stand with a 70-90 year old overstory of pine and spruce (11-22") over a younger cohort (~40 years old) of fir, spruce, cedar and white birch (5-8") |
| Age/history                 | Younger age-class regenerated following a partial harvest about 40 years ago.  |
| Stand health                | Fair; larger pine have rot in the first 16' and fir should be closely monitored for butt rot   |
| Stand volume                | 10.35 cords/acre   |
| Stand stocking              | good—younger cohort is well-stocked  |
| Stand quality               | Fair; pulpwood is 43 percent of total volume; large pine and some small fir have rot; some pine have excessive limbs   |
| Growth rate                 | Fair; 10-year PAI is 0.29 but next 10-year PAI (2017-27) is 0.56. Second decade growth is higher due to spruce and fir reaching merchantable size.           |
| Project Recommendations     | Improvement thinning designed to remove poor quality trees and accelerate succession to 3-age stand  |
| Long range silv. objectives | Retain most large pine and foster growth of mid-story; thin midstory in 25-30 years  |

**Table 6.20 Product table for S4D/S2B stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine  | 0               | 0.43             | 0               | 0                   | 0                           | 1.67                | 2.52             |
| Spruce  | 0               | 0.91             | 0               | 0                   | 0.26                        | 0                   | 2.44             |
| Fir     | 0               | 0.3              | 0               | 0                   | 1.06                        | 0.74                | 2.62             |
| Cedar   | 0               | 0                | 0               | 0                   | 0.74                        | 0                   | 0.74             |
| Tot Swd | 0               | 1.63             | 0               | 0                   | 2.06                        | 2.41                | 8.31             |
| W Birch | 0               | 0                | 0               | 0                   | 0                           | 1.18                | 1.18             |
| Oth Hwd | 0               | 0                | 0               | 0                   | 0                           | 0.86                | 0.86             |
| Tot Hwd | 0               | 0                | 0               | 0                   | 0                           | 2.04                | 2.04             |
| Tot All | 0               | 1.63             | 0               | 0                   | 2.06                        | 4.45                | 10.35            |

### 6.5.7. Stand Type: SH2B

The SH2B type (14 acres) is a of 1-4” mixedwood stand composed of white pine (11%), red spruce (14%), balsam fir (43%), aspen (10%), red maple (10%), and white birch (11%) trees that are 10-30’ tall. The stand likely regenerated following a clearcut about 30 years ago. There are some residual trees that were left after this harvest: 7-10” white birch and 18-25” white pine that combine for about 8.2 cords per acre.

The 10- and 20-year PAI are 0.66 and cords per acre per year. The higher growth rate in the second decade (2017-2027) is driven by the age structure—the abundance of 2-4” stems. The stand will become financially operable in the next 10-15 years depending on markets and growth rates. The basal area of the total and merchantable stand is 93.6 and 30 square feet per acre, respectively. The density is 2,093 and 26 trees per acre for total and merchantable stems, respectively. We recommend allowing the stand to grow for another 10-15 years before any harvesting is done, at which time the overstory should be removed and the younger cohort thinned to remove fir, aspen, white birch, and poorly formed red maple. The long-term objective is to move this stand to a softwood type dominated by red spruce and white pine.

**Table 6.21 Stand Attributes for SH2B type.**

| Attribute                           | Description  |
|-------------------------------------|--|
| Stand area                          | 14 acres   |
| Composition/ structure              | Mixedwood stand of 1-4” sapling/polesize trees that are 10-30’ tall. Fir comprise 43% of the trees (density basis) and the remainder are an even amount of spruce, pine, aspen, white birch, and red maple. Merchantable volume of 8.2 cords/acre is comprised of residual white birch and pine that were left following the commercial clearcut 30 years ago. |
| Age/history                         | Stand regenerated following a commercial clearcut about 30 years ago.  |
| Stand health                        | Good; sub-merchantable trees are healthy and growing rapidly   |
| Stand volume                        | 8.18 cords/acre  |
| Stand stocking                      | good—younger cohort is well-stocked  |
| Stand quality                       | Good;  |
| Growth rate                         | Fair; 10-year PAI is 0.28 but next 10-year PAI (2017-27) is 0.66. Second decade growth is higher due to spruce and fir reaching merchantable size.   |
| Project Recommendations             | None in this 10-year period  |
| Long range silvicultural objectives | Thin fir, aspen and white birch in 15-20 years to favor spruce and pine; move stand from mixedwood to spruce/fir/pine dominated  |

**Table 6.22 Product Table for SH2B stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine  | 0               | 1.83             | 0               | 0                   | 0                           | 2.59                | 6.16             |
| Tot Swd | 0               | 1.83             | 0               | 0                   | 0                           | 2.59                | 6.16             |
| W Birch | 0               | 0                | 0               | 0                   | 0                           | 2.02                | 2.02             |
| Tot Hwd | 0               | 0                | 0               | 0                   | 0                           | 2.02                | 2.02             |
| Tot All | 0               | 1.83             | 0               | 0                   | 0                           | 4.61                | 8.18             |

### 6.5.8. Stand Type: SH3A

The SH3A type (40 acres) is a relatively high volume mixedwood stand with 56 percent hardwood and 44 percent softwood by merchantable volume. It is composed of pole to log-size red maple (22%), white pine (21%), white birch (20%), aspen (11%), cedar (9%), red spruce (6%), balsam fir (5%), hemlock (4%), and red oak (2%). The basal area of the merchantable trees is 99.3 square feet per acre and the density is 266 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 8.3”.

Projected growth rates in the absence of any management are predicted to be steady for the next 20 years (~0.47 cords/acre/year) and then begin to decline in 30 years. The key for this stand is to maintain this growth rate, but on more valuable species and individuals and for a longer period of time. In the absence of harvesting, much of the growth will be to continue pulpwood production on poor quality trees. Such growth will begin to crash in 30-40 years. We recommend harvesting the fir, aspen, and white birch, and cutting the poor quality red maple and pine. The total removal should be about 8-10 cords per acre. The silviculture goal is to expedite what would occur naturally (i.e. speed up succession) through careful partial harvests that favor the longer-lived intermediate and shade tolerant species (spruce, pine, hemlock, and oak) over the shorter-lived species (fir, aspen, white birch). Most of the large pine should be left with the exception of pine with poor crowns or excessive branchiness to allocate more growing space to higher value individuals. Because red maple is prone to disease and poor form we recommend cutting red maple trees that are rough and rotten, but leaving good quality stems. The long-term objective is to slightly change the species composition so that it is dominated by white pine, spruce, hemlock, cedar, and oak in a 10-30-year period. We believe that this change would occur naturally but would take 50-70 years.

| <b>Attribute</b>                    | <b>Description</b>   |
|-------------------------------------|--|
| Stand area                          | 40 acres   |
| Composition/ structure              | Mixedwood stand of 5-9” pole/sawlog size trees that are 40-50’ tall. In addition, there are residual white pine that are older and larger (18-29”) than the main stand. Species composition by volume is white pine (21%), spruce (6%), fir (5%), hemlock (4%), cedar (9%), white birch (20%), red maple (22%), aspen (11%), and oak (2%). |
| Age/history                         | Stand is approximately 60 years old although older pine are about 100 years old  |
| Stand health                        | Many of the larger pine have rot in the first 16’; cedar, white birch and hemlock also have considerable rot; most of red maple shows signs of <i>Eutypella</i> canker, a common disease occurring in red maple caused by the fungus <i>Eutypella parasitica</i> .   |
| Stand volume                        | 24.3 cords/acre  |
| Stand stocking                      | Good—younger cohort is well-stocked  |
| Stand quality                       | Fair; 48% of volume is pulp with pine, cedar, red maple, and white birch having the highest proportions of pulp to growing stock/sawlog volume   |
| Growth rate                         | Good; 10-year PAI is 0.47 and next 10-year PAI (2017-27) is 0.48. Growth declines to 0.43 in third period.   |
| Project Recommendations             | Partial harvest designed to change species composition to favor pine, spruce, hemlock and oak and remove poor quality stems  |
| Long range silvicultural objectives | Partial harvesting on a 15-year interval to continually improve species composition and quality with the goal of allocating growing space to the growth of large, sawlog-size trees  |

**Table 6.24. Product Table for SH3A stand showing volume by species and product.**

|           | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-----------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine    | 0               | 0.69             | 0               | 0                   | 0                           | 3.54                | 5.03             |
| Spruce    | 0               | 0.32             | 0               | 0                   | 0.57                        | 0.03                | 1.38             |
| Fir       | 0               | 0.12             | 0               | 0                   | 0.93                        | 0                   | 1.25             |
| Hemlock   | 0               | 0.18             | 0               | 0                   | 0.14                        | 0.33                | 0.9              |
| Cedar     | 0               | 0                | 0               | 0                   | 0.71                        | 1.44                | 2.15             |
| Tot Swd   | 0               | 1.32             | 0               | 0                   | 2.36                        | 5.33                | 10.71            |
| W Birch   | 0               | 0                | 0               | 0                   | 2.73                        | 2.14                | 4.88             |
| Red Maple | 0               | 0                | 0               | 0                   | 2.6                         | 2.85                | 5.45             |
| Aspen     | 0               | 0.15             | 0               | 0                   | 1.61                        | 0.78                | 2.75             |
| Oak       | 0               | 0                | 0               | 0                   | 0                           | 0.53                | 0.53             |
| Tot Hwd   | 0               | 0.15             | 0               | 0                   | 6.94                        | 6.31                | 13.61            |
| Tot All   | 0               | 1.47             | 0               | 0                   | 9.3                         | 11.64               | 24.32            |

6.5.9. Stand Type: SH3B

The SH3B type (10 acres) is a mixedwood stand with 67 percent softwood and 33 percent hardwood by merchantable volume. It is composed of pole to log-size balsam fir (33%), red maple (33%), cedar (20%), and red spruce (15%). The basal area of the merchantable trees is 45 square feet per acre and the density is 170 trees per acre. The quadratic mean diameter (diameter of the tree with the average basal area) is 7.0”.

Projected growth rates in the absence of any management are predicted to increase slightly over the next 30 years (0.27, 0.36, 0.40 cords/acre/year, respectively for the next three decades) and then begin to decline in 40 years. We recommend a partial harvest to improve species composition and quality. The long-term silviculture is similar to the SH3A stand, to change the species composition to favor spruce and pine.

**Table 6.25. Stand Attributes for SH3B type.**

| Attribute                           | Description   |
|-------------------------------------|---|
| Stand area                          | 10 acres  |
| Composition/ structure              | Mixedwood stand of 5-15” pole/sawlog size trees that are 40-50’ tall. Species composition by volume is fir (33%), red maple (33%), cedar (20%), and red spruce (15%).                     |
| Age/history                         | Stand is approximately 50 years old, although there are some older residual trees that are about 100 years old.   |
| Stand health                        | Fair; nearly all cedar contains rot, most of red maple shows signs of <i>Eutypella</i> canker, a common disease occurring in red maple caused by the fungus <i>Eutypella parasitica</i> . |
| Stand volume                        | 10.3 cords/acre   |
| Stand stocking                      | fair—stocking is highly variable with some areas poorly stocked and others with adequate stocking   |
| Stand quality                       | Poor; cedar and red maple are very poor quality; fir is fair  |
| Growth rate                         | Fair; 10-year PAI is 0.27 and next 10-year PAI (2017-27) is 0.36.   |
| Project Recommendations             | Partial harvest designed to change species composition to favor pine, spruce, hemlock and oak and remove poor quality stems   |
| Long range silvicultural objectives | Partial harvesting on a 15-year interval to continually improve species composition and quality with the goal of allocating growing space to the growth of large, sawlog-size trees       |

**Table 6.26. Product table for SH3B stand showing volume by species and product.**

|         | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|---------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| Spruce  | 0               | 0.67             | 0               | 0                   | 0                           | 0                   | 1.53             |
| Fir     | 0               | 0                | 0               | 0                   | 1.87                        | 1.51                | 3.38             |
| Cedar   | 0               | 0                | 0               | 0                   | 0                           | 2.03                | 2.03             |
| Tot Swd | 0               | 0.67             | 0               | 0                   | 1.87                        | 3.55                | 6.94             |
| R Maple | 0               | 0                | 0               | 0                   | 0                           | 3.35                | 3.35             |
| Tot Hwd | 0               | 0                | 0               | 0                   | 0                           | 3.35                | 3.35             |
| Tot All | 0               | 0.67             | 0               | 0                   | 1.87                        | 6.9                 | 10.3             |

## 7 Main Road South

### 7.1 Plan Summary

The Main Road South tract is situated between Main Road South (Route 1A) and Mayo Road; to the east and west, respectively, and south of the Constitution Avenue subdivision. The parcel has no road frontage, but the most likely access points come from Liberty Road (off of Constitution Avenue) or from the middle school (off of Main Road South). The tract is about 63 acres in size with 55 acres classified as forested. Reeds Brook runs through the parcel from west to east where it eventually runs into the Penobscot River.

Based on our assessment, we believe this tract can be best used to meet the Town's goals for active recreation and forest demonstration. Perhaps the most valuable attribute of the parcel is its location behind the middle and elementary schools. There is a beaver viewing area behind the middle school that is used for education purposes. Additional "outdoor classrooms" could provide for more diverse education opportunities. Forest management, although secondary to recreation and demonstration, can be used to enhance recreation value and provide the setting for demonstrating the science of forest ecology and good forest management. Forest management as a primary use is not appropriate for this lot given the small size and lack of good existing forest structure.

The parcel receives a lot of use for recreation purposes. A snowmobile trail bisects the property following the gas line right-of-way; ATV use occurs on this trail as well; we found a few tree stands that have been recently used for bowhunting deer; and trails are actively used (primarily to get to and from the school) on the eastern half of the lot.

Based on our assessment, and in support of the Town's goals, the objectives for this tract are threefold:

1. Improve existing recreation trails
2. Create an outdoor classroom to serve the school and public
3. Harvest timber with the primary objective of serving as a demonstration of good forest management

## 7.2 Management Objectives and Recommendations

### 7.2.1. Improve existing recreation trails

Implicit in any planning for this parcel is the protection of water quality in Reeds Brook. Currently, a snowmobile trail crosses through the brook. While the impact to water quality may be minimal when the brook is frozen solid, activity from snowmobiles and ATVs is creating ruts in the brook bed, erosion, and sedimentation. The first and highest priority for this tract is the construction of a bridge to cross the brook. There may be funds available to offset the cost of the snowmobile bridge.

The snowmobile trail follows a gas line right-of-way that is perpendicular to the brook. Just south of the brook the trail runs up a gradual slope. Runoff from rain water and snowmelt runs down the trail and into the brook causing erosion and sedimentation. Given the problems with water quality and erosion, the trail needs to be properly drained, including the installation of culverts and water bars.

Once the bridge and drainage problems are fixed, a thorough trail construction and maintenance plan should be developed to determine the permitted uses (i.e. ATV, snowmobile, etc.), the trail standards for the concluded uses (i.e. trail widths, number and length of trails), a trail system design, and a development of trail costs for construction and maintenance.

### 7.2.2. Create an outdoor classroom to serve the school and public

Given the close proximity of the parcel to the public schools the parcel is ideally located to establish an "outdoor classroom." An outdoor classroom can be used to enhance all parts of a school's curriculum; particularly science and math. Project Learning Tree offers grants for establishing outdoor classrooms as well as guidelines for how to make a project successful. There is a beaver viewing area adjacent to this parcel between the parcel and the school on Reeds Brook that is likely used by the school. We recommend designing and building similar areas throughout the forest.

A walking trail leads from the school to this area and extends westerly. Heading west on the trail, there is a forested wetland on either side that could serve as a learning area. Beyond the wetland there is a regenerating mixed wood stand that is about 10 years old with spruce and birch. This could serve as an excellent area to teach about forest succession and competition. Traveling further west and crossing the Brook, the parcel transitions to a mature conifer forest providing an excellent example of a mature Maine forest. Within this block (area west of the right-of-way) one could develop a demonstration area showcasing forest management activities and different forest harvesting and silviculture activities to promote sustainable forest management.

All of these destinations or “classrooms” can be created within a 15-minute walk from the elementary and middle schools. We recommend that the Town work with Project Learning Tree to develop and plan the outdoor classroom.

7.2.3. Harvest timber with the primary objective of serving as a demonstration of good forest management

From a timber management perspective, the area west of the pipeline is in need of some level of harvesting. This area is about 16 acres in size and contains about 350 cords. We recommend thinning out the poor quality trees to increase the health and aesthetic value of the forest. Any harvesting should be planned in accordance with the outdoor classroom planning and should be done primarily to serve this purpose.

## 7.3 Property Description

### 7.3.1. Acreage and Location

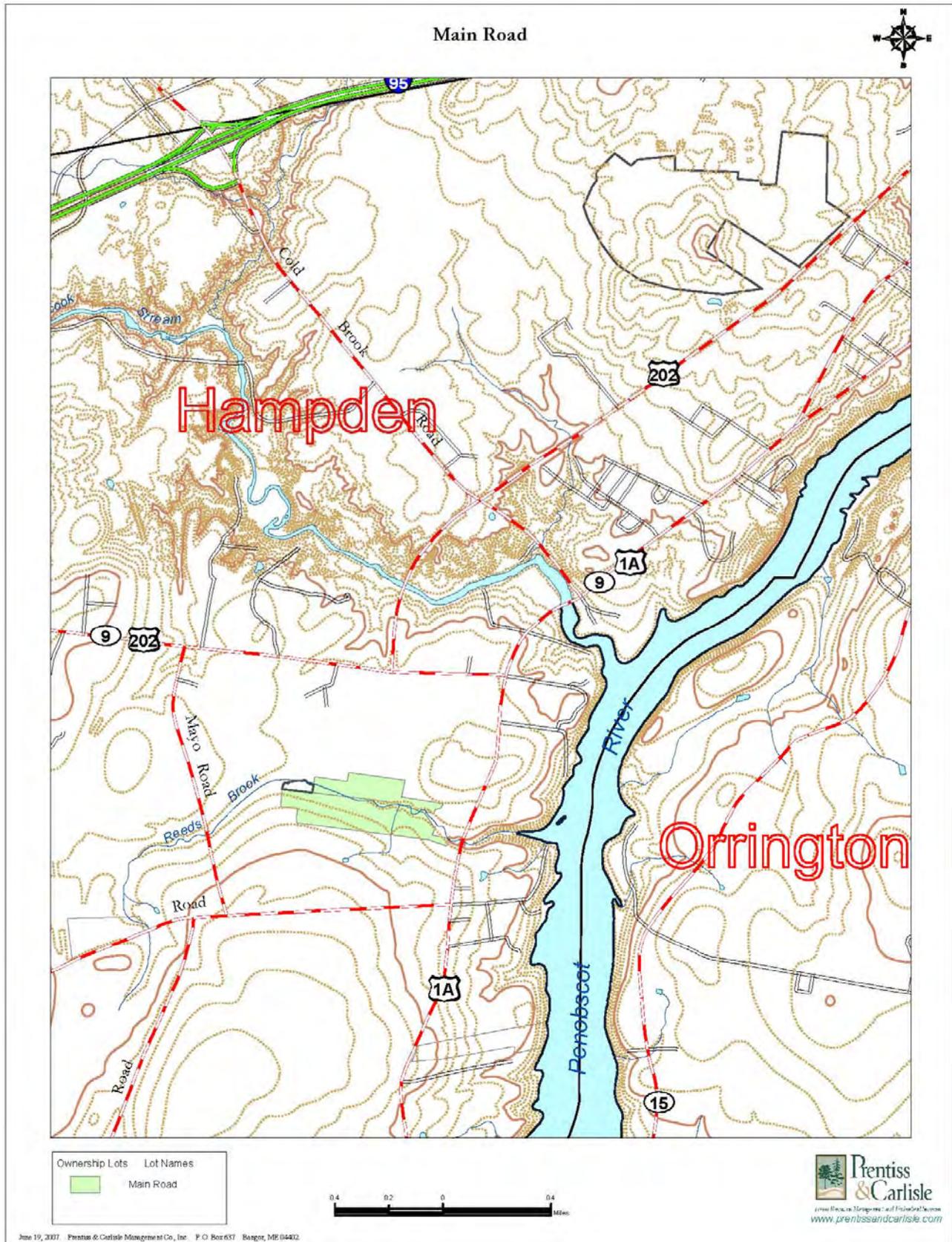
The Main Road South parcel is located between Main Road South (Route 1A) and Mayo Road to the east and west, respectively, and south of the Constitution Avenue subdivision. The parcel has no road frontage, but the most likely access points come from Liberty Road (off of Constitution Avenue) or from the middle school (off of Main Road South). The tract is about 63 acres in size with 55 acres classified as forested. Reeds Brook runs through the parcel from west to east where it eventually runs into the Penobscot River.

We estimated there are 63 gross GIS acres based on information provided by the Town. The forested acres, conventionally defined as the acreage available for harvesting trees (i.e. accessible, productive, and harvesting is not prohibited) was estimated to be 55 acres. Acreage estimates are not the result of a survey but represent the best available information. The acreage calculations by type are shown in Table 7.2.

**Table 7.2. Acreage by forest and non-forest categories.**

| <b>Category</b> | <b>Broad Type</b>           | <b>Acreage Class</b>    | <b>Acres</b> |
|-----------------|-----------------------------|-------------------------|--------------|
| Forested Acres  | Softwood                    | S3A                     | 1.1          |
|                 |                             |                         | <u>1.1</u>   |
|                 | Mixedwood                   | S4D/SH3B                | 14.7         |
|                 |                             | SH2C                    | 3.0          |
|                 |                             | SH3C                    | 6.4          |
|                 |                             |                         | <u>24.1</u>  |
|                 | Hardwood                    | H1C                     | 8.2          |
|                 |                             | H2A                     | 7.7          |
|                 |                             | H3A                     | 1.1          |
|                 |                             |                         | <u>17.0</u>  |
|                 | <b>Total Forested Acres</b> | <b>42.2</b>             |              |
| Non-Forest      |                             | Wetlands                | 18.8         |
|                 |                             | Pipeline ROW            | 1.5          |
|                 |                             | Other                   | <u>0.9</u>   |
|                 |                             | <b>Total Non-Forest</b> | <b>21.2</b>  |
|                 | <b>Grand Total</b>          | <b>63.4</b>             |              |

Figure 7.1. Location map



### 7.3.2. Forest Age/Disturbance History

The forest is composed of two broad age/structural types:

- (1) young, even-age stands that regenerated from clearcutting or heavy partial cuts about 25 years ago (25 acres); and
- (2) mature even-age stands regenerated from heavy harvesting 50-70 or more years ago (17 acres);

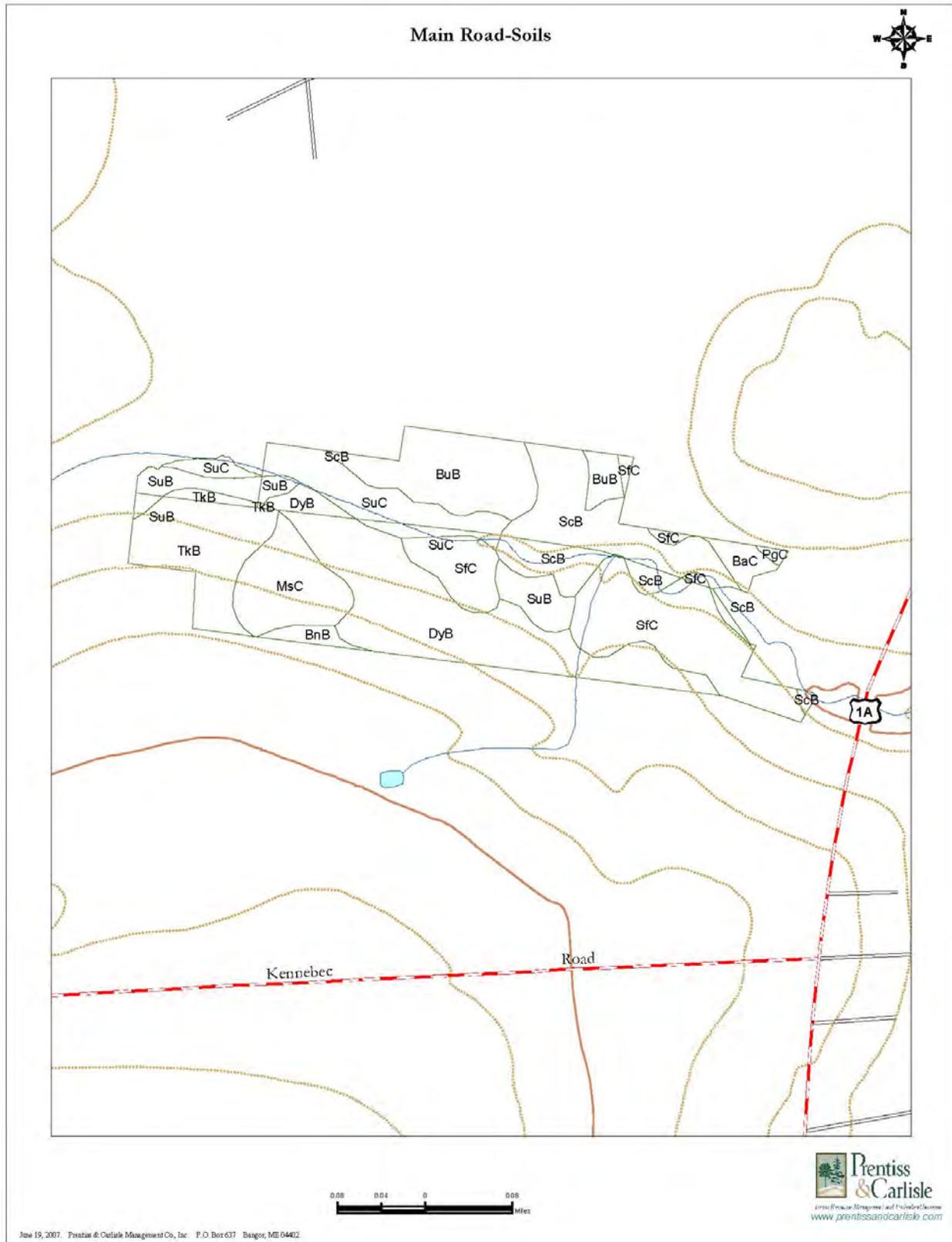
The entire parcel appears to have regenerated following pasture land abandonment about 60-80 years ago. About 25 years ago, most of the parcel east of the pipeline was aggressively harvested.

The area east of the pipeline (47 acres) is dominated by young stands that were aggressively harvested about 25 years ago to remove spruce, fir and sawlog quality red maple, leaving cedar, small spruce and fir, and poor quality red maple. The area west of the pipeline is dominated by mature softwood and mixed wood stands that regenerated on abandoned pasture land about 50-70 years ago. This area does not appear to have been harvested since its establishment.

### 7.3.3. Soils/Topography

The topography is generally flat north of Reeds Brook to the brook. South of the brook the elevation increases gradually with distance from the brook. In general, the soils around the brook are more poorly drained while the soils south of the brook and higher are better drained. However, there are pockets of more poorly drained soils in the higher elevation areas south of the brook (Figure 7.2). A significant portion of the property is classified as having silt loams, which are highly prone to erosion. Care should be taken when harvesting near the brook and perennial streams to avoid causing erosion and siltation of the brook.

Figure 7.2. Soils map (key on next page)



| <b>Key</b> | <b>Series</b>   | <b>Drainage Class</b>        | <b>Farmland Class</b>            | <b>Acres</b> |
|------------|---|------------------------------|----------------------------------|--------------|
| BuB        | Buxton silt loam, 2 to 8 percent slopes               | Somewhat poorly drained      | Farmland of statewide importance | 0.9          |
| ScB        | Scantic silt loam, 0 to 8 percent slopes              | Poorly drained               | Not prime farmland               | 2.9          |
| ScB        | Scantic silt loam, 0 to 8 percent slopes              | Poorly drained               | Not prime farmland               | 6.1          |
| SfC        | Stetson-Suffield complex, 0 to 15 percent slopes      | Well drained                 | Farmland of statewide importance | 0.4          |
| ScB        | Scantic silt loam, 0 to 8 percent slopes              | Poorly drained               | Not prime farmland               | 0.1          |
| BuB        | Buxton silt loam, 2 to 8 percent slopes               | Somewhat poorly drained      | Farmland of statewide importance | 6.2          |
| SuC        | Suffield silt loam, 8 to 15 percent slopes            | Moderately well drained      | Not prime farmland               | 0.7          |
| SuC        | Suffield silt loam, 8 to 15 percent slopes            | Moderately well drained      | Not prime farmland               | 4.0          |
| SuC        | Suffield silt loam, 8 to 15 percent slopes            | Moderately well drained      | Not prime farmland               | 0.7          |
| PgC        | Plaisted gravelly loam, 8 to 15 percent slopes        | Well drained                 | Farmland of statewide importance | 0.2          |
| SuB        | Suffield silt loam, 2 to 8 percent slopes             | Moderately well drained      | All areas are prime farmland     | 0.2          |
| SuB        | Suffield silt loam, 2 to 8 percent slopes             | Moderately well drained      | All areas are prime farmland     | 0.4          |
| SuB        | Suffield silt loam, 2 to 8 percent slopes             | Moderately well drained      | All areas are prime farmland     | 1.3          |
| DyB        | Dixmont very stony silt loam, 2 to 8 percent slopes   | Somewhat poorly drained      | Not prime farmland               | 13.1         |
| DyB        | Dixmont very stony silt loam, 2 to 8 percent slopes   | Somewhat poorly drained      | Not prime farmland               | 0.8          |
| TkB        | Thorndike very rocky silt loam, 2 to 8 percent slopes | Somewhat excessively drained | Not prime farmland               | 6.1          |
| TkB        | Thorndike very rocky silt loam, 2 to 8 percent slopes | Somewhat excessively drained | Not prime farmland               | 0.0          |
| TkB        | Thorndike very rocky silt loam, 2 to 8 percent slopes | Somewhat excessively drained | Not prime farmland               | 0.4          |
| BaC        | Bangor silt loam, 8 to 15 percent slopes              | Well drained                 | Farmland of statewide importance | 1.0          |
| MsC        | Monarda and Burnham extremely stony silt loams        | Very poorly drained          | Not prime farmland               | 4.8          |
| SfC        | Stetson-Suffield complex, 0 to 15 percent slopes      | Well drained                 | Farmland of statewide importance | 2.6          |
| SfC        | Stetson-Suffield complex, 0 to 15 percent slopes      | Well drained                 | Farmland of statewide importance | 8.1          |
| SfC        | Stetson-Suffield complex, 0 to 15 percent slopes      | Well drained                 | Farmland of statewide importance | 0.1          |
| SuB        | Suffield silt loam, 2 to 8 percent slopes             | Moderately well drained      | All areas are prime farmland     | 1.7          |
| BnB        | Bangor very stony silt loam, 0 to 8 percent slopes    | Well drained                 | Not prime farmland               | 0.7          |

#### 7.3.4. Water Resources

The primary water feature on the property is Reeds Brook. Reeds Brook runs west to east where it drains into the Penobscot River. It is important that water quality is protected in the brook because it in turn affects aquatic habitat in the Penobscot River. Harvesting near the brook, if not done carefully can lead to sedimentation. Sedimentation can decrease water quality and negatively impact salmon and other native fish habitat. We suggest that logging contractors strictly adhere to BMPs and state regulations pertaining to harvesting near brooks, minimize crossings of brooks when legally permissible, and leave sufficient shade within a buffer around the brook. We have also noted where recreation activities have negatively impacted water quality in the brook and have made recommendations to fix these problems.

#### 7.3.5. Boundary Lines

By state law it is the responsibility of the landowner to ensure the boundary lines are properly maintained when harvesting more than 10 acres near a boundary. Lines should be identified and clearly marked with paint and updated when appropriate. Special consideration should be made when harvesting 10 or more acres within 200' of an adjacent owner. A forester should re-paint these lines if they are not clearly visible prior to any harvesting. In cases where lines are no longer visible, a surveyor may be required to re-establish the lines. Property line trees can not be harvested without first obtaining permission from abutting landowner.

The boundary lines are not adequate at this time. Although we did find several pins, the lines should be marked with boundary paint. It may be necessary to re-survey the lines. However, we advise that you attempt to mark the lines prior to hiring a surveyor. If it is not possible to determine a precise location for the line than we advise that you contact a surveyor to re-establish the lines.

#### 7.3.6. Forest Cover Types

We used aerial photo-interpretation (true-color contact prints taken by James W. Sewall in April 2006) to determine the productive forest acres and the acres by each forest and non-forest type within the ownership boundary (Figure 6.2). Photo-interpretation was ground-truthed and changed if necessary.

The typing scheme consists of a broad species grouping (H, HS, M, SH, S, C, P, PO), a size class (R, 1-4), and a canopy closure class (A-D). H, M, and S indicate hardwood, mixedwood, and softwood, respectively. C, P and PO designate a stand dominated by cedar (C), pine (P) or poplar [(PO); aspen or balm-of-Gilead]. A single H or S indicates this type comprises 75 percent or more of the volume. For HS or SH types, the first letter indicates the more dominant type. M is used if it cannot be discerned which group is more dominant. An "S" at the end of the type name indicates that the site is wet (i.e. CS3A and SH3CS). The size classes indicate the following:

- R = regeneration, or trees 5' tall or less
- 1 = saplings 1-3" DBH, or about 5-20' tall
- 2 = larger saplings/small polesize trees about 3-5" DBH and 20-40' tall
- 3 = polesize trees, 20-55' tall and 5-9" DBH
- 4 = sawlog size trees, 55'+ tall and 10"+ DBH

The canopy closure classes are:

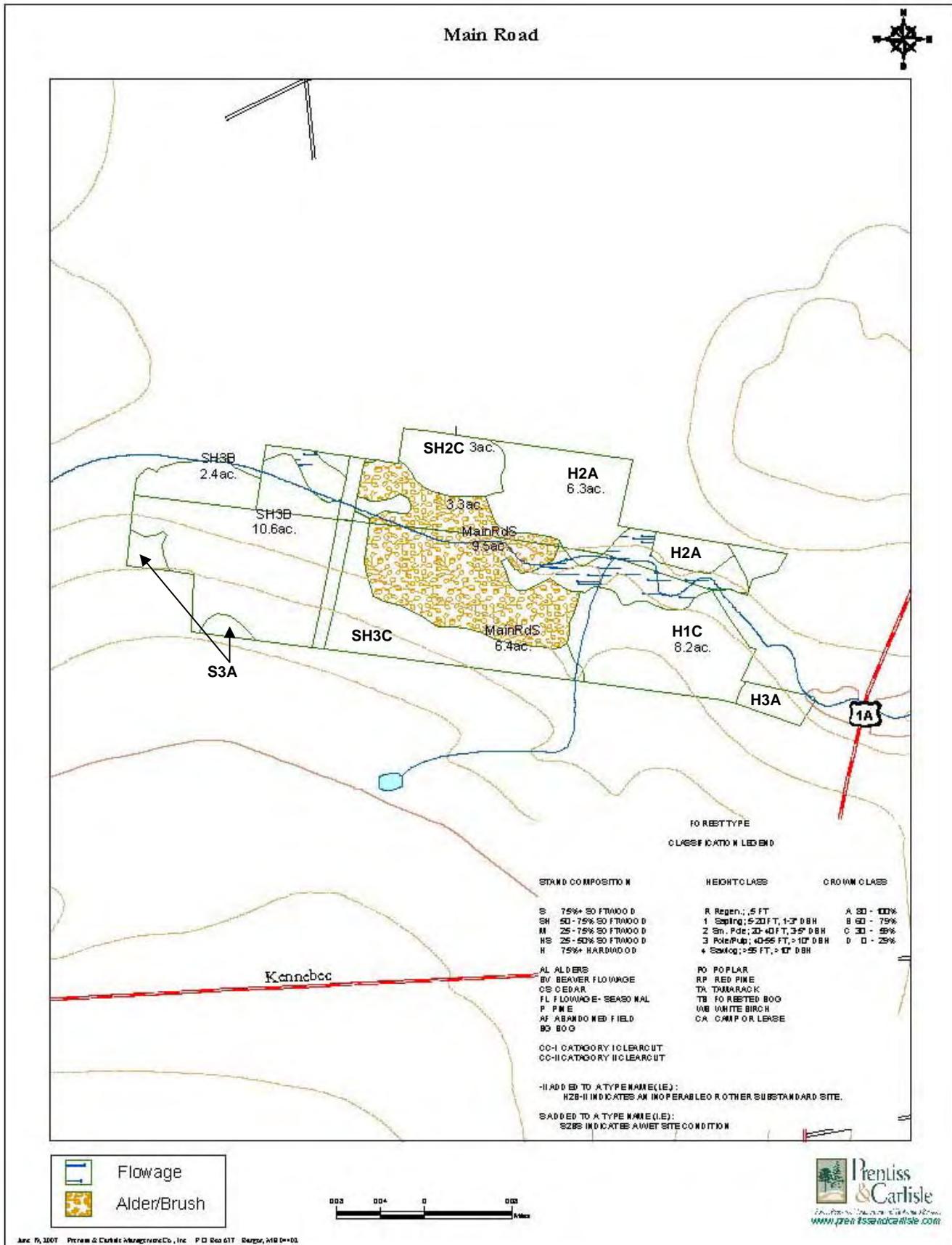
- A = 80 percent or greater
- B = 60-79 percent
- C = 30-59 percent
- D = 0-29 percent

Seven unique stands were delineated in the photo-interpretation and site inspection and are described below from field notes and through the inventory. Some were quantified by way of the timber cruise (if source of information is "Inventory") and others were described both quantitatively and qualitatively because there were few merchantable size trees ("Inventory/Qualitative description"). Some of the cruised types were combined because there were no significant differences among the combined types. The types that were classified on this property are shown below (Table 7.3).

**Table 7.3 Forest types designated and sources of inventory information**

| Type     | Acres | Source of Information              | Inventory Run Type |
|----------|-------|------------------------------------|--------------------|
| S3A      | 1.1   | Inventory                          | SH3B               |
| S4D/SH3B | 14.7  | Inventory                          | SH3B               |
| SH2C     | 3.0   | Inventory                          | MainRdS            |
| SH3C     | 6.4   | Inventory                          | MainRdS            |
| H1C      | 8.2   | Inventory /Qualitative description | MainRdS            |
| H2A      | 7.7   | Inventory /Qualitative description | MainRdS            |
| H3A      | 1.1   | Inventory /Qualitative description | MainRdS            |
| Total    | 42.2  |                                    |                    |

Figure 7.3. Type map for property showing forest types delineated from aerial photos and site inspection



### 7.3.7. Timber Volume and Quality

As part of this plan, we completed a timber inventory of the property in May 2007. We installed 19 plots along a grid. The inventory data were stratified according to the forest types developed from the photo-interpretation and ground checking. Across all forested acres, we estimate there are 377 cords of merchantable wood, which equates to 8.9 cords per forested acre  $\pm$  18.4 percent (Table 7.4).

Volume by product is shown in Table 7.5. Approximately 38 percent of the volume is pulp, 38 percent is growing stock, and 24 percent in sawlog volume (including pallet). Pulp volume is wood that cannot be merchandized as sawlogs now or in the future. This includes smaller trees with poor form and large sawlog-size trees that because of stem defects such as rot, seams or excessive branchiness can only be merchandized as pulpwood. These trees occupy valuable space in the forest that could otherwise be used to grow more valuable trees. The “growing stock” portion of volume is comprised of trees that meet sawlog quality specifications but are undersized. Sawlog volume meets the current specifications for logs in regional markets (See product specifications in Appendix).

**Table 7.4. Summary statistics**

| Forest Type | Area (Acres) | Number Plots | Mean  | Standard Deviation | Standard Error | Std Error as a Pct. of The Mean | Unless a 1 in (N) chance has occurred in sampling the true mean is within the interval below. |        |        |        |
|-------------|--------------|--------------|-------|--------------------|----------------|---------------------------------|---|--------|--------|--------|
|             |              |              |       |                    |                |                                 | N = 10  | N = 20 | N = 10 | N = 20 |
| MainRdS     | 26           | 12           | 3.14  | 3.250              | 0.94           | 44.78                           | 1.45  | 4.82   | 1.065  | 5.205  |
| SH3B        | 16           | 7            | 18.47 | 9.790              | 3.7            | 20.03                           | 11.28   | 25.66  | 9.42   | 27.52  |
| Total       | 42           | 19           | 8.98  | NA                 | 1.26           | 18.44                           | 6.78  | 11.18  | 6.32   | 11.64  |

**Table 7.5. Volume by product and species**

|           | Veneer (mbf) | Sawlogs (mbf) | Pallet (mbf) | Boltwood (cords) | Growing       |                  | Total (cords) |
|-----------|--------------|---------------|--------------|------------------|---------------|------------------|---------------|
|           |              |               |              |                  | Stock (cords) | Pulpwood (cords) |               |
| W Pine    | 0.0          | 7.9           | 0.0          | 0.0              | 0.0           | 35.8             | 51.7          |
| Spruce    | 0.0          | 20.4          | 0.0          | 0.0              | 8.3           | 4.0              | 57.2          |
| Fir       | 0.0          | 3.5           | 0.0          | 0.0              | 20.9          | 42.2             | 72.4          |
| Cedar     | 0.0          | 8.1           | 0.0          | 0.0              | 5.1           | 65.1             | 88.3          |
| Total Swd | 0.0          | 39.9          | 0.0          | 0.0              | 34.3          | 147.0            | 269.5         |
| Sf Maple  | 0.0          | 1.7           | 2.2          | 0.0              | 3.4           | 53.4             | 65.3          |
| W Ash     | 0.0          | 0.0           | 0.0          | 0.0              | 7.9           | 2.0              | 10.0          |
| Elm       | 0.0          | 0.0           | 0.0          | 0.0              | 0.0           | 6.8              | 6.8           |
| Cherry    | 0.0          | 0.0           | 0.0          | 0.0              | 0.0           | 7.7              | 7.7           |
| Other Hwd | 0.0          | 0.0           | 0.0          | 0.0              | 0.0           | 17.9             | 17.9          |
| Total Hwd | 0.0          | 1.7           | 2.2          | 0.0              | 11.3          | 87.8             | 107.7         |
| Total:    | 0.0          | 41.6          | 2.2          | 0.0              | 45.6          | 234.8            | 377.2         |

### 7.3.8. Species Composition

Approximately 71 percent of the volume is in softwood species (white pine, balsam fir, red spruce, and cedar), and the remaining 29 percent is in hardwood trees (white ash, red maple, elm, cherry, and other hardwood; Table 7.6). In comparison, the statewide average volume (2002) was 16.0 cords per forested acre, of which, approximately 44 percent is in hardwood species. Thus, this forest has substantially less volume than the state average and significantly more softwood than average.

**Table 7.6. Merchantable volume (cord) by diameter class and species**

| DBH   | W Pine | Spruce | Fir | Cedar | Sf Maple | W Ash | Elm | Cherry | Other Hwd | Tot Swd | Tot Hwd | Tot All |
|-------|--------|--------|-----|-------|----------|-------|-----|--------|-----------|---------|---------|---------|
| 5     | 4      | 0      | 5   | 3     | 0        | 0     | 0   | 0      | 0         | 13      | 0       | 13      |
| 6     | 0      | 0      | 10  | 0     | 5        | 0     | 0   | 0      | 0         | 8       | 13      | 23      |
| 7     | 0      | 0      | 10  | 5     | 0        | 0     | 0   | 0      | 0         | 15      | 0       | 15      |
| 8     | 0      | 0      | 9   | 5     | 0        | 0     | 0   | 0      | 0         | 15      | 0       | 15      |
| 9     | 0      | 6      | 5   | 5     | 25       | 10    | 7   | 0      | 0         | 16      | 42      | 59      |
| 10    | 12     | 0      | 9   | 0     | 0        | 0     | 0   | 8      | 10        | 21      | 18      | 39      |
| 11    | 0      | 0      | 24  | 8     | 26       | 0     | 0   | 0      | 0         | 33      | 26      | 59      |
| 12    | 0      | 0      | 0   | 13    | 0        | 0     | 0   | 0      | 0         | 13      | 0       | 13      |
| 13    | 16     | 0      | 0   | 15    | 8        | 0     | 0   | 0      | 0         | 31      | 8       | 39      |
| 14    | 0      | 10     | 0   | 0     | 0        | 0     | 0   | 0      | 0         | 10      | 0       | 10      |
| 15    | 10     | 0      | 0   | 8     | 0        | 0     | 0   | 0      | 0         | 18      | 0       | 18      |
| 16    | 0      | 31     | 0   | 0     | 0        | 0     | 0   | 0      | 0         | 31      | 0       | 31      |
| 17    | 0      | 10     | 0   | 16    | 0        | 0     | 0   | 0      | 0         | 26      | 0       | 26      |
| 18    | 0      | 0      | 0   | 8     | 0        | 0     | 0   | 0      | 0         | 8       | 0       | 8       |
| 19    | 0      | 0      | 0   | 2     | 0        | 0     | 0   | 0      | 0         | 2       | 0       | 2       |
| 20    | 10     | 0      | 0   | 0     | 0        | 0     | 0   | 0      | 0         | 10      | 0       | 10      |
| 5-9"  | 4      | 6      | 40  | 18    | 31       | 10    | 7   | 0      | 8         | 68      | 55      | 123     |
| 10+   | 48     | 51     | 33  | 70    | 35       | 0     | 0   | 8      | 10        | 201     | 53      | 254     |
| Merch | 52     | 57     | 72  | 88    | 65       | 10    | 7   | 8      | 18        | 269     | 108     | 377     |
| All   | 52     | 57     | 72  | 88    | 65       | 10    | 7   | 8      | 18        | 269     | 108     | 377     |

## 7.4 Recommended Projects

### 7.4.1 Timber Harvesting

The overall goal for harvesting is to manipulate stand structure and species composition to create a forest structure that will meet the multi-use objectives for this tract. Across the forest, the goals are to create three-age stands dominated by long-lived intermediate shade-tolerant species such as spruce, pine, hemlock, oak, sugar maple, and yellow birch. Such stands will be valuable from an economic, aesthetic and biodiversity perspective. These guidelines may be affected by plans for creating a demonstration forest depending on the final objectives for the parcel. However, the recommended prescription is designed to be consistent with a well-managed demonstration forest.

We recommend a removal of approximately 140 cords. The removal represents a 40-50 percent harvest on the forest types that have relatively high volume. We recommend using a cut-to-length system (processor). The harvest should take place in the winter on frozen ground. The harvest will take place primarily in the area west of the pipeline to remove poor quality and overmature trees. Removals should be a combination of commercial thinning and patch overstory removals. Patch overstory removal are prescribed for areas where thinning would result in extensive windthrow. The patch overstory removals should be no larger than 1-2 acres in size, and may be as small as ¼ acre. Harvests should target for removal the following species: fir, poor quality spruce or spruce that are not windfirm, red maple, white birch (minor component), and cedar; large white pine should be retained in all cases to provide vertical diversity for biodiversity, a seed source for regeneration, and for aesthetic purposes.

Harvesting is designed to create a three-aged stand with overstory pine, mid-story spruce and fir (3-7" dbh), and regeneration that will be created by harvesting. This relatively light harvest will result in abundant regeneration of shade tolerant species.

Because the soils consist of silt tills that are very prone to erosion, care should be taken when harvesting near brooks. BMPs should be strictly followed to avoid siltation of the brook and to limit compaction and rutting.

## 7.5 Detailed Stand Information

Seven stand types were identified in the typing. We combined the high volume types (S3A, S4D/SH3B, and H3A) and called them SH3B, since they were run together in the inventory and because S4D/SH3B represents 88 percent of the acreage. In addition, we combined SH2C and SH3C because they were very similar.

### 7.5.1. SH3B

The SH3B type is a combination of the S4D/SH3B (14.7 ac.), S3A (1.1 ac.) and H3A (1.1 ac.) for a combined total of 16.9 acres. This broad type represents the only merchantable component in the parcel. The merchantable volume is 18.5 cords per acre. The type appears to have regenerated following pasture land abandonment about 60-80 years ago. The health is beginning to decline as the cedar, fir and red maple are beginning to die. Spruce and white pine trees are healthy and should be released to increase their growth and proportion to total volume. The stand should be thinned using a processor in the winter on frozen ground to remove 40-50 percent of the standing volume by harvesting the poor quality trees. This harvest will release advance regeneration forming a second age class. A second harvest should be planned for 15-20 years from now to remove an additional 30-40 percent of the older age class and some of the younger age class to create a third age class. This silviculture system will promote the regeneration and growth of shade tolerant softwood species, primarily spruce and fir.

**Table 7.5. Stand attributes for SH3B type**

| <b>Attribute</b>                    | <b>Description</b>   |
|-------------------------------------|--|
| Stand area                          | 16.9 acres   |
| Composition/ structure              | Composed primarily of cedar (30%), fir (25%), red maple (22%), spruce (13%), and white pine (10%) by volume; trees are generally 40-55' tall, 5-10" dbh; canopy closure is 60-79 percent ; |
| Age/history                         | Approximately 60-80 years old; regenerated from pasture land abandonment   |
| Stand health                        | Good, although fir and red maple are beginning to die  |
| Stand volume                        | 18.5 cords/acre  |
| Stand stocking                      | Very good  |
| Stand quality                       | Fair to good; portions of fir, red maple, and cedar volume are poor in quality   |
| Growth rate                         | Good; 10-year PAI is 0.50 cds/ac/yr  |
| Project Recommendations             | Thin poor quality trees with 40-50 percent removal   |
| Long range silvicultural objectives | Create three age classes with an additional harvest in 15-20 years   |

**Table 7.6. Product table for SH3B**

|           | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-----------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine    | 0               | 0.49             | 0               | 0                   | 0                           | 0.88                | 1.88             |
| Spruce    | 0               | 0.98             | 0               | 0                   | 0.08                        | 0.25                | 2.47             |
| Fir       | 0               | 0.22             | 0               | 0                   | 1.3                         | 2.64                | 4.53             |
| Cedar     | 0               | 0.51             | 0               | 0                   | 0.32                        | 4.07                | 5.52             |
| Total Swd | 0               | 2.2              | 0               | 0                   | 1.7                         | 7.83                | 14.39            |
| Sf Maple  | 0               | 0.1              | 0.14            | 0                   | 0.21                        | 3.34                | 4.08             |
| Total Hwd | 0               | 0.1              | 0.14            | 0                   | 0.21                        | 3.34                | 4.08             |
| Total:    | 0               | 2.3              | 0.14            | 0                   | 1.91                        | 11.17               | 18.47            |

### 7.5.2. Stand Type: SH2C

The SH2C type is a combination of the SH2C and SH3C types and combines for 9 acres. The type is composed primarily of 3-5" softwood and hardwood trees that are 20-40' tall. It is essentially a hodge-podge of residual trees that were too small to harvest in the previous cut and poorly formed regeneration. The stocking is low—about 30-50 percent—primarily because of the aggressive past harvesting and poor soils. The soils are poorly to somewhat poorly drained on wet sites. There is no dominant species; the species composition is a mix of white pine, spruce, fir, cedar, red maple, grey and white birch, and other various hardwood species (ash, elm, other hardwood). We have estimated the merchantable volume to be less than 6 cords per acre. Red maple trees are generally smaller and regenerated from stump sprouting, while fir, spruce, cedar and pine are a combination of residual trees that were too small to harvest in the previous cut and regeneration. The soils are fair to poor and typical of old pasture on wet poorly to somewhat poorly drained soils. Grazing activity compacted the following a clearcut that occurred about 30 years ago. There are some residual large white pine trees in the overstory but they are scattered and contribute little to the volume and value and have little effect on the rapidly growing young hardwood trees below. The 10- year PAI is 0.37 cords per acre per year. The stand will become financially operable in the next 10-15 years depending on markets and growth rates. The current merchantable volume is less than 6 cords per acre and is composed of the larger (5-7") pine, fir and aspen. We recommend allowing the stand to grow for another 15-25 years before any harvesting is done.

**Table 7.7. Stand Attributes for SH2C type.**

| <b>Attribute</b>                    | <b>Description</b>   |
|-------------------------------------|--|
| Stand area                          | 9 acres  |
| Composition/ structure              | Composed primarily of white pine, spruce, fir, cedar, red maple, grey and white birch, and other various hardwood species (ash, elm, other hardwood) that are generally 20-40' tall, 3-5" dbh; canopy closure is 60-79 percent |
| Age/history                         | Approximately 30 years old; regenerated from clearcut  |
| Stand health                        | Very good  |
| Stand volume                        | Less than 6 cords/acre   |
| Stand stocking                      | Fair   |
| Stand quality                       | Very good  |
| Growth rate                         | Fair; 10-year PAI is 0.37 cds/ac/yr  |
| Project Recommendations             | None within 10 years   |
| Long range silvicultural objectives | Thin in 15-25 years  |

### 7.5.3. Stand Type: H2A

The H2A type is about 7.7 acres and is dominated by aspen and red maple. It appears to have regenerated approximately 30 years ago following a clearcut. Trees are 3-5" dbh and 25-35' tall. The merchantable volume is less than 6 cords per acre. Because of the low volume we do not recommend any harvesting until 10-15 years, at which time we recommend a thinning to remove poor quality trees to create more growing space for the best quality trees and species.

**Table 7.9. Stand Attributes for H2A type.**

| <b>Attribute</b>                    | <b>Description</b>                                    |
|-------------------------------------|---|
| Stand area                          | 7.7 acres   |
| Composition/ structure              | Composed primarily of aspen and red maple             |
| Age/history                         | Approximately 30 years old; regenerated from clearcut |
| Stand health                        | Very good   |
| Stand volume                        | Less than 6 cords/acre                                |
| Stand stocking                      | Very good   |
| Stand quality                       | Very good   |
| Growth rate                         | Good; 10-year PAI is 0.52 cds/ac/yr                   |
| Project Recommendations             | None within 10 years                                  |
| Long range silvicultural objectives | Thin in 10-15 years                                   |

#### 7.5.4. Stand Type: H1C

The H1C type is about 8.2 acres and is dominated by grey and white birch with pockets of alders. The stand had been clearcut in the last 15-20 years. The harvesting method was not appropriate for regenerating a high quality forest. Growth is slow due to poor soils and poor stocking and species composition. Trees are 1-3" dbh and 15-25' tall. The merchantable volume is less than 3 cords per acre. Because of the low volume we do not recommend any harvesting for 30 or more years.

**Table 7.9. Stand Attributes for H1C type.**

| <b>Attribute</b>                    | <b>Description</b>  |
|-------------------------------------|---|
| Stand area                          | 8.2 acres   |
| Composition/ structure              | Composed primarily of grey birch, white birch and alder             |
| Age/history                         | Approximately 15-20 years old; regenerated from clearcut            |
| Stand health                        | Fair  |
| Stand volume                        | Less than 3 cords/acre  |
| Stand stocking                      | Poor  |
| Stand quality                       | Poor  |
| Growth rate                         | Poor; 10-year PAI is 0.10 cds/ac/yr                                 |
| Project Recommendations             | None within 10 years  |
| Long range silvicultural objectives | Allow succession to occur and create regeneration of spruce and fir |

## 8 Kennebec Road

### 8.1 Plan Summary

The Kennebec Road parcel is located on the north side of Kennebec Road adjacent to and east of the railroad tracks. It currently serves as the town's snow dump. It is approximately 20 acres in size with 19 acres classified as forested. Based on our assessment, the parcel has little or no value as timberland, both in the present and future. The current condition of the forest is poor and in terms of the quality of individual trees and the stocking of the stand. The soils are poorly drained in places; and where drainage is limiting there is an abundance of alder.

The parcel is dominated by white pine that regenerated after a clearcut about 30 years ago. Nearly all of the pine are weeviled and have several tops. These trees will not develop into sawlogs, and therefore, strictly from a forest management standpoint, they ought to be harvested. However, if the existing forest was harvested, the stand would likely have to be regenerated by planting to ensure adequate stocking and to control the post-harvest species composition. We would not recommend planting because of the poor site quality. This catch-22 makes this a good tract to consider for conversion to another use or leaving alone as open space.

We cruised the parcel in May 2007 and estimated the total volume to be 305 cords, or about 16 cords per acre (Table 8.1). About 69 percent of the volume is composed of large, poorly formed white pine. Nearly all of the pine trees have suffered chronic pine weevil damage over the past 20 years. Pine weevil larvae chew and burrow completely around the stem causing the current year's growth to wilt, droop, and eventually die. One or more side branches (laterals) bend upward to take over as the terminal leader. Over time, damaged trees become forked, developing two or more primary stems. Such trees cannot be sold as sawlogs and are typically sold for pine pulp or biomass, which have very little economic value.

Based on our assessment, we believe the Town should carefully weigh the contribution of this parcel to its overall goals. It has relatively little value in timber, habitat, recreation, and as a place to protect water quality. It's only virtue in the context of the Town's objectives is that it is open space—that is, it is not developed. Despite its relatively low value for meeting the Town's objectives it may be valuable for development. It has about 1,500 feet of frontage on Kennebec Road and is 20 acres in size. The town might consider trading or selling this parcel to acquire a parcel that perhaps has less economic value per acre but has considerably more value in terms of the Town's objectives.

Given it's low value in terms of habitat, timber and recreation; and relatively high value for future development, we recommend that the parcel is traded, sold or developed. We have therefore not summarized management objectives and stand characteristics in the context of a traditional forest management plan.

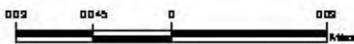
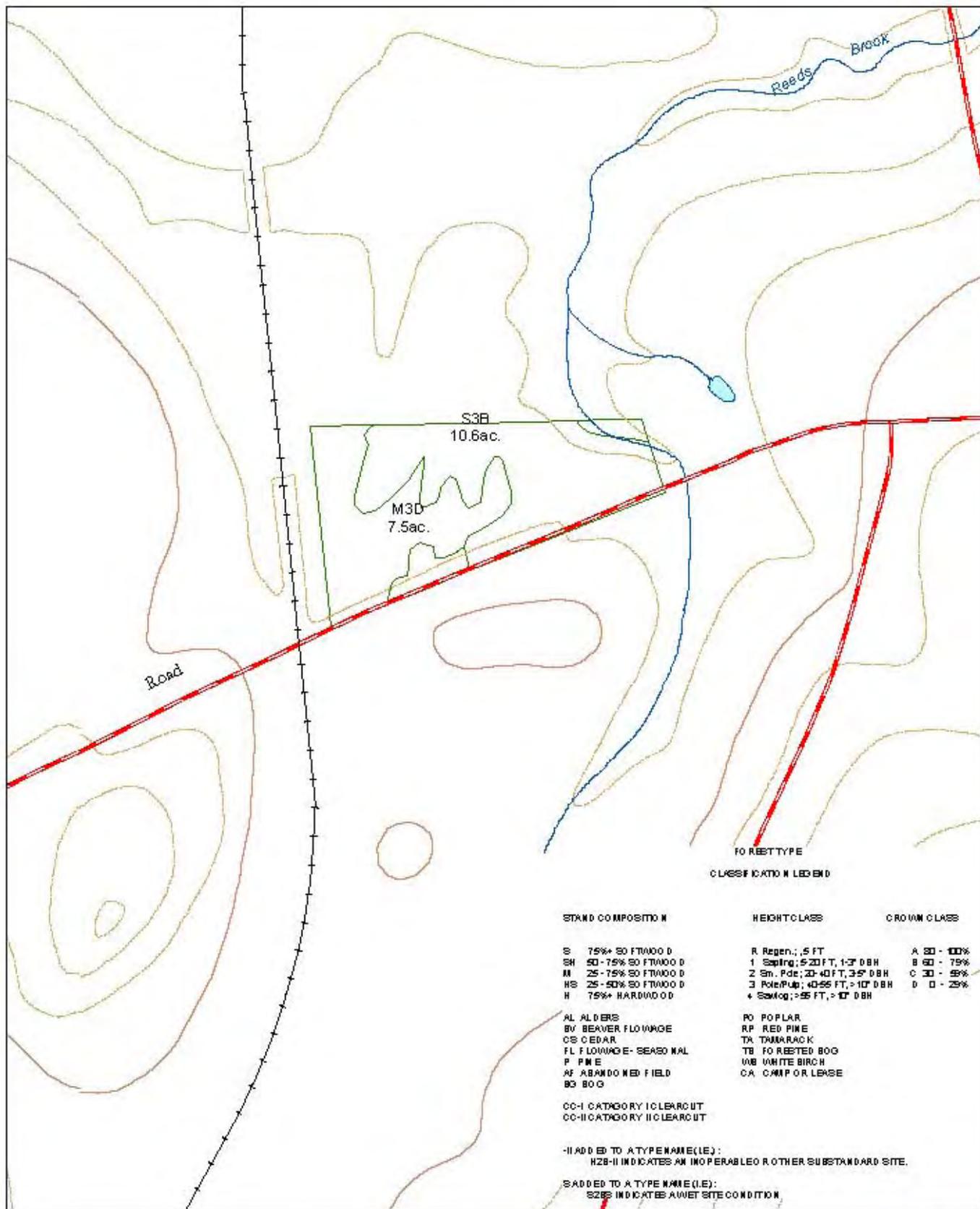
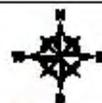
# Kennebec Road



| Ownership Lots | Lot Names     |
|----------------|---------------|
|                | Kennebec Road |



# Kennebec Road



**Table 8.1. Product Table for Kennebec Road parcel**

Hampden Kennebec Road  
Product Table  
19 Forested Acres  
Cruised May, 2007

|           | Veneer<br>(mbf) | Sawlogs<br>(mbf) | Pallet<br>(mbf) | Boltwood<br>(cords) | Growing<br>Stock<br>(cords) | Pulpwood<br>(cords) | Total<br>(cords) |
|-----------|-----------------|------------------|-----------------|---------------------|-----------------------------|---------------------|------------------|
| W Pine    | 0               | 9                | 0               | 0                   | 21                          | 171                 | 211              |
| Spruce    | 0               | 12               | 0               | 0                   | 8                           | 3                   | 37               |
| Fir       | 0               | 2                | 0               | 0                   | 0                           | 0                   | 6                |
| Total Swd | 0               | 23               | 0               | 0                   | 29                          | 174                 | 255              |
| Sf Maple  | 0               | 0                | 0               | 0                   | 0                           | 3                   | 3                |
| W Ash     | 0               | 0                | 0               | 0                   | 0                           | 2                   | 2                |
| Aspen     | 0               | 0                | 0               | 0                   | 4                           | 1                   | 5                |
| Elm       | 0               | 0                | 0               | 0                   | 0                           | 20                  | 20               |
| Cherry    | 0               | 0                | 0               | 0                   | 3                           | 2                   | 5                |
| Other Hwd | 0               | 0                | 0               | 0                   | 0                           | 15                  | 15               |
| Total Hwd | 0               | 0                | 0               | 0                   | 7                           | 43                  | 50               |
| Total:    | 0               | 23               | 0               | 0                   | 36                          | 217                 | 305              |

## 9 Laws Pertaining to Forestry

There are five state laws you must keep in mind when conducting wood harvesting operations in Maine's organized municipalities:

1. The Protection and Improvement of Waters Law
  - a. If soil or refuse as a result of logging washes into a waterway a violation has occurred, regardless of the distance from the logging operation to the water
2. The Erosion and Sedimentation Control Law,
  - a. This law requires you to prevent unreasonable erosion of soil or sediment beyond the project site or into a lake, stream, or wetland, and that erosion control measures are put in place prior to commencement of the activity
  - b. This law specifically applies to road construction or maintenance
3. The Natural Resources Protection Act (NRPA) and its associated rules
  - a. Regulates activities on, over, and adjacent to water bodies and areas above 2700'
  - b. See <http://www.state.me.us/dep/blwq/stand.htm> for more information
4. The Shoreland Zoning Act (SZA) and corresponding local ordinances
  - a. This law was enacted to prevent damage to the natural beauty and habitat provided by lakes, ponds, rivers, tidal areas, non-forested freshwater wetlands, and streams
  - b. The law targets development along the immediate shoreline of these resources and requires towns to enact a shoreland zoning ordinance at least as stringent as a model ordinance developed by the state.
5. The Forest Practices Act (FPA) and its associated rules
  - a. Landowners must notify the Maine Forest Service before beginning any timber harvesting activities.
  - b. Landowners who create clearcuts must adhere to standards for separation zones between clearcuts, and must prepare harvest plans for clearcuts larger than 20 acres.
  - c. Landowners must ensure that a clearcut has adequate regeneration within 5 years after harvest.

For more detailed information please see, "A Field Guide to Laws Pertaining to Timber Harvesting in Organized Areas of Maine." (<http://mainegov-images.informe.org/dep/blwq/docstand/timber.pdf>).

## 10 APPENDIX

### 10.1 Product Specification

**Table 10.1. Product specifications used in timber inventory**

| Code | Product        | Species                                     | Min. DBH | Min. Top Diam. | Min. Length | Description   |
|------|----------------|---|----------|----------------|-------------|---|
| P    | Pulpwood       | All Species                                 | 5"       | 4"             | 8 Feet      | Not a potential log/graded product  |
| L    | Sawlog         | All Hardwood                                | 12"      | 8"             | 8 Feet      | Minimum 2 clear sides   |
| L    | Sawlog         | Spruce/Fir                                  | 8"       | 6"             | 16 Feet     | Straight and sound. Must have at least 2 contiguous sections. Excessive branchiness is not a defect |
| L    | Sawlog         | Pine, Hemlock & other swd                   | 10"      | 8"             | 8 Feet      | Free of excessive knots, straight & sound   |
| T    | Tie/Pallet Log | All Hardwood                                | 10"      | 8"             | 8 Feet      | Straight and Sound  |
| V    | Veneer         | All Hardwood                                | 14"      | 12"            | 8 Feet      | Must have all 4 sides clear   |
| G    | Growing Stock  | All Species                                 | 5"       | 4"             | 8 Feet      | Potential to produce a sawlog or better product in the future.                                      |
| B    | Boltwood       | White & Yellow Birch, Hard Maple, White Ash | 10"      | 8"             | 8 Feet      | Minimum of 2 clear sides  |
| C    | Cull           | All Species                                 | 5"       | 4"             | 8 Feet      | Live trees with 50% rot or unusable   |

## 10.2 Silviculture Terminology

Prepared by the Silviculture Instructors Subgroup, Silviculture Working Group (D2), Society of American Foresters

Terminology Committee: David L. Adams (Univ. Idaho), John D. Hodges (Mississippi State Univ.), David L. Loftis (USDA FS), James N. Long (Utah State Univ.), Robert S. Seymour (Univ. Maine), John A. Helms, Chair (Univ. California). Reviewed by membership of Silviculture Working Group

This project was conceived by Prof. Clair Merritt (Purdue Univ.) who served as the committee's initial chair. Others contributing to earlier drafts included Al Alm (Univ. Minnesota), Ted Daniel (Utah State Univ.), and Ralph Griffen (Univ. Maine).

### **Advance Regeneration (Reproduction) syn. Advance Growth**

Seedlings or saplings that development or are present in the understory

### **Afforestation**

Establishment of a forest or stand in an area not recently forested.

### **Age class (Cohort)**

A distinct aggregation of trees originating from a single natural event or regeneration activity, or a grouping of trees, e.g. 10-year age class, as used in inventory or management.

### **Artificial Regeneration (Reproduction)**

An age class created by direct seeding or by planting seedlings or cuttings.

### **Basal Area**

The area of the cross section of a tree stem, including the bark, generally at breast height (4.5 feet above the ground).

### **Breast Height**

A standard height from ground level for recording diameter, girth, or basal area of a tree, generally 4.5 feet.

### **Burning, Prescribed**

The application of fire, usually under existing stands and under specified conditions of weather and fuel moisture, in order to attain silvicultural or other management objectives.

### **Canopy**

The foliar cover in a forest stand consisting of one or several layers.

### **Canopy Closure**

See Crown Cover

### **Cleaning**

A release treatment made in an age class not past the sapling stage in order to free the favored trees from less desirable individuals of the same age class which overtop them or are likely to do so (see Improvement Cutting, Liberating, Weeding).

### **Clearcutting**

(see Regeneration Methods)

### **Codominant**

(see Crown Class)

### **Cohort**

see Age Class

### **Composition, Stand**

The proportion of each tree species in a stand expressed as a percentage of either the total number, basal area, or volume of all tree species in the stand.

### **Coppice**

(see Regeneration Method)

**Crop Tree**

Any tree that is selected to become a component of a future commercial harvest.

**Crop Tree Release**

A thinning designed to remove trees around selected crop trees. Typically, the best trees are flagged to retain and competing trees that interfere with crop trees are marked to cut

**Crown**

The part of a tree or woody plant bearing live branches and foliage.

**Crown Class**

A class of tree based on its crown position relative to the crowns of adjacent trees.

**Emergent**

Trees with crowns completely above the general level of the main canopy receiving full light from above and from all sides.

**Dominant**

Trees with crowns extending above the general level of the main canopy of even-aged stands or, in uneven-aged stands, above the crowns of the tree's immediate neighbors, and receiving full light from above and partly from the sides.

**Codominant**

Trees with crowns forming the general level of the main canopy in even-aged stands or, in uneven-aged stands, the main canopy of the tree's immediate neighbor's, receiving full light from above and comparatively little from the sides.

**Intermediate**

Trees with crowns extending into the lower portion of the main canopy of even-aged stands or, in uneven-aged stands, into the lower portion of the canopy formed by the tree's immediate neighbors, but shorter in height than the codominants. They receive little direct light from above and none from the sides.

**Overtopped (Suppressed)**

Trees of the varying levels of vigor that have the crowns completely overtopped by the crowns of one or more neighboring trees.

**Crown Cover**

The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area (syn. Canopy Cover).

**Crown Density**

The amount and compactness of foliage of the crowns of trees and/or shrubs.

**Cutting Cycle**

The planning interval between partial harvests in an uneven-aged stand (see Thinning Interval)

**Dominant**

(see Crown Class)

**Emergent**

(see Crown Class)

**Even-Aged Stand**

A stand of trees containing a single age class in which the range of tree ages is usually less than 20 percent of rotation.

**Even-Aged System**

A planned sequence of treatments designed to maintain and regenerate a stand with one age class. The range of tree ages is usually less than 20 percent of the rotation. (see Clearcutting, Seed Tree, Shelterwood, Coppice).

**Forest Fertilization**

The addition of nutrient elements to increase growth rate or overcome a nutrient deficiency in the soil.

**Genotype**

The genetic constitution of an organism in terms of its hereditary characteristics as distinguished from its physical appearance or phenotype.

**Green Tree Retention**

see Reserve Trees

**Group Selection**

(see Regeneration Methods)

**Harvesting Method (Cutting Method)**

A cutting method by which a stand is logged. Emphasis is on meeting logging requirements while concurrently attaining silvicultural objectives (see Regeneration Methods)

**Improvement cutting**

A cutting made in a stand pole-sized or larger primarily to improve composition and quality by removing less desirable trees of any species (see Cleaning, Liberating, and Weeding).

**Ingrowth**

Trees that during a specified period have grown past an arbitrary lower limit of (usually) diameter or height. Ingrowth is usually measured as basal area or volume per unit area.

**Intermediate**

(see Crown Class)

**Intermediate Treatments (Tending)**

A collective term for any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest (see Tending, Stand Improvement).

**Liberating (Liberation cut)**

A release treatment made in a stand not past the sapling stage in order to free the favored trees from competition of older, overtopping trees.

**Monoculture**

A stand of a single species, generally even-aged.

**Mycorrhiza**

The symbiotic association between certain fungi and plant roots which enhances the uptake of water and nutrients.

**Natural Regeneration**

An age class created from natural seeding, sprouting, suckering, or layering.

**Nurse Tree (Nurse Crop)**

A tree, group or crop of trees, shrubs or other plants, either naturally occurring or introduced, used to nurture, improve survival or improve the form of a more desirable tree or crop when young by protecting it from frost, isolation, or wind.

**Overstory Removal**

The cutting of trees comprising an upper canopy layer in order to release trees to other vegetation in an understory (see Clearcutting).

**Overtopped**

(see Crown Class)

**Phenotype**

The observed expression of a trait in an individual resulting from a developmental interaction of the individual's genotype and its operational environmental.

**Pole**

A tree between the size of a sapling and a mature tree.

**Precommercial Thinning (PCT)**

A thinning that does not yield trees of commercial value, usually designed to reduce stocking in order to concentrate growth on the more desirable trees.

**Reforestation**

The natural or artificial restocking of an area with trees (syn. Regeneration).

**Regeneration**

Seedlings or saplings existing in a stand; or the act of establishing young trees naturally or artificially (syn. Reforestation).

## **Regeneration (Reproduction) Method**

A cutting method by which a new age class is created. The major methods are Clearcutting, Seed Tree, Shelterwood, Selection, and Coppice (see Harvesting Method).

### **Coppice Methods**

Methods of regenerating a stand in which the majority of regeneration is from stump sprouts or root suckers.

#### **Coppice**

A method of regenerating a stand in which all trees in the previous stand are cut and the majority of regeneration is from sprouts or root suckers.

#### **Coppice with Reserves (Coppice with Standards)**

A coppice method in which reserve trees are retained to attain goals other than regeneration. The method normally creates a two-aged stand.

### **Even-Aged Methods**

Methods to regenerate a stand with a single age class.

#### **Clearcutting**

A method of regenerating an even-aged stand in which a new age class develops in a fully-exposed microclimate after removal, in a single cutting, of all trees in the previous stand. Regeneration is from natural seeding, direct seeding, planted seedlings, and/or advance reproduction. Cutting may be done in groups or patches (Group or Patch Clearcutting), or in strips (Strip Clearcutting). In the Clearcutting System, the management unit or stand in which regeneration, growth, and yield are regulated consists of the individual clearcut stand (see Group Selection). When the primary source of regeneration is advance reproduction, the preferred term is **Overstory Removal**.

#### **Clearcutting with Reserves (see Two-Aged Methods)**

#### **Seed Tree**

An even-aged regeneration method in which a new age class develops from seeds that germinate in fully-exposed micro-environments after removal of all the previous stand except a small number of trees left to provide seed. Seed trees are removed after regeneration is established.

#### **Seed Tree with Reserves (see Two-Aged Methods)**

#### **Shelterwood**

A method of regenerating an even-aged stand in which a new age class develops beneath the moderated micro-environment provided by the residual trees. The sequence of treatments can include three distinct types of cuttings: 1) an optional preparatory cut to enhance conditions for seed production; 2) an establishment cut to prepare the seed bed and to create a new age class; and 3) a removal cut to release established regeneration from competition with the overwood. Cutting may be done uniformly throughout the stand (Uniform Shelterwood), in groups or patches (Group Shelterwood), or in are in strips (Strip Shelterwood).

#### **Shelterwood with Reserves (see Two-Aged Methods)**

### **Two-Aged Methods**

Methods designed to maintain and regenerate a stand with two age classes. In each case the resulting stand may be two-aged or tend towards an uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve trees that may represent one or more age classes.

#### **Clearcutting with Reserves**

A clearcutting method in which varying numbers of reserve trees are not harvested to attain goals other than regeneration.

#### **Seed Tree with Reserves**

A seed tree method in which some or all of the seed trees are retained after regeneration has become established to attain goals other than regeneration.

#### **Shelterwood with Reserves**

A variant of the Shelterwood Method in which some or all of the shelter trees are retained, well beyond the normal period of retention, to attain goals other than retention.

### **Uneven-Aged (Selection) Methods**

Methods of regenerating a forest stand, and maintaining an uneven-aged structure, by removing some trees in all size classes either singly, in small groups, or in strips.

### **Group Selection**

A method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. The maximum width of groups is approximately twice the height of the mature trees, with small openings providing micro-environments suitable for tolerant regeneration and the larger openings providing conditions suitable for more intolerant regeneration. In the Group Selection System, the management unit or stand in which regeneration, growth, and yield are regulated consists of a landscape containing an aggregation of groups (see Clearcutting).

### **Group Selection with Reserves**

A variant of the Group Selection Method in which some trees within the group are not cut to attain goals other than regeneration within the group.

### **Single Tree Selection**

A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural characteristics.

### **Regeneration (Reproduction) Period**

The time between the initial regeneration cutting and the successful re-establishment of a new age class by natural means, planting, or direct seeding.

### **Regular Uneven-Aged (Balanced) Stand**

A stand in which three or more distinct age classes occupy approximately equal areas and provide a balanced distribution of diameter classes.

### **Release (Release Operation)**

A treatment designed to free young trees from undesirable, usually overtopping, competing vegetation. Treatments include cleaning, liberating, and weeding (see Stand Improvement).

### **Reserve Trees (Standards, Green Tree Retention)**

Trees, pole-sized or larger, retained in either a dispersed or aggregated manner after the regeneration period under the Clearcutting, Seed Tree, Shelterwood, Group Selection, or Coppice Methods.

### **Root Pruning**

The root pruning of seedlings in a nursery bed to limit the extension of roots in depth or laterally (see Undercutting).

### **Rotation**

In even-aged systems, the period between regeneration establishment and final cutting.

### **Salvage Cutting**

The removal of dead trees being damaged or dying due to injurious agents other than competition, to recover value that would otherwise be lost.

### **Sanitation Cutting**

The removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and disease (see Stand Improvement)

### **Sapling**

A tree, usually young, that is larger than a seedling but smaller than a pole. Size varies by region.

### **Scarification**

Mechanical removal of competing vegetation and/or interfering debris, or disturbance of the soil surface, designed to enhance reforestation.

### **Seed Tree**

(see Regeneration Methods)

### **Shelterwood**

(see Regeneration Methods)

### **Silviculture**

The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

### **Silvicultural System**

A planned process whereby a stand is tended, harvested, and re-established. The system name is based on the number of age classes (see Even-Aged, Two-Aged, Uneven-Aged), and/or the regeneration method used (see Clearcutting, Seed Tree, Shelterwood, Selection, Coppice, Coppice with Reserves).

### **Single Tree Selection**

(see Regeneration Methods)

### **Site Class**

A classification of site quality, usually expressed in terms of ranges of dominant tree height at a given age or potential mean annual increment at culmination.

### **Site Index**

A measure of actual or potential forest productivity expressed in terms of the average height of a certain number of dominants and codominants in the stand (balsam fir for this report) at an index age (age 50 in this report).

### **Site Preparation**

A hand or mechanized manipulation of a site designed to enhance the success of regeneration. Treatments may include bedding, burning, chemical spraying, chopping, disking, drainage, raking and scarifying. All treatments are designed to modify the soil, litter, and vegetation and to create microclimate conditions conducive to the establishment and growth of desired species.

### **Site Quality (Productivity)**

The productive capacity of a site, usually expressed as volume production of a given species.

### **Size Class**

Tree size recognized by distinct ranges, usually of diameter or height.

### **Snag**

A standing dead tree from which the leaves and most of the branches have fallen.

### **Stand**

A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit (see Mixed, Pure, Even-Aged, and Uneven-Aged).

#### **Mixed Stand**

A stand in which there is a mixture of species.

#### **Pure Stand**

A stand composed of essentially a single species

#### **Stratified Mixture**

A stand in which different species occupy different strata of the total crown canopy.

### **Stand Density**

A quantitative, absolute measure of tree occupancy per unit of land area in such terms as numbers of trees, basal area, or volume.

### **Stand Improvement**

A term comprising all intermediate cuttings made to improve the composition, structure, condition, health, and growth of even - or uneven- aged stands.

### **Stocking**

An indication of growing-space occupancy relative to a pre-established standard. Common indices of stocking are based on percent occupancy, basal area, relative density, and crown competition factor.

### **Stratum (Canopy Layer)**

A distinct layer of vegetation within a forest community.

### **Structure**

The horizontal and vertical distribution of components of a forest stand including the height, diameter, crown layers and stems of trees, shrubs, herbaceous understory, snags, and down woody debris.

### **Succession**

A series of dynamic changes by which organisms succeed one another through a series of plant community (seral) stages leading to potential natural community or climax.

**Suppressed**

(See Crown Class)

**Tending**

See Intermediate Treatments

**Thinning**

A cultural treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality.

**Crown Thinning (Thinning from Above, High Thinning)**

The removal of trees from the dominant and codominant crown classes in order to favor the best trees of those same crown classes.

**Free Thinning**

The removal of trees to control stand spacing and favor desired trees using a combination of thinning criteria without regard to crown position.

**Low Thinning (Thinning from Below)**

The removal of trees from the lower crown classes to favor those in the upper crown classes.

**Mechanical Thinning (Geometric Thinning)**

The thinning of trees in either even - or uneven-aged stands involving removal of trees in rows, strips, or by using fixed spacing intervals.

**Selection Thinning (Dominant Thinning)**

The removal of trees in the dominant crown class in order to favor the lower crown classes.

**Thinning Interval**

The period of time between successive thinning entries, usually used in connection with even-aged stands (see Cutting Cycle).

**Tolerance, Shade**

The relative capacity of a plant to become established and grow beneath overtopping vegetation.

**Two-Aged System**

A planned sequence of treatments designed to maintain and regenerate a stand with two age classes.

**Undercutting**

The root pruning of seedlings in a nursery bed to limit root depth extension (see Root Pruning).

**Uneven-Aged Stand**

A stand of trees of three or more distinct age classes, either intimately mixed or in small groups.

**Uneven-Aged System**

A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes (see Single Tree Selection, Group Selection)

**Weeding**

A release treatment in stands not past the sapling stage that eliminates or suppresses undesirable vegetation regardless of crown position

## 10.3 Regarding High Grading

### ***Just Say No to High-Grading, Selective Cutting, and Diameter-Limit Cutting***

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Cutting the best trees (those of highest value) and leaving the low value, often diseased or malformed trees, is too common. This type of forestry is called high-grading, where the highest grade (or value) trees are removed. By cutting only the largest and most valuable trees you remove those best suited to that site. The trees that are less well adapted remain as the next forest and the seed source for future forests. The financial gain of high-grading exist only briefly, yet ownership objectives can be sacrificed for decades. A similar analogy from livestock is the farmer or stable manager who shoots the blue ribbon bull or winning race horse and uses the losers for breeding stock. The quality of the herd, just as the quality of the forest and woodlot, declines rapidly!

In addition to high-grading, similar practices exist with different names. High-grading is often disguised under the name of "diameter-limit cutting". This is a practice that removes all trees above a certain minimum diameter. In some rare situations diameter-limit cutting is appropriate. For example, if old pasture trees are shading the growth of young hardwood saplings. Often however, diameter-limit cutting removes trees of commercial value (say above 12 or 14 inches in diameter) before these trees can attain a more valuable size and add seed and seedlings to the forest. Selective cutting is another technique where high-grading can occur. Selective cutting (generally not recommended) differs from the selection system of silviculture (a legitimate technique). Selective cutting, as commonly practiced, involves selecting the highest quality trees and cutting them. (Technical note: selective cutting by definition can include other activities such as improvement cuts) The selection system involves someone professionally trained in silviculture to select trees from all age and size classes, both high and low quality to produce an uneven-aged forest. Diameter-limit cutting and selective cutting are often rationalized by arguing to remove the bigger trees so the smaller trees can grow. However, the smaller trees may be undesirable species, poor form, or poor health. By any name, high-grading degrades the value of the forest regardless of the "logic" used by foresters or loggers trying to make a quick buck.

Why does high-grading happen? A common cause for high-grading is greed to maximize immediate profits. Beginning in the early 1970's, demand for high-value timber increased and sawmills could pay more for certain species. Thus, markets for high-value trees grew stronger while markets for low value trees did not. Further, it costs about the same amount of money to cut and haul a \$10 tree as it does to cut and haul a \$300 tree of the same size. The result is that more immediate profit is gained by cutting

only the highest value trees, but left behind is a legacy of low quality trees and under-productive forests. This knowledge helps explain high-grading, but doesn't excuse it.

What are the consequences of high-grading, is it really that bad? One result is that the trees that are left behind won't grow as quickly as better quality trees and the time until the next harvest is lengthened. In addition, the next harvest will remove the low quality trees previously left so the value at the next harvest will be reduced. If you magnify the practice of high-grading across a region, assuming the demand for wood products remains steady, then more acres must be harvested to meet the demand. While timber harvesting is not bad, accelerated harvesting is not in the best interest of our natural resources and conflicts with a growing demand by the public for accountability of natural resource management. As the value of the land to produce timber crops decreases, the incentive to subdivide and develop increases.

So what can you do to avoid high-grading? One step is to work with competent and professional loggers and foresters. When you select a new refrigerator or car you likely consider several features, including price, reputation, service after the sale, and other long-term benefits. Similarly select your forester and logger. Ask for references, find out if the forester participates in continuing education programs and whether the logger has completed the "Trained Logger Certification" program, make a visit to forests or woodlots where they have worked, and know that the best price may not provide the best treatment for your land. The logger who out bids his competitors for a timber sale by a few percent may be more efficient or may not devote enough effort to ensure your property is left in good condition. Similarly the forester who promises you maximum short-term profit likely doesn't have in mind the best interests for you and your land. The consequences of selecting an incompetent forester or logger will exist longer than a bad choice on a refrigerator.

Another step to avoid high-grading is to have a written management plan. Your management plan will state your objectives and help keep you on track. The harvesting schedule in your management plan will help you decide when harvesting is appropriate. Just because a forester or logger offers to cut your timber doesn't mean it's the best time for your interests. The value of trees increases greatly as trees get bigger, and it's probably a safe assumption that good markets will continue to exist for high quality trees (although markets fluctuate).

Third, look for creative solutions to remove the low value trees at the same time the high value trees are harvested. A harvest that removes high-value and low-value trees provides financial benefits from the high- and low-value trees and improves the quality of the residual forest. One way is to have the forester mark and the logger skid the low value trees to the log landing. Then you can cut them yourself for firewood, or sell them to a firewood processor. This will require extra effort on the part of the logger and forester, which means you might not make as much money, but the benefits, including even greater profits, will exist a few years down the road.

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