



**Commissioned by:
The Lee Conservation Commission**

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September 28, 2010

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Report Copy # _____

FOREST MANAGEMENT PLAN

for the

LEE TOWN FOREST

Lee, New Hampshire

September 28, 2010

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The author of this forest management plan, Charles A. Moreno, certifies that the contents of the plan, except where footnoted, but including all written material, maps (base information referenced), plan format and organization, are original to the author.

The purpose of this plan is to provide natural resources information and forest and wildlife management recommendations to the Lee Conservation Commission, the citizens of Lee, and others interested in the management of the Lee Town Forest, Lee, New Hampshire. No part of this plan, including all written material, maps, plan format and organization, is to be copied or reproduced without proper citation to the author, Charles A. Moreno, Consulting Forester.

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I. INTRODUCTION

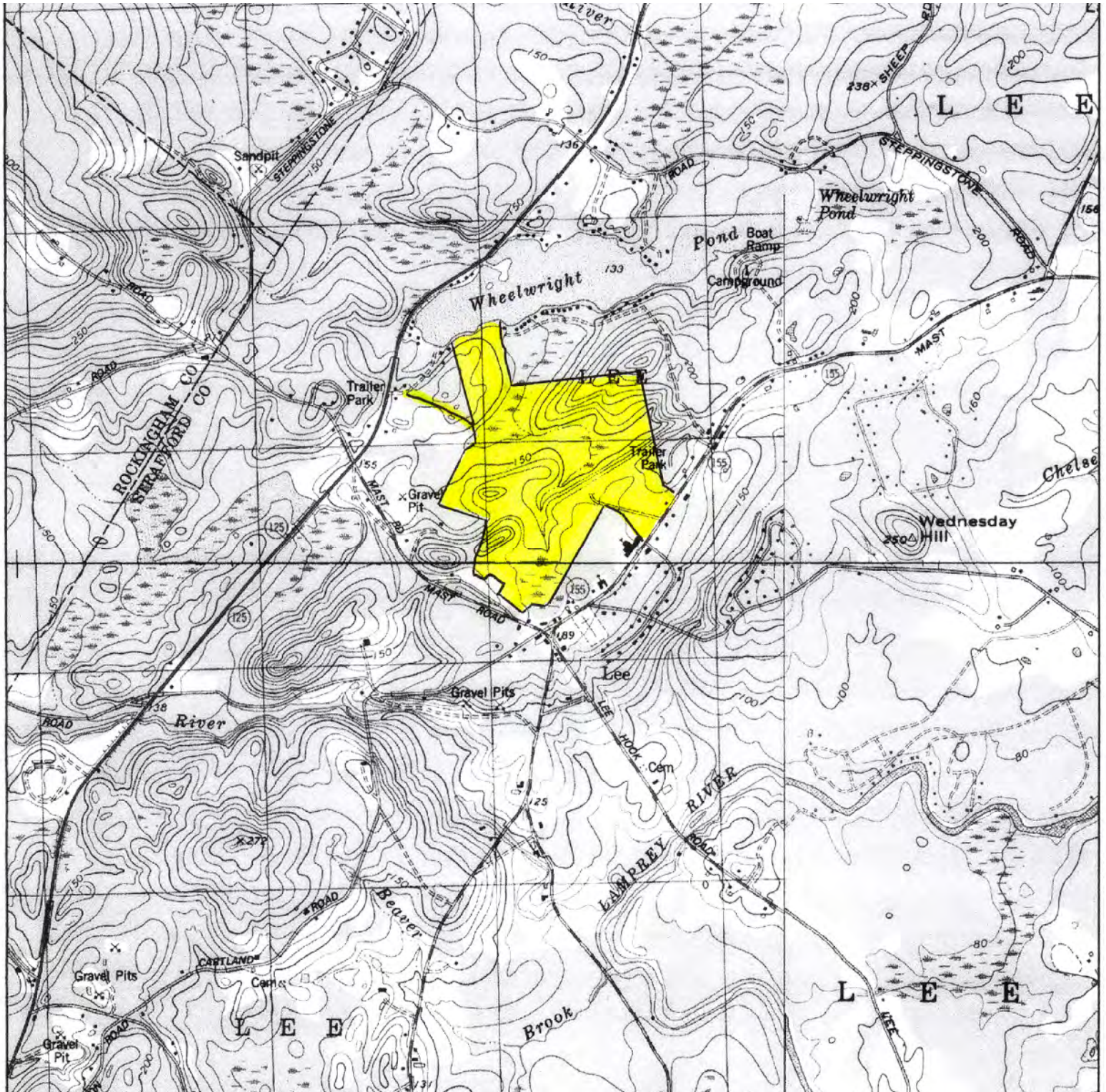


MAP SCALE:



1 inch = 2000± feet

Locus Map of the Lee Town Forest Lee, New Hampshire 191.5± Acres



Forest Management Plan
for the
LEE TOWN FOREST
Lee, New Hampshire

INTRODUCTION

This forest management plan was prepared for a 191.5± acre community-owned woodland property in Lee, New Hampshire, variously known as the “Lee Town Forest” or the “Town Forest Complex”. The property is situated in the town center, adjacent to the town’s municipal buildings and elementary school, thus affording exceptional access to the community for recreational and educational activities. In addition to an extensive trail network, the Lee Town Forest includes about 900± feet of scenic frontage on Wheelwright Pond.

The purpose of this plan is to guide the management and protection of the Lee Town Forest’s forest, wildlife, and water resources, as well as manage recreational activity on the property. The plan also addresses the purposes and specifications of a conservation easement (2003) on the property held by the Society for the Protection of New Hampshire Forests.

To prepare the plan, forest inventory and multiple walk-through examinations of the property were conducted between 2008 and 2010. Natural features, forest types and vegetation, wildlife habitat, water resources, historical features, scenic values, and management logistics were carefully discerned and examined. Forest structure, composition, and timber stock were analyzed. Recreational use was observed.

This forest analysis, in concert with interviews of the Lee Conservation Commission to identify management objectives, forms the basis for the plan. From this foundation, the long-term (50+ year) forest management strategy and recommendations were synthesized. The plan is a “working” document; over time it will likely require updating to reflect the ongoing management activities, unforeseen natural disturbances and conditions, as well as evolving community interests and objectives.

This project was performed under contract with the Lee Conservation Commission. The author of this forest and wildlife management plan, Charles Moreno, certifies that the plan’s entire contents, including all written material, maps, plan format, and organization are original to the author.

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April 2010



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MANAGEMENT PLAN FEATURES

Comprehensive forest and land management involves:

- 1) *Natural resource assessment.* The plan provides an in-depth natural resource analysis, including soils, wetlands, forest, wildlife, and timber. These resources are assessed, mapped, and summarized. A forest inventory was conducted, with statistical analysis, to determine the Lee Town Forest's timber volume and value.
- 2) *Recommendations.* The plan specifies sustainable forest and wildlife management practices for the next 30+ years. The plan also studies recreational usage and the community's recreational policies for the property.
- 3) *Implementation.* The plan examines logistical considerations and organizes comprehensive forest management in a financially and ecologically optimal manner

Maps of the Lee Town Forest are an important feature of this plan; they summarize a great deal of information in an easy-to-assimilate visual format. The maps may also be useful to anyone visiting the property. The plan includes detailed mapping of physical and natural features, forest types, wildlife habitat, and management recommendations.

Plan Organization

This introductory chapter contains the management objectives for the Lee Town Forest, which the Lee Conservation Commission has considered and identified for this community property. These long-term objectives are the underpinning for the recommendations presented in this plan.

Recommendations for the Lee Town Forest are based on the management objectives as well as a detailed study of the property's natural resources. A capsule summary and map of all the management plan recommendations are also found in this Introduction. The recommendation summary covers the following areas:

- Access
- Boundary lines
- Cultural features
- Forest education
- Insects and disease
- Invasive plants
- Recreation
- Silviculture
- Water quality protection
- Wildlife

The other plan chapters cover natural resource information for the property, the logistical considerations of property management and community use, and detailed forest and habitat assessment. The "Forest Resources" and "Silvicultural Planning" chapters are devoted to the strategy and specific recommendations for managing the Town Forest over the long-term.

The "Appendices" include: a) Observed tree and plant species list; b) Natural Heritage Bureau report; c) NH Wildlife Action Plan information and map; d) Timber inventory specifications; e) References; and f) Forester's credentials.



Lee Town Forest

FOREST MANAGEMENT OBJECTIVES

This stewardship plan is based on long-term management objectives that the Lee Conservation Commission has established for the Town Forest Complex. Broadly, these include:

- Maintain or increase biological diversity.
- Keep the property free of exotic, invasive plants.
- Increase timber value over time.
- Develop educational uses.
- Maintain and promote passive recreational uses for the community.
- Designate the Lee Bogs and vernal pools as reserve areas.
- Define and actively manage silvicultural areas.
- Protect water quality, wetlands, soils, rare plant and animal species, and historic features.
- Abide by the terms of the property's conservation easement.

NATURAL RESOURCE OBJECTIVES:

Natural Resource	Town Priority	Relative Resource Value	Comments
Forest Resources and Health	High	High	The Conservation Commission desires a healthy, diverse, and increasingly valuable forest; Silvicultural management will encourage near-natural forest conditions. Forest improvement practices will promote future value growth by removing low quality trees and encouraging healthy, valuable timber. The eventual re-introduction of American chestnut is an objective.
Wildlife Habitat	High	Good	Silvicultural practices will compliment and enhance woodland wildlife habitat. Protecting and maintaining diverse habitat for a diversity of wildlife, both vertebrate and invertebrate will be encouraged. Interfacing with the Wildlife Action Plan.
Soil Resources	High	Good	Preventing erosion and naturally increasing soil fertility are management objectives.
Water Resources	High	High	The property contains a network of forested wetlands and seasonal streams, as well as over a dozen vernal pools. The Town Forest also contains 870 feet of frontage on Wheelwright Pond, and partially overlays an aquifer. Protecting surface and subsurface water features is a priority.



PROPERTY USE OBJECTIVES:

Property Use or Concern	Town Priority	Comments
Forest Access	High	The Town Forest contains 5 access points and about 4± miles of trails. While minor upgrades are needed, it is unnecessary to expand the existing trail network. Forest management access will require the establishment of 3 landing sites.
Recreational Use	High	Light, non-motorized trail-based recreation is an important community use of the Town Forest, as are passive uses of the Wheelwright Pond waterfront. Welcome activities include walking, snowshoeing, skiing, nature observation, fishing, and the use of canoes/kayaks.
Educational Uses	High	The Town Forest provides an outstanding and accessible outdoor education setting for students, community members, and others.
Reserve Areas	High	Reserve areas include sections that are maintained generally free of human disturbances. Designated areas include the Lee Bogs and the vernal pools. The 40± acre northeastern section of the property will be presently retained from forest improvement harvesting as a temporary reserve.
Cultural Features	Medium	The property contains extensive stonewalls, and a primitive cemetery is located on the adjacent Church property. Preservation of stonewalls is an important concern.
Forest Aesthetics	High	The Conservation Commission is interested in maintaining a “natural” (versus “manicured”) appearance in the forest. Harvest operations, including wildlife projects and TSI, should be thoughtfully prepared and neatly carried out.
Invasive Plants	Medium	The Conservation Area woodlands are largely free of exotic, invasive plants. Annual monitoring and immediate removal of any plants is a priority objective for maintaining forest health. Invasive plant control is most effective when their presence is low, and prior to overtaking a large area.
Boundaries	Medium	Property bounds are to be blazed and painted, with scheduled maintenance on a 10-year basis.
Timber Production	Medium	The growth of high quality sawtimber, especially white pine, red oak, and black birch is a key silvicultural objective over time.
Timber Income	Low	While cutting timber strictly to produce revenue is not the Conservation Commission’s goal, some income will be generated from the sale of trees that are harvested for forest health/improvement purposes. The Conservation Commission plans to re-invest this income into the management of the Conservation Area, or use it for other conservation purposes.
TSI	High	While non-commercial timber stand improvement (TSI) work is a cost operation, it is often critical in establishing young forest growth and dramatically improving the quality of this growth. TSI can also be tailored to enhance wildlife habitat. Timber sale income can be partially invested to fund TSI.



MANAGEMENT RECOMMENDATIONS

Access – The Lee Town Forest is readily accessed at any of 5 access points, all with adequate parking. The property contains nearly 4 miles of recreational trails and roads, with only minor modifications needed for forest management.

- No new or extended woods roads or trails are recommended.
- Three to four landing sites will provide full forest management access.
- Upgrade and maintain seasonal stream fords on recreational trails.
- Conduct harvesting during dry or frozen ground conditions.

Boundary Lines – Property lines are not fully surveyed, and are in need of demarcation.

- Axe-blaze and paint *all* perimeter boundaries lines.
- Use brush-on surveying (heavy-duty) paint.
- Re-paint every 10 years.

Cultural Features – Protect and further investigate the property's history, as cultural sites may be presently undiscovered.

- Protect the property's stonewalls from degradation.

Forest Education – The Town Forest may provide a model of careful resource management and land stewardship. The property has good potential for outdoor learning and nature observation by the public.

- Publicize educational uses to local schools. Conduct field tour/workshop for teachers.
- Link with NH Project Learning Tree.
- Organize field tours for townspeople, landowners, students, etc.
- Develop an interpretive trail guide.

Insects and Disease – From an insect and disease perspective, the Lee Town Forest has no acute infestation or pathogen affecting trees in the forest presently. However, the viburnum leaf beetle (VLB), an exotic insect, is active in the forest. Arrowwood and highbush cranberry are especially susceptible; these important fruit-bearing shrubs may succumb after several years of defoliation.

- Remove individual diseased trees during the next improvement harvest, including:
 - White pine – White pine blister rust
 - Red oak – Strumella canker
 - Black birch, yellow birch, white birch – Nectria canker, cinder conk.
 - Beech -- beech bark (or scale) disease
 - Red maple - Nectria
 - Ash decline
- Maintain vigilance for serious, potential insects, which have not been found in the immediate vicinity, especially:
 - Woolly adelgid – Affects hemlock, stripping foliage and causing fairly rapid death.
 - Asian longhorn beetle – Affects maple and other hardwoods, causing mortality.
 - Emerald ash borer – Attacks white ash and black ash, causing rapid death.
- Forest management should address any insect and disease concerns silviculturally, i.e., encouraging healthy trees of a variety of species while removing afflicted diseased trees.
- Strategize mechanical or other control of VLB if viburnums are seriously affected.
- Work towards the eventual re-introduction of American chestnut. Promote the growth of any naturally-seeded or stump-sprout chestnuts in the interim.



Invasive Plants – There is low-level incidence of exotic, invasive plants on the Town Forest at present. Immediate control response and annual monitoring should remain high-priority concerns.

- In early-successional areas, annually monitor for Oriental bittersweet, Japanese barberry, burningbush, multiflora rose, and autumn olive.
- In forest areas, monitor for glossy buckthorn, Japanese barberry, and burningbush. Buckthorn, a serious invasive, is found in a wide variety of sites—from wet to dry.
- Upon discovery, apply immediate action to check the spread of plants into the surrounding forest.
- Utilize pulling and collecting technique as *primary control* effort, followed by cutting and stem or foliar treatment as the treatment for more established or persistent infestations.
- After initial control efforts, annual monitoring and follow-up control is usually required.
- Try to interest abutters in control efforts on their own lands.
- Re-invest timber sale proceeds into invasive plant control.

Recreation – Continue to allow light recreational usage of the property that has little or no affect on habitat, wetlands, streams, water quality, natural features, or plants.

- Discourage all forms of motorized wheeled vehicles, as is current town policy.
- Encourage hiking, running, skiing, snowshoeing, geo-caching, and nature study.
- Paint color-coded blazes along trails. Do not expand trail system.
- Stock kiosk with trail maps. Establish kiosk in Access Point #2.
- Post “no-wheeled vehicle” signs at all property entry points.
- Install appropriate fords on trails at all stream crossings.

Silvicultural – See “Forest Resources” and “Silvicultural Planning” chapters for *detailed* future management specifications.

- Manage primarily for forest health, habitat enhancement, and to improve forest growth.
- Silviculture should encourage near-natural established-forest conditions over time.
- Apply silviculture comprehensively by management area, on a 15± year harvest cycle.
- Follow sustainable management, i.e., harvesting less timber volume than the amount the forest is able to replenish during the 15-year harvest cycle interim.
- Invest in non-commercial timber stand improvement (TSI) to help establish mid-successional regeneration and improve forest growth.
- Pursue the long-term reintroduction of American chestnut, when disease-resistant seedlings become available.
- Reinvest timber income into the management of the Town Forest. Consider timber revenue as a bi-product, not the goal of silvicultural management to avoid conflict with ecological and community-use objectives.
- A professional forester should always be engaged to select and mark trees for harvest prior to cutting in order to reflect silvicultural prescriptions and to control the extent of cutting.

Water Quality Protection – Protecting the Town Forest’s surface and subsurface water resources from degradation is a major management objective and conservation easement purpose.

- All recreational trails should properly ford stream-crossing points.
- For harvest operations, reconnoiter and plan necessary stream and/or wetland crossings. Minimize the number of stream and/or wetland crossings. Logging contractor should submit and work within appropriate wetland permitting.
- Maintain minimal harvest buffers (removals not to exceed 10% of basal area; maintain at least 75% canopy cover) within 100 feet of vernal pools, and 25 feet of streams.



- Contractors should study and apply New Hampshire Best Management Practices when conducting a harvest operation.
- Schedule harvest operations during dry or frozen ground conditions when working in the vicinity of wetlands, particularly vernal pools.

Wildlife – Wildlife habitat is managed in conjunction with harvesting, timber stand improvement, and volunteer projects.

- Silviculturally manage forest towards a multi-aged condition.
- Encourage stratification of forest canopy layers.
- Encourage the growth of broad-crowned mast-producing oaks and hickories. Diversify the property's mast sources.
- Retain dense shrub vegetation in wetlands including arrowwood, winterberry holly, highbush blueberry, sweet pepperbush, speckled alder. Maintain hemlock wildlife corridors.
- Establish a minimal harvest “vernal pool protection zone” within 100 feet of vernal pools, with removals not to exceed 10% of basal area, and at least 75% canopy cover maintained.
- Allow the accumulation of coarse woody debris for amphibian and reptile habitat, particularly within 400 feet of vernal pools including the vernal pool protection zone and the broader “amphibian life zone”.¹
- Maintain early-successional habitat on a 15 to 30 year rotation.
- Retain old residual trees (150+ years).
- Retain snags, cavity trees, and downed woody debris.
- Set-up bat boxes and waterfowl nesting boxes.
- Maintain the Town Forest free of exotic, invasive plants.
- Establish an on-line wildlife sighting register for the Town Forest (also, town-wide).
- Conduct periodic wildlife surveys such as bird counts, winter tracking observations, mammal checklists, etc.
- Periodically update the Town Forest Complex Bio-inventory.

¹ “Forestry Habitat Management Guidelines for Vernal Pool Wildlife”, Aram J. K. Calhoun and Phillip deMaynadier, MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, 2004.



Management Recommendations Map

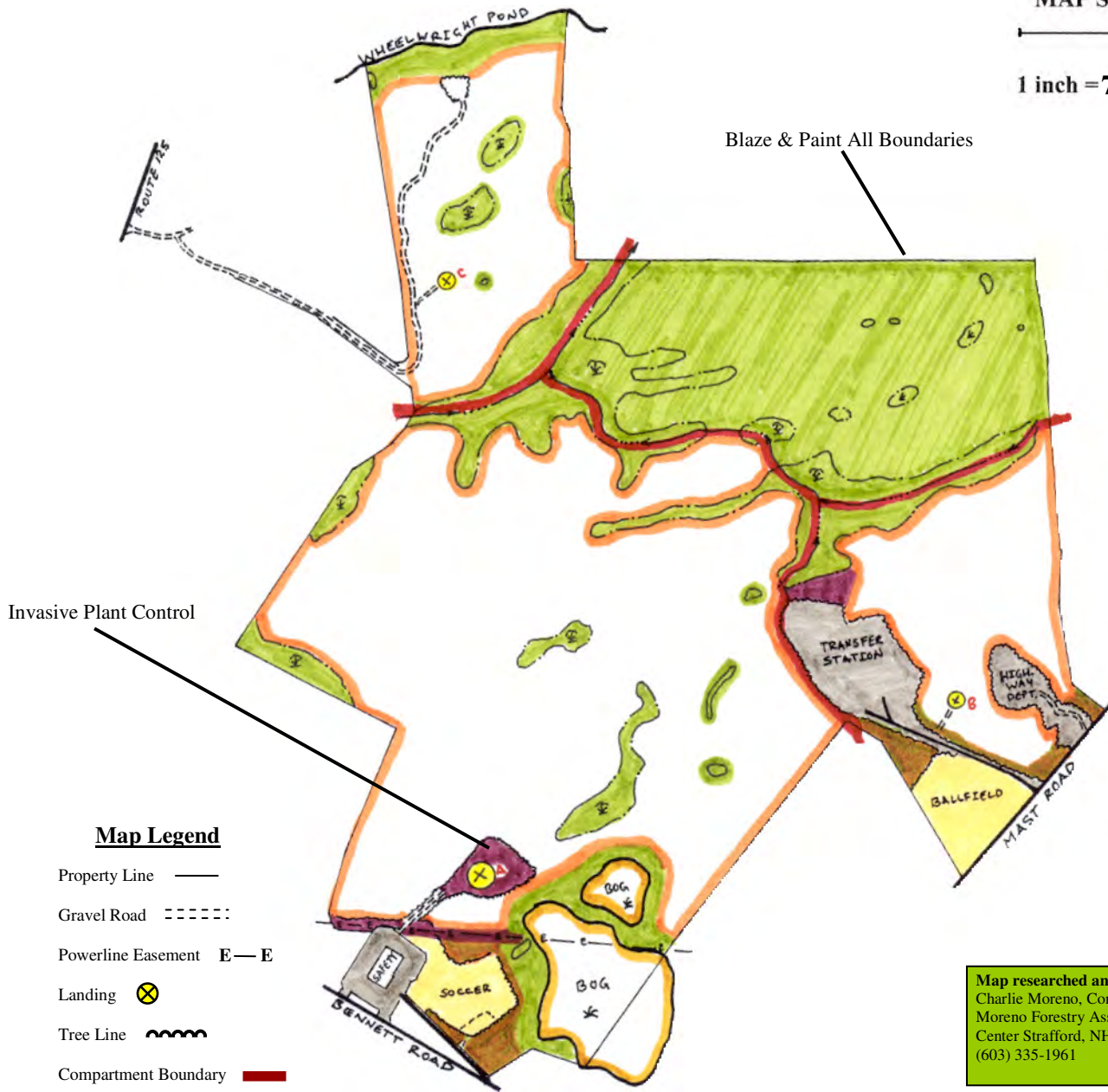
of the LEE TOWN FOREST Lee, New Hampshire 191.5± acres



MAP SCALE:



1 inch = 700± feet



Map Legend

- Property Line ———
- Gravel Road - - - - -
- Powerline Easement E—E
- Landing ⊗
- Tree Line ~~~~~
- Compartment Boundary ———
- Forested Wetland ☼
- Silvicultural Management Areas ○ 112± acres
- Early-Successional Management Areas ● 3± acres
- Woodscaping Areas ● 3± acres
- Reserve Areas ● 63± acres

Map researched and drawn by:
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Moreno Forestry Associates
Center Strafford, NH
(603) 335-1961 April 2010

MAP REFERENCES:

Town of Lee Tax Maps
Aerial Photos: USGS 1952, 1974, and 1998 series. Eastern Topographics, Inc., 3/86 flight. Google Earth 2004; bing.com maps
Perimeter Surveys:
 > "Survey and Plat...Bales", RSL Layout & Design, Inc., 5/8/95. SCRDP Plan #45-93.
 > "Boundary Line Adjustment...Wulf", Atlantic Survey Co., 11/4/97. SCRDP Plan #51-4.
 > "Boundary Adjustment...Morgan", Atlantic Survey Co., 12/29/97. SCRDP Plan #53-100.
 > "Subdivision Plan for the Town of Lee", Doucet Survey, Inc., 7/1/04. SCRDP Plan #77-77.
 > "Conservation Easement ...Lee", RSL Layout & Design, 10/14/05. SCRDP Plan #83-44.
Property Reconnaissance:
 Timber Inventory (Moreno Forestry Associates, February 2008)
 Field Examination (C. Moreno, 2008-2010)

II. PROPERTY PROFILE

GENERAL INFORMATION

LOCATION and GEOGRAPHY

The Lee Town Forest property is located in Lee, New Hampshire, adjacent to the town center, and between Mast Road (NH Route 155), George Bennett Road, and Wheelwright Pond.

The subject property is located on the New Hampshire coastal plain, about 16 miles inland from the Atlantic Ocean. The property's elevation ranges from about 135± feet above sea level at Wheelwright Pond to the highest point of land, a knoll in the former Bales Lot area at about 220± feet. Topography is variable, ranging from level and gently rolling (0 to 9% slopes), to steeply sloping (10-25±%) along the sides of several small knolls and a few stream ravines. The property lies within the Oyster River watershed.

REFERENCE INFORMATION

Area: Property Total – 191.5± acres

- Upland Forest.....148.9± acres
- Wetlands (including bogs and forest/shrub swamps).....32.6± acres
- Early-successional openings (including powerline)..... 2.8± acres
- Athletic fields, woods roads, parking areas.....7.2± acres

Deeds: SCR D Book 463, Page 0421. Comings' Lot acquisition, 1920.
SCR D Book 1252, Page 0598 . Durgin Lot fee simple acquisition, 8/22/86.
SCR D Book 1801, Page 0771. Bales Lot fee simple acquisition, 5/12/95.
SCR D Book 1804, Page 0328. Additional parcel from Bales, 5/30/95.
SCR D Book 1972, Page 0001. Wulf Lot fee simple acquisition, 12/12/97.
SCR D Book 2041, Page 0043. Fee simple acquisition of lane to Durgin Lot, 9/17/98.
SCR D Book 3628, Page 0102. Grants conservation easement.

Aerial Photos: USGS 1952, 1974, and 1998 series. Eastern Topographics, Inc., 3/86 flight.

Reference Plans:

- > “Survey and Plat...Bales”, RSL Layout & Design, Inc., 5/8/95. SCR D Plan #45-93.
- > “Boundary Line Adjustment...Wulf”, Atlantic Suvey Co., 11/4/97. SCR D Plan #51-4.
- > “Boundary Adjustment...Morgan”, Atlantic Suvey Co., 12/29/97. SCR D Plan #53-100.
- > “Subdivision Plan for the Town of Lee”, Doucet Survey, Inc., 7/1/04. SCR D Plan #77-77.
- > “Conservation Easement Plan for the Town of Lee”, RSL Layout & Design, 10/14/05.
SCR D Plan #83-44.

Tax Maps: Comings Lot—Map 11, Lot 5.
Durgin Lot—Map 11, Lot 10-9.
Bales Lot—Map 11, Lot 7.
Wulf Lot—Map 11, Lot 8.



CONSERVATION EASEMENT PROVISIONS

A conservation easement was granted over most of the Lee Town Forest on March 26, 2008. While the Town of Lee owns, manages, and uses the property, the conservation easement is held and monitored by the Society for the Protection of New Hampshire Forests (SPNHF). The easement protects the property in perpetuity from land development, as well as natural resource abuse, neglect, or unsustainable exploitation.

Conservation easement clauses that are relevant to management activities on the land are summarized below. This brief, non-comprehensive summary does not replace requisite reference to the conservation easement document itself, for full comprehension of the easement's terms and obligations.

PURPOSES

- 1) The protection of the natural habitat of native plant and animal species, including vernal pools, rocky outcrops, dry acidic uplands, wetlands, intermittent streams, brushy powerline habitat, and the property's two bogs.
- 2) The protection of dwarf huckleberry, a State-threatened plant species found in the bogs.
- 3) The protection and conservation of open spaces, i.e., the conservation of productive forestland and wildlife habitat, and long-term protection of the land's capacity to produce economically valuable agricultural and forest products.
- 4) The protection of 875± feet of undeveloped frontage along Wheelwright Pond, while providing recreational access and scenic enjoyment to the public.
- 5) Protect quality and yield of surface and groundwater resources on and under the property, as property overlays a public water supply aquifer.

USE LIMITATIONS

- 1) General—Agriculture and forestry are allowed as long as activities are not detrimental to the Easement's purposes, or impair the property's scenic qualities or productive capacity.
- 2) Goals—Forestry shall be performed in accordance with the following goals: a) Maintain soil productivity; b) Protect water quality, wetlands, and riparian areas; c) Improve forest product quality; d) Conserve property's scenic qualities; e) Protect unique and fragile natural areas (esp. poor level fen/bog ecosystem) and any species of concern; f) Protect historic/cultural features; and g) Conserve native flora and fauna.
- 3) Forest Management Plan—
 - a. Forestry to be performed in accordance with a written management plan submitted to, and with written approval by, SPNHF at least 30 days before implementation. Plan must be reviewed and updated within 10 years of commencement of a timber harvest.
 - b. Town of Lee shall submit a written certification by Licensed Professional Forester (LPF) that plan is current and in compliance with the terms of the Easement.
 - c. Plan shall include landowner objectives, and address the Easement Purposes (summarized as 1 through 5 above), as well as Easement Goals (7, above).



- 4) Timber Harvesting—
 - a. Supervised by LPF and conducted in accordance with management plan.
 - b. Follows all governmental laws and regulations, and applies NH Best Management Practices (BMP's).
 - c. Follows "Guide to Logging Aesthetics" (G. Jones, 1993).
- 5) Structures—Allowed if necessary for forestry, habitat management, or non-commercial outdoor recreation. Includes woods roads, culverts, barns, sheds, and sugar houses. Allows signs up to 16 sq. ft. in size (ex. 4' x 4' maximum).
- 6) Soil Surface Disturbances—No mining or quarrying, unless:
 - a. Commonly necessary to accomplish and done in "connection" to agriculture, forestry, habitat management, or outdoor recreational uses, such as excavated gravel for a woods road.
 - b. Does not harm endangered or threatened species, species of concern, or exemplary natural communities.
 - c. Not detrimental to Easement Purposes.
- 7) No onsite disposal of man-made materials or environmentally hazardous materials.
- 8) Posting—The land may be temporarily posted during forest harvesting or other forest management activities. Property may be posted to not allow camping or hunting.
- 9) Recreational Uses—Shall keep public access for minimal impact, pedestrian, non-commercial outdoor recreational and educational uses, including, but not limited to:
 - a. Hiking, wildlife observation, cross-country skiing, and fishing.
 - b. But not camping or hunting.

LANDOWNER RESERVED RIGHTS

The Town of Lee reserves the following rights, subject to a number of Easement contingencies:

- 1) Right to withdraw groundwater for public water supply.
- 2) Right to archeological investigations.
- 3) Right to maintain one dock on Wheelwright Pond not to exceed 40 sq. ft. (ex., 4' x 10' max.)



PROPERTY HISTORY

NATURAL and LAND USE HISTORY

In the distant past, the primeval forest that occupied the Lee Town Forest uplands probably included a species mixture variously dominated by American beech, American chestnut, northern red oak, white oak, shagbark hickory, white pine, and eastern hemlock. Birch (4 species), red maple, white ash, American basswood, American elm, aspen (2 species), cherry (3 species), and pitch pine were also important components of the mix, with their presence dependant on soils and forest disturbance patterns. Forest disturbance—fire, wind, ice, human-caused clearing—created an assortment of forest ages, with trees ranging from new seedlings to 500+ year olds in the pre-European settlement forest.

Humans undoubtedly played a part in the forest's early history after glaciation. Woodlands may have been intentionally altered to encourage mast crops or enhance hunting opportunities. The possibility of Native American settlement exists as well, with cleared areas for crops and habitation.

European settlers left their mark beginning in the latter half of the 17th century, cutting specimen white pines for ship masts, and later (\pm 1700-60's), clearing and settling the land. Stonewalls, and later, barbed wire fencing, are lingering evidence of a long period when the Lee Town Forestlands were cleared fields and pastures, and/or somewhat open woodlands used for grazing.

While forest has reclaimed the land, with a century-worth of growth obscuring the existence of former farmland, the early settlers had a vast impact on the forest environment. Simply put, the "new" forest lacks complexity. Forest structure is largely even- or two-aged, lacking multiple generations of trees. As with much of New Hampshire, old trees, 300 to 500+ years, are absent—the oldest trees in the Lee Town Forest are a mere 150 \pm years old. Furthermore, entire species, both plant and animal, are extirpated, or exist with radically changed presence. American chestnut and butternut, for example, are barely viable species; large carnivores, including mountain lion and gray wolf, are lost.

With the return of the forest after over a century as pastureland, numerous species have made a comeback. For example, the natural restoration of a multitude of vernal pool-dependant amphibians and invertebrates in the Town Forest is dramatic.

Timber harvesting has been the most significant disturbance type on the Lee Town Forest since pastureland abandonment and the return of the forest in interior areas after the Civil War. Wind events, ice storms, and forest pasturing have also influenced present forest structure and composition.

The first round of timber-cutting focused on the harvest of relatively young white pine saw-wood, in the early 1900's through the first World War. The composition of the Durgin Preserve lands, as well as sections of the Comings Lot, were affected by these early harvests; extensive areas contain few (or a diminished number of) white pines, and fairly even- or two-aged forest. A blowdown in the 1950's (perhaps Hurricane Carol, 1954) felled trees in the property interior, as evidenced by vaguely discernable pit and mound terrain. This event may have precipitated a salvage/timber harvest in the Comings' Lot (the "original" town forest land) in the 1950's. White pine sawtimber was extensively harvested on the Bales and Wulf parcels in 1985 \pm and 1995 \pm , respectively. In



these areas, white pine is a minor overstory component, and new generations of sapling growth have populated the harvest openings.

Present forest composition and structure are detailed in the Forest Type Descriptions section of this study.

ACQUISITION HISTORY

The Lee Town Forest consists of four contiguous parcels which were acquired by the town over the course of nearly a century. A summary of the transactions involving these parcels follows.

The 100+ acre original town forest parcel, known as the “Comings’ Lot”, which is located north of Mast Way School, was acquired by the town in 1920±. The property was subdivided in 2004 to provide separate parcels for the town recycling center and the highway department. The remaining land, covering 91.76± acres, is designated town forest, and is protected by conservation easement.

The town acquired the adjacent 20± acre “Alfred C. Durgin Preserve” property, with financial assistance from the U.S. Land and Water Conservation Fund, on August 22, 1986. The property grantors were Chesley F. Durgin and Evangeline D. Perkins. On September 17, 1998, a 0.71± acre lane was added to the Durgin lot to provide public access from Clement Road.

The 61± acre Bales property was acquired in two transactions from Michael S. Bales in May 1995, using town funds. This property was subdivided in 2005 to provide parcels for the town public safety complex and for potential expansion of other town facilities. The remaining 43.6± acres are protected under conservation easement.

The final acquisition was the 17.0± acre Wulf parcel, acquired with town funds from Gary W. and Nancy J. Wulf on December 12, 1997. The entire parcel is protected by conservation easement.

A conservation easement deed was executed on March 26, 2008 over 153± acres of the town forest complex. The easement grantee and holder is the Society for the Protection of New Hampshire Forests (SPNHF). The conservation easement protects the land from development and exploitation, with fee simple ownership held by the Town of Lee for the enjoyment and benefit of the general public.



WATER RESOURCES

Surface Waters

The Lee Town Forest lies in the Oyster River watershed. All streams on the property are first order (beginning of watershed), flowing to Wheelwright Pond, which drains to an unnamed brook, and thereafter to the Oyster River. The Lee Town Forest includes approximately 875± feet of undeveloped Wheelwright Pond shoreline.

The Wheelwright Pond frontage is wooded, with dense shrub coverage. Sweet pepperbush and highbush blueberry are common, along with some winterberry holly and silky dogwood. The shorefront shrubs provide cover for wildlife as well as bank stabilization, protecting the lake from soil runoff and sedimentation. Lake access is confined to a small area that includes a dock.

A series of forested wetlands lie in the Lee Town Forest, interconnected by seasonal streams. The forested wetlands cover considerable area: 17.6± acres, or about 9% of the property. The forested wetlands are generally represented by two natural community types: the more common *Red maple – sensitive fern swamp*; and the enriched site—minerotrophic—*Red maple—black ash—swamp saxifrage swamp*. The *Red maple-red oak-cinnamon fern forest* natural community may also describe peripheral areas between forested swamp and upland forest. Specific description of the composition and structure of forested wetlands is presented in the Forest Type descriptions for the Lee Town Forest.

Vernal pools—approximately a dozen—are also an important Town Forest surface water feature. The pools vary greatly in size (.1 to .25± acre) and character, ranging from deeper open water to shallow shrub-forested. Some pools are embedded within forested swamp areas. While not studied, the number of days that the pools retain water, i.e. the “hydroperiod”, likely ranges from 2 weeks to over two months. Longer hydroperiods provide preferable habitat. The Town Forest’s vernal pools represent vital habitat for crustaceans, insects, amphibians, and reptiles.

The most spectacular surface water features on the property are a pair of bogs, totaling approximately 8± acres. Known as the “Lee Bogs”, these wetlands are exemplary examples of an uncommon wetland natural community system: *Poor level fen/bog system*; and specifically the *Leatherleaf-black spruce bog* natural community. The bogs are ecologically significant due to their uniqueness and relatively undisturbed character. Interesting vegetation in the bogs include: a) Rare/uncommon plant species, such as dwarf huckleberry, which is threatened in New Hampshire, rhodora, and frostweed (in the adjacent uplands)²; b) Species at the limit of their natural range, such as black spruce and tamarack; and c) Both native insectivorous plant species, sundew and pitcher plant. The bogs are oligotrophic—that is, containing nutrient-poor waters and soils. The bogs lack a surface water source or outlet, such as a stream or seep; rather, they remain water-saturated and replenished by groundwater seepage.³ Sphagnum mosses are well adapted to this near-stagnant, nutrient poor environment, producing highly acidic conditions.

According to the New Hampshire Natural Heritage Bureau, the property’s wetlands may contribute habitat for the following species of concern: Blanding’s turtle, spotted turtle, wood turtle, and northern black racer.

The property’s surface waters are mapped and illustrated on the “Natural and Physical Features Map”, on page 2 of this report.

² “A Biological Inventory of the Town Forest Complex”, by Alan T. Eaton, with Kim Therrian, August 22, 2005, pages 21 and 22.

³ “A Biological Inventory of the Town Forest Complex—Introduction”, by Bill Humm and Alan T. Eaton, August 22, 2005, page 3.



Subsurface Waters

A stratified-drift aquifer underlies the Hinckley soil areas along the east side of the property, underlying the bogs, town complex, and adjacent forest. Hinckley soils are gravelly and water permeable, providing recharge capacity to the aquifer.

Water Resource Protection Recommendations

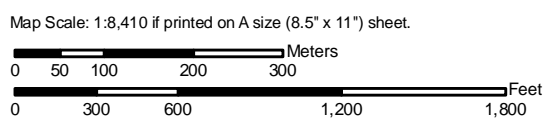
- Logging contractors should carry emergency spill kits, particularly if operating on Hinckley soils, as these soils generally overlay the aquifer area. Well-drained, gravelly sites are indicative of Hinckley soils.
- Do not expand the existing recreational trail network, as this may entail additional stream crossings.
- Continue to upgrade and install appropriate fords at all recreational trail stream crossings.
- Forest harvesting activity should strictly follow NH Best Management Practices (BMP's) for fording streams, and working in the vicinity of forested wetlands and vernal pools.
- Maintain a 100-foot no-harvest buffer along Wheelwright Pond and around the Lee bogs, unless future conditions, such as a storm event, warrant activity.
- Control exotic, invasive plants by mechanical means where possible, avoiding the use of herbicides.



Soils Map




Soil Map—Strafford County, New Hampshire
(Lee Town Forest, Lee, New Hampshire)



MAP LEGEND






















Area of Interest (AOI)

 Area of Interest (AOI)

Soils


 Soil Map Units

Special Point Features




-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

 Very Stony Spot

 Wet Spot

 Other



Special Line Features

-  Gully
-  Short Steep Slope
-  Other






Political Features

 Cities

Water Features

-  Oceans
-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

Map Scale: 1:8,410 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Strafford County, New Hampshire
Survey Area Data: Version 10, Oct 27, 2009

Date(s) aerial images were photographed: 8/24/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Strafford County, New Hampshire (NH017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HaA	Hinckley loamy sand, 0 to 3 percent slopes	21.5	11.6%
HaB	Hinckley loamy sand, 3 to 8 percent slopes	17.4	9.4%
HcB	Hollis-Charlton fine sandy loams, 3 to 8 percent slopes	5.3	2.9%
HcD	Hollis-Charlton fine sandy loams, 15 to 25 percent slopes	1.1	0.6%
HdC	Hollis-Charlton very rocky fine sandy loams, 8 to 15 percent slopes	24.9	13.5%
HdD	Hollis-Charlton very rocky fine sandy loams, 15 to 25 percent slopes	90.7	49.1%
Mp	Muck and peat	7.8	4.2%
SwA	Swanton fine sandy loam, 0 to 3 percent slopes	15.9	8.6%
W	Water	0.1	0.0%
Totals for Area of Interest		184.5	100.0%

SOIL RESOURCES

Terrain and Topography

Four distinct soil types underlie the Lee Town Forest. Gravelly soil underlies the eastern property area adjacent to the bogs and along Route 155; this soil is of glacial outwash origin. By contrast, glacial till underlies most of the property's upland interior to Wheelwright Pond. These areas contain copious rocks and scattered ledge outcrops. Parent material is generally marine silt and clay deposits. Wetland soils include poorly-drained silt/clay soils underlying the property's riparian areas and swamps, as well as deep mucky peat in the bogs.

While wetlands and gravelly areas are level or mildly sloped (0 – 8% slopes), slopes in the till uplands range from gentle to steep (3 to 25+% slope), including a ravine area.

Soil Types

Hinckley (HaA & HaB) – This gravelly glacial outwash is extremely permeable and well-drained. A thin loamy-sand surface layer overlies deep mineral soil of mixed variably-sized particles including sand, gravel, and cobble. Dry conditions are encountered year round with Hinckley soil, rendering it favorable for forest management access, and particularly for locating landing sites. White pine generally tolerates the soil's dry conditions, and is able to readily regenerate under its own canopy. Various oak species, including white oak, are also common components.

Hollis-Charlton (HdC & HdD) – This upland complex is a close intermingling of two soil types. Hollis soils are characterized as a thin layer of loam over bedrock, which typically lies within 1½ feet of ground surface. In the Lee Town Forest, Hollis soils are shallow-to-ledge with areas where ledge outcrops are a common surface feature. Charlton soils are a deeper glacial till which intermixes the ledgy Hollis areas. Charlton soils are rocky and reasonably well-drained; moderately permeable fine sand underlies the subsoil, two feet below the soil surface.

These soils are reasonably productive for forest growth, with white pine, red oak, red maple, and hemlock commonly found. This soil complex covers most of the upland interior area, north and west to Wheelwright Pond.

Muck and peat (Mp) – Very poorly-drained mucky peat soil underlies the bogs, where organic material has accumulated for centuries. The soil is considered “peat” when organic material is still recognizable to permit identification of plant forms. Plant material is thoroughly decomposed in the underlying “muck”.

The Lee bogs are oligotrophic in nature—saturated and replenished by groundwater seepage. The bog peat is thus low in pH and is nutrient poor. Unique vegetation, including black spruce and pitcher plant, is adapted to growth in this environment.

Swanton (SwA) – This poorly drained soil underlies the property's forested swamps and stream riparian areas. The upper horizons of the soil consist of sandy loam, while the silt and clay substratum has low water permeability. Swanton soils are generally low-lying with a high watertable. Resulting low-oxygen soil conditions limits tree growth, with roots generally confined to the soil surface. Thus, trees growing in Swanton soil areas may be prone to blowdown, creating a generally dynamic environment. In the Lee Town Forest, red maple, highbush blueberry, and winterberry holly typically occupied the Swanton soil sites.



Soil Resource Protection Recommendations

- Schedule harvest operations for dry summer through mid-fall conditions (June-October), or frozen/snowy ground in winter, (late Dec-early March), to avoid unnecessary rutting of ground.
- Avoid equipment travel on poorly-drained soil areas.
- Use brush matting or wood corduroy to stabilize crossings on poorly drained soils.
- Pre-plan all stream crossings, and use the minimum number of crossings needed to access the woodlands.



WILDLIFE RESOURCES

Wildlife usage of the Lee Town Forest is dependant on the property's habitats, features that may enhance these habitats, as well as the continuity of habitat on adjacent open space lands. While habitat is varied and nuanced, seven core habitats have been identified that contain broad similarity in both physical and vegetative attributes. The core habitats include wetland and upland types, and some, like the Lee Bogs, are quite specialized. Detailed descriptions of the woodland-specific core habitats are found in the "*Silvicultural Planning*" chapter. Recommendations to perpetuate or enhance these habitats, on a forest type level, are specified as an integral part of the silvicultural prescriptions.

List of Core Wildlife Habitats in the Lee Town Forest

- Lee Bogs
- Forested swamps
- Vernal pools
- Early-successional and young forest habitat
- Mast-production habitat
- Dense softwood thermal cover habitat
- Transitional softwood-hardwood habitat

Town Forest Wildlife Species

A comprehensive inventory of the Lee Town Forest's wildlife and plant species has been conducted and published by Alan T. Eaton of Lee, New Hampshire, as "A Biological Inventory of the Town Forest Complex, Lee, New Hampshire", August 22, 2005. In addition to trees, shrubs, vines, and herbaceous plants, this ambitious bio-inventory includes birds, mammals, amphibians, reptiles, fish, butterflies, and dragonflies. The inventory was updated in April 2007, and is available at the Lee Library and at the Lee Town Hall through the Lee Conservation Commission.

Interface with NH Wildlife Action Plan

Most of the Lee Town Forest is classified in the NH Wildlife Action Plan (WAP) as highest ranked, tier 1, habitat by ecological condition (see Appendix C: NH WAP Map).⁴ In addition, the Lee Bogs rank as "highest quality habitat" both for ecological condition in New Hampshire, and as compared to all habitats in the same ecoregion. Background information about WAP may be found in Appendix C of this report.

WAP identifies 10 ecoregions in New Hampshire; the Lee Town Forest is situated on the edge of two ecoregions: the *Gulf of Maine Coastal Lowlands* and the *Gulf of Maine Coastal Plain*. There are 7 watershed groupings in the state; the Town Forest lies within the *Tidal Coastal Watershed*. 19 large-scale habitats have been classified for New Hampshire, including five matrix forest types and four freshwater habitats.⁵ The matrix forest type in the Lee Town Forest is the *Appalachian Oak-Pine Forest*. The relevant wetland habitats include *Wet Meadow-Shrub*, *Peatlands*, and *Vernal Pools*.

⁴ Ibid.

⁵ Ibid.



WAP provides a “coarse filter”, landscape-level classification of New Hampshire’s habitats. The forest type delineations and habitat assessments researched for this report, the Lee Town Forest Management Plan, are a refinement of the broad habitat classifications in WAP. Interfacing of these delineations with WAP will provide a clearer picture of the landscape-level classifications.

WAP states that the greatest danger for New Hampshire’s wildlife is conversion of habitats into “surfaces and structures—in a word, development”.⁶ With the community acquisition and conservation easement protection of the Lee Town Forest, the major component of conservation has been accomplished—the exceptional habitat within this property will not be lost to development. Furthermore, the conservation easement obliges careful stewardship of the land, including its wildlife habitat, by the Town of Lee.

The recommendations for habitat management in this plan are the second phase of habitat conservation. Management is forest type specific, but broad-based to benefit indigenous wildlife in general, where there is opportunity. In the future, species specific measures may be implemented, in conjunction with the New Hampshire Wildlife Action Plan. For example, sections of the parcel may be deemed to hold habitat management opportunities for Blanding’s turtle, whip-poor-will, or Canada warbler. A future management plan update (2025±) may consider species specific measures, particularly as the scientific knowledge collected in WAP continues to expand.

⁶ Ibid.



NATURAL COMMUNITIES

Natural communities are recurring aggregations of plants and animals found in particular physical environments.⁷ On the Lee Town Forest, these environments include wetland and upland forest sites. The Lee Bogs represent an exemplary natural community, *Leatherleaf-black spruce bog*, due to its rarity and general lack of alteration.

Forested wetland natural communities on the Lee Town Forest are represented by: a) *Red maple – sensitive fern swamp*, which is red maple dominated swamp in a headwater or near headwater location, and are somewhat minerotrophic; and b) *Red maple—black ash—swamp saxifrage swamp*, found in limited areas as groundwater-enriched swamps or sections of swamps. The *Red maple-red oak-cinnamon fern forest* natural community is found in some peripheral forested swamp areas, and is transitional between swamp and upland forest.

Vernal woodland pool describes the natural community that occurs in several small, isolated, seasonally-flooded depressions, both within the upland forest and forested wetlands of the Lee Town Forest. “Seasonally-flooded vernal depressions” best describes the pools found within forested wetlands. Vernal pool hydroperiod and vegetative conditions vary widely in the Town Forest. Some pools are entirely unvegetated, while others have ample wetland shrub and tree stocking.

The Lee Town Forest upland forest is representative of three natural communities. *Dry red oak-white pine forest* describes the mesic/near-xeric forest adjacent to the bogs and in the eastern sections of the property, particularly Hinckley soil areas. This natural community transitions to the more extensive *Hemlock-beech-oak-pine* natural community, which describes upland forest areas covering the Town Forest’s till-ledge interior. Finally, the *Mesic Appalachian oak-hickory forest* natural community describes the upland forest in the Durgin Preserve area. This area contains a variety of hardwood species, particularly oaks and hickory. A heath shrub layer (esp. lowbush blueberry) is mostly absent; rather, shrubs include beaked hazelnut, maple-leaf viburnum, witch-hazel, and occasional alternate-leaf dogwood and hawthorn.

Summary

At least eight natural communities are found in the Lee Town Forest, including an exemplary example signified below by an asterisk.⁸

Wetland Natural Communities

*Leatherleaf-black spruce bog**
Red maple – sensitive fern swamp
Red maple—black ash—swamp saxifrage swamp
Red maple-red oak-cinnamon fern forest
Vernal woodland pool

Upland Natural Communities

Dry red oak-white pine forest
Hemlock-beech-oak-pine
Mesic Appalachian oak-hickory forest

⁷ Natural Communities of New Hampshire, by Dan Sperduto and William Nichols, pp 1.

⁸ *Ibid*, with reference to multiple pages.



**III. PROPERTY LOGISTICS
and
COMMUNITY USE**

TOWN FOREST ORGANIZATION

MANAGEMENT COMPARTMENTS

The organization of a large property into management areas, or “compartments”, assists in planning and implementing recommendations. A *management compartment* is a section of land within the property that is readily defined by surrounding *physical* features such as a woods road, stream, wetland edge, and/or stonewall. Each management compartment has a distinct access strategy, and silvicultural operations are conducted systematically on a compartment basis. Furthermore, a compartment may contain specific areas that are not actively managed; these areas are designated as reserves within the compartment.

Accordingly, the 191.5± acre Lee Town Forest is organized into four management compartments, as follows:

- **The Central Woodlands** (Management Compartment #1) – 92.4± acres
- **The Eastern Woodlands** (Management Compartment #2) – 30.6± acres
- **The Durgin Woodlands** (Management Compartment #3) – 27.7± acres
- **The Northeasterly Reserve** (Management Compartment #4) – 40.8± acres

Management Compartment #1 (MC #1), the Central Woodlands, covers approximately 92.4± acres. It encompasses all upland forest (and embedded minor wetlands) between Bennett Road and the central wetlands, including all of the former Bales and Wulf Lots, as well as part of the original Town Forest. Areas accessible to silvicultural and habitat management currently cover 80.6± acres, and are accessible via Landing A. Vegetation under the powerlines is regularly mowed by utility company contractors, which is an activity in sync with early-successional habitat goals. The remaining 11.8± acres are to be designated as “reserve” and withheld from active management. Reserves include the Lee Bogs, vernal pools, and forested wetlands, as well as buffers around these natural features.

Management Compartment #2 (MC #2), the Eastern Woodlands, covers approximately 17.8± forested acres, all accessible to management. MC #2 encompasses forestlands east of the Transfer Station and bordered by forested wetlands to the north. All forestry and habitat work in MC #2 is accessible via Landing B.

Management Compartment #3 (MC #3), the Durgin Woodlands, covers approximately 27.7± forested acres, with 21.5± acres readily accessible to management, via landings C and/or D. Forested wetlands and the Wheelwright Pond shoreline are to be withheld from silvicultural management.

Management Compartment #4 (MC #4), the Northeasterly Reserve, covers approximately 40.8± acres of upland and wetland forest, which are to be held in reserve from active management at the present time. This reserve status will be revisited in the future.



PLAN IMPLEMENTATION BY COMPARTMENT

The implementation of recommendations is complex from a large-picture standpoint. Some recommendations are a one-time occurrence, such as situating a new trail. Many tasks are annual, including monitoring and removing invasive plant species, surveying wildlife species, and trail maintenance. Re-painting property lines is a 10-year maintenance task.

Perhaps most complex, from an organizational perspective, is forest and habitat management recommendations. These involve long-term commitment (100+ years), and cyclical implementation. A core concept to logistically organizing forestry and habitat recommendations in the Lee Town Forest is that a ***15-year implementation cycle*** will be used. In other words, treatment of any given place will occur once every 15± years. Furthermore, the entire suite of forestry and habitat treatments for each compartment should be completed before initiating treatment of the next management compartment. After 15 years, the first compartment will be re-visited for the next cycle of forest and habitat work, and so forth, on the 15± year cycle.

The following schedule is established to implement habitat recommendations in each management compartment:

Management Compartment	Forestry & Wildlife Treatment Schedule		
	1st Cycle	2nd Cycle	3rd Cycle
MC #1: Central Woodlands	2010±	2025±	2040±
MC #2: Eastern Woodlands	2015±	2030±	2045±
MC #3: Durgin Woodlands	2020±	2035±	2050±
MC #4: Northeasterly Reserve	Reserve - No Treatment , but periodically re-evaluate status		

This scheduling cycle will continue to repeat indefinitely. It is noted, that specific forestry and habitat recommendations, though projected into the future at the present time, should be reviewed and updated on a 25± year basis, taking into account changing conditions and unforeseen environmental disturbances.

In practice, it is likely that all habitat treatments in one compartment will not be completed in a specific year or in one year's time. Treatments can be completed within the course of the 5-year window before moving to the next compartment. It is preferable to complete the work in the early years of the 5-year treatment windows.

FOREST TYPES

The Lee Town Forest varies widely in forest structure and species composition. Forest types define the distinctive character of various forest sections: A ***forest type*** represents a homogeneous forest area that results from similar soils, hydrology, land uses, and disturbance history.



Seven general forest types were delineated in the Lee Town Forest, with multiple variants, as part of the forest assessment phase of this management plan. These are illustrated in the “Forest Type Map”, and described in detail in the “FOREST RESOURCES” chapter of this plan. Descriptions of each forest type explain their natural history and their distinctive characteristics. Wildlife and timber attributes for each forest type are also specified. The plan also specifies silvicultural goals for each forest type, with corresponding prescriptions for wildlife and forest management.

A *stand* is a pocket of a particular forest type, which is located separately from other pockets of the same forest type. In the Forest Type Map, the forest types are delineated as stands with cumulative acreage calculated for each forest type. Silvicultural prescriptions are generally the same for all areas of one forest type, though there are exceptions for inaccessible or variant areas. Though prescriptions vary between different forest types, all forest types/stands within one management compartment are usually treated concurrently during a harvest, each to their own specification.

LIST OF FOREST TYPES

Forest Type/Variant

- A.** Upland Hardwood.....34.8± acres
 - Upland Hardwood, 29.7± acres
 - Upland Mixed Hardwoods, 5.1± acres
- B.** White Pine.....15.9± acres
 - White Pine, Older, 4.7± acres
 - White Pine, Dry Site, 6.7± acres
 - White Pine, Young, 4.5± acres
- C.** White Pine/Hardwood.....65.3± acres
 - White Pine/Hardwood, Well-stocked, 33.1± acres
 - White Pine/Hardwood, Moderately-stocked, 32.2± acres
- D.** Hemlock/Pine/Hardwood.....22.7± acres
- E.** Hemlock/Hardwood..... 10.2± acres
- F.** Early-successional/Young Forest..... 2.8± acres
 - E-S, Herbaceous, Scattered Trees, 1.7± acres
 - E-S, Herbs, Shrubs, Scattered Trees, 0.5± acres
 - E-S, Saplings or Young Forest, 0.6± acres
- G.** Forest Wetlands.....17.6± acres
 - Forested Wetland, 12.1± acres
 - Forested Wetland, Enriched Site, 5.5± acres



FOREST ACCESS

Current Conditions

In total, about 21,500± feet (4± miles) of woods roads, trails, and footpaths exist on the Lee Town Forest, providing recreational, fire protection, and potential forest management access to the entire forest. There are five public access points into the Lee Town Forest (please refer to corresponding numbers on the Lee Town Forest Natural and Physical Features Map, page 2). Recreational and forest management access via each access point is summarized below.

It is significant that Lee Town Forest access has been so well laid out and established that little upgrading is presently necessary. Recommended improvements involve only the establishment of three landing sites to access forest improvement activity on the Town Forest. Expansion of the existing access infrastructure—parking areas, woods roads, and trails—is *not* recommended, as the existing network adequately provides a wide variety of recreational interests for the community. Further trail expansion may negatively impact wildlife.

Access Point #1

Access Point #1 provides convenient access to Wheelwright Pond and the northern portion of the Town Forest. This entrance leads in from Route 125 and Clement Road, then via a well-graveled forest access road owned by the Town. A parking lot is located within the forest providing ready access to Wheelwright Pond. The parking lot is close enough to the pond that recreationists can portage small boats from their cars and launch from a small dock on the pond's edge.

Access Point #1 provides the only feasible forest management access to The Durgin Woodlands (Management Compartment #3). The landing site for forestry activity would be located either along the snowmobile trail and/or off the parking lot area. A small scale operation may utilize two landings to minimize skidding distances.

Access Point #2

Access Point #2 refers to access from Old Bennett Road and the Public Safety Complex in the southwestern section of the property. Parking is available along the old road, alongside the soccer field, and behind the Safety Complex. The main trail into the forest leads from the north side of the soccer field. This trail entrance is a popular route for community residents due to straightforward parking that does not conflict with other traffic such as the Transfer Station or school. Several trail loop options are readily available from this access point in The Central Woodlands area.

Access Point #2 will also provide the primary forest management access into The Central Woodlands (Management Compartment #2). The former field/orchard behind the Public Safety building can provide an ideal landing site location—adequately-sized, level, and central. In addition, this location is not used recreationally. Furthermore, clearing the young vegetation will provide for periodic maintenance of the early-successional growth in this abandoned field area.



Access Point #3

Access Point #3 is strictly recreational trail access into the Town Forest from behind the Lee Library and Historical Society buildings. Parking is available alongside the Town Office Building. This access provides the best route to the Lee Bogs. This route is not recommended for forest management activities.

Access Point #4

Access Point #4 is trail access located behind the ball field off the Transfer Station Road. Parking for 2 or 3± vehicles is available along the road edge. This route is a popular for access to the forest interior, linking to same trail loops as Access Points #2 and 3. Access Point #4 is not recommended for forestry access, however, as Access Point #2 will provide excellent management access while the disruption of an additional landing site is avoided.

Access Point #5

Access Point #5 is located on the east side of the Transfer Station Road, across from Access Point #4. Currently trail access, this route may provide forest management access into The Eastern Woodlands (Management Compartment #2). A small landing site can be situated within the forest, necessitating upgrading of the trail to a woods road for the first 50 to 100± feet.

An alternative forest management access route into this management compartment is through the Highway Department facility, with landing location on the back edge of the facility clearing. This route has the advantage of avoiding changes to the existing trail scenery at the public trail access point. However, the Highway Department needs to agree and comply with temporary logging access through their facility.

Forest Access Recommendations

Recommendations:

- Further expansion of the road and trail system is not recommended, as the present network adequately serves community needs. Over-built trail networks will impact wildlife.
- Continue to maintain existing parking areas free of trash.
- Continue to support volunteer efforts to install effective trail fords across seasonal streams that minimize recreational use impact to the streams.
- Consider assigning names to the Town Forest trails. Avoid nailing trail markers to trees; rather, paint color-coded trail blazes on trees.
- All recommended silvicultural management can be accessed from three readily established landing sites on the Town Forest as outlined above.
- Do not schedule harvest operations during spring thaw and wet seasons to avoid damage to roads and forest rutting.



COMMUNITY USE

Community use of the Lee Town Forest for recreation and educational activities is a primary purpose of the property. A major management objective is striking a careful balance between public usage and other property objectives, including protecting water resources, maintaining quality wildlife habitat, promoting natural forest conditions, and honoring the conservation easement purposes. Community volunteers are a valuable resource to help maintain and enhance the Town Forest, as well as foster an atmosphere of local support for conservation.

Recreational Uses

Recreational use of the Lee Town Forest is multi-faceted, including trail-based activities, water access, recreational fields (soccer and baseball). Trail-based activities include all pedestrian uses, such as walking, running, snowshoeing, and skiing. Horseback riding and mountain biking are not promoted. ATV's, hunting, and camping are not permitted.

Possible off-trail activities include nature observation, orienteering, and geo-caching. These are all permissible as long as there is no environmental impact, including littering of the forest or removal/damage to natural features, wildlife, or plants.

Waterfront access to Wheelwright Pond is an outstanding feature of the Lee Town Forest, which broadens recreational opportunities. Picnic tables, with handicap trail access, are located near the pond. A small dock provides access for fishing, and for launching canoes or kayaks. Swimming is not allowed.

Recommendations:

- Update trail color code markings. Avoid nailing trail markers to trees; rather paint trail blazes on trees.
- Stock kiosk at Access Point #4 with trail maps.
- Install a trail kiosk at Access Point #2, and stock with trail maps.
- Post "no-wheeled vehicle" signs at all property access points.
- Continue to upgrade and maintain the fords on trails at all stream crossing points.

Educational Uses

The Lee Town Forest's exceptional location in the town center, adjacent to the elementary school, provides ready access for outdoor learning. The property provides an outdoor classroom for students, community residents, conservation groups, landowners, and others to observe and learn about nature, and forest and wildlife management activities. Furthermore, as community property, the Lee Town Forest has the potential to serve as a visible, evolving example of careful resource management and forest stewardship.

The Conservation Commission may consider developing an interpretive trail for visitor education about forest management activities and natural/historical features.



Recommendations:

- Promote educational uses of the Town Forest to local school(s). Conduct a field tour/workshop for teachers.
- Link with New Hampshire Project Learning Tree to promote nature education for educators and students.
- Organize forest tours to illustrate management to townspeople and town officials, landowner and conservation groups, land trusts, university classes, and other conservation commissions.
- Develop an interpretive trail guide with corresponding learning stations.

Community Volunteer Projects

Students, Scouts, community groups, and other local volunteers may be available to provide community service. Certain projects within the Town Forest may prove beneficial to the land and the community, as well as provide an educational experience for the participants. In some cases, the volunteer(s) must be trained to conduct the activity. The Conservation Commission should be consulted by any potential volunteers prior to organizing an activity. The Conservation Commission can prioritize projects, establish goals and guidelines, and oversee the implementation. The following project list provides a scope of the potential:

- Plan, construct, and install stream fords on trails.
- Maintain trail blazing by color code.
- Maintain no-wheeled vehicle postings.
- Conduct a multi-season bird survey.
- Monitor/survey winter mammal tracks.
- Continue to conduct vernal pool surveys.
- Construct and set-up bat boxes and/or wood duck boxes.
- Maintain property lines after they are initially laid out by a surveyor.
- Pick-up and remove litter or trash.
- Invasive plant removal teams.



FOREST CONDITIONS and MANAGEMENT

Forest Conditions

Forests found in New Hampshire's coastal plain, including the Lee Town Forest, lie within the northerly extent of the Appalachian oak-pine forest. The tree species mix of this forest region changes noticeably within 25 miles of the ocean. For example, just a few miles north, shagbark hickory and black oak are no longer found, while red spruce and balsam fir—trademark species of the boreal forest—begin to appear on the landscape.

Some defining characteristics of the Lee Town Forest at present are:

- 1) The oldest trees are scattered residuals of about 140 to 150± years of age. The matrix forest averages 85 to 100± years.
- 2) Relative to natural stands, the forest is not structurally complex. Most stands are either even-aged, two-aged, or three-aged.
- 3) The forest has fine diversity of native tree (40 species), shrub (at least 37 species), and herbaceous plant species (200± species)⁸. Tree species composition is dominated by a relatively few number of species well adapted to the property's sites. Less common tree species include species near the limit of their natural range such as swamp white oak and black gum (northern limit), and black spruce and tamarack (southern limit).
- 4) The following table summarizes the proportion of upland forest area represented by the hardwood/softwood and young/older *forest types/variants*:

FOREST TYPE	Young Open	Young Forest	Intermediate	Older
Hardwood	2%	0%	6%	17.5%
Softwood	0%	3%	39%	32.5%

- 5) Logging, as well as occasional windstorms, including possible hurricane damage in the mid-1950's, have been the prime disturbance mediums in this forest since its establishment from abandoned pastureland.

As time progresses, the even-aged to three-aged character of forest stands in the Lee Town Forest will evolve to incorporate additional generations of trees. This progression may occur naturally and/or through silvicultural management. With input from the Lee Conservation Commission, this forest plan designates areas as reserves, as well as, prescribing the management in silvicultural areas. A description of these areas follows, in Chapter 6, "SILVICULTURAL PLANNING", with detailed forest type analysis of the Lee Town Forest and silvicultural prescriptions specified over time.

Reserve Areas

Reserve areas are selected sections of the Town Forest that are not silviculturally managed, where the progression towards forest complexity is allowed to follow solely natural disturbance patterns. The property's bogs are conferred full reserve status: that is, human disturbance and interference on these sites will be completely eschewed. The property's forested wetlands may be designated as modified reserves, with human disturbance limited to recreational and forestry trails that may cross wetlands and invasive plant control if this becomes a future issue.

⁸ Eaton, Alan T., "Biological Inventory of the Town Forest Complex", August 2005. Also, 2008-2009 forest assessment by Charles A. Moreno, LPF.



At present, the northeast corner of the Town Forest, covering approximately 30± upland acres, will also be designated as a modified reserve. This area is less readily accessed for silvicultural management, requiring several stream crossings. However, a recreational trail loop does enter the area. The reserve status of the northeast corner should be revisited periodically for various reasons. For example, an acute natural disturbance may trigger the desire for “clean-up” of the forest and trails, as well as timber salvage. Furthermore, harvesting machinery and techniques may be more versatile in the future, allowing low-impact access to the area. On the other hand, the Conservation Commission may opt to retain this area management-free, thus establishing a naturally-evolving zone that represents increasingly natural baseline conditions.

In total, approximately 63± acres are recommended for reserve status, representing 33% of the property’s area.

Silvicultural Areas

Silvicultural management of the Lee Town Forest is intended to compliment the natural progression towards multi-aged conditions. Silviculture will also promote forest health, enhance wildlife habitat, and provide a moderate, sustainable income stream to help cover property management costs. The silvicultural treatments recommended in this plan are mild or light, aiming to remain similar to the prevailing mild natural disturbance regime of New Hampshire’s seacoast area. If a large natural disturbance were to occur, silviculture will respond to the disturbance either through salvage and restoration, or by allowing areas to naturally evolve from the effects of the disturbance.

The total area recommended for silvicultural management, including early-successional areas, on the Lee Town Forest is approximately 118± acres, or about 62% of the property area.

Sustainable Management

To allow an adequate period of growth, commercial harvests should follow a periodic schedule or “harvest cycle”. Silvicultural treatment of the Lee Town Forest is well suited for a 12 to 15± year harvest cycle. Generally, no area should be harvested more than once within this interval, thus allowing the forest to fully recover the volume and density of timber removed. Furthermore, measures should be taken (as specified in the silvicultural prescriptions) to insure adequate levels of natural regeneration, particularly of mid-successional species. Finally, timber value per acre should increase and surpass the previous value during the harvest cycle interim. At the end of each 15-year harvest cycle, these three factors—*fully recovered timber volume, abundant natural regeneration (especially mid-successional), and an increased value per acre*—are key indicators of sustainable forest management.

Timber Outlook

The Lee Town Forest contains a substantial volume of medium-quality white pine sawtimber, mostly in the 12 to 20± inch diameter range, and representing over 2/3rds of the property’s sawtimber volume and value. Good-quality red oak sawtimber, mostly 10 to 18 inch, is also a significant timber component. Eastern hemlock, black oak, and white oak are reasonably common, though less-valuable, sawtimber species. A high proportion of hemlock stocking is contained in the northeastern section, destined as a reserve.

The area on the Lee Town Forest that will involve some extent of commercial harvesting is approximately 115± acres (this does not include the proposed northeastern corner reserve area). According to the forest inventory (2008) prepared for this plan, *conservative harvesting for*



improvement purposes will gross about \$25,000± from the sale of timber on the available silviculturally managed acreage. This estimate assumes sustainable management on a 12 to 15 year harvest cycle. Though there will likely be variation between areas, harvesting should not exceed an average of \$215±/acre, assuming similar pricing to the data in Table #1 “Timber Valuation”. The forest inventory data is included in this chapter.

To remain consistent with the management objective of improving forest health and growth, harvests should emphasize the removal of low-quality, poorly growing trees, while providing growing space to promising timber, and promoting regeneration. Careful logging is a critical element of a successful outcome. Tree selection and marking in advance of cutting by an experienced forester is also crucial to insure that the forest is not over-harvested, growth is optimized, and the full host of ecological factors are considered.

An indicator of sustainable silvicultural management is that harvesting does not exceed the rate of forest growth. In addition, the value of timber should increase on a per acre basis over time. Presently, timber value on the property averages about \$1100±/acre, which is below forest potential. With careful management, including judicious harvesting, the value of pine and hardwood timber inventory may be increased to \$1300+/acre in 20± years (using constant dollar analysis). Long-term, this value should exceed \$2,000/acre.

Another indicator of sustainable management for the Town Forest is that white pine, red oak, black birch, and shagbark hickory seedlings—mid-successional species—are successfully established after harvesting. New growth should be established naturally, without the expense of planting.

Non-commercial timber stand improvement (TSI) work is important for establishing regeneration and to optimize long-term forest growth and value. Essentially, this involves the thinning and release of trees that are too young to have commercial value, including the sapling growth that regenerates after a harvest. Since marketable forest products are not produced, this improvement work tends to be a cost operation, though of great benefit.

Best Management Practices (BMP's)

Forest and wildlife management necessitates the use of heavy equipment to establish/maintain access (excavator, dozer, York rake), for early-successional management (Brontosaurus, Bobcat shrub mulcher, bushhog), and for improvement harvesting (skidder or forwarder, feller), timber processing (landing loader, chipper), and transport (log trucks, trailers). Depending on the project type and scale of operation, some or all of the listed equipment may be employed; if thoughtlessly used, the property's water and soil resources can be impacted.

The following Best Management Practices (BMP's) for logging on the Lee Town Forest are intended to protect surface water quality and minimize impact to wetlands and soils. The list is not necessarily all-inclusive and should be revisited at the time of harvest planning.

LOGGING BMP's to PROTECT SURFACE/SUBSURFACE WATERS, WETLANDS, and SOILS:

- On *moderately-drained soils*, harvest operations are optimally timed for summer through mid-fall *dry conditions* (June-October), or frozen/snowy ground in winter (late Dec-early March), to avoid unnecessary rutting of ground. There is scheduling flexibility for *well-drained soil* areas: with light machinery, gravelly soils may be operated almost year-round.
- During the tree marking process, Forester considers optimum stream crossing layout, as well as, buffers (minimal harvest) around vernal pools and along riparian areas. This information is then passed to the logging contractor for consideration and implementation.



- Logging contractors must file NH DES Wetland Permit for Logging Activity. Logging contractor must follow NH BMP provisions as stated on permit.
- Stream crossings require temporary poled fords or bridging.
- Chipper debris or treetops can be used as woody matting to stabilize soft soils and approaches to stream crossings.
- Logging equipment should not enter into forested wetlands, except where a permitted crossing is necessary.
- Tree harvesting in buffer areas, i.e., near vernal pools (50± feet) or riparian filter strips (25± feet), may range from 0 to 10±% basal area removal, and be judiciously limited to removals for forest health (diseased or declining) or for wildlife habitat enhancement purposes. Professional Forester should make on-the-ground selection decisions. Trees should not be felled into open water, and logging equipment within buffers should not disturb the ground surface.
- Logger, or any heavy equipment operator, should employ well-maintained and serviced equipment on site, i.e., not prone to leaky hydraulic connections, etc.
- Logger, or any heavy equipment operator, should use absorbent padding to protect soil from inadvertent spills when servicing equipment. Contractor should have on-site spill kit.
- Where possible, service equipment off-site, prior to the project.

Summary

Forest Reserve Areas

- Covers 63± acres, or approximately 33% of the Town Forest area.
- Follow natural disturbance patterns.
- Develop “old growth” characteristics over very long term—centuries.
- Minimize wetland crossings, including trails.
- Decide on response, if any, to natural disturbances.
- Retain dense shade to discourage invasive plants, though natural disturbances will create openings.

Silvicultural Management Areas

- Covers 118± acres, or approximately 62% of the Town Forest area.
- Manage proportion of old/young forest as well as dense/open forest.
- Advance the development of multi-aged forest.
 - Promote age spectrum of very young to very old trees.
- Stratify forest canopy.
- Encourage herbaceous layer.
- Promote healthy mast trees and shrubs for wildlife.
- Retain white component.
- Encourage the natural regeneration of mid-successional tree species, including oaks and hickory. Manage for uncommon species (swamp white oak, pignut hickory)
- Re-introduce American chestnut.
- Actively control non-native, invasive plants.
- Retain/promote snags, cavity trees, coarse woody debris.
- Perpetuate early-successional areas.
- Carefully prepare projects and apply BMP’s during management activities.
- Provide cash flow for forest management fund.



IV. FOREST RESOURCES

FINDINGS

Timber Volume and Value:

- The Lee Town Forest contain standing timber volumes as follows:

966,962± board feet of sawtimber

Softwood – 781,015± BF

Hardwood – 185,947± BF

8,055± tons of chipwood/softwood pulp

1,781± cords of firewood

- The total timber stumpage value is currently \$183,800±.
- On a per acre basis, timber value averages \$1,235±/accessible upland acre.
- White pine sawtimber accounts for about 67% of the property's timber value.
- Red oak sawtimber accounts for about 13% of the property's timber value.
- Cumulatively, all other sawtimber, pulp, firewood, and chipwood on the Lee Conservation Lands accounts for the remaining 20% of timber value.

Tree Species Composition

- White pine, red oak, hemlock, and red maple are the property's dominant species, accounting for 43%, 14%, 13%, and 12.4% of tree species composition (by basal area), respectively. White pine represents 75% of the total sawtimber volume, with red oak a distant second at 11%. Hemlock follows at 6% of timber volume.
- The property's oaks, include four species—red, black, white, and swamp white—which account for 25% of property's forest composition (by basal area).
- Forest regeneration includes a variety of tree species in the Lee Town Forest, particularly in previously harvested areas. Common seedling/sapling growth includes white pine, red oak, beech, hemlock, red maple, white birch, white ash, hickory, popple, and black cherry. Black and yellow birch is found in small pockets, particularly in canopy gaps created by natural disturbances.



Timber Quality and Density

- White pine quality is generally average to above-average, with dense forest conditions producing many tall and straight trees. Most pines have at least some branches, and thus, are not premium quality.
- Red oak quality is generally good, including mostly grade-sawtimber, with some low-grade pallet logs and lesser amounts of high-quality veneer.
- The Lee Town Forest is generally well-stocked with timber or young growth.



TIMBER VALUATION

VALUATION OF STANDING TIMBER – TOTAL MERCHANTABLE VOLUME

Lee Town Forest Lee, New Hampshire

<u>PRODUCT/ SPECIES</u>	<u>TOTAL VOLUME</u>	<u>% of VOLUME¹</u>	<u>UNIT PRICE²</u>	<u>TOTAL VALUE</u>	<u>% of VALUE³</u>
Sawtimber					
White Pine	724.2 MBF	74.9%	@ \$170/MBF	\$123,114	67.0%
Hemlock	56.8	5.9	\$ 25	1,420	0.8
Black Oak	19.6	2.0	\$100	1,960	1.1
Red Oak	105.2	10.9	\$225	23,670	12.9
White Oak	28.1	2.9	\$ 50	1,405	0.8
Red Maple	11.9	1.2	\$ 40	476	0.3
Sugar Maple	5.8	0.6	\$200	1,160	0.6
Black Birch	9.2	1.0	\$110	1,012	0.5
Hickory	6.2	0.6	\$ 20	124	<0.1
TOTALS	967.0± MBF			\$154,341	
Chipwood/Pulp	8,055± Tons		@ \$ 1/Ton	\$ 8,055	4.4%
Firewood	1,781± Cords		@ \$ 12/Cord	\$ 21,372	11.6
			GRAND TOTAL	\$ 183,768	100%
			ROUNDED	<u>\$ 183,800</u>	

April 2010

¹ % of total sawtimber volume.

² Adjusted to include pallet grade logs.

³ % of overall value, including logs, pulp, chipwood, and firewood.

TIMBER VOLUME ESTIMATE NOTES:

- 1) MBF = One thousand board feet.
- 2) Sawtimber volume totals include veneer, grade log, and pallet log totals for each species, except where otherwise noted. Unit prices are average combined value of veneer and grade logs, with discount for pallet logs.



Note: Pallet log % of total volume figures for the following species is:

White Pine – 23%±

Black Oak – 30%±

Red Oak – 25%±

White Oak – 50%±

- 3) Softwood pulp conversion is 2.2 tons per cord, and it includes hemlock and white pine. Estimate assumes approximately 1 ton of top wood pulp per MBF of softwood sawtimber. Furthermore, all other potential pulp either from full trees or tree top wood tips, is accounted for as chipwood.
- 4) Chipwood estimate assumes 110 tons of total biomass per acre (110 tons/acre – 26 tons/acre sawtimber – 29.9 tons/acre firewood = 54.1 tons/acre chipwood/pulp. Therefore, 54.1 tons/acre chipwood x 148.9 accessible/upland forested acres = 8,055± tons).
- 5) As of April 2010, the Lee Town Forest contains standing timber volumes, as follows:

966,962± board feet of sawtimber (90% Confidence Interval: ± 86,521 bf)

Softwood – 781,015± BF

Hardwood – 185,947± BF

8,055± tons of chipwood and softwood pulp

1,781± cords of firewood (90% Confidence Interval: ±149 cords)



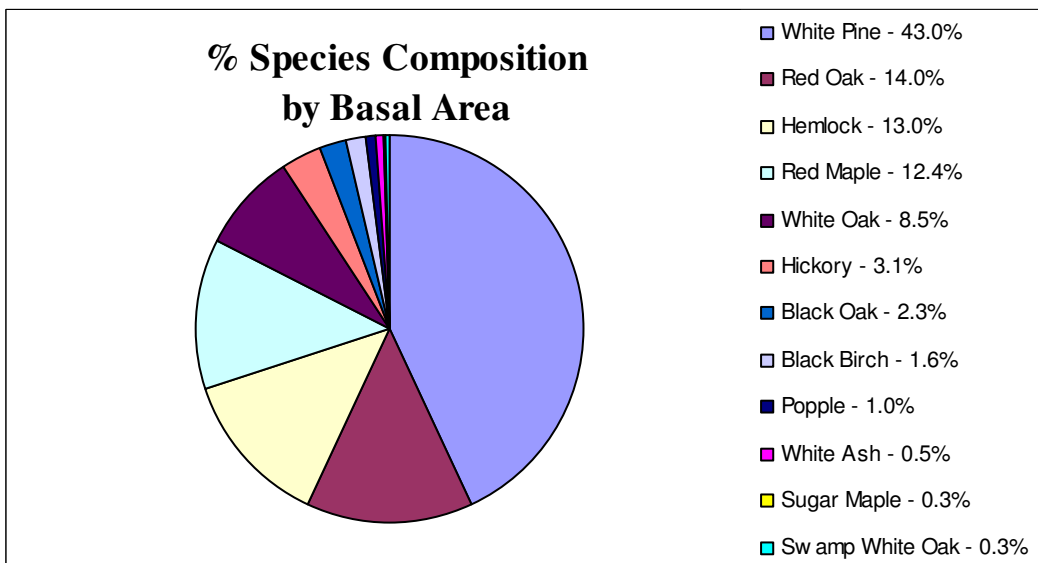
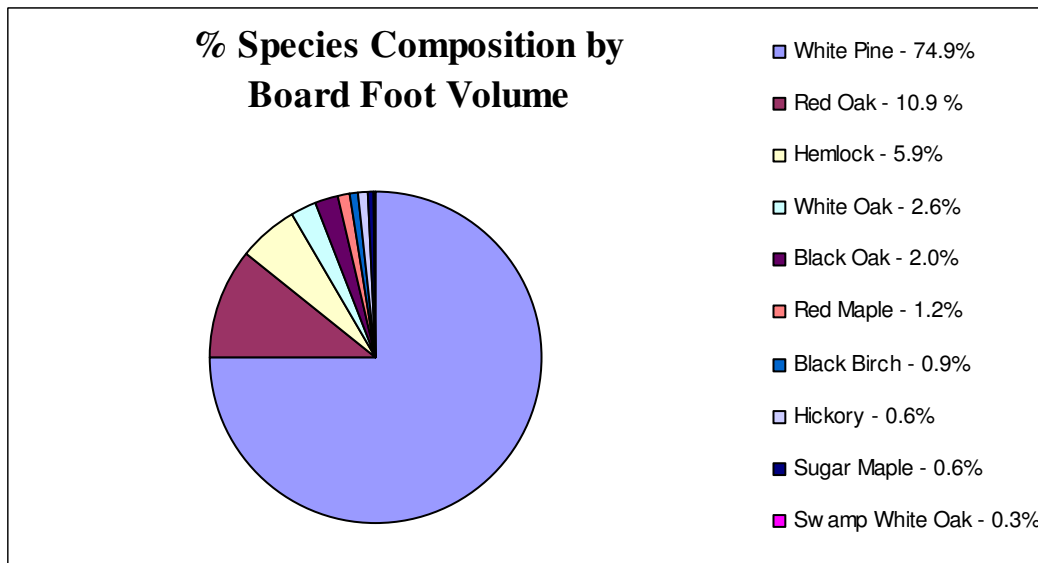
		Sawtimber Volume per Acre (Board Feet)										Firewood	
		BB	BO	HM	RM	RO	SH	SM	SWO	WO	WP	Vol/Acre (Cords)	
Upland Hardwood & Upland Mixed Hardwood													
Ac = 34.8	Trees/acre = 174*	Mean	0	315	85	0	1492	0	166	84	230	1930	20.6
N = 11	BA = 115 ft ² /acre	Total	0	10954	2946	0	51913	0	5780	2939	7988	67175	718
White Pine, Older/White Pine, Dry Site/White Pine, Young/ & White Pine/Hardwood, Well-Stocked													
Ac = 49.0	Trees/acre = 176*	Mean	0	93	118	88	573	127	0	0	0	6958	10.0
N = 21	BA = 129 ft ² /acre	Total	0	4547	5763	4335	28083	6211	0	0	0	340934	488
White Pine/Hardwood, Moderately-Stocked													
Ac = 32.2	Trees/acre = 98*	Mean	58	0	0	0	194	0	0	0	89	6278	3.4
N = 15	BA = 79 ft ² /acre	Total	1863	0	0	0	6235	0	0	0	2860	202149	110
Hemlock/White Pine/Hardwood/Hemlock & Hemlock/Hardwood Hemlock/Hardwood													
Ac = 32.9	Trees/acre = 163*	Mean	222	124	1461	229	577	0	0	0	435	3464	14.1
N = 17	BA = 133 ft ² /acre	Total	7308	4078	48069	7550	18989	0	0	0	14315	113979	465
VOLUME GRAND TOTAL			9171	19578	56778	11885	105220	6211	5780	2939	25163	724237	1781

* Trees > 5" diameter at breast height

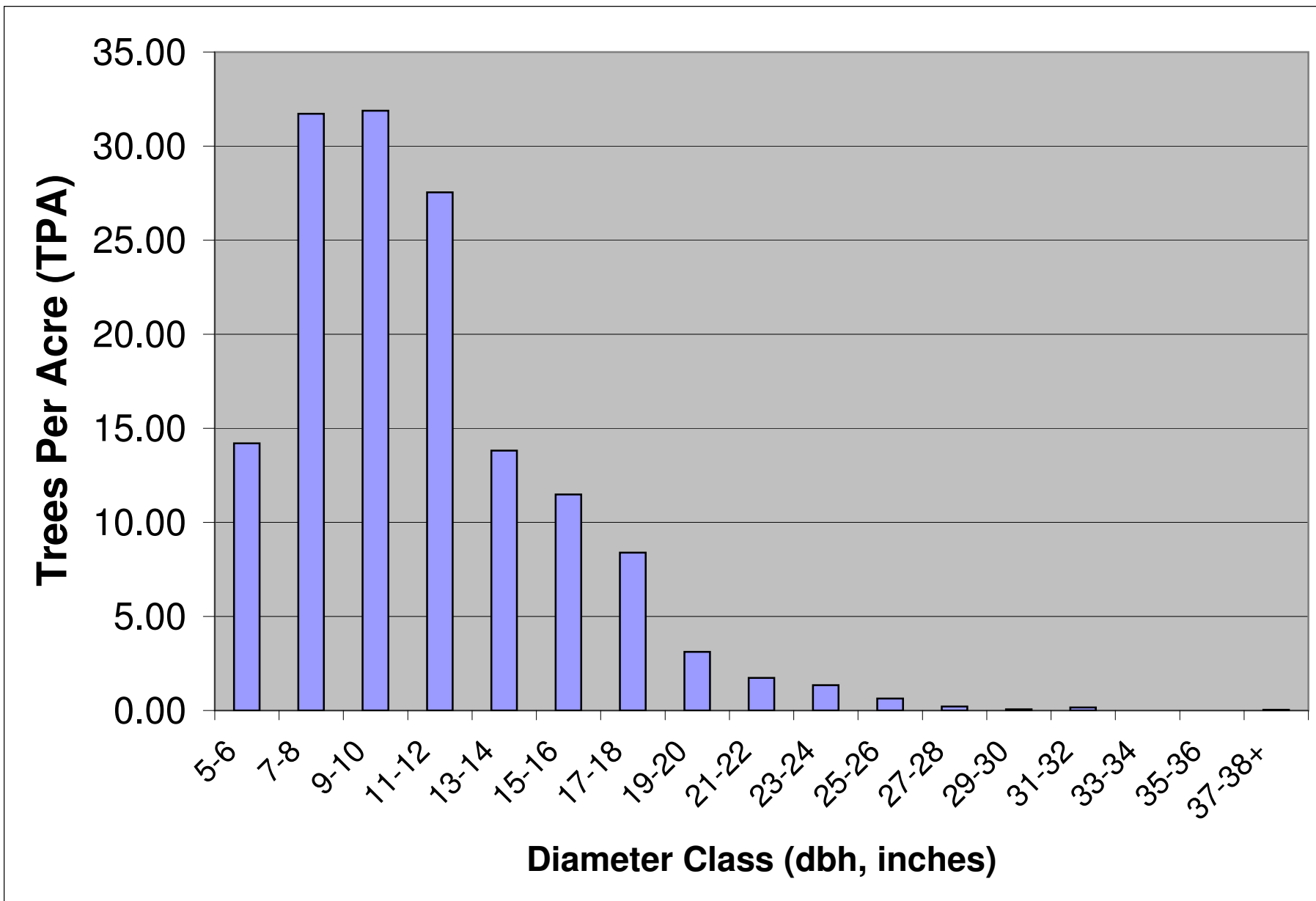
SPECIES COMPOSITION

% Species Composition by Board Foot Volume and Basal Area

Lee Town Forest Lee, New Hampshire



Tree Diameter Distribution
Lee Town Forest, Lee, New Hampshire



SUSTAINABLE HARVEST TIMBER VOLUMES In Various Cutting Cycle Scenarios

Lee Town Forest Lee, New Hampshire

<u>PRODUCT/ SPECIES</u>	Estimated Sustainable Volume Removals		
	<u>HARVEST CYCLE</u>		
	<u>12± Years</u>	<u>15± Years</u>	<u>25± Years</u>
<i>Sawtimber:</i>			
White Pine	153.0 MBF	185.7 MBF	282.6 MBF
Hemlock	10.3	12.6	19.5
Black Oak	3.7	4.6	7.0
Red Oak	20.2	24.6	37.8
White Oak	5.1	6.2	9.6
Red Maple	2.2	2.7	4.2
Sugar Maple	1.1	1.3	2.0
Black Birch	1.7	2.1	3.3
Hickory	1.1	1.3	2.1
<i>Totals:</i>	198.4± MBF	241.1± MBF	368.1± MBF
Chipwood/Pulp	1,920Tons	2,325Tons	3,491Tons
Firewood	424 Cords	514 Cords	771 Cords
TOTAL VALUE	\$38,962±	\$47,307±	\$71,930±
AVAILABLE VALUE	\$23,377±	\$28,384±	\$43,158±

Discussion:

The table above estimates the harvestable timber volume, by species/product, that the Lee Town Forest is capable of re-growing using three harvest interval scenarios. The net projected timber revenue to the town is listed below.

For example, assuming current stocking levels, the property is capable of re-growing about 153.0 MBF (MBF = One thousand board feet) of white pine sawtimber over the next 12 years, if 153.0 MBF were to be cut at present. Thus, 153.0 MBF of white pine is the minimum sustainable harvest level if a 12 year harvest cycle is used. If less than 153.0 MBF were presently harvested, the forest will have a net increase in white pine volume after 12 years; conversely, if more is harvested, the forest will probably not fully recover the 153.0 MBF volume in the span of 12 years. The projected timber revenue to the landowners is listed as available value; that is, the value of only those trees readily accessible for harvest, which is estimated as 60% of the total timber value. Total value represents all trees, including trees in the 30 acre upland reserve, wetlands or sensitive areas, along public roads, or near recreational areas. Most of these trees would not be harvested due to state regulations, inaccessibility, or for aesthetic reasons.



FOREST TYPES and PRESCRIPTIONS

The Forest Types Map—the 1st page of this Chapter—illustrates the forest type locations.

A. Upland Hardwood – 34.8± acres

Status: A major forest type. Found as three main stands, with additional small pockets. This forest type covers most of the Durgin Preserve area.

Description: This forest type is characterized as well-established, oak-dominated hardwoods, with overstory trees nearing a century of age. It is likely that pine was cut 50 to 60 years ago, resulting in small inclusions of 50-year old hardwoods. Very scattered old residuals range 120-150± years. The forest type occupies dry, well-drained soils with scattered wetland pockets. Variants to this forest type include an area of younger hardwoods (75± year) east of the transfer station, and a stand where dense hemlock is found beneath the oak-dominated overstory.



Upland hardwoods—oak—typical of Forest Type A.

Timber – High quality red oak sawtimber and veneer (10 – 18± inch DBH) is developing, often averaging over 1,000 board feet/acre. The forest type contains relatively few white pines. While these pines may contain sawtimber, they also provide a valuable natural seed source, and generally should not be cut.

Wildlife – This forest type embodies one of the key, defining habitat types of the Lee Town Forest. Covering nearly 20% of the Town Forest area, the high oak canopy represents a significant local mast source. Acorns are a food staple for many mammal and avian species. White oak represents a significant proportion of the oaks, while two hickory species are also present; these species collectively enhance the mast habitat. Promoting a diversity of mast producing tree/shrub species—oaks, hickory, beech, beaked hazelnut—helps stabilize mast availability, since single-species acorn crops vary considerably from year to year. Prior to succumbing to a ubiquitous spore-transmitted disease (about 1915± in Lee), American chestnut was a component upland hardwood species in the Town Forest. Potential reintroduction of blight-resistant chestnuts over the next 50 years will dramatically enhance the mast quality of the forest. Another recommendation is the retention of scattered old residuals in this forest type, and allowing the development of additional old trees (150+ years).

This forest type is especially attractive to deer, gray fox, gray squirrel, and flying squirrels. Avian species particularly utilizing this forest type include turkey, Cooper's hawk, broad-winged hawk, pileated woodpecker, scarlet tanager, ovenbird, red-eyed vireo, and wood thrush.

Tree Species Composition –

Primary^A – Red oak, white oak, black oak.

Secondary^B – Red maple, white pine, white birch, shagbark and pignut hickory, hemlock, bigtooth aspen.

Tertiary^C – Beech, sugar maple, basswood, pitch pine, swamp white oak, black birch.

Regeneration (seedlings) – White pine, red oak, white oak, shagbark hickory, red maple. Dense hemlock understory under hardwood in northeast corner stand.

Shrubs/Herbaceous – Beaked hazelnut, witch-hazel, maple-leaf viburnum. Occasional alternate-leaf dogwood and hawthorn. Sarsaparilla, false Solomon's seal.

^A Dominant tree species in main canopy layer.

^B Fairly common to less common tree species.

^C Unique tree species; or only one or a few specimens in the forest type.



Forest Type A - Continued

FOREST STRUCTURE

<i>Composition</i>	Stand Structure	Even-aged w/ residuals and inclusions.
	Silvicultural Stage	Mid to late-intermediate.
	Stand Age	85 - 100± years. Scattered old residuals 120-150± years old. Inclusions (pockets) 50-70± years of age.
<i>Tree Size</i>	DBH range	5 - 20± inches (some trees up to 24”).
	Mean DBH	11 inches
	Avg. Maximum Height	60± feet
<i>Stand Density</i>	Relative Stocking	Moderate to considerable
	Basal Area/Acre	90± sq. ft./acre (average)
	Canopy Closure	80 - 100± %
<i>Ecological</i>	Canopy Stratification	Good – Well-developed shrub and herbaceous layers. Mid-story fairly well developed. Almost full overstory canopy.
	Coarse Woody Debris (CWD)	Moderate to good accumulation, a few larger trunks.
	Invasive Plants	Low/no incidence

SILVICULTURAL PRESCRIPTION

Objectives –

Silvicultural treatment is intended to maintain and enhance the fine mast qualities of this forest type. Specifically: 1) Promoting the growth of broad-crowned white oaks and red oaks, including a significant component of 125 to 150+ year old oaks; 2) Increasing and diversifying hard/soft mast-producing species, both in the overstory—white oak, shagbark hickory, perhaps some cherry—and understory—beaked hazelnut, maple-leaved viburnum, lowbush blueberry; 3) Broadening of stand age structure to include abundant young growth, and ample mid-aged and mature trees; 4) Regeneration of the stand to include an increased white pine, black birch, white oak, and pignut and shagbark hickory composition; 5) Increase per acre timber value; and 6) Long-term, the re-introduction of American chestnut in this forest type.

Structural Sequence: Even-aged (present condition) → Two-aged (2025±) → Multi-aged (2050±)

Silvicultural Treatments:

2010±: *Crown thinning/Improvement harvest.* Provide 5 to 10 feet of growing space around the crowns of the healthiest, high quality hardwoods. Harvest poor quality trees. Retain white pine, white oak, and both hickory species as future seed sources.

2025±: *Single-tree/micro-group selection/Liberation.* Remove trees individually or in groups of up to 6 trees. Release any advance regeneration from previous cut. A new generation will become established in the micro-group openings, while stand quality is upgraded and growing space is provided to favored trees.

2040±: *Single-tree/Expanded micro-group selection/Liberation.* Similar treatment as previous, however, harvest along edges of previous group openings to release young growth and establish a new generation. Encourage pine, oak, and hickory regeneration.



B. White Pine – 15.9± acres

Status: A significant forest type. Found as several stands, with variation between stands.

Description: This forest type is distinguished as well-established forest where white pine constitutes 75% or more of the overstory stocking. While hemlock may be present, it is found mostly in the understory or mid-story canopy. Transitional areas may contain proportionally more hardwood or hemlock. The white



Forest Type B: Dry site 80± year old white pine.



Forest Type B: Pine overstory over deciduous growth.

pine forest type originated from pasture that was abandoned in 1900±, though it is possible that forest grazing continued in areas. Fire is likely part of the natural ecology in gravelly sites that contain pitch pine.

Four variants of this forest type were identified. Interior pockets of white pine grow on ledgy ground, with reasonable density of large diameter, 100± year old pines. By contrast, the other pine stands are situated on dry gravelly soils. Behind Mast Way School, pines are 80+ years old, and are also well stocked. Pines were partially thinned over 30 years ago from the dry-site pine area next to the highway garage, resulting in a two-aged stand, with younger pines. Near the bogs, pines were cut in the 1980's, resulting in a partial pine overstory and a dense understory of hardwood saplings. Pine decline was noted in some of the trees within this latter stand.

Timber – With silvicultural management, excellent quality white pine sawtimber may be grown within this forest type, particularly in moister interior areas. Some good quality red and white oaks were also noted. Treatment entails crown thinning/improvement cutting, where the finest trees are selected and provided with sufficient growing space. Trees showing signs of pine decline should be salvaged at present. Pines which are presently 80 to 100 years of age will mature as sawtimber over the next 20 to 50± years; however, individual timber trees may be grown for much longer. Moister sites are likely to transition towards a mixed hardwood-pine composition over time. Dry site areas will readily regenerate as pine, though various oak species may also become more common.

Wildlife – The white pine forest type is attractive for a more limited and fairly specific set of mammal and avian species including red squirrel, red-breasted nuthatch, and pine warbler. Habitat features in the Town Forest such as the dense hardwood understory in areas, broaden species use by providing mammal travel cover and small bird feeding opportunities/cover.

Tree Species Composition –

Primary – White pine.

Secondary – Red oak, black oak, white oak, red maple. Hemlock and shagbark hickory in areas.

Tertiary – Pitch pine.

Regeneration (seedlings/saplings) – White oak, red oak, red maple. White pine, beech, black birch in areas.

Shrubs/Herbaceous – Lowbush blueberry, Canada mayflower, starflower, partridgeberry. Sassafras, highbush blueberry, witch-hazel, beaked hazelnut, and maple-leaved viburnum found in areas.



FOREST STRUCTURE

<i>Composition</i>	Stand Structure	Even-aged with some residuals and a few hemlock inclusions. Two-aged in two pockets.
	Silvicultural Stage	Mid and late-intermediate areas.
	Stand Age	Mostly 80 - 100± years; some 40 - 70± years.
<i>Tree Size</i>	DBH range	5 - 24± inches
	Mean DBH	11 - 16± inches
	Avg. Maximum Height	70± feet
<i>Stand Density</i>	Relative Stocking	Moderate to considerable
	Basal Area/Acre	Variable: 100 to 160± sq. ft./acre
	Canopy Closure	60 to 100± %
<i>Ecological</i>	Canopy Stratification	Most areas have fairly full overstory and moderate to dense understory. Mid-story canopy is less well-developed.
	Coarse Woody Debris (CWD)	Generally light accumulation.
	Invasive Plants	Some incidence near soccer field area.

SILVICULTURAL PRESCRIPTION

Objectives –

Specific silvicultural objectives over time include: 1) Improvement of timber growth, and upgrade of quality; 2) Salvage of trees with pine decline; 3) Transition to age-diverse stands, including ample pine/oak regeneration, as well as mid-aged trees, and older (150+ year) residuals; 4) Development of mid-story canopy layer to benefit wildlife and expand structural diversity; 5) Encourage accumulation of larger woody debris on forest floor; and 6) Perpetuate the white pine forest type, particularly in dry site areas.

Structural Sequence: Even-aged & Two-aged (present condition)→Multi-aged (2050±)

Silvicultural Treatments:

2010±: *Salvage/Improvement cut/Crown thinning.*

2025±: *Single-tree/micro-group selection/Liberation.*

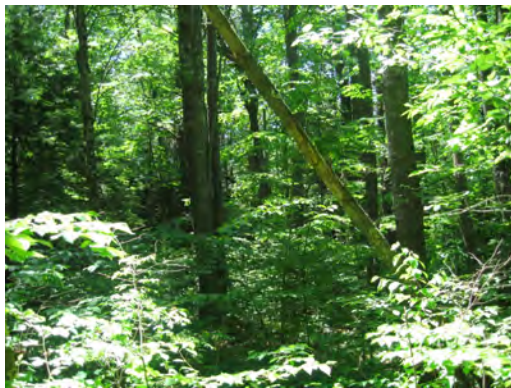
2040±: *Single-tree selection/Expanded micro-groups /Liberation.*



C. White Pine/Hardwood – 65.3± acres

Status: A major forest type. Two general types of white pine/hardwood stands—those not recently cut, and those heavily cut since the mid-1980's—are found covering much of the Town forest's central interior, particularly in the former Bales and Wulf parcels.

Description: White pine is a primary component (25 to 75% of stocking) in this forest type, as are red oak, white oak, and to a lesser extent red maple. Roughly half the forest type acreage has not been acutely disturbed in over 50 years. In these stands, the overstory is well-stocked with variable proportions of pine and oak; pines range up to 26" diameter in some scenic pockets. An area of pit and mound terrain indicates storm blowdowns in the 1950's; 55± year old hardwoods have filled the canopy gaps.



Forest Type C: Typical established pine-hardwood mix.



Forest Type C: Pine-hardwood heavily cut in 1995±.

White pine sawtimber was heavily harvested from extensive areas of the former Bales and Wulf lots in 1985± and 1995± respectively, as well as in the more distant past (photo on right). In both lots, a 3-aged forest structure has resulted, with ample regeneration beneath the open overstory. Seedling and sapling growth consists of a diverse species mix. The Lee Conservation Commission has endeavored to encourage the regeneration of two seed-bearing American Chestnuts by creating a small regeneration opening in the vicinity of the trees within this forest type.

This forest type primarily occupies well-drained uplands, though a few moist areas contain a mesic variant. Hophornbeam, a small tree, and pipsissewa, a trailing ground plant, are enriched site indicators found in at least one mesic area.

Timber – Areas that escaped recent harvesting contain fine quality red oak and white pine, with timber generally in the 14 to 20 inch diameter range. Crown thinning and improvement cutting will favor the growth of high quality sawtimber, which will mature over the next 15 to 50 years. Management should emphasize abundant natural regeneration of these species. In the 32± acres that were heavily harvested, silviculture should focus on developing the younger generations, by favoring healthy trees and providing adequate growing space. Presently, this is a cost operation, as trees are of sapling size.

Wildlife – This forest type contains ample understory and mid-story canopy layers with diverse shrub and tree species, which is attractive to wildlife. Coarse woody debris is also substantial. The oak component provides supplementary mast—acorns—to the nearby upland hardwood stands (Forest Type A). As with the upland hardwood areas, diversifying mast sources, including American chestnut, is a long-term silvicultural goal. Allowing the development of at least a dozen legacy (150+ years) trees per acre is also favorable.

This forest type is attractive to deer, gray fox, gray squirrel, southern flying squirrel, and white-footed mouse. Avian species observed in this forest type include turkey, ruffed grouse, great-crested flycatcher, white-breasted nuthatch, black and white warbler, ovenbird, black-throated blue warbler, brown creeper, hermit thrush, and tufted titmouse.



Species Composition –

Primary – White pine, red oak, white oak, red maple (variable).

Secondary – In areas: black oak, black birch, big-tooth aspen, shagbark hickory, white birch.

Tertiary – Hemlock (in patches), beech, American chestnut, pitch pine, white ash, ironwood, hophornbeam.

Regeneration (seedlings/saplings) – Areas not recently cut: Hemlock, white pine, red maple, red oak.

Heavily cut areas: Red oak, hemlock, white oak, red maple. Also white pine, beech, black birch, shagbark hickory, black cherry, chestnut, sugar maple.

Shrubs– Witch-hazel, beaked hazelnut, maple-leaved viburnum, alternate-leaf dogwood, hawthorn. Herbaceous—Sarsaparilla, wintergreen, partridgeberry, pipsissewa, rattlesnake root, dogbane.

FOREST STRUCTURE

	White Pine/Hardwood Forest Type Variant		
COMPOSITION	Established forest, not recently cut	Heavily cut 1985± (Bales Lot)	Heavily cut 1995± (Wulf Lot)
Structure	Even-aged, Two-aged	Three-aged	Three-aged
Stage	Late-Intermediate	Regenerating & Young-Intermediate	Intermediate (mid-late)
Stand Age (years)	85-100± years (55± years)	15-20//50-80±//100+ years	12-15±//65±//95± years
TREE SIZE			
DBH range (inches)	8 – 20±”	1-22±”	1-22±”
Mean DBH (inches)	13”±	--	--
Avg. Maximum Height	70± ft.	65± ft.	65± ft.
STAND DENSITY			
Relative Stocking	Considerable	Overstory-light/moderate; Understory-dense.	Overstory-light/moderate; Understory-dense.
Basal Area/Acre (sq. ft/ac)	145±	60±	45±
Canopy Closure (overstory)	85-100%	0-50%	0-50%

SILVICULTURAL PRESCRIPTION

	White Pine/Hardwood Forest Type Variant		
OBJECTIVES	Established forest, not recently cut	Heavily cut 1985± (Bales Lot)	Heavily cut 1995± (Wulf Lot)
Upgrade timber quality	✓		
Growing space	✓	✓	✓
Create regeneration openings	✓		
Overstory release of seedling/sapling growth		✓	✓
Inter-sapling release		✓	✓
Wildlife	✓	✓	✓
Reserve or retain old trees	✓	✓	✓
Reintroduce chestnut	✓	✓	✓
FAVORED SPECIES	White pine, white & red oak, shagbark hickory	White pine, white & red oak, chestnut, sugar maple	White pine, white & red oak, chestnut
DATE/TREATMENT			
2010±	Improvement cut/ Crown thinning	Single-tree selection, expanded group openings. Invasive plant removal.	Single-tree selection, expanded group openings
2015±		Inter-sapling release (cleaning)	Inter-sapling/seedling release (cleaning)
2030±	Single-tree & micro-group selection/Liberation	Single-tree selection (overstory); weeding/thinning (young growth)	Single-tree selection (overstory); weeding/thinning (young growth)
2045±	Single-tree selection/ Expanded micro-groups/Liberation cut	Similar to previous	Similar to previous



D. Hemlock/White Pine/Hardwood (22.7± acres) –

Status: A major forest type. One main stand in the original Town Forest parcel, as well as multiple, scattered smaller stands.

Description: In addition to upland hardwoods and white pine, an abundance of hemlock characterizes this forest type. *Hemlock is present in all canopy layers*, not just in the understory as with other forest types. Some pockets have few white pines. The proportion of white oak, red oak, red maple and shagbark hickory varies between stands. Generally, the forest type is situated on ledgy terrain.



Forest Type D: Hemlock/pine/hardwood



Forest Type D: Dense overstory canopy.

Most of this forest type has not been acutely disturbed in 50+ years. Trees range in age from 60 to 140+ (hemlock) years, indicating areas that were abandoned as pasture perhaps as early as the Civil War. While densely shaded areas lack young forest, shrub, and herbaceous growth, hemlock, pine, oak, and hickory saplings were noted in a few small canopy openings. Maple-leaved viburnum was also noted in moist, lighted openings.

Timber - This forest type contains good quality white oak and white pine; trees have grown straight and benefited from the protective shade of surrounding hemlocks. Some white oaks may be candidate trees for specialized local initiatives such as the Gundalow reconstruction project, which requires difficult-to-find, large diameter, good quality white oaks. Red oak in this forest type is generally of good quality. This forest type contains a high proportion of hemlock, which has not been a highly marketable species since the 1960's. In managed areas, the harvest of some hemlock may be favorable to promote young growth, despite depressed hemlock timber prices.

Wildlife - Covering an extensive area in the northeastern portion of the Town Forest, this forest type provides dense softwood habitat juxtaposed between forested wetlands and hardwood stands that are more open. The forest canopy has well-defined mid and upper layers, including pine super-canopy, though dense shade greatly curtails understory and herbaceous development. The dense hemlock foliage that characterizes this forest type affords thermal cover for wildlife both in winter (deer, snowshoe hare, grouse) and hot summer weather. The presence of white oak and large snags are two important habitat enhancers. Birds specific to this forest type include barred owl, pileated woodpecker, black-throated green warbler, blue-headed vireo, and red-breasted nuthatch.

Tree Species Composition –

Primary – White pine, hemlock, white oak.

Secondary – Red oak, red maple, black oak, shagbark hickory (in pockets).

Tertiary – White birch, beech.

Regeneration (seedlings/saplings) – Sparse. Hemlock primarily. Also, red oak, white pine, and shagbark hickory.

Shrubs/Herbaceous – In openings: maple-leaved viburnum, sarsaparilla, partridgeberry.



Forest Type D – Continued

FOREST STRUCTURE

<i>Composition</i>	Stand Structure	Even-aged, even-aged with inclusions, and three-aged.
	Silvicultural Stage	Late-intermediate
	Stand Age	60±// 100±// 120-140+ years
<i>Tree Size</i>	DBH range	8 - 24± inches
	Mean DBH	15± inches
	Average Max. Height	65± feet
<i>Stand Density</i>	Stocking (density)	Considerable to dense.
	Basal Area (BA)	195± sq. ft./acre (variable)
	Canopy Closure	90-100%
<i>Ecological</i>	Canopy Stratification	Fair – Upper and mid canopy. Minimal understory.
	CWD	Moderate to good – Variable abundance; some large decaying trunks.
	Invasive Plants	Low/no incidence

SILVICULTURAL PRESCRIPTION

Objectives –

It is likely that the main stand of this forest type in the northeastern section of the Town Forest will be withheld from silvicultural management for the time being as a reserve. For managed stands of the hemlock/pine/hardwood type, the recommended silvicultural treatments are intended to maintain extensive dense softwood cover while broadening the range of tree generations and species diversity. Specifically: 1) Retain some (5 to 10 trees/acre) large, increasingly older, legacy trees, particularly hemlock, white oak, red oak, and shagbark hickory; 2) Retain hemlock cover while creating within-stand openings less shaded by hemlock to allow the establishment of mixed hardwood growth; 3) Encourage herbaceous growth and ground cover in these openings; 4) Retain ample white pine, white oak, red oak, and shagbark hickory seed sources to assure natural regeneration of these species; 5) Apply single-tree selection within hemlock groves to minimize scenic quality changes; 6) Release favorable young growth over time; 7) Grow broad-crowned oaks; and 8) Monitor for the presence of hemlock wooly adelgid.

Structural Sequence: Even-aged to Three-aged (present condition)→ Multi-aged (2050±).

Silvicultural Treatments:

- 2010±: *Single-tree/micro-group selection.* Focus on naturally regenerating the stands. Retain ample pine, oak and hickory as seed sources. Provide growing space to promote large-crowned oaks and to free existing regeneration.
- 2025±: *Single-tree/expanded micro-group selection.* Increase perimeter of previous openings to release previous regeneration and create space for another new forest generation. Retain oldest generation (150+ years) as legacy trees.
- 2040±: *Single-tree/expanded small-group selection.* Further increase perimeter of previous openings to release previous regeneration and create space for another new forest generation. Retain oldest generations as legacy trees.
- 2045± *Inter-sapling release.* Non-commercial (TSI) treatment to thin pockets of favorable sapling and small pole-sized growth.



E. Hemlock/Hardwood (10.2± acres)

Status: Minor forest type; several scattered 1 to 4± acre stands.

Description: Unlike Forest Type D, white pine is largely absent in the Hemlock/Hardwood forest type. Hemlock predominates along with varying proportions of oak, maple, and birch. The forest type is often transitional between stands stocked with white pine as well as hemlock and mixed hardwoods. Though most of the forest type is well-established (trees 90 – 140+ years of age), small pockets of a 50-55± year old forest generation (cohort) indicate a disturbance of similar vintage (1950's) as with other forest types in the town Forest.



E. Minimal understory in heavily-shaded Hemlock/Hardwood.

Timber - This forest type contains some quality hardwood sawtimber, both developing and mature. Though hemlock is abundant, the species holds minimal value in present day markets.

Wildlife – The hemlock/hardwood forest type, often situated near wetlands or mesic sites, provides thermal cover and limited travel cover for mammals and birds. Oaks provide a mast source. Some older hemlocks serve as large diameter cavity trees. Birds utilizing this forest type include roughed grouse, pileated woodpecker, black-throated green warbler, blue-headed vireo, and red-breasted nuthatch.

Tree Species Composition –

Primary – Hemlock.

Secondary – White oak, red oak, red maple, white birch, black oak.

Tertiary – White pine, black birch.

Regeneration (seedling/saplings) – Densely shaded. Some hemlock, but generally sparse.

Shrubs/Herbaceous – Maple-leaf viburnum, few witch-hazel; sarsaparilla, mayflower.

FOREST STRUCTURE

<i>Composition</i>	Stand Structure	Even-aged patches. Generally, 2 to 3-aged.
	Silvicultural Stage	Mid to late-intermediate/ Mature.
	Stand Age	50±// 90±// 120-140+ years
<i>Tree Size</i>	DBH range	8 - 22± inches
	Mean DBH	12±//16± in. (variable by area)
	Average Maximum Height	55± feet
<i>Stand Density</i>	Stocking (density)	Dense
	Basal Area (BA)	205± sq. ft./acre
	Canopy Closure	95 - 100%
<i>Ecological</i>	Canopy Stratification	Fair – Full high canopy; mid-story is mostly hemlock branches/foliage.
	Coarse Woody Debris (CWD)	Moderate accumulation, with some large trunks.
	Invasive Plants	Low/no incidence



Forest Type E – Continued

SILVICULTURAL PRESCRIPTION

Objectives –

Barring a large disturbance, hemlock will continue to dominate this forest type, perhaps with decreasing variety of hardwood species over time. Though silvicultural management will encourage a broader variety of species, generations, and canopy layers, the creation of larger openings may detract from the stands' scenic values. Thus two approaches are recommended: For the stand in the central, managed area (Bales Lot), silviculture will aim to create moderate openings to encourage regeneration of mixed species growth. In the northeasterly section, which is likely to be withheld as a temporary reserve, no silvicultural action will be undertaken presently. However, a significant natural disturbance is likely to eventually inspire a salvage cut and/or follow-up management.

Structural Sequence: Even-aged to Three-aged (present condition)→ Multi-aged (2030±).

Silvicultural Treatments:

In managed areas:

- 2010±: *Single-tree/micro/ and small group selection.* Keep desirable hardwood and pine seed sources.
Larger openings will favor mid-successional forest species and fruit-bearing plants.
Retain hemlock travel corridors, particularly along seasonal streams.
- 2025±: *Expanded group selection/single-tree selection.* Follow-up with non-commercial TSI *release cutting (weeding and thinning)* of young growth, to promote pine, oak, hickory, and black birch.
- 2040±: *Similar treatment.*



F. Early-successional/Young Forest – 2.8± acres

Status: Minor in size, this forest type includes four areas: 1) A small patch adjacent to the Transfer Station; 2) The powerline corridor in the southern portion of the Town Forest; 3) A small young-forest patch between the soccer field and powerline; and 4) A former orchard immediately north of the powerline.

Description: Forest Type F includes all areas of the property containing forest growth under 50 years of



Recently mowed powerline—early-successional growth.



Forest Type F—Former orchard, young forest growth.

age. In the case of the powerlines, vegetation is removed in roughly 5± year intervals, and as recently as the winter of 2009-2010. The small former orchard area on the north side of the powerline is still fairly open, containing herbaceous growth, saplings, and apple trees. The patch behind the Transfer Station has 10 to 15± year old sapling growth. The oldest pocket lies between the soccer field and the powerline in the south side of the Town Forest, with 20 to 45± year old pine/hardwood mix.

Early-successional growth refers to the pioneering species mix that typically grows when fields are first abandoned. Tree species such as staghorn sumac, gray birch, quaking aspen, black cherry, and white pine thrive under full sunlight. Herbaceous growth may include grasses, milkweed, various goldenrod and aster species, and woody growth such as common juniper, blackberry, meadowsweet, and sweet fern. Exotic, invasive plants were noted in the early-successional areas, also thriving in the sunlit conditions.

Timber – The various early-successional pockets do not currently hold timber value. Perpetuating early-successional conditions to benefit wildlife is a desirable goal, though this will circumvent the growth of timber in this area.

Wildlife – The limited area of this forest type can be managed strictly for wildlife purposes by periodically re-clearing the stands to promote dense wildlife cover and perpetuate the early-successional species mix. All areas should be treated and monitored for the presence of invasive plants, as the sunlit environment provides a vector for the spread of exotic plants into the Town Forest.

Enhancements to this habitat are the presence of apple trees in at least one stand; stump piles (for denning) on the edge of the former orchard; and good transitional edge for all of the stands between wetlands or open areas (such as the soccer field) and the adjacent woodlands.

Early-successional forest growth provides important habitat for snowshoe hare and a variety of birds including: Red-tailed hawk, wild turkey, brown thrasher, gray catbird, chipping sparrow, song sparrow, white-throated sparrow, and Eastern towhee.

Species Composition – varied between patches:

Primary – White pine, red maple, black cherry, white birch, gray birch, red oak, black oak, shagbark hickory, apple spp., white ash, quaking aspen, and big-tooth aspen.

Shrubs/Herbaceous – Staghorn sumac, common juniper, lowbush blueberry, meadowsweet, blackberry, wild strawberry, bristly dewberry, lance-leaved goldenrod, rough-stemmed goldenrod, hay-scented fern, milkweed, sulphur cinquefoil.



Forest Type F – Continued

Exotic Invasive Species – Black locust, multiflora rose, Japanese knotweed, Japanese barberry. Autumn olive, honeysuckle spp., and glossy buckthorn may also be present.

FOREST STRUCTURE – Young Forest Areas

<i>Composition</i>	Stand Structure	Even-aged, even-aged with residuals.
	Silvicultural Stage	Regenerating/young intermediate.
	Stand Age	0 to 50 years.
<i>Tree Size</i>	DBH range	<1 - 14± inches
	Mean DBH	variable
	Avg. Maximum Height	2± (mowed powerlines) to 50± feet
<i>Stand Density</i>	Relative Stocking	Moderate to dense
	Basal Area/Acre	N/A
	Canopy Closure	0 - 100± %
<i>Ecological</i>	Canopy Stratification	Good – In addition to herbaceous and low canopy layers, several areas have taller sapling or pole-sized growth.
	Coarse Woody Debris (CWD)	Low accumulation.
	Invasive Plants	Moderate incidence

SILVICULTURAL PRESCRIPTION

Objectives –

The main objective for this forest type is to perpetuate the early-successional forest condition. Retaining the young growth patches provides distinct and valuable habitat for wildlife, since most of the Town Forest’s interior consists of well-established forest. Maintaining enhancements such as the presence of apple trees and additional structure such as the stump pile in the old orchard, is also an objective. Eliminating exotic, invasive plants remains an important goal.

The various patches may be managed on different rotations and with different specifications. For example, the powerline strip is mowed cleared every 3 to 5± years by PSNH. The Town must hire a Brontosaurus or similar equipment to maintain the other early successional patches on longer, perhaps staggered rotations of 15 to 30± years. Apple trees should not be removed.

Structural Sequence: Even-aged (present condition)→Even-aged (2040). Periodically clear to re-establish early-successional/young forest growth conditions.

Silvicultural Treatment:

2010±: *Eliminate* exotic, invasive plants.

2015±: *Brontosaurus clearing* of young stand between soccer field and powerline, leaving forested buffer along the field.

Monitor for the presence of invasive plants in conjunction with periodic (15± year) clearing work.

Plan and implement appropriate response if plants are detected.

2020±: *Brontosaurus clearing* of old orchard area and patch behind Transfer Station.

Inspect for and treat invasive plants in conjunction with clearing work.

2035±: *Similar treatment, all areas.*



G. Forested Wetlands – 17.6± acres

Status: Major forest type—found as forested swamps that are widespread throughout the Town Forest.

Description: Forest Type G encompasses all forested areas occupying the Town Forest’s poorly and very poorly drained soils (*Swanton* soil areas). Red maple is by far the most common trees species on these wetland sites, with elm and black ash as secondary.



Forest Type G: Forested wetland.



Forest Type G: Enriched forested wetland site.

The latter species is more common in pockets that appear to be mildly enriched by groundwater seepage. The Town Forest’s forested wetlands are at headwater location; groundwater seepage and surface sheet flow contribute significantly to their hydrology.

The Town Forest’s forested wetlands have high water tables that are periodically, if not frequently, water-saturated. The underlying soil environment is not conducive to the growth of upland species such as oak and beech; tree roots must tolerate extended periods of low-oxygen conditions. Tree windthrow is always a possibility since roots remain along the ground surface. The forest type’s wettest areas have light tree stocking with a fairly open canopy—conditions which are conducive for dense wetland shrub growth.

Species Composition – varies between swamps:

	Typical Conditions	More Enriched Sites
Primary	Red maple.	Red maple, black ash.
Secondary	none	Elm.
Tertiary	Elm, black ash.	White pine, hemlock.
Regeneration	Elm, red maple	Hemlock, red maple
Shrubs/vines	Highbush blueberry, winterberry holly, grapevine.	Speckled alder, winterberry holly, northern arrowwood, poison sumac
Herbaceous	Marginal wood fern, sensitive fern, royal fern, cinnamon fern. Arrow arum, false hellebore.	Sensitive fern, New York fern (edges). Gold saxifrage, Jack-in-the-pulpit, jewelweed, water hemlock, white turtlehead, hog peanut, wood aster.

Timber – Due to the difficulty of accessing timber on wetland sites while avoiding impact to water-saturated soils, silvicultural management is largely unfeasible. Minimal harvesting or tree salvage may occasionally occur along wetland edges to enhance habitat or salvage valuable storm-damaged trees. Harvest equipment must remain on the upland edges, with felled or downed trees carefully removed by cable or lifted by a mechanical feller.

Wildlife – Forested wetlands are dynamic sites that tend to provide valuable habitat for wildlife. Tree blowdowns and snag formation are commonplace; the resulting woody debris and cavity trees provide shelter and feeding opportunities. Dense shrub and herbaceous growth that are found in canopy gaps, or



Forest Type G – Continued

under partial canopy cover, are used by a variety of wildlife as travel and resting cover. Fruit-bearing wetland shrubs, including winterberry holly, highbush blueberry, and viburnums are widely-used food sources. Uneven terrain, consisting of exposed tree roots and grassy hummocks, provide potential amphibian habitat.

Management to enhance forested wetland habitats is limited due to the difficulty of access and potential for ground disturbance. Silviculturally, this may involve careful, limited harvesting along wetland edges to induce the growth of shrub and herbaceous plants. Transitional edges can be created on the upland edge of some forested wetlands, where favorable.

Management to control exotic, invasive plants is typically a concern for wetland areas. Sunlit, moist environments are susceptible to invasion by buckthorn, barberry, honeysuckle, and multiflora rose, among other undesirable species. A program of periodic reconnaissance and removal of plants is strongly recommended.

Birds that were observed in the forested wetland type include common yellowthroat, Baltimore oriole, chipping sparrow, and wood pewee. Other wildlife species that likely utilize the property’s forested wetlands include American woodcock, alder flycatcher, veery, blue-gray gnatcatcher, northern waterthrush, raccoon, opossum, mink, and white-tailed deer. Four-toed salamander may utilize swamp hummocks.

FOREST STRUCTURE – Forested Wetlands

<i>Composition</i>	Stand Structure	Even-aged with inclusions, patchy.
	Silvicultural Stage	n/a
	Stand Age	50 to 80± years.
<i>Tree Size</i>	DBH range	4 - 14± (20±) inches
	Mean DBH	Variable: 6 -9 inches
	Avg. Maximum Height	40 to 50± feet
<i>Stand Density</i>	Relative Stocking	Variable: Light to moderate
	Basal Area/Acre	Variable: 20 to 120±
	Canopy Closure	Variable: 0 - 100± %
<i>Ecological</i>	Canopy Stratification	Good – Dense herbaceous layer generally. Patchy understory with shrubs. Mid-story and overstory variable. Some open overstory areas.
	Coarse Woody Debris (CWD)	Moderate—snags and fallen debris are accumulating.
	Invasive Plants	Glossy buckthorn and Japanese barberry noted.

SILVICULTURAL PRESCRIPTION

Objectives – Designate as reserve, where timber harvesting is largely excluded. Exceptions include restricted harvesting to create small openings along wetland edges to promote shrubs and enhance habitat. In addition, salvage harvesting after a natural disturbance may be occasionally warranted.

Structural Sequence: Even-aged (present condition)→Multi-aged (eventually).

Silvicultural Treatment:

2010±: *Inspect for and eliminate* exotic, invasive plants.

Create *small group* openings along 1/20th (5%) of forested wetland edges.

2015±: *Monitor* for the presence of invasive plants. *Implement* appropriate response if plants are detected.

2020±: *Monitor* for the presence of invasive plants. *Implement* appropriate response if plants are detected.

2025±: *Inspect for and eliminate* exotic, invasive plants.

Create *small group* openings along 1/20th (5%) of forested wetland edges.

2040±: *Similar treatment.*



Appendix A: PLANT SPECIES LIST

Lee Town Forest Trees, Shrubs, and Vines

Common Name

Scientific Name

-NATIVE TREES-

DECIDUOUS

Northern Red Oak	<i>Quercus rubra</i>
Black Oak	<i>Quercus velutina</i>
White Oak	<i>Quercus alba</i>
Swamp White Oak	<i>Quercus bicolor</i>
American Beech	<i>Fagus grandifolia</i>
American Chestnut	<i>Castanea dentata</i>
Red (Swamp, Soft, White) Maple	<i>Acer rubrum</i>
Sugar (Rock, Hard) Maple	<i>Acer saccharum</i>
Striped Maple (Moosewood)	<i>Acer pensylvanicum</i>
White (Paper) Birch	<i>Betula papyrifera</i>
Yellow (Silver) Birch	<i>Betula allegheniensis</i>
Black (Sweet, Cherry) Birch	<i>Betula lenta</i>
Gray Birch	<i>Betula populifolia</i>
Black Cherry	<i>Prunus serotina</i>
Pin (Fire) Cherry*	<i>Prunus pensylvanica</i>
Shagbark Hickory	<i>Carya ovata</i>
Pignut Hickory	<i>Carya glabra</i>
White Ash	<i>Fraxinus americana</i>
Black Ash	<i>Fraxinus nigra</i>
Basswood	<i>Tilia americana</i>
American Elm	<i>Ulmus americana</i>
Bigtooth Aspen (Popple)	<i>Populus grandifolia</i>
Quaking Aspen	<i>Populus tremuloides</i>
Black Gum	<i>Nyssa sylvatica</i>
Ironwood (Musclewood)	<i>Carpinus caroliniana</i>
Hophornbeam	<i>Ostrya virginiana</i>
Sassafras	<i>Sassafras albidum</i>
Staghorn Sumac	<i>Rhus typhina</i>
Smooth Sumac	<i>Rhus glabra</i>
Poison Sumac	<i>Rhus vernix</i>
Apple	<i>Malus spp.</i>

EVERGREEN

White Pine	<i>Pinus strobus</i>
Red Pine	<i>Pinus resinosa</i>
Pitch Pine	<i>Pinus rigida</i>



Eastern Hemlock	<i>Tsuga canadensis</i>
Black Spruce	<i>Picea mariana</i>
Red Spruce*	<i>Picea rubens</i>
Balsam Fir	<i>Abies balsamea</i>
Tamarack (Larch)*	<i>Larix laricina</i>
Red Cedar	<i>Juniperus virginiana</i>

- NATIVE SHRUBS & VINES-

Speckled Alder	<i>Alnus rugosa</i>
Sweet Pepperbush	<i>Clethra alnifolia</i>
Maleberry	<i>Lyonia ligustrina</i>
Black Huckleberry	<i>Gaylussacia baccata</i>
Dwarf Huckleberry**	<i>Gaylussacia dumosa</i>
Witch-Hazel	<i>Hamamelis virginiana</i>
Mapleleaf Viburnum	<i>Viburnum acerifolium</i>
Winterberry Holly	<i>Ilex verticillata</i>
Hawthorn	<i>Crataegus</i> spp.
Choke Cherry*	<i>Prunus virginiana</i>
Beaked Hazelnut	<i>Corylus cornuta</i>
Serviceberry	<i>Amelanchier</i> spp.
Common Elderberry	<i>Sambucus canadensis</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>
Lowbush Blueberry	<i>Vaccinium angustifolium</i>
Nannyberry	<i>Viburnum lentago</i>
Northern Wild-raisin	<i>Viburnum cassinoides</i>
Northern Arrowwood	<i>Viburnum dentatum</i>
Alternate-leaf Dogwood	<i>Cornus alternifolia</i>
Red-osier Dogwood*	<i>Cornus stolonifera</i>
Gray Dogwood*	<i>Cornus racemosa</i>
Spicebush	<i>Lindera benzoin</i>
Currant	<i>Ribes</i> spp.
Buttonbush*	<i>Cephalanthus occidentalis</i>
Black Raspberry	<i>Rubus occidentalis</i>
Red Raspberry	<i>Rubus idaeus</i>
Blackberry	<i>Rubus allegheniensis</i>
Canada (American) Yew	<i>Taxus canadensis</i>
Sweet Fern	<i>Comptonia peregrina</i>
Common Juniper	<i>Juniperus communis</i>
Leatherleaf	<i>Chamaedaphne calyculata</i>
Bog Laurel*	<i>Kalmia polifolia</i>
Swamp Rose*	<i>Rosa palustris</i>
Sheep Laurel	<i>Kalmia angustifolia</i>
Meadowsweet	<i>Spiraea latifolia</i>
Steeplebush	<i>Spiraea tomentosa</i>
Grape	<i>Vitis</i> spp.
Virginia Creeper	<i>Parthenocissus quinquefolia</i>



-NATIVE GROUNDCOVER & FERNS-

See “A Biological Inventory of the ‘Town Forest Complex’ Lee, New Hampshire,” by Alan T. Eaton for a list of non-woody plants found on the Lee Town Forest.

-EXOTIC, INVASIVE PLANTS-

Black Locust	<i>Robinia pseudoacacia</i>
Common Buckthorn	<i>Rhamnus cathartica</i>
Glossy (European) Buckthorn	<i>Frangula alnus</i>
Multiflora Rose	<i>Rosa multiflora</i>
Tartarian Honeysuckle	<i>Lonicera tatarica</i>
Japanese Knotweed	<i>Polygonum cuspidatum</i>
Oriental Bittersweet	<i>Celastrus orbiculatus</i>
Winged Euonymus (Burningbush)	<i>Euonymus atropurpureus</i>
European Barberry	<i>Berberis vulgaris</i>
Japanese Barberry	<i>Berberis thunbergii</i>

Note:

* From Biological Inventory of the ‘Town Forest Complex’ Lee, New Hampshire” by Alan T. Eaton

** From Biological Inventory of the ‘Town Forest Complex’ Lee, New Hampshire” by Alan T. Eaton & New Hampshire Natural Heritage Bureau Report, 3/11/2009





NEW HAMPSHIRE NATURAL HERITAGE BUREAU

DRED - DIVISION OF FORESTS & LANDS

PO Box 1856 -- 172 PEMBROKE ROAD, CONCORD, NH 03302-1856

PHONE: (603) 271-2214 FAX: (603) 271-6488

To: Charles Moreno, Moreno Forestry Associates
PO Box 60
Center Strafford NH 03815

From: Sara Cairns, NH Natural Heritage Bureau

Date: 2009-03-12

Re: Review by NH Natural Heritage Bureau of request dated 2009-03-11

NHB File ID: 537

Town: Lee

Project type: Landowner Request

Location: South of Wheelwright Pond (Map 11, Lots 5, 7, 10)

I have searched our database for records of rare species and exemplary natural communities on the property(s) identified in your request. Our database includes known records for species officially listed as Threatened or Endangered by either the state of New Hampshire or the federal government, as well as species and natural communities judged by experts to be at risk in New Hampshire but not yet formally listed.

NHB records on the property(s):

	Mapping Precision	% within tract	Last Reported	Listing Status		Conservation Rank	
				Federal	NH	Global	State
Natural Community				Federal	NH	Global	State
Poor level fen/bog system	Good	63	2006	--	--	-	S3
Plant species				Federal	NH	Global	State
Dwarf Huckleberry (<i>Gaylussacia dumosa</i>)	Good	22	1993	--	T	G5	S2

NHB records within one mile of the property(s):

	Last Reported	Listing Status		Conservation Rank	
		Federal	NH	Global	State
Vertebrate species (For more information on animal species, contact Kim Tuttle, NH F&G at 271-6544)					
American Brook Lamprey (<i>Lampetra appendix</i>)	2007	--	E	G4	S2
Banded Sunfish (<i>Enneacanthus obesus</i>)	2005	--	--	G5	S3
Spotted Turtle (<i>Clemmys guttata</i>)	1995	--	T	G5	S3
Wood Turtle (<i>Glyptemys insculpta</i>)	2000	--	--	G4	S3
Blanding's Turtle (<i>Emydoidea blandingii</i>)	2005	--	E	G4	S3
Northern Black Racer (<i>Coluber constrictor constrictor</i>)	1993	--	T	T5	S3

NOTE: This review *cannot* be used to satisfy a permit or other regulatory requirement to check for rare species or habitats that could be affected by a proposed project, since it provides detailed information only for records actually on the property.



NEW HAMPSHIRE NATURAL HERITAGE BUREAU

DRED - DIVISION OF FORESTS & LANDS

PO Box 1856 -- 172 PEMBROKE ROAD, CONCORD, NH 03302-1856

PHONE: (603) 271-2214 FAX: (603) 271-6488

Natural Community		Federal	NH	Global	State
Circumneutral seepage swamp	1983	--	--	--	S1
Plant species		Federal	NH	Global	State
Northern Blazing Star (<i>Liatris scariosa</i> var. <i>novae-angliae</i>)	1937	--	E	T3	S1
Tufted Loosestrife (<i>Lysimachia thyrsiflora</i>)	1995	--	T	G5	S2
Granular Sedge (<i>Carex granularis</i>)	1944	--	E	G5	S1
Six Weeks Fescue (<i>Vulpia octoflora</i> var. <i>glauca</i>)	1945	--	E	T5	--
Knotty Pondweed (<i>Potamogeton nodosus</i>)	1994	--	E	G5	S1

Listing codes: T = Threatened, E = Endangered

Rank prefix: G = Global, S = State, T = Global or state rank for a sub-species or variety (taxon)

Rank suffix: 1-5 = Most (1) to least (5) imperiled. "--", U, NR = Not ranked.

B = Breeding population, N = Non-breeding. H = Historical, X = Extirpated.

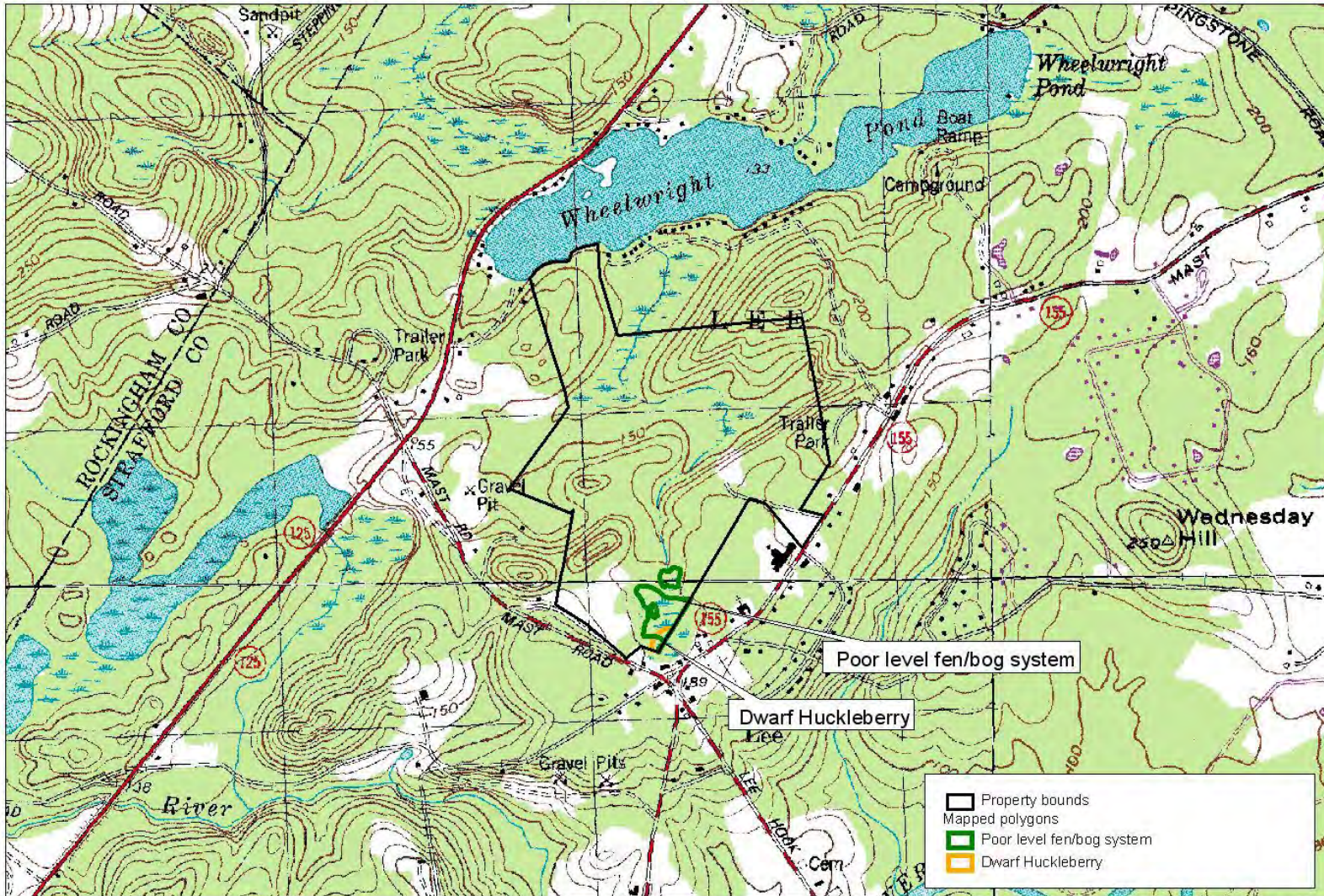
A negative result (no record in our database) does not mean that no rare species are present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

NOTE: This review *cannot* be used to satisfy a permit or other regulatory requirement to check for rare species or habitats that could be affected by a proposed project, since it provides detailed information only for records actually on the property.

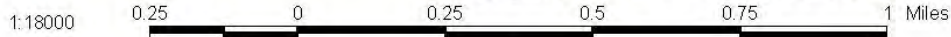


Known locations of rare species and exemplary natural communities

Sensitive species are labelled but not mapped. All other records are clipped to the property boundaries. Occurrences not on the property are not shown.



Property: Lee Town Forest Complex



New Hampshire Natural Heritage Bureau - Plant Record

Dwarf Huckleberry (*Gaylussacia dumosa*)

Legal Status

Federal: Not listed
State: Listed Threatened

Conservation Status

Global: Demonstrably widespread, abundant, and secure
State: Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 1993: Seen by Sue Williams. Speciman ID verified by Dan Sperduto. Many plants seen.
1939: ARH specimen #3375 at NHA/July 18, 1939.

General Area:

Location

Survey Site Name: Lee Bog Behind Town Hall
Managed By: Bales Lot

County: Strafford	USGS quad(s): Epping (4307111)
Town(s): Lee	Lat, Long: 430723N, 0710044W
Size: 2.8 acres	Elevation: 110 feet

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Lee. Large bog behind Lee town hall.

Dates documented

First reported: 1939	Last reported: 1993-07-23
----------------------	---------------------------

Williams, Sue. 1993. Field survey to bog behind Lee Town Hall on July 23. (40 Dennett Ave, Lee, NH 03824).

New Hampshire Natural Heritage Bureau - System Record

Poor level fen/bog system

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Not ranked (need more information)
State: Rare or uncommon

Description at this Location

Conservation Rank: Fair quality, condition and/or lanscape context ('C' on a scale of A-D).
Comments on Rank:

Detailed Description: 2006: System observed and photographed. 1998: Supports several peatland communities including a *leather-leaf - sheep laurel dwarf shrub bog*, a *highbush blueberry - mountain holly wooded fen*, a *winterberry - cinnamon fern wooded fen*, and a *marshy moat*. *Gaylussacia dumosa* (huckleberry) is broadly distributed throughout the peatland in the dwarf shrub heath community.

General Area: 1998: The Lee Town Hall, police station, other town offices, and a few residential buildings lie along the peatland's southern edge. A powerline corridor crosses near the peatland's northern edge. A small upland island (30 x 20 m) occurs in the fen near its western border. Surrounding upland typically supports a hemlock-beech-oak-pine forest.
2006: At visit in May, water table was very high and the moat/lagg was completely flooded. At visit in July, a small wooden dock platform extends out onto the peat mat from the powerline corridor at the northern edge of the larger of the two peatland basins, providing the only feasible access out onto the peat mat.

Location

Survey Site Name: Lee Town Hall Bog
Managed By: Bales Lot

County: Strafford
Town(s): Lee
Size: 7.5 acres

USGS quad(s): Epping (4307111)
Lat, Long: 430727N, 0710045W
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Park at the Lee Town Hall off of Rte. 155. Fen is just behind the town hall at the base of the slope.

Dates documented

First reported: 1998-08-03 Last reported: 2006-07-06

Kimball, Ben. 2006. Field visit to sites along the NH seacoast on July 6.

Sperduto, Daniel and William F. Nichols. 2000. Exemplary Bogs and Fens of New Hampshire. Prepared by NH Natural Heritage Inventory for the U.S. Environmental Protection Agency. Concord, NH.

Appendix C: NH Wildlife Action Plan

Background

In 2001, Congress established a “State Wildlife Grants” program that provided funds to state wildlife agencies for the conservation of fish and wildlife, and their habitats. Each state was charged with developing a comprehensive wildlife conservation plan as a proactive effort to keep species off rare species lists, and in the process save taxpayer dollars. Spearheaded by the New Hampshire Fish and Game Department (NH Fish & Game), with partners in the conservation community, the New Hampshire Wildlife Action Plan was created to directly address the “species in greatest need of conservation.” As part of the Wildlife Action Plan (WAP), NH Fish & Game identified wildlife species at risk (those with low and declining populations), assessed the condition of wildlife habitats, and evaluated risk factors for species and habitats.¹⁰

NH Fish & Game has identified 123 species of greatest need of conservation concern in the state, along with associated habitats. The species include freshwater mussels, insects, fish, amphibians, reptiles, birds, mammals, and four species of game animals (See Appendix D: NH WAP Table 1). WAP includes a suite of wildlife habitats that the species of concern are dependent on and which represent several spatial scales.

Species of Conservation Concern

The following table provides a list of invertebrates, amphibian, reptile, bird, and mammal species of conservation concern as identified in the NH Wildlife Action Plan (WAP) that are known to occur in the Lee Town Forest. Listing is based on data from the WAP watershed grouping cross-referenced with the matrix forest types and freshwater habitats found (as mapped in the WAP) on the Town Forest.

Common Name	WAP - Habitat	Habitat Type	Lee Town Forest occurrence?¹¹
Brook floater	TCW	Slow-moving streams	
Banded sunfish	MSW	Ponds, low-lying streams, acidic waters	
Blue-spotted salamander	OPF, VP	Deciduous forest, wooded swamps	
Fowler’s toad	OPF	Sandy alluvial lowlands, forests	
Northern leopard frog	MSW, Ptl	Wet open meadows, shallow streams	
Black racer	OPF	Fields, meadows, marshes, woodlands	
Blanding’s turtle	OPF, MSW, Ptl, VP	Marsh & shrub wetlands, upland forest	

¹⁰ New Hampshire Fish and Game Department. 2009. New Hampshire Wildlife Action Plan website & Eaton, Alan T., “Biological Inventory of the Town Forest Complex”, August 2005. Also, 2008-2009 forest assessment by Charles A. Moreno, LPF.

¹¹ Lee Town Forest occurrence has either been observed during fieldwork for this management plan or documented by volunteers for the Town of Lee.



Ribbon snake	OPF, MSW, Ptl, VP	Marsh & shrub wetlands	
Spotted turtle	OPF, MSW, Ptl, VP	Vernal pools, emergent marshes	
Smooth green snake	OPF, MSW	Fields, meadows, dense vegetation	
Wood turtle	OPF	Sandy-bottomed streams	
American bittern	MSW	Marsh & shrub wetlands	
American black duck	MSW	Marsh & shrub wetlands	
American woodcock	OPF, MSW	Early successional	✓
Bald eagle	OPF	Large lakes, rivers, estuaries	
Canada warbler	OPF	Dense understory wetland forest edge	✓
Cerulean warbler	OPF	Mature deciduous forest	
Cooper's hawk	OPF	Mature upland forest	✓
Common moorhen	MSW	Marsh & shrub wetlands	
Eastern towhee	OPF, Ptl	Early successional	✓
Golden-winged warbler	MSW	Early successional	
Great blue heron	MSW	Marsh & shrub wetlands	✓
Northern goshawk	OPF	Older mixed forest, deep woods	
Northern harrier	MSW	Marsh & shrub wetlands	
Osprey	MSW	Lakes, rivers	✓
Pied-billed grebe	MSW	Marsh & shrub wetlands	
Purple finch	OPF	Open softwood-hardwood forest	
Red-shouldered hawk	MSW	Riparian/open wetland-forest edges	✓
Ruffed grouse	OPF	Upland forest, early successional	✓
Sedge wren	MSW	Marsh edges	
Turkey*	OPF	Upland forest	✓
Veery	OPF	Early successional	✓
Whip-poor-will	OPF	Upland, open forest	
Wood thrush	OPF	Established upland forest	✓
Black Bear*	OPF	Forest w/ openings, wetlands, young growth patches	✓
Bobcat	OPF	Early successional, rocky ridge upland forest	
Eastern pipistrelle	OPF	Harvested open forests	
Eastern red bat	OPF,MSW	Hardwood/softwood forest	
Moose*	OPF,MSW	Marsh & shrub wetlands, young forest	✓
New England cottontail	OPF, MSW	Dense early successional, swamps	
Northern myotis	OPF	Older trees, ponds, clearings	
Silver-haired bat	OPF, MSW	Hardwood clearcuts, ponds, streams	
White-tailed deer*	OPF	Mast forest, softwood cover, dense swamps, young growth	✓

The WAP habitats are encoded in the table as:

OPF = Appalachian Oak-Pine Forest

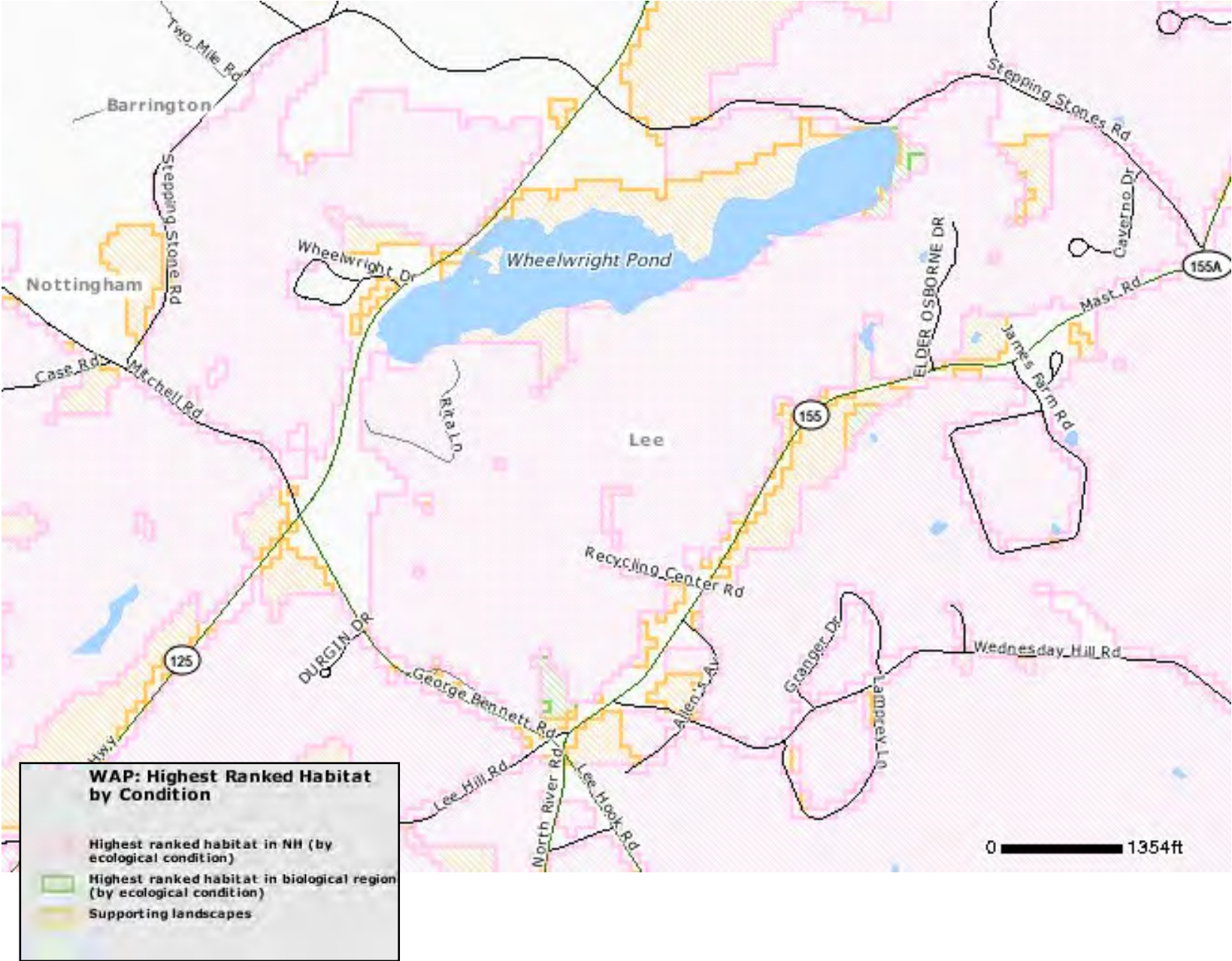
MSW = Wet Meadow-Shrub Wetlands

Ptl = Peatlands

VP = Vernal Pools



NH Fish & Game Department WAP Highest Quality Habitat in New Hampshire



Appendix D: FOREST INVENTORY SPECIFICATIONS

Lee Town Forest Lee, New Hampshire

The Lee Town Forest, owned by the Town of Lee and comprising 191.5± acres (**148.9± accessible forested acres**), was cruised in February 2008 using the variable-radius plot sampling technique. Data were collected from 64 prism plots arranged in a grid pattern covering the forest. The average sampling intensity was 1 sample point per 2.3 accessible forested acres. Aerial photos and reconnaissance of the property were employed to delineate forest types into four strata for statistical purposes.

A summary of inventory and statistical specifications follows:

- 1) Statistical error around the total sawtimber volume estimate: ±7.8%
(Total sawtimber includes grade logs, veneer, and pallet logs of all species).
966,389 Board Feet ± 75,613 BF
- 2) Statistical error around the total firewood volume estimate: ±8.7%
1,836 cords ± 160 cords
- 3) Confidence level: 90%
- 4) Sample plot layout
 - a. Systematic sample
 - b. Spacing: 300' x 300' grid
- 5) Plot type and number: 64 prism plots
- 6) Number of strata:
- 7) Angle-gauge: 20-factor prism
- 8) Tree scaling/grading specifications:
 - a. Diameter: All merchantable trees > 5 inches DBH measured
 - b. Stem DBH measurements: 1 inch increments
 - c. Top diameters (merchantable heights)
 - Firewood – 4", straight stem
 - Sawtimber: White pine: 8 inches
Other softwoods: 10"
Hardwoods: 10"
 - d. Grades:
 - Veneer (black, red, and white oak; black, and yellow birch; sugar and red maple)
 - Grade sawlogs (Hardwood and softwood)
 - Pallet logs (Hardwood and softwood)



Appendix E: REFERENCES

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CHARLES MORENO, LPF
Consulting Forester, Forest Ecologist

New Hampshire Licensed Professional Forester #115
Maine Forester License #2000

EDUCATION

B.S. FORESTRY – University of New Hampshire, Magna Cum Laude, May 1980
SAF Study Tour of France – Three-week study of French silvicultural methods, September 1983

PROFESSIONAL SERVICE and AFFILIATIONS

Forest Stewards Guild – Board of Directors (1999-2005), Chair (2005)
Society of American Foresters (SAF) – NH Chairman (1996)
New Hampshire Tree Farm Program – Executive Committee (1984-87)
Society for the Protection of New Hampshire Forests

WORK EXPERIENCE

1980 - FORESTRY CONSULTANT, founder and proprietor of Moreno Forestry Associates.
Present Thirty years experience managing private and public forests in New Hampshire. Projects include forest and wildlife management planning and implementation, ecological assessments, forest inventory and appraisals, timber sales, mapping, forest taxation and litigation, forest improvement and habitat enhancement, and conservation plans for towns, corporations, and private landowners. 30,000+ acres under management.

1984- TOWN FOREST MANAGER for the Towns of Exeter, Londonderry, Candia, Plaistow,
Present Brentwood, East Kingston, Deerfield, Epping, Brentwood, Sandown, Rye, Pittsfield, Derry, Dover, Madbury, Strafford, and Rochester developing/implementing multiple-use plans for publicly owned forests.

1985- ALTON TOWN FORESTER. Consultant to the Town on Current Use Assessment
1992 and NH Timber Tax matters.

1980- K-F TREE FARM, Forest Manager. Experience in all areas of woodland and wildlife
1988 management in this intensively managed, 700-acre property in Alton, New Hampshire. Selected as 1988 Belknap County Tree Farm of the Year.

PROFESSIONAL RECOGNITION

New Hampshire Outstanding Forester Award (Society of American Foresters) -- 2001
National Outstanding Tree Farm Inspector Award -- 1999
Austin Cary Practicing Professional Award – (New England SAF, 1998)
NH Wildlife Stewardship Award – 1995
Outstanding New Hampshire Tree Farm Award 1987, 1992, 2002, & 2006
NH Tree Farm Inspector of the Year – 1985, 1990, 1992, 1993, 1998
Xi Sigma Pi (Forestry Honor Society, 1978)
Eagle Scout (1976)



Charles Moreno, Consulting Forester
Center Strafford, New Hampshire
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