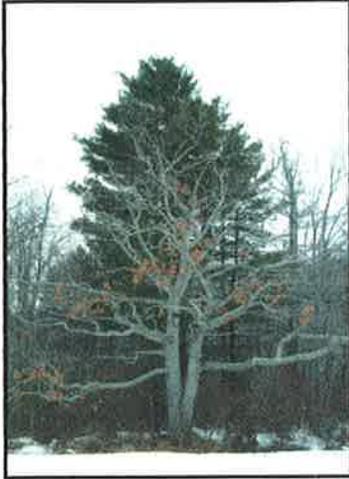


FOREST MANAGEMENT PLAN

for the

RYE TOWN FOREST

Rye, New Hampshire



Prepared for:

**Rye Conservation Commission
Rye, NH**



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July 11, 2003



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Information relevant to Town Forest management added by the Rye Conservation Commission.



INTRODUCTION

FOREST MANAGEMENT PLAN
for the
RYE TOWN FOREST
Rye, New Hampshire

ABSTRACT

This forest management plan was prepared for the Rye Town Forest, which is located in and owned by the Town of Rye, New Hampshire. Established in 1981, the Rye Town Forest encompasses 199.7± acres of forest, fields, freshwater wetlands, and salt marsh. Highly valued by the community today as open space and for its recreational amenities, the property boasts a 300+ year history of agricultural and logging use.

On January 31, 2001, the Town of Rye granted a Conservation Easement to the Rockingham County Conservation District on 176± acres of the property (not including the recreational field area) to insure that the Town Forest remains in an undeveloped, open space condition in perpetuity. Recreational use and forest management, consistent with the conservation of natural resources, are permitted uses. The easement stipulates that a Forest Management Plan must be prepared and updated every 10 years. Working in conjunction with the Rye Conservation Commission, this plan has been written to meet this requirement.



Charles A. Moreno, LPF
July 2003



Locus Map

of the

RYE TOWN FOREST

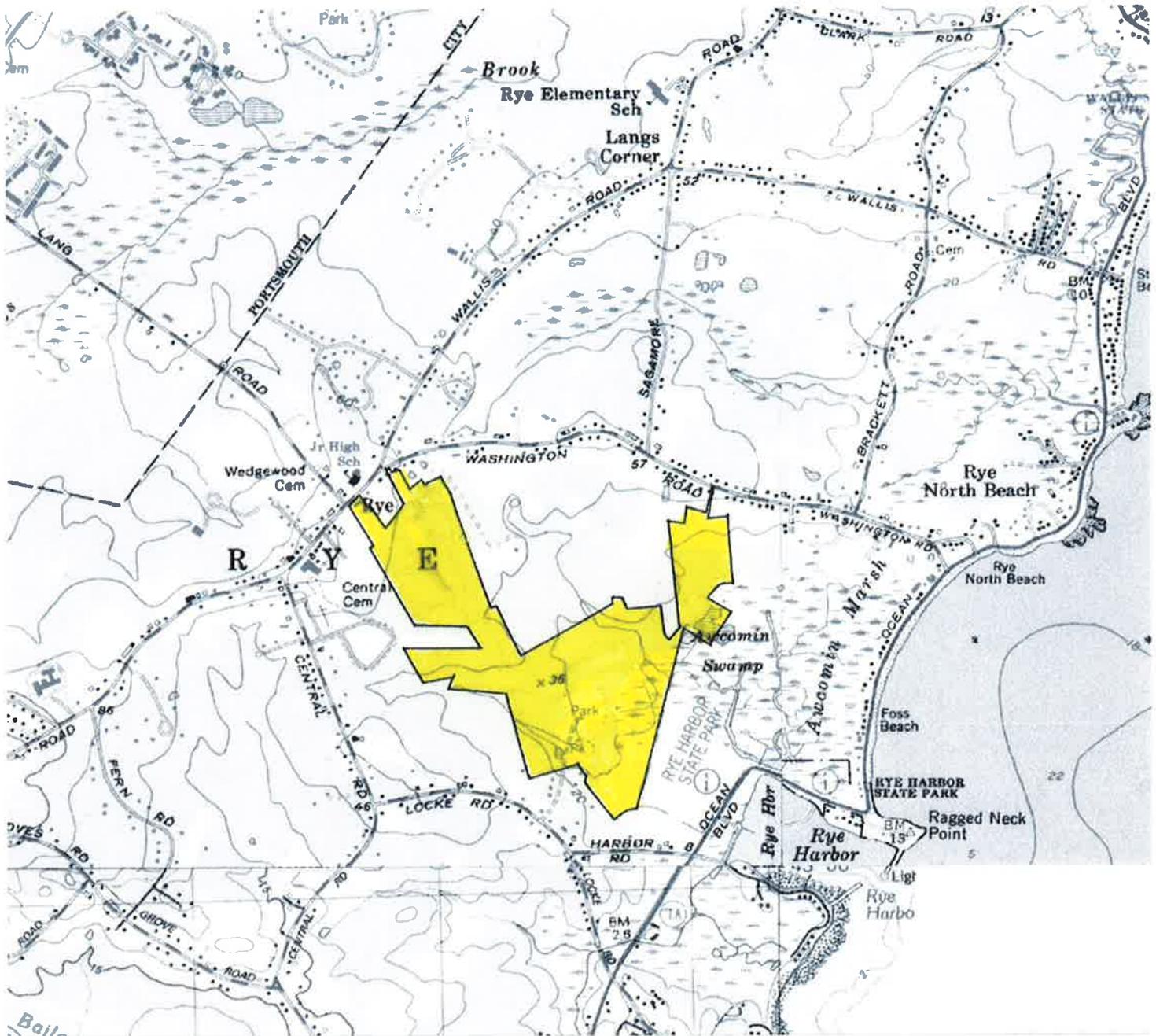
Rye, New Hampshire

199.7± Acres

MAP SCALE:



1 inch = 2000± feet



USGS Topographic Map, "Portsmouth, NH" Quadrangle, 1997, Maptech, Inc.

Map of the

RYE TOWN FOREST

Rye, New Hampshire

199.7± acres

Showing Physical and Natural Features

Index of Wildlife Trees:

- 1 = Den tree, white pine, 34±" DBH, on wall
- 2 = Snag, white pine, 25"
- 3 = Red squirrel nest in white pine, 32"
- 4 = Snag, white pine, 17"
- 5 = Barkless snag with canopy cavity (16±"), white pine, 21"
- 6 = "Pasture" pine snag
- 7 = Cavity tree, red maple 30"
- 8 = Snag, 29"

Acresage Summary

Woodlands - 155.4± acres

Salt marsh - 31.7± acres

Recreational field - 12.6± acres

Map Legend

- Property line
- Stone wall
- Theatrical stage
- Boulder
- Cemetery
- Building
- Paved Road
- Gravel Road
- Trail
- Footpath
- Perennial stream
- Seasonal stream
- Forested wetland
- Vernal pool
- Small pond
- Salt marsh
- Tree line
- Significant tree
- Wildlife tree
- Salt marsh edge

Map references:

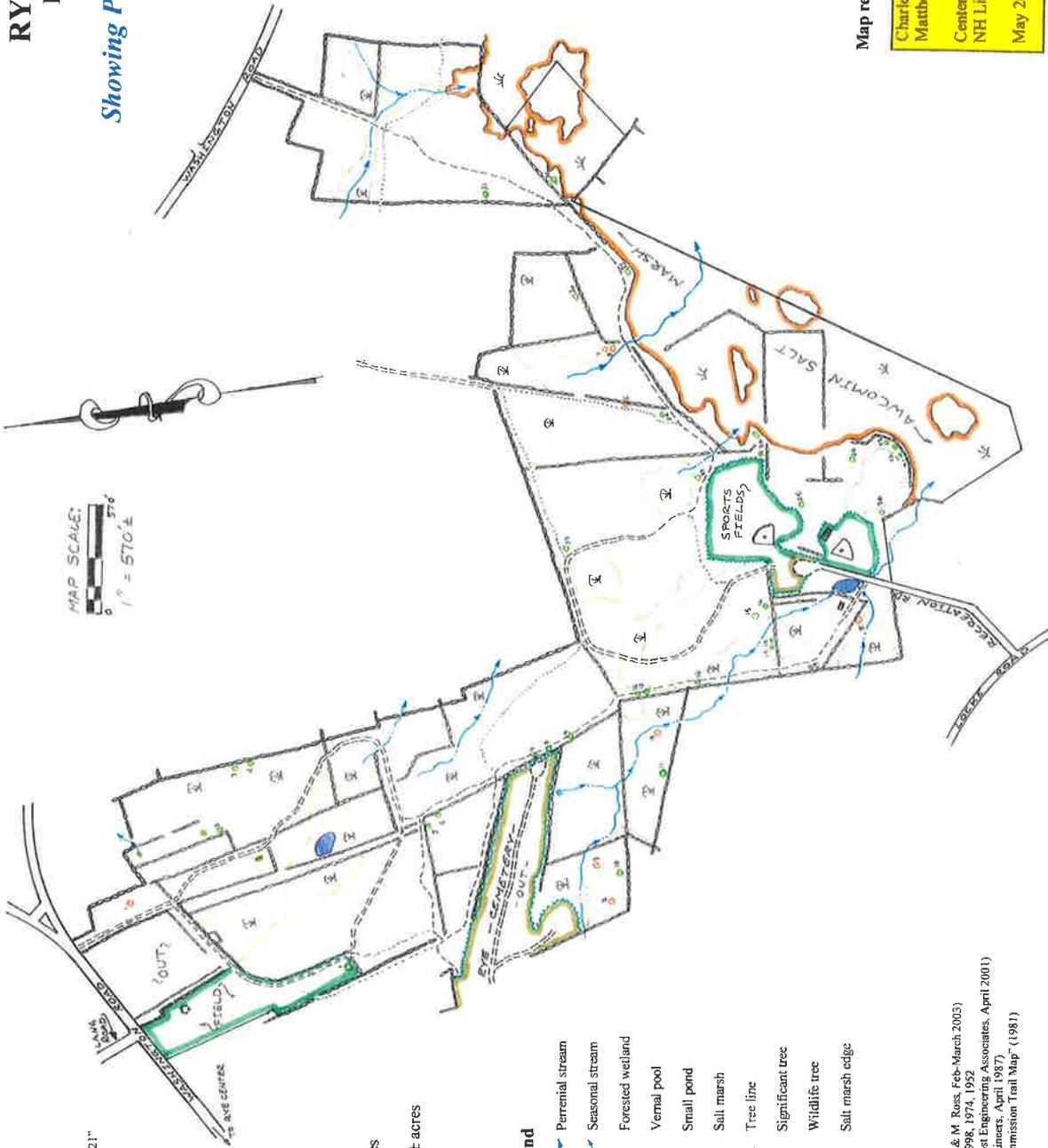
- Field examination (C. Moreno & M. Ross, Feb-March 2003)
- USGS/USDA Aerial Photos: 1998, 1974, 1952
- Town of Rye Tax Maps (Seacoast Engineering Associates, April 2001) and (Parmentier Civil Engineers, April 1987)
- Maps: "Rye Conservation Commission Trail Map" (1981)

Index of Significant Trees:

- 1 = Red oak, 29±", DBH stunted (field grown)
- 2 = Sugar maple, 32"
- 3 = Black birch, 24"
- 4 = Red oak, 28"
- 5 = White pines, 35" and 31"
- 6 = White pine, 38", on wall
- 7 = White pine, 32", on wall
- 8 = White pine, 36", on wall
- 9 = White pine, 45±", "bull pine"
- 10 = Stand of 10-12 white pines, 20-25", clean boles
- 11 = White pine, 34"
- 12 = Red oak, double, 36"
- 13 = White pine, 32"
- 14 = Yellow birch, 24"
- 15 = Red maple, 25", broken top
- 16 = Red maple, 32"
- 17 = White pine, 36", on wall
- 18 = Red oak, 40±", on wall
- 19 = Red oak, 32", boundary tree
- 20 = White pine, 40±", "pasture pine"
- 21 = Red oak, 34", along shore
- 22 = Red oak, 24", "stumpy" growth
- 23 = Red oak, 36"
- 24 = Red oak, 38", large crown
- 25 = Red oak, 35", double
- 26 = White oak, 34"
- 27 = Red oak, 40"
- 28 = Three red oaks, 25±"
- 29 = Red oak, 27"
- 30 = Red oak, 36", on wall, leaning 50-55°
- 31 = Red oaks, 36" and 30" and red maples, 22" and 22" along shore
- 32 = Four red oaks, 28-36", along shore

Map researched and drawn by:

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 NH Licensed Professional Forester #115
 May 2003



INTRODUCTION

Town Forest Location

The Rye Town Forest is located in two contiguous areas: The bulk of the land, 171.2± acres, lies south of Washington Road and adjacent to the Rye Cemetery, encompassing much of the land between the Rye town center and Awcomin Salt Marsh. 28.5± acres of recently acquired property, formerly known as the “Varrell Woods” and the “Goodwin Lot”, lie to the east of the original tract, also off Washington Road.

Please refer to the “Locus Map” on page 2.

The Open Space Value of the Rye Town Forest

The Rye Town Forest encompasses a large stretch of open space adjacent to the town’s center. In addition to quietly contributing to the town’s rural character, the Town Forest is a valuable natural resource area.

Adjacent to protected State-owned land in the Awcomin Salt Marsh, these properties collectively represent a substantial block (350± acres) of undeveloped coastal land. *Unfragmented* open space is crucial for wildlife breeding and nesting habitat, as well as to maintain water quality and the integrity of forest and wetland ecosystems.

Habitat fragmentation occurs when sections of land are radically altered from their natural condition. Development, busy roads, and surface mining are alterations that result in fairly permanent habitat fragmentation. Other significant land modifications include power lines, clear cutting, and conversion to fields. These latter disturbances cause at least temporary disruption, however, over time, may produce valuable habitat in their own right, particularly if people do not heavily use the land thereafter.



Over the last 30 years, significant roadfront development has occurred in Rye, with some development incursion into the forested blocks surrounded by the town's established roads. However, a number of these open space blocks remain, most ranging from 100 to 500± acres. Spearheaded by the Rye Conservation Commission, efforts are underway to protect and connect several of these open space blocks. The Rye Town Forest is a significant “anchor” property for this effort.

Community Values of the Rye Town Forest

Town Forests are an important recreational asset to communities. Recreational opportunities come in numerous forms, generally described as broad-based, trail-based, water-related, and intensive-use areas such as sports fields. The Rye Town Forest provides opportunities for all these use types, though the Conservation Easement specifically prohibits any type of motorized recreational vehicle use. The Easement states that recreational activity must “not adversely affect the natural condition of the Premises”.

Another important community value of the Rye Town Forest is its potential to serve educationally. The property provides an outdoor location for school groups and townspeople to observe and study nature or forest management activities. Currently, Rye Junior High School students are conducting a nature study project in the Town Forest in conjunction with the University of New Hampshire. Equally important, the community forest should serve as a visible, evolving example of careful resource management.

From a forest management perspective, the Rye Town Forest offers the opportunity to view, and possibly research, the results and benefits of silviculture and



wildlife management over the very long term, i.e., 100+ years. In silviculturally managed areas, sustainable forestry practices will focus on the continued health and increased value of the forest. Moderate periodic income from the sale of forest products may be reinvested for enhancement activities on the Town Forest such as wildlife projects, trail maintenance/development, or timber stand improvement (TSI). In the future, as the forest matures, some surplus income may be available for conservation land acquisition or conservation easements.

The Rye Town Forest also offers the opportunity to designate, as part of the overall management scheme, “reserve areas”. Reserve areas are sections left permanently to the course of nature and generally free of human intervention. These areas can be formally meshed with the State of New Hampshire’s Ecological Reserve Initiative—a system of designated undisturbed lands for the purpose of protecting the State’s biodiversity. This system is currently being established by a State-appointed group of scientists, resource managers, community leaders, and conservation organizations.

Finally, the Town Forest has intrinsic aesthetic and spiritual appeal to community residents. Though this value cannot be ascertained in concrete terms, it is one of the forest’s amenities enjoyed by many local residents.

Forest Management Plan Purpose

The purpose of this document is to plan, guide, and record forest management activity. It is a “working document” that should be periodically updated (required every



10 years by the Conservation Easement) to reflect the ongoing management activity and evolving Town interests and objectives.

Forest and land management involves analysis, recommendations, and application. Thus, this plan consists of the assessment of the Town Forest's natural resources and features, as well as recommendations to manage these resources. Consideration of logistical and environmental constraints is an important aspect in developing workable recommendations.

The forest management plan provides reference maps and summaries of the property's forest, wetlands, wildlife, and soil resources. The plan also specifies the course of forest and natural resource management practices for the next 30+ years. Recommendations are grounded in the community's primary interest of having the land provide recreational opportunities and to serve as wildlife habitat. Consistent with the Conservation Easement, the plan provides specific silvicultural recommendations for the enhancement of timber and wildlife resources, while protecting the property's many natural amenities, including native biodiversity.

Various steps were taken to prepare this plan: First, comprehensive walk-through examinations of the land were conducted in February-March 2003, followed by in-depth analysis and mapping of the property's physical and natural features, forest types, and wildlife habitat. The Rye Conservation Commission was then interviewed to establish forest management objectives. Recommendations are based on the resource analysis, management objectives, and measures to protect the property's natural amenities.



Land Protection Recommendations

- Research further land protection or acquisition opportunities for parcel contiguous to the Town Forest in the Washington Road area.
- Use any income generated from forest management activities towards a Town Forest maintenance fund, to be used for trail maintenance, wildlife projects, boundary maintenance, TSI, etc.
- Enroll designated reserve areas in the State Ecological Reserve System.
- Locate, blaze, and paint all perimeter property boundaries on the Town Forest.



FOREST MANAGEMENT OVERVIEW

TOWN FOREST HISTORY

The Town Forest History section was compiled from information kindly provided by Louise H. Tallman, long-term member of the Rye Conservation Commission.

The Rye Town Forest presently covers about 200± acres of open space that have been progressively acquired by the Town since the early 1960's. The original parcel covered 97± acres off Locke Road that included both forest and salt marsh. This parcel was granted to Rye by the State of New Hampshire, which had taken the land (along with other coastal property) during World War II for defense purposes.

The Town created a Recreation Commission to administer the tract. The Commission created access to the parcel, constructed the southerly (or “lower”) loop road through the woods, and built the first Little League field. The local Boy Scout Troop was granted an area for camping, which is still in use today, and includes a small log shelter. A small pond was also dug alongside Recreation Road.

About 1970, the Parsons property, adjacent to the Town Forest in Rye Center, was threatened by development. Townspeople formed the Parsons Park Corporation to collect funds that would enable the Town to purchase the property. The Town was then able to buy 46± woodland acres, and the following year, Parsons Field. This land has been widely used and treasured by townspeople ever since.

Soon after the purchase of the Parsons property, the northerly (“upper”) woods road loop was constructed. The road provides fire and recreational access to townspeople, and is occasionally maintained by the Rye Public Works Department.



In 1968±, the Rye Conservation Commission was formed. The Conservation Commission has taken an active role in land protection, facilitating the acquisition of additional land to the Town Forest. Over the years, they have also helped plan and create a fine trail network, and overseen forest improvement efforts, with advice from the County Forester, in sections of the forest.

At Town Meeting in March 1981, the Rye conservation lands were officially designated as “Town Forest”. The Rye Conservation Commission, in accordance with New Hampshire statutes, is formally charged with management of the property.

Also in 1981, Ralph Brown, serving on the Conservation Commission, recognized that some of the woodland purchased by the Town for the adjacent Central Cemetery was unsuitable for cemetery use. This acreage was subsequently added to the Town Forest.

In the early 1990’s, Phil Auger, Rockingham County Forester, organized a joint forest management project with the Rye Conservation Commission and three adjacent landowners. The project involved forest improvement work using a biomass operation, which could feasibly be staged using the economy of scale that was created by combined acreages and shared access. The Conservation Commission contracted with Charles Moreno, Consulting Forester to carry-out the field work and administer the harvest operation. Subsequently, poor quality trees were thinned from a 15± acre area of the Town Forest along the “lower” loop road. No further silvicultural work has taken place on the Town Forest since the completion of this project in 1992.

The latest land acquisitions to the Town Forest, spearheaded by Jim Raynes, Conservation Commission Chairman, occurred in the late 1990’s, resulting in the addition of the more remote northeastern section of the forest. Through the Conservation



Commission's Land Acquisition Fund, the Town was able to acquire, after a year of negotiations, the 17.5± acre Varrell Woods property. This parcel, once threatened by development, adds mature pine forest, forested wetlands, and scenic salt marsh frontage to the Town Forest.

With the acquisition of the Varrell Lot, an adjacent parcel, the 5± acre Goodwin Lot, was then donated by Harlan Goodwin, and added to the Town Forest acreage. The Goodwin parcel contains salt marsh and most of a scenic wooded islet within the marsh.

Over the years, there have been repeated proposals for development of parts of the Town Forest. This centrally located undeveloped land was eyed by some for the siting of municipal buildings. To insure that the land would never be developed, the Rye Conservation Commission headed the drive to have the land protected under a conservation easement. By vote at Town Meeting in March 2000, the citizens of Rye granted, and thereby extinguished, Town Forest development rights to the Rockingham County Conservation District via a conservation easement. The easement permits forest management and public recreation, but dictates that the Rye Town Forest “will be retained IN PERPETUITY predominantly in its natural, scenic, undeveloped, and open condition....”



FOREST MANAGEMENT OBJECTIVES

OBJECTIVES OUTLINE

GOALS	Degree of Importance			Remarks
	High	Med	Low	
Aesthetics	X			*Townspeople value the forest's natural beauty. Large trees, areas of evergreen cover, and diversity of species are all of importance. Forest improvement work must be done to the highest quality standards, with short-lived visual impact.
Forest Education	X	- X		*Rye Junior High School currently involved in project in conjunction with UNH. Potential to: 1) Establish interpretive trail; 2) Periodic educational tours for townspeople.
Forest Health and Productivity	X			*An increasingly healthy, productive, and valuable forest is a result of silvicultural management.
Forest/Wetland Protection	X			*A conservation easement permanently protects this centrally-located, "core" conservation parcel from development. The property includes significant freshwater wetlands and salt marsh.
Preserve Area(s)		X		*Designate fragile wetland areas and difficult access areas as "no-treatment" zones. Reevaluate the status of no-treatment uplands periodically.
Recreational Use	X			*Community recreational use of the Town Forest is a major interest, particularly trail based-use. The Conservation Easement prohibits motorized recreational vehicles and uses that adversely impact the natural environment.
Timber Income Current Long Term			X X	*Timber income may be generated as a result of implementing the recommended silvicultural practices. Trees are not to be cut specifically for the purpose of generating income, but rather for forest improvement or wildlife management purposes. Projects should breakeven financially from an overall standpoint.
Wildlife Habitat Enhancement	X			*Protect and enhance wildlife habitat for species diversity.
Woodland Access	X	- X		*Woodland access is well developed. Periodic trails/woods roads maintenance needed.



FOREST MANAGEMENT

DEFINITIONS

Forest Management

Forest management means the thoughtful, well-planned set of actions undertaken to maintain or enhance: 1) Forest health; 2) Timber growth and value; 3) Wildlife habitat; 4) Recreational opportunities; and 5) Forest access. These objectives are managed *while protecting* the forest's soil integrity, wetlands, water quality, biodiversity, and scenic values (aesthetics). Management also deals with logistics: scheduling, access, permitting, contracting, and budgets. Forest management is a marriage between ecological values and economics—maintaining and improving the former, while considering the realities of the latter.

Multiple-use Management

The potential uses of a forest are numerous, particularly for a community. The management plan considers and accommodates these various uses and objectives, interwoven on the land over time. The plan creates a “*multiple-use*” strategy for the forest.

Silviculture

Silviculture is discussed throughout this management plan. Silviculture is the *applied* scientific techniques of working with the forest over the long-term under the above-discussed “marriage” of ecology and economics. Silvicultural practices are at the heart of implementing forest management. For many situations, logging (carefully prepared and supervised by a forester) serves as an important vehicle to accomplish



silviculture. For the Rye Town Forest, some situations will also entail “glading” and “reserve” areas, as well as trail maintenance and wildlife work.

Due to the complexity and scientific nature of forestry, actual implementation requires the participation of an experienced field forester (NH Licensed Professional Forester).

REASONS FOR FOREST MANAGEMENT

The Rye Town Forest presents an outstanding opportunity for thoughtful and enduring conservation and forest management. Forest and silvicultural management is a long-term proposition—labor and technique are invested now to enhance the forest for the future. As permanent open space, the Rye Town Forest lends itself to long-term management.

A listing of specific reasons favoring active silvicultural management, as well as potential concerns, follows:

- 1) **Forest growth and value** – Silviculture favors healthy trees with the potential to increase in value in the future. Diseased and poor-quality trees are generally thinned (removed), unless they have value for wildlife or aesthetics.
- 2) **Forest maintenance** – Occasionally, storm events damage or blow down timber in the forest. Management will provide access and methodology to salvage these trees, and clean-up slash.
- 3) **Wildlife habitat** – Silviculture incorporates many measures to improve habitat, including diversification of species, ages, canopy layers, and forest structure over time.



- 4) **Maintenance fund** – The sale of forest products harvested over time provides a modest cash flow that should adequately cover the cost of trail and boundary maintenance, wildlife projects, etc.
- 5) **Education** – Town Forest management provides the public with a tangible local example of where our wood and paper products come from. Careful forest management is both ecologically sensitive and sustainable—local examples help spread this message.
- 6) **Rural Character** – As New Hampshire’s population increases, many communities wish to maintain their rural character. Farming and forestry have a long tradition of being integral to the texture of New Hampshire’s rural character.
- 7) **Forest History** – The Rye Town Forest has a history of forest management for over 50 years. This history has resulted in a more diverse and increasingly valuable forest today. There are no traces of logging impact to the soil or wetlands. This tradition can be carried forward.



MANAGEMENT LOGISTICS

ORGANIZATION *of the* RYE TOWN FOREST

The organization of woodlands into management areas and forest types facilitates the achievement of forestry goals. With this approach, access is planned, specific silvicultural recommendations are made, and property management work is systematically completed.

A MANAGEMENT AREA, or compartment, is a readily defined *project area* on the property. Management areas (MA's) ease logistics planning and scheduling when implementing the forest management plan. Three forest management areas have been designated on the Rye Town Forest (please refer to the "Forestry Recommendations" Map) corresponding to property access. The three management areas include all the property's forest. The Awcomin Salt Marsh, Parsons Field, and the recreational fields, while integral to the property, lie outside the potential silvicultural management area, and are therefore not designated management compartments. The forest management areas of the Rye Town Forest are further defined by "*forest types*".

A FOREST TYPE, or "*stand*", is a *homogeneous forest area* that is usually the result of similar soils, land use, and/or harvest history. Silvicultural goals are specified for each forest type, with corresponding silvicultural prescriptions. Though prescriptions may vary between forest type, several stands are usually treated concurrently during a harvest, each to its own specifications. Ten forest types, or stands, were defined on the Rye Town Forest. This diversity of forest types is a result of the property's farming and logging history.

A list of the Town Forest's forest types follows:



Forest Types of the Rye Town Forest:

Stand A: White Pine, Intermediate, 23.8± acres.

B: White Pine, Older, 19.6± acres.

C: White Pine/Hardwoods, Intermediate, 14.0± acres.

D: White Pine/Hardwoods, 2-aged, Intermediate, 3.3± acres.

E: White Pine/Hardwoods, 2-aged, Older, 2.3± acres.

F: Upland Hardwoods, Pole-Intermediate, 15.9± acres.

G: Upland Hardwoods, Older, 21.9± acres.

H: Mixed Hardwoods, 12.6± acres.

I: Forested Wetlands, 40.1± acres.

J: Early-successional, 1.9± acres.



MANAGEMENT AREA SCHEDULING

The silvicultural recommendations specified in this forest management plan are sustainable on a 12 to 15 year basis. In other words, the timber volume removed in a harvest from any given stand will grow back on the residual trees in 12 to 15 years. In most cases, the harvest magnitude will be less than 20% of the trees and 1/5 of the management area's standing *timber value*. Harvests, almost without exception (timber salvage from storms or insect infestations may be aberrations), will not exceed timber growth during *the harvest cycle which is to be set at 14 years*.

Silvicultural management is possible in all three forest management areas of the Rye Town Forest. Two scheduling options are available for carrying out silvicultural work in the three forest management areas.

First, it is possible to schedule all silvicultural work concurrently once every 14 years. This approach has the advantages of an economy of scale and easier forest access. In addition, logging disruption is minimized by occurring only once every 14 years. The 100± acres of forest available for silvicultural management is a size suitable for a single operation.

A second option is to implement management of Area #1 at a separate time from Areas #2 and #3. Starting in 2006, Areas #2 and #3 would be silviculturally treated concurrently (perhaps as part of an overall Rye Forest Management Project). Area #1 would then be treated 7 years later in 2013. Areas #2 and #3 would be revisited in 2020 and so on, with at least one section treated every 7 years.



While this second scheduling option has the advantage of spreading timber sale income more periodically, management costs and logistical challenges may also increase. Another advantage, however, is that in 7 years time, it is more likely that at least some Conservation Commission members will bridge this time period and have an historical knowledge of the management work that took place in the past. After 14 years, the management process mostly likely must start anew.

The suggested scheduling options for silvicultural management are summarized as follows:

Dates	Management Areas	
	Option #1	Option #2
Past – 1992	Part of MA #2, only	Part of MA #2, only
1 st Harvest Cycle – 2006	MA #1, 2, and 3	MA #2 and 3
1 st Harvest Cycle – 2013	--	MA #1
2 nd Harvest Cycle – 2020	MA #1, 2, and 3	MA #2 and 3
2 nd Harvest Cycle – 2027	--	MA #1
3 rd Harvest Cycle – 2034	MA #1, 2, and 3	MA #2 and 3
3 rd Harvest Cycle – 2034	--	MA #1

Recreational fields are maintained regularly by the town. All wetland areas will remain as preserve areas, without treatment.



WOODLAND ACCESS PLAN

Access Types and Town Forest Internal Access

As there are no set standards or definitions for woodland access, the following explanation of forest access is intended for clarity. Existing conditions on the Rye Town Forest are also cited. Internal access in the Rye Town Forest is well-developed; several trail loops exist, and townspeople regularly use these trails. Since most of the forest is accessible, further expansion of the trail system is not a major priority. However, periodic trail maintenance is necessary.

In my experience, there are generally three levels of forest access for woodlots:

Woods roads are 10 to 12 feet wide, are graded and often graveled where needed. Culverts with stone headers are usually installed to ford water crossings. The Rye Town Forest has two woodland roads that are mainly used recreationally. The woods roads also provide fire protection, and have been used to access silvicultural work in the past.

To stage silvicultural work, vegetation along the woodland road's edges must be trimmed back, which is necessary maintenance. The logging contractor will usually do this work as part of their harvest contract. A landing site(s) must also be established along, or off, the woods road. The landing is the location where timber is yarded and sorted, and logging trucks are loaded. After the harvest operation, the landing is allowed to re-vegetate naturally and remain as a small clearing. During the 1992 harvest operation, a landing site was established on the abutting landowner's (D. Tilton) property, which was thinned concurrently with a portion of the Rye Town Forest. Today, this



former landing site, which may again be available in the future, lies as a small clearing alongside the Town Forest “lower” woods road.

A second level of access is *trails*. Trails are 6 to 8 feet wide, and are often improved with minor grading, mostly to remove stumps and rocks. Gravel is generally not imported. Stream crossings include culverts, stone fords, or small bridges. Trails are ideal for light recreation such as walking, skiing, horseback riding, and mountain biking. Motorized vehicle use of the Town Forest trails is not permitted. Trails may also serve for limited fire access.

The Town Forest contains an ample network of trails, including the Ray Greene Memorial Trail, which is maintained by local Boy Scout Troop #181. Additional trails are not presently needed, as most of the Town Forest is accessible by existing woods roads, trails, and footpaths. If additional trails are desired, however, they can be created from previously cleared logging skid trails. Planning should include the coordination of harvest layout, by the Forester, with future trail needs, defined by the Conservation Commission.

The mildest level of woodland access is *footpaths*. Generally defined as narrow paths 2 to 4 feet wide, footpaths weave through the forest with minimal disturbance to trees and vegetation. Paths follow the natural terrain, also with minimal or no alteration. Bog bridges or stones are used to ford wetlands. The purpose for paths is strictly light recreation, including walking, snowshoeing, and running. In addition, paths may have limited use for single-track mountain biking and cross-country skiing.

Footpaths in the Rye Town Forest are numerous, and lead to some of the more remote areas of the forest. As with trails, the painted blazes that demarcate the footpaths



need occasional repainting. *Annual* (spring) removal of downed trees and dense vegetation is also recommended; this work may be done by a volunteer trail committee, Boy Scouts, or an outside contractor.

External Access and Parking

The main access into the Rye Town Forest is through Recreation Road. Public parking is available at the end of the road during all seasons. While the parking area is not well defined, there is ample space around the Recreation Road cul-de-sac and in the clearing beyond to accommodate town sporting events (e.g., baseball, softball, and soccer). If incursions into the clearing, and resulting damage to grass are an issue, consideration may be given to defining an area for 5 to 10 cars using a border of timbers, large stones, or fencing. The Conservation Commission may also contemplate installing a simple kiosk to post trail/interpretive map(s) of the property, and information about Town Forest events, activities, history, etc.

Visitors can also access the Town Forest via the Rye Town Cemetery and from Washington Road, both through Parsons Field or the woods road across from the Wallis Road junction. Trails lead into the forest from all these locations. However, parking is limited within the cemetery and hazardous along Washington Road. ?

The easternmost area of the Town Forest, the “Varrell Woods” section is also accessible from Washington Road via a town-owned lane. Local, walk-in access is most suitable for this location, since parking on Washington Road is both limited and hazardous.



Silvicultural Access

The “lower” woods road from Recreation Road was improved during April 1992 in coordination with the multi-property Rye Forest Management Project (please see Forest History), and the Town Forest’s first silvicultural operation (January-February 1992). However, usage during the mud season or wet weather periods may result in rutting due to the springtime water-saturated qualities of the Scituate-Newfields soil complex. Therefore, silvicultural management—which requires the use of heavy trucks to implement—should be scheduled for dry or frozen ground periods of year. Nevertheless, some gravel may be necessary if the weather turns inclement during the course of silvicultural operations.

Woods road improvements for silvicultural access appear unnecessary provided an appropriate time of year is selected and the weather cooperates. Due to the possibility of adverse impact to the woodland road(s), a portion of the timber sale income should be allocated (\$1,000-\$2,000) to covering the cost of road restoration, if this contingency becomes necessary.

As previously noted, the landing site for the 1992 Rye Forest Management Project was located on an abutter’s property (n/f D.Tilton). This landing location adequately accesses Management Area #2, and may possibly access Area #3. A second landing site will be necessary to access Management Area #1, along the woods road that enters from Washington Road.

Management Area #3 is remote from the rest of the property and difficult to reach due to a narrow constriction in the property boundaries. The upland forest in this area, including 15± acres, is currently inaccessible to silvicultural management unless it is



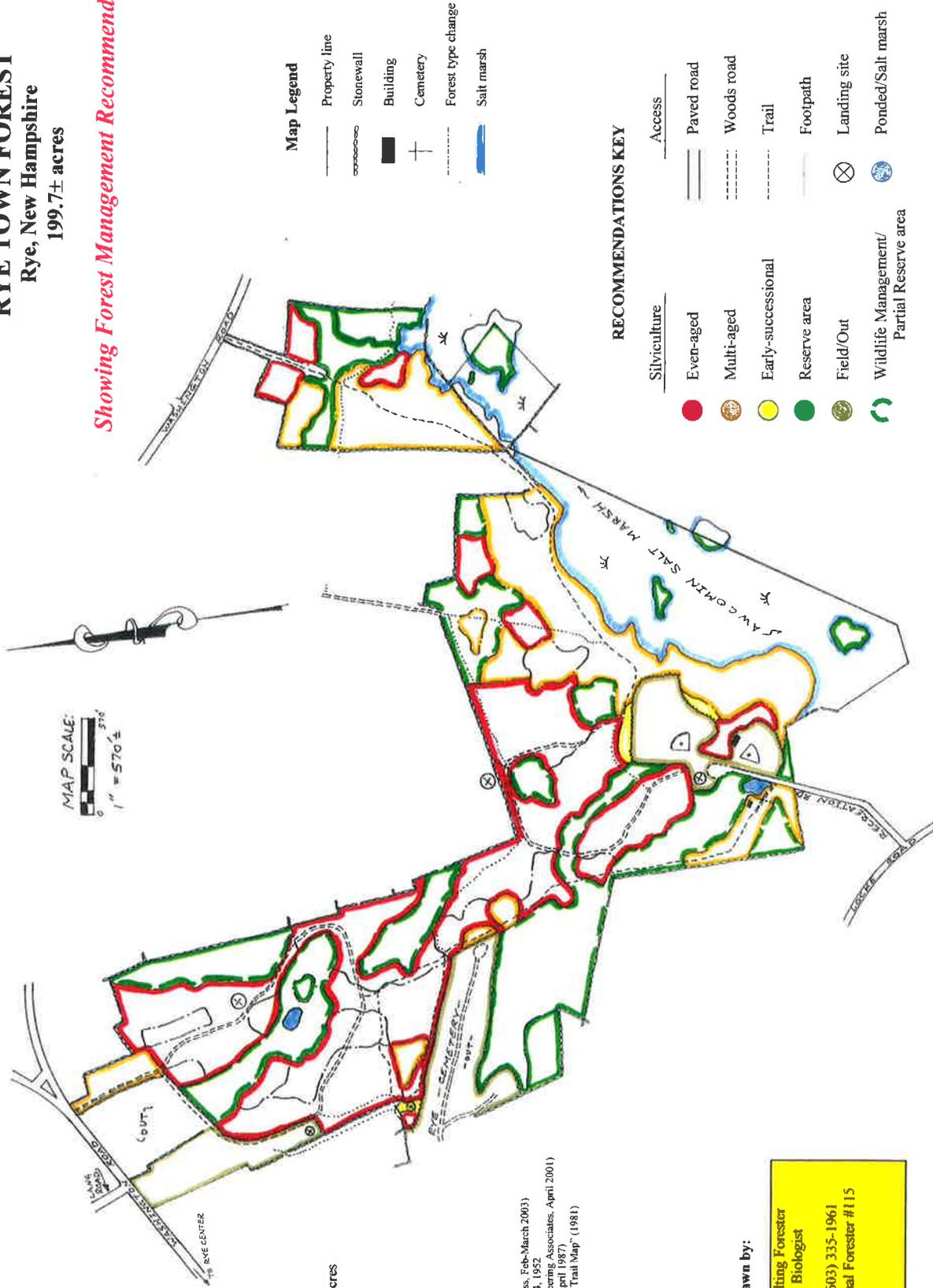
reached via an abutter's land, with their consent. The possibility of a follow-up Rye Forest Management Project remains, whereby forest improvement work is conducted on several adjacent properties concurrently with work on the Town Forest. This approach would provide access to Management Area #3.



Map of the

RYE TOWN FOREST
Rye, New Hampshire
199.7± acres

Showing Forest Management Recommendations



Acresage Summary

- Woodlands - 155.4± acres
- Salt marsh - 31.7± acres
- Recreational field - 12.6± acres

Map references:

Field examination (C. Moreno & M. Ross, Feb-March 2003)
USGS/USDA Aerial Photos: 1998, 1974, 1952
Town of Rye Tax Maps (Seacoast Engineering Associates, April 2001)
and (Parmentier Civil Engineers, April 1987)
Maps "Rye Conservation Commission Trail Map" (1981)

Map researched and drawn by:

Charles Moreno, Consulting Forester
Matthew Ross, Wildlife Biologist
Center Strafford, NH (603) 335-1961
NH Licensed Professional Forester #115
May 2003

Map Legend

	Property line
	Stone wall
	Building
	Cemetery
	Forest type change
	Salt marsh

RECOMMENDATIONS KEY

	Even-aged		Paved road
	Multi-aged		Woods road
	Early-successional		Trail
	Reserve area		Footpath
	Field/Out		Landing site
	Wildlife Management/ Partial Reserve area		Ponded/Salt marsh
			Access

NATURAL RESOURCES

FOREST TERRAIN and SOILS

TERRAIN and TOPOGRAPHY

Lying within ¼ mile of the Atlantic Ocean, the Rye Town Forest is almost entirely flat. Slopes range from 0 and 5% grade, without exception (since slopes on the property are all under 30%, slope restrictions outlined in the Conservation Easement, Book 3539, Page 0341, do not apply). Elevations range between 0 feet (Awcomin Salt Marsh) and 25± feet above sea level.

Overall, the Town Forest is only moderately rocky, with the degree of surface rock dependent on soil type. While level topography and moderate terrain pose little impediment to forest management, extensive wetland soils present logistical challenges to forest access.

SOIL TYPES

The Rye Town Forest contains nine delineated soil types, shown on the property Soils Map and described as follows:

Canton (43B) gravelly fine sandy loam occurs in the southern corner of the property, due west of the Town Forest entrance on Recreation Road. *Canton* soils are a well-drained. Rocks are conspicuous on the ground surface. Tall tree heights in the *Canton* area indicate favorable conditions for forest growth.

Scarboro muck (115) is a very poorly drained soil underlying the wetland in the heart of the northwestern section of the property, near Parsons Field. Typically underlying drainages, the soil is characterized by a thick layer of organic “muck”. Wet



conditions limit tree growth; a ponded area is found in the middle of the area. This area is not suitable for silvicultural management.

Udorthents (299) smoothed is found in areas where the soil has been excavated and re-graded, or where fill has been placed and the new material re-graded. Udorthent soils are found beneath the baseball and soccer fields on Recreation Road and within the Awcomin marsh. Decades ago salt marsh hay was a common agricultural commodity, and drainages placed in the marsh for this former practice has left numerous rectangular or irregularly shaped Udorthent areas.

Pipestone sand (314A) is a poorly drained soil characterized by a seasonally high water table, that is found in two small pockets near Washington Road. Unlike the very poorly drained “muck” soils, Pipestone is less organic and is water-saturated for shorter periods, allowing for productive forest conditions. Access is limited to dry or frozen weather.

Ipswich muck peat (397) is a nearly level soil found within tidal marshes. The salt content in Ipswich mucky peat exceeds 1%. Characteristic plants—“halophytes”, such as cordgrass and rockweed—tolerate tidal flooding, waterlogged ground, and high salt conditions.

The *Scituate-Newfields complex* (446 & 447) is the predominant soil type on the Rye Town Forest. The soils are closely intermingled and therefore grouped together. While relatively deep (60+ inches) to bedrock, these soils are prone to seasonal wetness. Conditions are favorable for forest growth, particularly hardwoods, but forest management activity should be limited to dry or frozen ground



Hoosic (510) gravelly fine sandy loam underlies Parsons Field and the section of forest between this field and the town cemetery. This soil is a stony, well-drained glacial till; it is well suited as field land, and productive for the growth of fine quality white pine, red oak, and hemlock.

Walpole (546 & 547) very fine sandy loam is a poorly drained soil underlying the forested wetlands and stream courses on the property. A hardpan clay layer at a 12± inch depth maintains moist to saturated soil conditions. Red maple, hemlock, white pine, white ash, yellow birch, and elm are commonly associated with this soil. Forest management activity will be limited however, due to wet conditions. While individual trees may be harvested and cabled from the site, travel by logging machinery should be avoided except, possibly in the driest of seasons or frozen ground.

Westbrook mucky peat (597) is similar to *Ipswich mucky peat* (397) in that this soil is also found within tidal marshes; however, Westbrook soils are typically located on the marsh edges or shoreline. The salt content in Westbrook mucky peat also exceeds 1%. Characteristic plants found growing here include: black grass, marsh elder, saltmeadow cordgrass, glassworts, widgeon grass, sweet gale, slough grass, switch grass, seashore mallow, and several reed species.

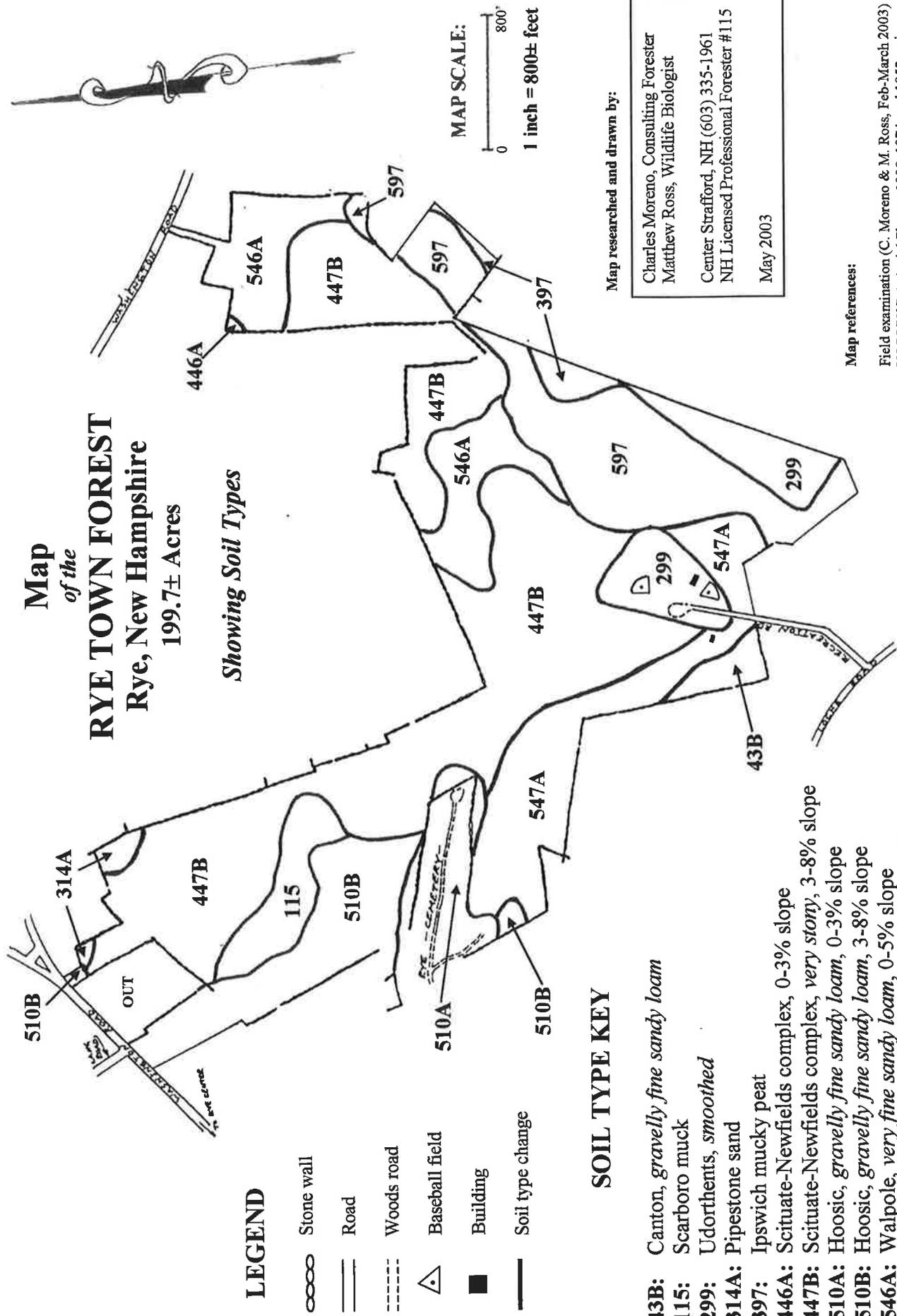
Summary:

Overall, the property's upland soils are conducive to high-quality timber growth; however, the interspersed wetland soils pose considerable impediment to logging access. Logging activity should be restricted to dry summers or cold and snowy winter conditions. Please refer to Woodland Access section and individual stand prescriptions for detailed activity planning.



**Map of the
RYE TOWN FOREST
Rye, New Hampshire
199.7± Acres**

Showing Soil Types



LEGEND

- Stone wall
- Road
- Woods road
- Baseball field
- Building
- Soil type change

SOIL TYPE KEY

- 43B:** Canton, *gravelly fine sandy loam*
- 115:** Scarboro muck
- 299:** Udothents, *smoothed*
- 314A:** Pipestone sand
- 397:** Ipswich mucky peat
- 446A:** Scituate-Newfields complex, 0-3% slope
- 447B:** Scituate-Newfields complex, *very stony*, 3-8% slope
- 510A:** Hoosic, *gravelly fine sandy loam*, 0-3% slope
- 510B:** Hoosic, *gravelly fine sandy loam*, 3-8% slope
- 546A:** Walpole, *very fine sandy loam*, 0-5% slope
- 547A:** Walpole, *very fine sandy loam, very stony*, 0-3% slope
- 597:** Westbrook mucky peat

Map researched and drawn by:

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May 2003

Map references:

Field examination (C. Moreno & M. Ross, Feb.-March 2003)
USGS/USDA Aerial Photos: 1998, 1974, and 1952 series
Town of Rye Tax Maps: (Seacoast Engineering Assoc, April 2001 and (Parmenter Civil Engineers, April 1987)
Maps: "Rye Conservation Commission Trail Map" (1981)

WATER RESOURCES

Surface water resources on the Rye Town Forest consist of 40.1± acres of forested wetland area (freshwater), 31.7± acres of salt marsh, and several ephemeral (temporary) pools. All surface waters drain towards Awcomin Salt Marsh and the Atlantic Ocean.

FORESTED WETLANDS

The varying characteristics of the forested wetland areas are primarily due to the degree of soil water saturation. Much of the forested wetland, though containing tree and ground cover indicator species, is only seasonally wet. Somewhat wetter areas have uprooted trees, and resulting pit and mound topography, as well as denser shrub growth. Very poorly drained sections are characterized by vegetation growth on hummocks and areas of standing water.

Red maple is the dominant tree species in the forested wetland areas. Wetland hardwoods as well as white pine, hemlock, and spruce, are also present. An understory of fruit-producing shrubs such as winterberry holly, highbush blueberry and beaked hazelnut is well-established. Ground cover is dominated by cinnamon fern, sensitive fern, and gold thread.

The moist soils and abundant shrub cover are attractive habitat for small mammals such as voles and shrews. Predators such as red foxes and barred owls hunt these small mammals along the wetland edges. The dense shrub cover provides suitable nesting and/or feeding habitat for songbirds such as yellow-rumped warblers and black-throated green warblers.

Wildlife habitat in the forested wetland areas may be enhanced by low impact tree harvesting, i.e., cable winching of felled trees from wetland edges to higher ground



before skidding. Removal of small groups (<12 trees/group) of maple from forested wetlands will spur the growth of herbaceous ground cover for small mammals and birds. Deer and snowshoe hares browse resulting hardwood stump-sprouts. Increased sunlight will improve wetland shrubs berry production. The creation of up to two or three small openings is recommended for each of the forested wetland areas, if well-timed logging entry using careful techniques is possible.

SALT MARSH

The salt marsh is a brackish transitional zone between the salty, wave-laden ocean and fresh, relatively quiet, inland waters. Fed by several freshwater streams, Awcomin Salt Marsh lies in this intertidal niche between the Town Forest uplands and Ragged Neck Point Barrier Island. The marsh formed over time: As the streams washed tons of sediment into the lagoon behind Ragged Neck Point, suspended sand and dirt particles settled, while organic material accumulated, forming a mud flat.

Water level, pH, and salinity are in constant flux; during high tide the flat is covered by brackish water; when the tide ebbs, the flat is exposed to the open air. The pulse of tides continually supplies nutrients and oxygen to specially adapted salt marsh grass, *Spartina*. At low tide, algae remains and marine organisms decay in the sun, fertilizing the flat. The tallest form of *Spartina*, saltmarsh cordgrass, is found growing along the tidal creeks at water's edge; the incoming tides repeatedly flush away debris from the plants' bases. Closer to shore, a shorter *Spartina*, saltmeadow cordgrass, forms a low, dense carpet of vegetation. However, unlike the front-line cordgrass that is constantly cleansed by the tides, the remains of saltmeadow cordgrass from the previous year does not get washed out to sea. This dead layer of grass becomes mulch,



maintaining good soil moisture and providing protective cover for wildlife, particularly rodents. Glassworts and widgeon grass are highly tolerant of salty conditions and may also be found growing in shallow dips or salt pans, where water is trapped as the tide recedes, and salinity rises through evaporation.

To preserve the aesthetic and ecological integrity of the salt marsh, a 50± foot protective “minimal harvest” buffer will be established along the upland forest edge. Minimal harvest is restricted to trees that are diseased or have other pressing silvicultural concern. No more than 10% of the basal area may be removed in any 15 year period.

EPHEMERAL POOLS

An ephemeral pool is a small natural water impoundment that dries up for part of the year. Some ephemeral pools meet the definition of “vernal pool”, which must be self-contained without inlet or outlet, and must have evidence of at least one of five amphibian/crustacean species.

Four ephemeral pools (possibly vernal pools) were observed during the field examinations, as noted on the Natural and Physical Features Map. These wetlands fill with water in late winter/early spring and usually dry by mid- to late-summer. Since the pools dry, fish and certain insects that prey on young frogs and salamanders do not inhabit them. In southern New Hampshire, vernal pools are important breeding sites for spotted salamanders and wood frogs.

Wetland habitat on the Rye Town Forest can be protected by excluding or limiting silvicultural management to less fragile areas and seasonally timing the harvest to avoid rutting of wetland soils. Rutting is of special concern with ephemeral pools; a change in wetland drainage may alter pool depth, or disturb the length of time the pools



are able to hold water. Consequently, habitat quality may diminish. Skidder roads should be marked by a Forester to ensure that vernal pools are entirely avoided even during dry summer periods. ✓

Adult amphibians generally use ephemeral pools for only a few weeks during the breeding period; they spend the remainder of the year under leaf litter, stumps and fallen logs, often over 100 yards from the nearest wetland. Increasing the number of fallen logs throughout the property, is a measure that can be incorporated into silvicultural management to enhance amphibian habitat.



FOREST RESOURCES

Sustainable Forestry and Silvicultural Management

Sustainable forestry, in a broad sense, refers to forest management strategies that maintain or enhance the forest ecosystem's health, vitality, and integrity. Because people value the forest in many ways, planning strives to accommodate a variety of forest uses, while maintaining the integrity of forest and wetland ecosystems.

In application, sustainable forestry includes the rehabilitation and growth improvement in areas where the forest's timber value and productive capacity are diminished. This may be a result of past timber losses and harvesting practices, such as the forest harvesting that took place as a result of the 1950's hurricane, prior to Town ownership. Insects and disease, such as gypsy moth, or other environmental stress factors, such as drought, also diminish forest health and the growth of some trees.

Sustainable forestry also means management that generates *modest* income from the forest while ensuring that adequate and desirable forest regeneration is established for the future. Sustainable forestry endeavors to balance economic and ecological objectives.

Silvicultural management means working with the forest to nurture timber growth and maintain forest ecosystem health over time. Silviculture is complex science, relying on forest analysis and well-planned forest practices to achieve intended results many years into the future. When silviculture is practiced sustainably, the forest's overall timber value *continues to increase*, despite periodic timber harvests. Eventually, the forest's natural productive potential may be reached and maintained; a highly valuable and scenic forest is the resulting legacy for future generations to manage. In the Rye



Town Forest, Stand E is an example of a scenic and mature forested area containing valuable trees. This area serves as an example of the potential forest that may grow in the Town Forest. Silvicultural management will help reach this potential. The specifications for the silvicultural management of the Town Forest are detailed in the “Silvicultural Planning” section of this study.

Recommendations for the different sections of the Rye Town Forest fall under one of two levels of management: 1) Moderate-use, in silviculturally managed and recreational use areas, representing about 54% of the land base; and 2) Light-use/reserve areas, constituting about 46% of the Town Forest property.

Timber Income

From an economic standpoint, the commercial value of timber on upland forest areas of the Rye Town Forest ranges from \$0 to \$2500± per acre. A rough general average is \$300 per acre. White pine sawtimber and high-quality hardwood sawtimber and veneer represent the majority of this value. However, much of the Town Forest is stocked with young forest and/or poor quality growth, which lowers the per acre value.

Timber value will increase through silvicultural management—forest growth will improve, and trees that are rapidly appreciating in value are favored. Over time, the overall Town Forest timber value may be increased to the following projected averages: \$700±/acre in 15 years, \$1600±/acre in 30 years, and \$2000+/acre in 45 years. *A valuable forest base is conducive to sustainable forestry, as it is possible to generate moderate income without decimating the forest.*



Income from the prescribed silvicultural practices will be currently minimal, as forest improvement dictates that the valuable trees are favored and left to grow. Since harvesting will focus on the removal of low value (sometimes no value), poor quality trees, present treatments are projected to be breakeven, at best. Over time, however, forest improvement work will yield increasingly greater revenue.

Income generated from Town Forest management can be used by the community to: cover Town Forest maintenance costs, and, over the long-term, provide conservation funds to protect other valuable open space in town.

Forest Ecology

From an ecological standpoint, silviculture is best-practiced “close to nature”, as follows: 1) Light, low-impact harvesting; 2) Encouraging forest diversity—species, density, ages, and canopy layers; 3) Not over-cutting the forest; 4) Maintaining long harvest cycles on any given area, i.e., 12 to 5± years; 5) Protecting the integrity of the various forest resources and systems—soils, water, wildlife, trees, etc.; 6) Encouraging abundant forest regeneration of diverse species; and 7) Generally harvesting the less valuable, poorly growing, and diseased trees, while retaining better trees to grow.

Regarding this last point, one trend seems clear for the future: The value of high-quality sawtimber, for almost any tree species, is increasing. High-quality timber, which usually takes over a century to grow, is both desirable and increasingly scarce. It is therefore important to encourage the growth of promising, good-quality sawtimber trees. These trees should generally not be harvested until they are at least financially mature, and until desirable young growth is established to replace them.



Over the long-term, several forest regeneration techniques are recommended to encourage the growth of species well-suited to the Town Forest's soils and current tree growth. The shelterwood method generally favors white pine and some hardwood regeneration. The various selection methods favor the regeneration of a broad variety of species.

Forest Aesthetics

Maintaining the scenic qualities of the Rye Town Forest will be an important aspect of silvicultural management. Though silvicultural activity is temporarily disruptive, the following measures are recommended to minimize logging impacts:

- 1) Leaving a minimal harvest buffer along the fields, cemetery, and Awcomin Salt Marsh (50 feet), and woods roads/major trails (25 feet). "Minimal harvest buffer" means that no more than 10% of the basal area would be removed within any 10 year period. Moreover, only trees that are diseased, or in serious decline would be removed.
- 2) The preservation of large specimen trees throughout the property.
- 3) Maintaining a variety of attractive tree species—particularly hemlock, red oak, white birch, beech, and sugar maple.
- 4) Well-preserved property features, including stonewalls, streams, fields, trails, and woods roads.
- 5) Well-stocked stands (versus overly cut).
- 6) Comprehensive silvicultural project layout and preparation, with close harvest supervision. With mechanized harvest operations, i.e., biomass, skid trails should be laid out in advance by the Forester.



- 7) A careful touch in logging: Avoidance of ground rutting and damage to the residual stands and regeneration. Conscientious slash disposal (< 2 feet, or chipped).
- 8) Post-harvest reclamation work: Grading of woody debris in landing site(s); grading of access roads; follow-up seeding. Reclamation fund will probably be necessary.

Light-use/Reserve Areas

Light-use areas are sections of the Town Forest that are minimally visited by people, and are generally left in their natural state, free of human intervention. These include “reserve” areas, that is, designated sections of forest to be permanently withheld from harvesting and other human impact, and left to follow nature’s course. The reasons for reserve areas are: 1) To protect fragile environments, such as ephemeral pools or the salt marsh; 2) To develop, over time, some old-growth habitat for wildlife; 3) To maintain visual buffers, where appropriate; and 4) To further increase biodiversity – i.e., in addition to the diversity of species in managed areas, to harbor species possibly found only in undisturbed areas.

At a minimum, approximately 46%, or 91± acres, of the 199.7± acre Rye Town Forest are candidate light-use/reserve areas. Because wetlands cover over 1/3 of the property’s acreage, much of the land designated as light use/reserve is wetland acreage. This includes the salt marsh, forested wetlands (Stand I), ponds, and ephemeral pools.

At least 5± acres of *upland* forest is suggested for reserve designation. This includes the scenic older trees in Stand E and a remote section of Stand B in Management Area #3. It is possible that Management Area #3 will remain inaccessible to silvicultural management about 15 additional upland acres as “reserve”.



It should be noted that no areas of unique upland forest, were noted on the property. Stand E is distinct as it represents some of the oldest forest on the property, but it is far from “old growth”. On the contrary, the forest’s present condition demonstrates a need for silvicultural attention, to maintain the forest’s health and enhance wildlife habitat, and possibly earn conservation income for the Town. Therefore, additional upland acreage is not included as reserve to avoid lowering the proportion of area left to silviculture and wildlife management.

WILDLIFE RESOURCES

WILDLIFE HABITAT FEATURES

The Rye Town Forest is unique in that it contains four broad, but diverse, habitats types with excellent attributes for wildlife. These include the property’s: 1) forested wetlands, some of which contain dense shrub-dominated areas; 2) extensive upland forest; 3) field land; and 4) and coastal wetland, the Awcomin Salt Marsh area.

Specific habitat requirements for individual species vary widely, however the four basic components that all wildlife need to survive are: *food* (e.g. berries, plants, prey animals), *cover* (e.g. nesting/denning cover, cover from predators, cover from harsh weather), *water* (e.g. for drinking, and as a medium for feeding, breeding, raising young), and *space* (e.g. area required to meet daily/seasonal requirements for food, cover, water and breeding). The Rye Town Forest’s resident wildlife utilize the property because it contains sufficient resources to satisfy these requirements.



A summary of the property's natural habitat follows, with general recommendations for maintaining these habitats. Specific recommendations can be found in the Silviculture section. Also, please refer to the Forest Type Map.

Open Space

One of the Rye Town Forest's most valuable wildlife attributes is its position as an integral component of a large block of undeveloped open space. As discussed in the Introduction, substantial areas of unfragmented forest represent critical—and increasingly threatened—wildlife habitat. The open space block that includes the Town Forest is over 300 acres in size, and is located in the middle of one of the most highly developed areas in southern New Hampshire. Although some wildlife species may spend their entire life on the Town Forest property (red-backed salamanders, white-footed mice), most species travel through the property daily (fisher, deer), or as their food and cover needs change with the seasons (scarlet tanagers). Adjacent open space plays critical role in how wildlife uses the Rye Town Forest. Discouraging further development on surrounding properties would benefit the integrity of the entire open space area.

Wetlands

The varied and extensive surface water resources of the Town Forest compliment the diverse forested habitat available to wildlife. Water resources include the lacustrine (ponded) areas such as the recreation area pond and the old ice pond, ample palustrine (forested wetland/shrub swamp) areas, seasonal and year-round streams, ephemeral (vernal/autumnal) pools, and coastal salt marsh. In addition, no other New Hampshire Town Forest has coastal salt marsh habitat. Each wetland type meets the habitat requirements for various fish, amphibian, reptilian, avian, and mammalian species.



Salt Marsh

Wildlife found in salt marsh habitat have evolved to deal with a constantly changing environment. Despite the alternating condition of exposed, then submerged, soils and vegetation, many animals depend on salt marshes for survival. Salt marshes, such as the Awcomin Salt Marsh, act as a fish nursery, a wave buffer, a water purifier, an oxygen pump, and a food pantry to a number of wildlife (Benyus 1989).

Most wildlife activity occurs in and around the tidal creeks. Fresh food and nutrients are brought in with the tides. The tall saltmarsh cordgrass along the banks provides shelter for wary shorebirds (Virginia rail and sora) and perch sites for songbirds (marsh wren and savannah sparrow). Fiddler crabs dwell along these banks, and serve as a food staple for many marsh animals (gulls, black-crowned night herons, and green herons). Raccoons and muskrats forage for mussels, and muskrats den in lodges or “bank burrows” along the tidal creeks. Mink are active nocturnally, hunting for fish and small rodents (meadow voles).

Inland Wetlands and Streams

Forested wetlands range from incipient to well-established, having an interesting variety of fruit-bearing shrub species including northern arrowwood, high-bush blueberry, winterberry holly, speckled alder, and maleberry. Forested wetlands and riverine habitat accommodates several aquatic mammalian, avian, and amphibian species. Pools of slow or stagnant water allow for prolific insect reproduction (mosquito, caddisfly, midge larvae, etc.). These insects supply nutrient rich food for bats (little brown bat) and insectivores (star-nosed mole, and possibly the more uncommon water shrew). In addition, the perennial streams hold native crustaceans year-round, and



attractant raccoon, mink, and river otter. Patchy dense fruit-bearing vegetation growing along these riparian areas provide fine perching and foraging habitat for both insect-eating (warbling vireo and alder flycatcher) and soft-mast eating birds (black-capped chickadee, tufted titmouse, etc.), as well as excellent escape cover for a multitude of animals. Stream-dependant amphibians such as the northern dusky salamander and two-lined salamander are found along the edges of the property's intermittent drainages.

Though the opportunity to silviculturally enhance wetland interiors is limited due to ground conditions, wetland edges are often accessible. Small group selection openings are effective in promoting the growth of wetland forbes and shrubs that are valuable food and cover providers.

Upland Mast Forest

The Rye Town Forest is endowed with upland forest habitat that include extensive oak stands, dense softwood areas, and mixed species forest. The oak forest is dominated by red oak, with varying amounts of white and black oak, is an crucial mast production area. Acorns rank among the most important wildlife foods in our local forests, utilized by a great variety of animals (flying squirrels, wild turkeys, and deer). White oak acorns are a preferred hard mast type. Older oaks with a well-developed crown are most favorable for producing copious amounts of acorns. A silvicultural objective is to encourage and maintain an abundance of mast-producing trees—white and red oak, beech, and hickory. Over the long-term, healthy, large-crowned mast producers, ranging from 100 to 150 years of age, should be well-represented in the Rye Town Forest.



Softwood Cover

The Rye Town Forest contains extensive softwood cover. White pine areas provide perch/roost sites for owls and hawks. Moreover, white pine stands provide an abundant, albeit cyclical, source of seeds. Red squirrels, nuthatches, and evening grosbeaks feed on pine seeds. Hemlock is also a significant species, providing valuable winter cover. Snow depths tend to be less under the dense foliage of scattered large hemlocks, encouraging deer to yard (conserve energy) under their canopy. Hemlocks also provide winter thermal cover. While hemlock and spruce saplings are of moderate food value to wildlife, they provide year-round travel cover. Major wildlife travel corridors are found in dense hemlocks that sometimes line stream and wetland edges. It is recommended that pockets of pine and hemlock be silviculturally maintained in roughly the same proportion of total area (30±%) as present, particularly along wetlands.

Mixed Forest

Mixed forest areas represent varied conditions, including areas with combined mast and softwood cover conditions; mesic hardwoods (yellow and black birch, red and sugar maple, white ash, basswood, red oak, aspen, black cherry); aspen (popple) pockets; and young/old tree mixes. Mesic hardwoods offer another variety of seeds and mast, as well as soft trees for cavity-making such as popple or basswood. Mature white ash, sugar maple and red maple produce samaras (seeds) during the spring and fall that are eaten by small mammals and turkeys. Aspen (popple) is an important species for beaver and ruffed grouse. Beavers rely on aspen growing within 300 feet of swamps. It is recommended that silviculture encourage the growth of a variety of hardwoods, particularly in moist (mesic) areas.



Old Forest

In the 19th century, the Rye Town Forest was entirely open fields, as indicated by the numerous stone walls that demarcate former field edges. The present forest is variously aged primarily dependent on when these fields were abandoned, as well as past logging. Most of the Rye Town Forest is between 50 and 90 years old, though some areas contain trees up to 110± years. It is possible that a few, scattered individual trees in the Town Forest range up to 200 years of age.

A long-term silvicultural objective is to increase the number of old trees, and to develop areas with old growth conditions for wildlife. *Conversely*, only a small amount of the Town Forest (1%) is covered by young, early forest succession growth. This forest type provides an increasingly less common, but important, habitat type for wildlife, and should be at least maintained.

From a silvicultural perspective, practicing a combination of uneven-aged and even-aged management *with standards* (i.e., retaining individual old trees indefinitely), favors a mixture of mature forest with areas of forest regeneration and young growth. Trees of various long-lived species—hemlock, pine, and oak—should be retained indefinitely, both individually scattered and in groves. These individual trees can live for several hundred years, barring natural disturbance. In general, the overall age for economic maturity of the forest can be considered 125 to 150 years for most trees, much older than the Town Forest's average present age.

Young, Early-Successional, Forest

Early-successional forest has an abundance of pioneer species, i.e., trees that tend to become established under full sunlight conditions. These include gray and white birch,



white pine, aspen, red maple, black cherry, and sumac. A variety of shrubs and vines also thrive under full sunlight; hawthorn, highbush blueberry, and blackberry are three types that were noted in Stand J (the forest type representing early-successional growth in the Town Forest). Since recently abandoned pasture is scarce in New Hampshire (New Hampshire is the second most forested state in the nation), early-successional habitat is increasingly in short-supply to the many songbirds that depend on it. Maintaining most of the acreage of Stand J (2+ acres) as early-successional is recommended for the important diversity of habitat it represents.

Other Wildlife Features: Snags, Cavity Trees, and Downed Wood

Along with live trees, standing dead trees (snags) and downed woody biomass are essential components of a forest, providing critical wildlife habitat. A forest devoid of dead trees is unnatural and barren to wildlife. Wetland forest areas in particular contain great numbers of snags, which at various stages, may be inhabited by woodpeckers and kingfishers, and possibly, great blue herons and wood duck. As the trees in the Town Forest age, snags and remnant woody material on the forest floor will become increasingly abundant. These should be left behind where possible (with the exception of hazard trees *overhanging* Town Forest trails) for use by wildlife.

Endangered Wildlife Species

Though no endangered or threatened wildlife species were noted in the Rye Town Forest, it is remotely possible that the following species may be sighted on the property's upland or wetland habitats by the property (it is unlikely that the Town Forest currently serves as nesting or breeding habitat for these species): Birds—Pied-billed grebe, bald eagle, northern harrier, upland sandpiper, osprey, Cooper's hawk, and sedge wren.



Wildlife Recommendations Summary

General Measures

- Conduct wildlife surveys including: birds (migratory and breeding counts), mammal (sign, sighting, winter tracks), amphibians (in ephemeral pool and forested wetlands).
- Set-up nesting boxes along wetland and salt marsh edges.
- Protect unique natural communities (e.g., Awcomin Salt Marsh) from pollution sources or unwarranted disturbance.

Silvicultural measures to compliment existing wildlife features and habitat:

Open Space/General

- Maintain forest diversity, particularly, tree age, density, and species mix.
- Throughout the forest, stratify tree-canopy layers, to maintain vertical cover and habitat.

Wetlands

- Maintain wildlife cover vegetation, especially in and around wetlands.
- Maintain wildlife corridors, specifically by promoting shrubby vegetation or areas of young hemlock along streams and wetlands.
- Harvest red maple on wetland edges to create stump sprouts and release wetland shrubs.
- Encourage desirable native, wetland wildlife shrubs—winterberry holly, highbush blueberry, silky dogwood, speckled alder, arrowwood, northern wild-raisin—in wetlands or wetland edges.

Upland Mast Forest

- Desirable native, upland wildlife shrubs include: staghorn and smooth sumac, beaked hazelnut, witch-hazel, maple-leaved viburnum, nannyberry. Desirable native vines or cane plants include: grapevine, Virginia creeper, blackberry, raspberry, and dewberry.
- Retain abundant, healthy mast trees, especially large-crowned oaks and beech.

Softwood Cover

- Maintain areas of dense young and/or older hemlock, both scattered and in groves, for yarding, thermal cover, and travel corridors.

Mixed Forest

- Encourage growth of scattered aspen groves.

Old Forest/Early-Successional Forest

- Practice even-aged and uneven-aged silviculture to ensure good representation of young and older-growth forest.
- Increase overall average mature forest upper canopy trees age to 125+ years. However, maintain and manage ample areas as early successional and younger growth.



- Retain old residual trees (18+ inches) throughout the forest indefinitely, i.e., 150+ years. Designate as specimen trees.

Other

- Retain homes for wildlife including dead trees, snags, cavity-trees, potential den trees, and downed woody biomass.
- Create small, scattered brushpiles from tree limbs left after logging.
- After use, seed landing areas and forest roads with clover and native grasses attractive to wildlife.



SILVICULTURAL PLANNING

Map of the RYE TOWN FOREST Rye, New Hampshire 199.7± acres

Showing Forest Types



- Map Legend**
- Property line
 - == Town Road
 - Stonewall
 - Driveway
 - Building
 - + Cemetery
 - Small pond
 - Forest type change
 - Salt marsh

Map researched and drawn by:

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May 2003

Map references:

Field examination (C. Moreno & M. Ross, Feb.-March 2003)
USGS/USDA Aerial Photos: 1998, 1974, 1952
Town of Rye Tax Maps (Seacoast Engineering Associates, April 2001)
and (Farmer Civil Engineers, April 1987)
Maps: "Rye Conservation Commission Trail Map", (1981)

Acreeage Summary
Woodlands - 155.4± acres
Salt marsh - 31.7± acres
Recreational field - 12.6± acres

Forest Type Key

- Stand A:** White Pine, Intermediate (23.8± acres)
- B:** White Pine, Older (19.6± acres)
- C:** White Pine/Hardwood, Intermediate (14.0± acres)
- D:** White Pine/Hardwood, Two-aged, Intermediate (3.3± acres)
- E:** White Pine/Hardwood, Two-aged, Older (2.3± acres)
- F:** Upland Hardwoods, Pole-Intermediate (15.9± acres)
- G:** Upland Hardwoods, Older (21.9± acres)
- H:** Mixed Hardwoods (12.6± acres)
- I:** Forested Wetlands (40.1± acres)
- J:** Early successional (1.9± acres)

STAND A - White Pine, Young/Intermediate – 23.8± acres

FOREST TYPE DESCRIPTION

Description: This forest type developed from field land that was abandoned during or soon after World War II. White pine became densely established and today ranges from pole (8± inch) to small sawlog size (12 -16 inch). Several pockets of this forest type were delineated throughout the property. Sections of this stand in Management Area #2 were thinned in 1992 as a part of a multi-property silvicultural operation.

Location: Adjacent to parking lot, cemetery, and eastern entrance from Washington Rd.

Timber Quality/Potential: Timber quality is variable; many trees have multiple stems, a condition caused by the pine weevil. The poorest quality trees were thinned in areas treated in 1992. Further thinning will provide growing space to favorable trees, while upgrading stand quality.

Several pockets have a severe invasive plant problem: European buckthorn, oriental bittersweet, burning bush, Japanese barberry, knotweed are among the species threatening forest growth.

TECHNICAL DATA

PRIMARY SPECIES: White pine

2nd SPECIES: Red oak, red maple, popple, black cherry, beech

SILVICULTURAL STAGE: Mid-intermediate

AGE: 45-65 ± years

TREE DIAMETERS: 7 – 20 inches

MEAN DBH: 11± inches

STOCKING LEVEL: Well to densely stocked

BASAL AREA: 180 ± sq. ft/ac.

FOREST REGENERATION: E. buckthorn, black birch, red maple, bittersweet, white ash, beech.

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Improve stand quality, potential and growth by continuing to remove the poorest quality trees. Initiate control of invasive plants; stop spread of plants.

Long Term: Promote the regeneration of a mixed species, mixed aged stand over long-term (50+ years). Control/eradicate invasive plants.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: Dense young white pine stands provide winter cover and feeding opportunities for white-tailed deer, red squirrels, and porcupine. Scattered red oak and understory beech represent a developing mast source for the future. Over time, a diverse tree species mix is conducive to multiple seed sources.

SILVICULTURAL SYSTEM: Even-aged (→ multi-aged)

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1 –14 Years):	<u>Improvement cut/Crown thinning/Pruning.</u> Remove lesser quality, less vigorous trees, while releasing the crowns of the finest quality pines on one to two sides (provide 5-8± feet of growing space around crowns). Also, trim dead branches flush to stem up to a height of 12-17± feet on healthy, straight-growing pines. (Residual basal area: 140±)
2 nd (14–30 Years):	<u>Improvement cut/Crown thinning.</u> Similar treatment.
3 rd (30–45 Years):	<u>Crown thinning.</u> Continue to provide adequate growing space.



STAND B — White Pine, Older – 19.6± acres

FOREST TYPE DESCRIPTION

Description: While similar to Stand A—this forest type is dominated by white pine in the canopy—trees are typically older and larger (16+ inches DBH). Silvicultural treatment has not been performed in this stand since original field abandonment, which occurred in the early 20th century. This stand does not appear to have been heavily damaged by the 1955 coastal hurricane.

Location: This forest type occurs in several small pockets in Management Areas #1 and #2. Much of the former Varrell Lot is also delineated as this forest type.

Timber Quality/Potential: Variable, many pines are weeviled, i.e., with multiple tops. Some trees, however, are fine examples of the outstanding growth the Town Forest soils are capable of.

TECHNICAL DATA

PRIMARY SPECIES: White pine.

2nd SPECIES: Red oak, red maple, hemlock, beech.

SILVICULTURAL STAGE: Late intermediate

AGE: 75 - 95± years

TREE DIAMETERS: 10 – 28+ inches

MEAN DBH: 16± inches

STOCKING LEVEL: Well-stocked

BASAL AREA: 120-180 ± sq. ft/ac.

FOREST REGENERATION: Spruce, black cherry, E. buckthorn, arrowwood, red maple.

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Upgrade stand quality. Harvest declining trees. Encourage advance pine regeneration.

Long Term: Regenerate a mixed stand of white pine and hardwood species over the next 50 years. Allow the development of a multi-aged stand with various canopy layers.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: The mature white pine within this parcel offers breeding and nesting opportunities for the several birds, including the pine warbler, hermit thrush, and veery. Wild turkeys prefer to roost in large pines, while the dense spruce/hardwood understory provides food sources and good escape cover from predators.

SILVICULTURAL SYSTEM: Even-aged → multi-aged

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1 –14 Years):	<u>Improvement cut/Crown thinning.</u> Remove less vigorous and/or poorer quality trees. Release crowns of the finest quality pines on one to two sides. The creation of small openings between trees may allow the establishment of some young white pine. Harvest on a good pine seed year if possible. (Residual basal area: 120+).
2 nd (14–30 Years):	<u>Improvement cut/Crown thinning.</u> Similar treatment.
3 rd (30–45 Years):	<u>Single-tree selection.</u> This harvest is primarily intended to encourage regeneration – both pine and mixed hardwoods.



STAND C – White Pine/Hardwood, Intermediate – 14.0± acres

FOREST TYPE DESCRIPTION

Description: This forest type is characterized by a mixed composition of white pine and hardwood species, mostly 8 – 16 inch DBH. In some areas, red oak predominates, while in other areas, red maple is the major hardwood component. Much of the white pine in this forest type has a wide multi-branch growth form, indicating previous abandonment of pastureland followed by the establishment of open-grown pine.

Location: While the primary area of this forest type lies adjacent to Parsons Field, many small pockets are located throughout the property.

Timber Quality/Potential: Low quality white pine (weeviled) stocks much of this forest type, though reasonably straight trees are scattered throughout. Red oak generally shows good form and promise to develop as valuable timber and wildlife trees. Red oak seedling/sapling growth was also noted in many areas.

TECHNICAL DATA

PRIMARY SPECIES: White pine, red oak or red maple

2nd SPECIES: Black cherry, beech, popple

SILVICULTURAL STAGE: Mid-intermediate

AGE: 60± years

TREE DIAMETERS: 6 – 24 inches

MEAN DBH: 11 ± inches

STOCKING LEVEL: Moderate to well stocked

BASAL AREA: 120± sq. ft./acre

FOREST REGENERATION: Beech, white pine, European buckthorn, red oak

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(s):

Short Term: Favor the growth of quality pine and oak – upgrade overall stand quality by removing multiple-stem trees over time. Initiate control of buckthorn to check its spread.

Long Term: Rehabilitate this forest type into a more productive condition. A stand of stately pine and oak, both scenic and valuable as timber, is the ultimate goal.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: Sections of fairly dense pine provide winter cover for deer, and feeding opportunities for red squirrels and porcupine. Young red oaks represent a future source of mast.

SILVICULTURAL SYSTEM: Even-aged (→ multi-aged)

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1–14 Years):	<u>Improvement cut (light).</u> Remove poorest quality and least healthy trees. (Residual basal area: 95±).
2 nd (14–30 Years):	<u>Improvement cut/Crown thinning.</u> Remove poorest quality trees while releasing the crowns of the finest quality trees (oak and pine) on one to two sides. Provide 5-8± feet of growing space around crown.
3 rd (30–45 Years):	<u>Crown thinning.</u> Similar treatment.



STAND D - White Pine/Hardwood, Two-aged, Intermediate - 3.3± acres

FOREST TYPE DESCRIPTION

Description: Also containing a pine-oak mix, this forest type is distinct because it contains two forest age classes, including trees older than in Stand C, but not as old as the mature growth in Stand E. During the 1950's, it is likely that some of the stand's original pine was either salvaged or harvested in conjunction with hurricane clean-up work. Oak and younger pine filled the resulting openings in the forest canopy.

Location: Only two small pockets of this stand are found on the Town Forest, in Management Areas #1 and #2.

Timber Quality/Potential: This forest type contains promising young oak; white pine quality is variable.

TECHNICAL DATA

PRIMARY SPECIES: Red oak, white pine
2nd SPECIES: Red maple, beech

SILVICULTURAL STAGE: Two-aged, generally intermediate age **AGE:** 50/75± years
TREE DIAMETERS: 5 – 18 inches **MEAN DBH:** 8/14± inches
STOCKING LEVEL: Moderate to well stocked **BASAL AREA:** 130± sq. ft./acre

FOREST REGENERATION: Beech

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Develop high quality oak, while retaining white pine component.
Long Term: Regenerate a mixed species, mixed age stand over time.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE : Numerous small piles of moderately-sized granite fragments were noted which offer excellent den site habitat for reptiles such as the milk snake.

SILVICULTURAL SYSTEM: Two-aged → multi-aged

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1 –14 Years):	<u>Improvement cut/Crown thinning.</u> Remove lower quality, less vigorous trees while releasing the crowns of the finest quality trees on one to two sides. Provide 5-8± feet of growing space around crowns. (Residual basal area: 100±)
2 nd (14–30 Years):	<u>Crown thinning.</u> Provide additional growing space between crowns.
3 rd (30–45 Years):	<u>Single-tree selection.</u> Provide growing space and continue removing lesser trees, however, harvest on good pine or oak seed year to encourage regeneration.



STAND E – White Pine/Hardwood, Two-aged, Older – 2.3 ± acres

FOREST TYPE DESCRIPTION

Description: This older stand contains significant stocking of both white pine and various hardwoods. Pines are stately—tall, straight, and large diameter—and are amongst the finest trees in the Town Forest. The pines are probably over 100 years of age. A second age class of younger mixed hardwoods is also an important component of this stand. These trees probably became established when the older pine was partially harvested in the 1950's±.

Location: One small pocket, located south of the cemetery. This stand is somewhat difficult to access from the rest of the property as it is isolated by a wetland and the adjacent cemetery. Silvicultural management would probably entail access via the cemetery, which is not ideal.

Timber Quality/Potential: The large residual white pines (4+ logs, clear) are among the most outstanding on the property, and are indicative of the potential forest growth in the Town Forest. Red oak growth and quality is also excellent. Pole-sized yellow and black birch also exhibit promising growth, although Nectria canker is present in the birches.

TECHNICAL DATA

PRIMARY SPECIES: Red oak, white pine, yellow birch, black birch, and red maple.
2nd SPECIES: Beech, white ash, spruce

SILVICULTURAL STAGE: Two-aged

AGE: 50±/85-100+ years

TREE DIAMETERS: 5 – 24+ inches

MEAN DBH: 9/20 ± inches

STOCKING LEVEL: Well-stocked

BASAL AREA: 130± sq. ft./acre

FOREST REGENERATION: Beech, white pine, spruce.

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: No treatment presently. Use as a demonstration area to show what the Town Forest would look like in 50 to 75 years, particularly if silvicultural management is implemented.

Long Term: Leave as demonstration reserve area, however, if natural disturbance of acute magnitude occurs, salvage damaged or downed timber, and regenerate as a mixed species, mixed age stand.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: Red oak and beech in the stand provide mast. Snags and cavity trees (standing dead or diseased trees) offer food and nesting opportunities for birds like pileated woodpeckers, flickers, hairy and downy woodpeckers, and black-throated blue warbler. Small and mid-sized mammals such as eastern flying squirrel and porcupine may also nest in these cavity trees.

SILVICULTURAL SYSTEM: Reserve area.

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1–14 Years):	<u>No Treatment</u> , unless salvage needed. Establish as a demonstration area.
2 nd (14–30 Years):	<u>No Treatment</u> , unless salvage needed.
3 rd (30–45 Years):	<u>No Treatment</u> , unless salvage needed.



STAND F – Upland Hardwood, Young Intermediate – 15.9± acres

FOREST TYPE DESCRIPTION

Description: This promising young forest type is characterized as stocked by pole-sized upland hardwoods, with trees mostly 6 to 12 inches DBH. Red oak, red maple, and black birch are the predominant species. The stands probably originated in areas where pine was clearcut, or salvaged from the 1950's hurricane.

Location: Several pockets of this forest type are found in all three management areas. A typical area is found lying east of the Recreation Road woods road as it curves back towards the athletic fields.

Timber Quality/Potential: The red oak and black birch in this stand is just reaching the age where it will rapidly appreciate in value as it grows into larger, and in some cases, veneer-quality, timber. Some sections of this stand are more heavily stocked with red maple, which is becoming somewhat more valuable as sawtimber, but will probably not have the high quality growth of the other hardwood species.

TECHNICAL DATA

PRIMARY SPECIES: Red oak, red maple, black birch, beech.

2nd SPECIES: Black oak, white birch, white pine, popple.

SILVICULTURAL STAGE: Even-aged

AGE: 60 ± years

TREE DIAMETERS: 5 – 16+ inches

MEAN DBH: 9 ± inches

STOCKING LEVEL: Well-stocked

BASAL AREA: 90± sq. ft./acre

FOREST REGENERATION: Beech

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Develop high quality red oak and birch. Favor growth of best quality maple. Retain scattered remnant pines as a future seed source.

Long Term: Regenerate mixed species, including pine, mixed age stand over time.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: Nearby and surrounding stonewalls provide den sites for many small mammals, including the eastern chipmunk and white-footed mouse, which in turn may attract predators like the red fox or fisher.

SILVICULTURAL SYSTEM: Even-aged.

SILVICULTURAL TREATMENT:

<i>Harvest Cycle</i>	<i>Treatment</i>
1 st (1–14 Years):	<u>Timber stand improvement (TSI): Crown thinning.</u> The trees to be removed in the initial stand treatment may be too small for marketing, or if marketed, will be of very low value. This initial project is therefore “pre-commercial”, and must be subsidized by harvest income from other stands. Biomass harvesting may also be an option. Outstanding growth response is usually the outcome of early (TSI) treatment. (Residual BA: 70±).
2 nd (14–30 Years):	<u>Improvement cut/Crown thinning.</u> Similar treatment, but harvested trees are now of commercial size.
3 rd (30–45 Years):	<u>Crown thinning.</u> Continue to provide adequate spacing around crowns.



STAND G – Upland Hardwood, Older – 21.9± acres

FOREST TYPE DESCRIPTION

Description: This is the only forest type predominantly stocked with red oak, much of which is of larger diameter (12 to 16± inch DBH). The stand borders the Awcomin Salt Marsh, and at one time was probably well stocked with white pine. However, most of the pine in this area was either felled by the 1955 hurricane or harvested during salvage logging thereafter. Upland hardwoods, primarily oak, became well-established in succeeding years.

Location: This stand lies in Management Area #2 along the Awcomin Salt Marsh. Three of the Town Forest islets within the salt marsh are also classified under this forest type.

Timber Quality/Potential: Much of the red oak in this stand is of fine quality and is developing as valuable high grade sawlogs, or veneer quality.

TECHNICAL DATA

PRIMARY SPECIES: Red oak

2nd SPECIES: Red maple, white pine, black cherry

SILVICULTURAL STAGE: Mid-late Intermediate **AGE:** 65-85 ± years

TREE DIAMETERS: 6 – 20+ inches (30)

MEAN DBH: 11± inches

STOCKING LEVEL: Moderate to well stocked

BASAL AREA: 75± sq. ft./acre

FOREST REGENERATION: White pine, European buckthorn, red oak, blueberry

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Continue to develop high quality oak. Retain white pine for diversity and as a future seed source.

Long Term: Regenerate multi-aged, mixed species stand, with at least 30% oak composition.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: As the most extensive, well-developed section of oak in the Town Forest, this stand is the major producer of hard mast—acorns—in the area. A broad variety of mammals and birds depend on acorns as a staple food.

SILVICULTURAL SYSTEM: Even-aged → multi-aged

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1–14 Years):	<u>Improvement cut/Crown thinning.</u> Remove poorer quality, less vigorous trees while releasing the crowns of the healthiest, finest quality trees on one to two sides. Provide 5 - 8± feet of growing space around crowns.
2 nd (14–30 Years):	<u>Single-tree/Micro group selection.</u> <i>Light</i> harvest of less promising trees; removals should include both small and larger diameter trees. Create small openings by harvesting groups of 2 to 6 trees, thereby favoring regeneration of the forest.
3 rd (30–45 Years):	<u>Single-tree/Small group selection.</u> Similar treatment. In places, expand micro openings to include up to a dozen total harvested trees.



STAND H – Mixed Hardwood – 12.6± acres

FOREST TYPE DESCRIPTION

Description: This forest type includes areas with mixed hardwood species that generally occupy slightly moister sites than the upland hardwood type, Stand G. Pockets vary as either even-aged or two-aged forest, as follows: Even-aged areas are almost completely red maple, whereas two-aged areas include high quality red oak (vener), yellow and black birch, in addition to the predominant red maple. A small amount of white pine is also present. Trees are mostly pole-sized (7 – 11 inches DBH).

Location: A few pockets of this forest type are found in Management Areas #1 and 2.

Timber Quality/Potential: Good quality pole-sized red oak, yellow and black birch are numerous, as well as a few excellent quality large oak residuals. White pine quality varies.

TECHNICAL DATA

PRIMARY SPECIES: Red maple

2nd SPECIES: Red oak, yellow birch, black birch, white pine, spruce, popple,
white birch, white ash, sugar maple

SILVICULTURAL STAGE: Even and two-aged **AGE:** 50/80 ± years

TREE DIAMETERS: 6 – 19+ inches **MEAN DBH:** 8-9 ± inches

STOCKING LEVEL: Well-stocked **BASAL AREA:** 90± sq. ft./acre

FOREST REGENERATION: Spruce, white pine, beech, black birch.

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Short Term: Encourage the growth of high quality oak, birch, ash, and maple. Retain white pine to add complimentary softwood cover, while providing a future seed source.

Long Term: Maintain the present diverse species condition in future (50+ years) stand. Allow stand to develop into a multiple-aged forest.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: Create small openings in areas where this stand lies adjacent to forested wetlands. Young herbaceous growth will fill into these openings, providing excellent spring/summer food sources for deer, grouse, hare, etc.

SILVICULTURAL SYSTEM: Even-aged and two-aged.

SILVICULTURAL TREATMENT:

<u>Harvest Cycle</u>	<u>Treatment</u>
1 st (1 –14 Years):	<u>Timber stand improvement (TSI): Crown thinning.</u> The trees to be removed in this initial thinning may be too small for marketing, or if marketed, will be of very low value. This initial project is therefore “pre-commercial”, and must be subsidized by harvest income from other stands. Biomass harvesting may also be an option. Outstanding growth response usually results from early (TSI) treatment. (Residual BA: 70±).
2 nd (14–30 Years):	<u>Improvement cut/Crown thinning.</u> Similar treatment, but harvested trees are now of commercial size.
3 rd (30–45 Years):	<u>Crown thinning.</u> Continue to provide adequate spacing around crowns.



STAND I – Forested Wetland – 40.1± acres

FOREST TYPE DESCRIPTION

Description: This forest type occupies the moist, poorly-drained soils in the Town Forest. Several natural seeps, intermittent seasonal drainages, and vegetated wetlands are included in this cover type. The main forest canopy is mainly stocked by red maple, though white ash is common in pockets, and other wetland species are present throughout. The well-developed understory of hardwood saplings and wetland shrubs is densest in the more open forest canopy areas. A density gradient is present in some pockets, where tree growth is sparser towards the core, while understory growth becomes profuse. Trees growing on the water-saturated soils of this forest type are shallow-rooted and always at risk for windthrow.

Location: This forest type is located in pockets, some extensive, throughout the Town Forest. Fully 25% of the woodland acreage is classified as forested wetland.

Timber Quality/Potential: Wet ground conditions generally precludes silvicultural management in the forested wetland areas, with the exception of: 1) The creation of small openings along accessible wetland edges to enhance wildlife habitat, and 2) the carefully timed salvage of valuable, at-risk timber trees.

TECHNICAL DATA

PRIMARY SPECIES: Red maple

2nd SPECIES: White ash, yellow birch, spruce, elm, popple, white pine, red oak, and hemlock.

SILVICULTURAL STAGE: Mid-intermediate

AGE: 50-90 ± years

TREE DIAMETERS: 6 – 22+ inches

MEAN DBH: 10± inches

STOCKING LEVEL: Moderate to well-stocked

BASAL AREA: Variable (50-120)

UNDERSTORY VEGETATION: Red maple, black and white ash, high-bush blueberry, winterberry holly, European buckthorn, sensitive fern, cinnamon fern.

STAND PRESCRIPTION

MANAGEMENT OBJECTIVE(S):

Preserve wetland ecosystem integrity: Allow interior areas to progress through natural succession/vegetative development with minimal human intervention. Enhance wildlife habitat in wetland edges, where accessible.

SIGNIFICANT WILDLIFE FEATURE(S) TO PRESERVE/ENHANCE: This forest type contains a diverse mix of tree, shrub and herbaceous plant species. Dry hummocks and pockets of standing water form a complex maze within the dense vegetation: This provides prime, protected breeding sites to reptiles and amphibians, including spotted and red-backed salamanders, and wood frogs. Highbush blueberry and winterberry holly undergrowth supplies songbirds with soft mast.

SILVICULTURAL SYSTEM: Stand interior – Reserve areas
Stand exterior edges – Multi-aged

SILVICULTURAL TREATMENT:

Harvest Cycle *Treatment*

1st (1 –14 Years): Single-tree/Small group selection. Light harvest *along stand edges*, where accessible without impact; encourage establishment of native wetland shrubs and young forest growth.

2nd (14–30 Years): No treatment. Skip a harvest cycle in this stand.

3rd (30–45 Years): Single-tree /Small group selection. Similar treatment as 1st harvest cycle.



FOREST USE/PROTECTION

FOREST USE

FOREST RECREATION

The Rye Town Forest offers a variety of recreation opportunities to townspeople. Intensive-use areas include: the recreational fields which have facilities for team sports, including baseball, softball, and soccer; and Parsons Field, which is used for walking, as well as summer theater events.

Non-intensive, broad-based recreational opportunities in the forest and salt marsh area include: Nature study and birdwatching, berry picking, as well as orienteering.

The most popular activities, however, are trail-based. Presently, recreational trail access is exceptional within the Town Forest; trails were designed, constructed, and marked with color blazes in the early 1980's by the Rye Conservation Commission. Almost the entire property (see Natural and Physical Features Map) is accessible by trails and/or footpaths, including several *loops*.

Trail uses include: Walking (including dog walking), running, snowshoeing, Nordic skiing, and horseback riding. An interpretive trail may be developed as a long-range project for educational use. An accompanying guide would explain points of interest along the trail. Theme-based interpretive trails may include tree species, forest history, silvicultural practices, and a wildlife habitat/observation tour.

To enhance trail use, the present network should be properly maintained by cutting back any overhanging/encroaching brush and by ensuring that trail markers (paint blazes) are updated every other year. Also, trail maps available at the main Town Forest entrances would improve the trail-use experience.



FOREST PROTECTION

Several topics relevant to the Rye Town Forest's future are covered under the subject of forest protection, including: 1) Invasive plant species; 2) Forest diseases and insects; 3) The demarcation of property lines; 4) Vehicle control; and 6) The land protection status of the property.

INVASIVE PLANT SPECIES

An alarming amount of non-native, invasive plants have become established in the Town Forest. The unchecked growth of these exotics may eventually have a devastating effect on the Town Forest's native plants, shrubs, and trees, and their natural habitats. Once established, several of the invasive plants found in the Town Forest (listed below) have the ability to overtake a site, crowding out the native flora. This is particularly true of highly aggressive plants such as buckthorn, autumn olive, barberry, or honeysuckle. Oriental bittersweet will climb and strangle full-grown trees; Stand A in Management Area #3 is currently threatened by this species. As native plants are displaced, the species diversity of a plant community is diminished, while a handful of introduced species come to dominate the site.

Judging from the mix of exotics on the Rye Town Forest, it appears that they were originally planted nearby to improve wildlife habitat perhaps as part of the "wildlife package" program. The plants have spread dramatically since their initial introduction.

Contrary to initial expectations, exotic species are deleterious to wildlife habitat. Recent research has demonstrated that the nutritional value of the fruits of most invasive



species is significantly lower than native plants (Covell, 2002). While dense thickets of invasives may provide cover, they can shade out ferns, grasses, and wildflowers that serve as important microhabitat to insects, small rodents, and snakes (F. H. Clark 1998). They also eliminate the diversity of native plants that provide food, cover, and nesting requirements of the broad variety of wildlife species.

Recognizing the growing severity of the invasive plant problem, the State of New Hampshire established a study committee that has listed all the harmful exotics in the state. Legislation is now pending to ban further introductions of these plants, and to establish strategies for their control. All of the non-native, invasive plants found on the Rye Town Forest are on the proposed State's list of prohibited plants:

- Glossy (European) Buckthorn *Rhamnus frangula*
- Japanese Barberry *Berberis thunbergii*
- Burning bush *Euonymus alatus*
- Oriental Bittersweet *Celastrus orbiculatus*
- Japanese Knotweed *Fallopia Japonica*

Control methods:

Invasive species are found throughout the Town Forest, but are most pervasive in along fields and woodland edges on Washington Road and in the parking area on Recreation Road. While *eradication* of these plants is the most desirable outcome, it would require intensive, sustained effort, on an area, if not community-wide, basis. In view of the magnitude of such an undertaking, *control* of plant spread on Rye Town Forest is a more realistic alternative.

Control of invasive plants demands steady effort over time; maintenance must be on an annual basis at a minimum. Control or eradication requires that the plants be



killed, rather than occasionally cut or mowed, since they simply re-sprout more vigorously than before. Control of vegetation in adjacent areas is necessary as well, as invasives quickly re-invade treated areas by seeding or suckering. Annual control efforts should be done prior to the time the plants develop seeds, before a new generation proliferates.

There are various methods to eliminate invasive plants, as follows. *Uprooting*, *Plowing*; *Continuous (weekly) cutting or mowing*; *Grazing*; *Herbicides*; *Steam or boiling water*; and *Shading*. A discussion of each method follows, and the most effective control methods for the specific invasive found on site is summarized.

Uprooting, preferably with a “weed wrench” that mechanically removes most or all of the roots, is an excellent control method, though it is impractical with large numbers of dense shrubs. *Grazing*, with sheep or goats, is suitable for field edges, but not a practical solution for the Town Forest. Grazing is not selective in favoring native plants.

Plowing or tilling are effective large-scale control methods and can be used as an initial control strategy for the invasives found in the parking area on Recreation Road (Japanese knotweed). Native plants and grasses should be immediately introduced into the tilled areas.

Frequent mowing is also effective for all of the Town Forest open field areas (along Washington Road), as a preventative for the establishment of exotic, invasive plants. Weekly mowing minimizes photosynthesis, not allowing a plant to develop adequate roots. By contrast, occasional mowing creates denser root systems, making the plants more resistant to control (F.H. Clark, 1998).



Unfortunately, in view of potential ecological and health risks, *herbicidal treatment* of invasive plants is perhaps the most effective eradication/control method. Many naturalists and ecologists, regard herbicides in the context of invasive plant control, as the “lesser of evils”. To remain in conformance with the properties conservation easement, any herbicide treatment must be made by a licensed applicator, and RCCD (the Grantee) must be given at least 10 days notice.

The negative impact of chemical treatment can be mitigated by the method of application. Rather than foliar application via broadcast spraying, the herbicide may be applied directly to the freshly cut stumps of harvested invasive plants. To further contain the herbicide, the solution can be brushed onto the stump, rather than sprayed. Several successive seasons of stump treatments may be necessary to kill the root system of a well-established plant. A treatment of wand spraying the stump sprouts (when they are only a few inches tall) of a previously treated stump may be necessary as well. Town Officials must approve and be involved in the implementation process under closely controlled application standards for combating the invasive plant problem.

The use of *steam* sprayers and boiling water poured directly on the plants is most effective for small-scale application around yards and residences. There are logistical problems with hauling a steam sprayer through dense vegetation. Also, this method may adversely impact other plants and the microfauna of the transitional field/forest.

Encouraging dense *shading* from trees or other native shrubs is also a control/preventative strategy. This would serve as a partial solution, used in conjunction with the other strategies, since most of the invasives may still thrive under partial forest shade.



Control Measures for Invasives (Thompson, 1999)

SPECIES	CONTROL MEASURES				Remarks
	Uproot	Mow	Cut/treat stump	Till	
Buckthorn	x		x	x	Use glyphosphate on foliage & stumps.
Barberry	x		x	x	Use glyphosphate on foliage & stumps.
Burning Bush	x		x	x	Use glyphosphate on foliage & stumps.
Bittersweet	x		x		Eradicate using Garlon.
Knotweed		x	x		Use glyphosphate on foliage & stumps.

FOREST DISEASES and INSECTS

Forest Diseases:

Serious tree diseases, such as white pine blister rust, *Strumella* canker on red oak, *Nectria* canker on birch, and beech bark disease were noted on the Rye Town Forest, though incidence is relatively low. An important emphasis of silviculture is to identify and assess diseased trees. Diseased trees are removed principally according to their potential to spread the disease to other valuable trees, or sections of the forest. Harvest is also warranted if the loss of high-value timber is risked when the diseased tree(s) deteriorates or dies. Nonetheless, some diseased trees are left for wildlife (or other) purposes, if the risk of the first two factors have been deemed minimal.

Insects:

Insect threats to the Rye Town Forest are more portentous. The gypsy moth caterpillar and the hemlock wooly adelgid are the main risks. Due to high red oak stocking, several stands are susceptible to gypsy moth infestations. Favorably, the recent emergence of several natural controls—viruses, bacteria, and insects—has possibly



altered the frequency and severity of gypsy moth attacks. Until now, outbreak frequency has been about once per decade.

Silvicultural strategies to mitigate gypsy moth impact include managing hardwood stands for reasonable diversity of species, including tree species not favored by gypsy moth, such as red and sugar maple, and white ash. The introduction of shagbark hickory will also serve as a buffering measure, as this species is avoided by gypsy moth. Another recommendation is to monitor oak areas for the 5-year period after gypsy moth defoliations to assess the degree of stand stress and mortality, and schedule a salvage operation if needed.

Hemlock wooly adelgid is an expanding threat. This exotic insect has slowly spread from a release point in the New Jersey area, and is beginning to appear in New Hampshire, specifically in the Portsmouth area. Adelgid-infested hemlocks are quickly stripped of their foliage, triggering tree death. Though entire stands of hemlock have been devastated in Connecticut and Massachusetts, it does not appear that *all* stands are attacked.

There are no reliable silvicultural strategies for dealing with the adelgid—yet. As this insect's presence increases in Rockingham County, monitoring of hemlock areas in the Town Forest, especially Stand B, is advisable. Salvage of affected trees can then be arranged. Pre-salvage—in anticipation of an adelgid attack—is not recommended. As a critical forest species for wildlife, and a signature tree of our forested landscape, hemlock stands are far too valuable to harvest unless necessary.



BOUNDARY LINES

Locating and demarcating property lines is critical for avoiding the costly quandaries of timber trespass and property encroachment. To our knowledge, a perimeter survey of the Rye Town Forest currently does not exist. Fortunately most of the boundaries are lined by stone wall, and are readily identifiable in the field.

A durable method to demarcate the boundaries is with blaze marks and brush-on paint, which can last up to 25 years. Paint should be heavy-duty surveyor's grade. Boundary blazing for the entire Rye Town Forest perimeter is strongly recommended in the near future.

LAND PROTECTION

The Rye Town Forest was established by a vote of the townspeople in 1981, at which time the Rye Conservation Commission became officially responsible for its management. Permanent protection from any development was achieved by Town Meeting vote in March 2000, when a conservation easement was granted on the property to the Rockingham County Conservation District (RCCD). The application of forestry and silvicultural management are is encouraged and is consistent with the spirit of the conservation easement. RCCD must be given 45 days notice before forest management activities can be carried-out.



APPENDICES

Appendix A

SCIENTIFIC NAMES AND ABBREVIATIONS FOR TREE SPECIES

Softwoods

White Pine	WP	<u>Pinus strobus</u>
Red Pine	RP	<u>Pinus resinosa</u>
Pitch Pine	PP	<u>Pinus rigida</u>
Eastern Hemlock	HM	<u>Tsuga canadensis</u>
Red Spruce	SP	<u>Ricea rubens</u>
Eastern Red Cedar	RC	<u>Juniperus virginia</u>

Hardwoods

Northern Red Oak	RO	<u>Quercus rubra</u>
Black Oak	BO	<u>Quercus velutina</u>
White Oak	WO	<u>Quercus alba</u>
American Beech	BE	<u>Fagus grandifolia</u>
Red (White) Maple	RM	<u>Acer rubrum</u>
Sugar (Rock) Maple	SM	<u>Acer saccharum</u>
White (Paper) Birch	WB	<u>Betula papyrifera</u>
Yellow (Silver) Birch	YB	<u>Betula allegheniensis</u>
Black (Sweet) Birch	BB	<u>Betula lenta</u>
Gray Birch	GB	<u>Betula populifolia</u>
Ironwood	IW	<u>Carpinus caroliniana</u>
White Ash	WA	<u>Fraxinus americana</u>
Black Ash	BA	<u>Fraxinus nigra</u>
American Basswood	BW	<u>Tilia americana</u>
Black Cherry	BC	<u>Prunus serotina</u>
American Elm	EL	<u>Ulmus americana</u>
Bigtooth Aspen (Popple)	PO	<u>Populus grandidentata</u>



Appendix B

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APPENDIX C

FORESTRY GLOSSARY

Aquifer	Subsurface water reservoir.
Basal Area	The number of square feet contained in the cross-section of a tree at breast height (4.5 feet from ground level).
BA/Acre	<u>Basal Area per Acre</u> , given in square feet. This is a measure of tree density in a forest.
Biodiversity	The relative variety and abundance of all living species, in terms of their genetic composition, and the communities, ecosystems, and landscapes in which they occur.
Biomass Operation	Logging operation which involves chipping and marketing of tree tops and brush. Analogous to “chipping operation”.
Blaze Mark	Axe mark that scrapes the bark surface of a tree, usually to demarcate a boundary line or trail.
BF	Board feet.
Board Foot	A unit of volume measurement equal to the volume in a 1" x 12" x 12" block of wood.
Bole	The trunk section of a tree.
Boltwood	A forest product, primarily from birch or maple, that is used for dowels, spindles, and other “turned” stock.
Cavity Tree	Hollow, rotten or dead tree in which holes are excavated by birds for feeding and/or nesting.
Chips	Forest product produced when poor-quality trees or treetops are chipped. Wood chips are used primarily as fuel to produce steam for turbines that generate electricity.
Chipping Operation	Logging operation which involves chipping and marketing of tree tops and brush. Analogous to “biomass operation”.
Commercial	Merchantable or salable timber.



Commercial Operation	Any forest treatment where the harvested trees are marketable as timber, firewood, pulpwood, or other forest product, and the landowner receives income.
Conservation Easement	A technique for protecting lands from development. Though fee simple ownership continues, development rights are permanently granted to a conservation or governmental agency.
Conventional Logging	Any traditional method of logging involving chainsaws for tree felling, and <i>cable</i> skidders or tractors to yard the trees.
Cord	Unit of wood measurement equal to the volume in a 4' x 8' x 4' space.
Crop Tree	Tree, which because of its species, growth, vigor, form, location, and/or market value is designated to be a component of the mature stand of timber and is favored silviculturally through its lifetime.
Cutting Cycle	The period of years scheduled between harvests. Analogous to “harvest cycle”.
DBH	<u>Diameter at Breast Height</u> , or the diameter of a tree at a level 4.5 feet above the ground.
Dieback	The condition where a tree suffers increasing mortality of its crown from the outside tips towards the inside stems.
Early-successional	The pioneering tree and plant growth, mostly shade intolerant species, that become established in a disturbed site.
Edge	The demarcation or zone where different natural habitats come together.
Ephemeral Pool	An temporary body of water, found in the forest, and usually present only in wet seasons, including spring, autumn, and/or winter. Ephemeral pools serve as a vital breeding ground for amphibians due to the absence of fish, which are predatory.
Epicormic Branching	The sprouting of adventitious buds along a tree’s bole and branches, often as a result of environmental stress.
Even-aged	A forest stand where tree age variation in the main forest canopy does not exceed 25-30 years, and no more than two age classes are present.
Forest Type	An area of homogeneous forest growth, defined by species mix, tree density, and relative tree age.



Forest Succession	The natural trend where fewer, increasingly shade-tolerant species dominate a site over time. Natural or human-induced disturbances interrupt this trend, allowing greater species diversity that includes less shade tolerant species.
Fragipan	A semi-impervious subsurface soil layer of compacted clay.
Hardpan	A impervious subsurface soil layer of compacted clay.
Harvest Cycle	The period of years scheduled between harvests. Analogous to “cutting cycle”.
Intolerant	Any tree species that has difficulty becoming established or thriving under the shade of overtopping trees.
Mast	Fruit produced by trees that is usually edible for wildlife. May be hard (acorns, beechnut, etc.) or soft (cherry, maple "winged" seed pods, etc.).
Mature Timber	A) <u>Biological</u> maturity is the stage where a tree’s death is imminent, and in silvicultural terms, prior to the next harvest. B) <u>Economic</u> maturity is the stage where a tree's grade and value will deteriorate if left until the next harvest. C) <u>Financial</u> maturity is the stage where timber has reached its peak growth (and rate of return).
MBF	<u>Thousand Board Feet.</u>
Merchantable	Timber that is marketable.
Mid-story	The middle canopy layer in a forest stand, usually consisting of larger saplings and pole-sized trees.
Multi-aged	A forest stand characterized by a variety of age classes and tree age spread of more than 25 years. Analogous to “uneven-aged”.
Overstory	The upper, or highest, canopy of forest growth, including the tallest and largest trees in the stand.
Pole	A tree 4 to 10 inches in diameter (DBH).
Pre-commercial	An unmerchantable tree.
Pre-commercial Operation	A forest treatment, such as tree pruning or thinning in a young stand, that does not yield merchantable products.



Pulp(wood)	A forest product from low quality trees or small stems that is the raw material for paper.
Regeneration	Young forest growth, i.e., seedlings.
Rotation	The growth time planned for a forest stand or individual trees, between establishment and maturity. Thereafter, the stand or tree is harvested and new forest growth is regenerated.
Sapling	A tree 1 to 4 inches in diameter.
Sawlog	A forest product, from trunk section of a tree, that is sawn into lumber.
Sawtimber	Trees of sawlog size, or above 10 inches at DBH.
Scarification	Scraping or raking of the soil's duff layer to expose the mineral seed bed thereby improving germination conditions for new forest growth.
Seedling	A young tree less than one inch in diameter.
Silviculture	The science of working with the forest to maintain forest health, improve tree growth and value, produce forest products, stimulate regeneration, and enhance wildlife habitat.
Silvicultural Treatments	See summary at the end of the glossary that briefly defines techniques commonly-used by Charles Moreno on woodlots in New Hampshire.
Site Index	The ratio between tree age and total height, used to express the productivity of an area.
Site Potential	The capacity of a given area of land to grow timber.
Slash	Residual brush and woody debris left to decompose on the forest floor after a logging operation.
Snag	Any standing dead tree, often used by wildlife for feeding, nesting, and/or perching.
Stand	The site that constitutes a forest type.
Stocking	The density of trees on a given area of forest, usually a stand.



Standards	In silvicultural terms, trees that are permanently (beyond the rotation period, or until natural death) left in the forest.
Stumpage	Standing timber.
Stumpage Value	The market value of timber as it stands, prior to felling.
Sustained Yield	The periodic yield of forest products from a property in a manner that does not diminish the forest's productivity, so that a harvest is possible every 10 to 20 years, indefinitely.
Tolerant	Any tree species that readily regenerates and thrives under the shade of overtopping trees.
TSI	<u>Timber Stand Improvement</u> , refers to pre-commercial operations, such as pruning, weeding, and thinning, in stands of young trees.
Understory	The lower canopy of forest growth, including seedlings, saplings and shrubs.
Uneven-aged	A forest stand characterized by a variety of age classes and tree age spread over 25 years. Analogous to "multi-aged".
Veneer	A highly valued forest product, derived from the finest hardwood logs, which are peeled into thin sheets of wood, usually for furniture-grade plywood manufacturing.
Vernal Pool	An ephemeral body of water, found in the forest, and usually present only in the spring. Vernal pools serve as a vital breeding ground for amphibians due to the absence of fish, which are predatory.
Whole Tree Chipping	Harvesting operation involving the use of a mechanical tree harvester to fell trees, as well as grapple skidders and a large stationary chipper. Well-suited for improvement cutting on low-quality stands. Analogous to "chipping" or "biomass" operation.

Silvicultural Techniques Glossary (partial list of commonly applied techniques):

Liberation harvest -- Where overtopping residual trees are removed to release favorable young growth. This normally results in a commercial harvest (revenue generating).

Weeding & Thinning – In sapling and young pole-sized stands removing poorly growing trees, while providing growing space to promising young trees. Oak and pine are generally favored. This silvicultural treatment is pre-commercial.



Pruning – Removal of all dead and live branches from the trunks of white pines (usually), up to a standard height of 17 feet. Straight, fast-growing trees between 6 and 16 inches in diameter are prime candidates for this treatment which greatly increases the grade value of the tree. This treatment is pre-commercial.

Improvement cut/crown thinning -- Similar to weeding and thinning, however, trees are older and of commercial size.

Shelterwood – In an even-aged stand, the *mature* overstory trees are removed in 3(±) harvests, to establish favorable regeneration.

Single-tree selection – Individual trees of various sizes and ages are removed with the purpose of encouraging forest regeneration and developing a multi-aged forest. This technique favors the regeneration of shade tolerant species.

Group selection – Micro (2 to 6 trees) to patch (1/4+ acres) sized groups of trees are harvested to create forest openings for regeneration and to develop a multi-aged forest.





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TOWN FOREST MANAGEMENT
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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

Harvard University
Coursework in land management and land use planning, 1986

PROFESSIONAL AFFILIATIONS

Forest Stewards Guild – Board of Directors (1999-)
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 - Present FORESTRY CONSULTANT, founder and proprietor of Moreno Forestry Associates. Twenty-three years experience managing private and public forests in New Hampshire. Projects include forest management planning, timber appraisals, timber sales, mapping, forest taxation and litigation, timber stand improvement, and conservation plans for towns, corporations, and private landowners. 25,000± acres under management.
- 1984- Present TOWN FOREST MANAGER for the Towns of Exeter, Londonderry, Atkinson, Plaistow, East Kingston, Deerfield, Epping, Northwood, Rye, Derry, Dover, Madbury, Strafford, and Rochester developing/implementing multiple-use plans for publicly owned forests.
- 1985- 1992 ALTON TOWN FORESTER. Consultant to Town on Current Use Assessment and NH Timber Tax matters.
- 1980- 1988 K-F TREE FARM, Forest Manager. Experience in all areas of woodlot management in this intensively managed, 700-acre property in Alton, New Hampshire. Selected as 1988 Belknap County Tree Farm of the Year.

PROFESSIONAL RECOGNITION

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



The Sign of Good Forestry

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EDUCATION

M.S., WILDLIFE MANAGEMENT - University of New Hampshire 2003
Thesis Project: Utilizing wet lab chemistry analysis and near infrared spectroscopy of deer feces to predict supplemental feeding in winter diets of white-tailed deer.

B.S., WILDLIFE CONSERVATION– University of Massachusetts 1998
Minor: Forestry

WORK EXPERIENCE

- 2002 – Present WILDLIFE BIOLOGIST & FORESTER – Moreno Forestry Associates
•Design and implement forestry and wildlife habitat management projects on private and public forests in New Hampshire and Maine. •Develop forest stewardship plans for towns, corporations and private landowners. •Assess and map natural resources.
- 2000 – 2002 MANAGER, UNH WILDLIFE RESEARCH FACILITY – University of New Hampshire
•Coordinated and conducted research investigating white-tailed deer energy metabolism.
•Coordinated husbandry of the UNH white-tailed deer herd.
- 1999 – 2000 WILDLIFE TECHNICIAN – NY State Department of Environmental Conservation (Non-game)
•Oversaw lower Hudson Valley peregrine falcon management activities: nest monitoring and banding of young (including direct interaction and coordination with DEP biologists and NY State Bridge Authority). •Responsible for periodic non-game management: reptile and amphibian inventory in Wildlife Management Areas (WMA's), GIS/Natural Heritage Program review and reply to inquires concerning possible T/E species habitat. •Assisted in damage/nuisance control site visits and evaluations for marauding black bears. •Assisted in study marking/monitoring Canada geese to determine survival, distribution, movements, and harvest success of resident/migrant populations. •Conducted study determining wood duck recruitment success.
- 1998 – 1999 WILDLIFE TECHNICIAN – NY State Department of Environmental Conservation
•NYS cooperative hunting area and roadside checkpoint attendant. •Bi-weekly assigned to public wildlife phone duty personnel. •Provided technical and field assistance to WMA and multiple-use area (MUA) coordinators regarding posting wildlife and habitat management properties.
- 1997 – 1997 RESEARCH TECHNICIAN – Institute of Ecosystem Studies
•Performed transect/drag sampling for black-legged ticks. •Executed daily small mammal trapping/tagging of white-footed mice and eastern chipmunks with Sherman traps. •Slide preparation and inspection for *Borrelia burgdorferi* to determine site-specific infection rates.
•Constructed small mammal exclosures and silted track plates (baited with freeze-dried gypsy moth pupae) for mouse predation study.

Publications

- Predicting supplemental feed in winter diets of deer: an evaluation of fecal indicators. 2003. Final Report submitted to: Wildlife Division, New Hampshire Fish and Game Dept. Concord, NH. 30pp.
- Eder, Incorporated Columnist. Author of monthly internet column re: White-tailed deer biology and behavior. May 1998 – November 1998. Site: www.edersbow.com.