FOREST MANAGEMENT PLAN

for the

Henderson-Swasey Town Forest

Exeter, New Hampshire

Prepared for:
Exeter Conservation Commission
Exeter, New Hampshire

Prepared by:
Charles Moreno, Consulting Forester
Moreno Forestry Associates
PO Box 60, Center Strafford, New Hampshire 03815
(603) 335-1961

October 25, 2011

_____

Charles Moreno, NH LPF #115
Consulting Forester

Report Copy # _____

FOREST MANAGEMENT PLAN

for the

HENDERSON-SWASEY TOWN FOREST
Exeter, New Hampshire

October 25, 2011

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

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

Charles Moreno, Consulting Forester
Strafford, New Hampshire (603) 335-1961

TABLE OF CONTENTS

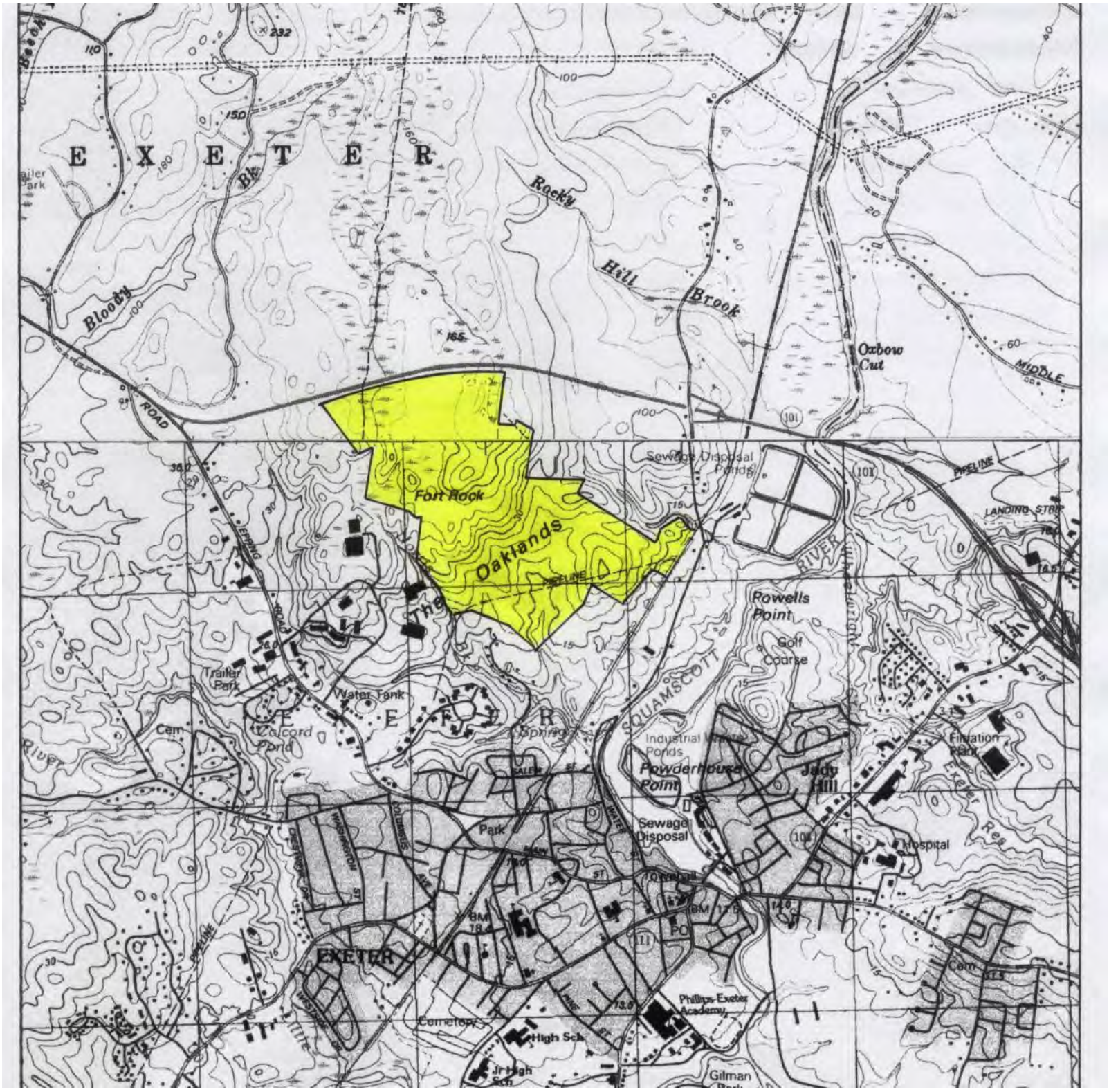
Page

MAPS

MAP SCALE:

1 inch = 2000± feet

Locus Map
of the
Henderson-Swasey Town Forest
Exeter, New Hampshire
240.5± Acres



USGS Topographic Map, "Exeter" Quadrangle

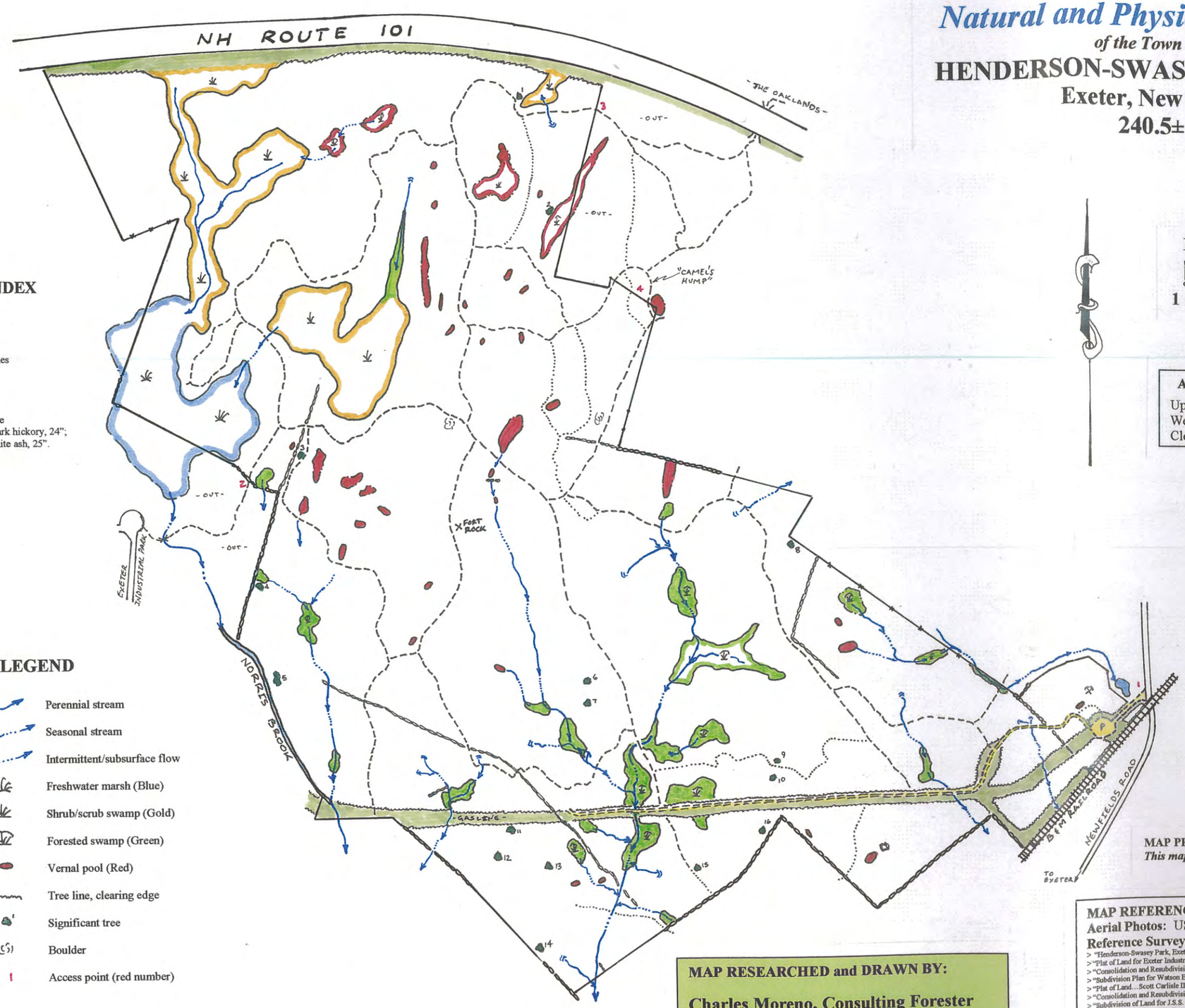
Natural and Physical Features Map

of the Town of Exeter's

HENDERSON-SWASEY TOWN FOREST

Exeter, New Hampshire

240.5± acres



SIGNIFICANT TREE INDEX

1- Hemlock, 36"± DBH, almost dead
2- Black gum, 18"±
3- Hemlock, 32"±, very old tree
4- White oak, 48"±, double trunk
5- Grove with 100'– 120' tall white pines
6- Red oak, 36"±, growing over rock
7- Red oak, 60'±, very old tree
8- Beech, 30"±, den tree
9- White oak, 55"±, very old tree
10- White oak, 52"± DBH, very old tree
11- Group of large hardwoods: Shagbark hickory, 24"; Red oak, 30"; Red oak, 22"; White ash, 25".
12- Big-tooth aspen, 25"±
13- Red oak, 36"±
14- Shagbark hickory, 27"±
15- Red maple, 24"±
16- Red oak, 65"±, double trunk

MAP LEGEND

Property Line		Perennial stream	
Stonewall		Seasonal stream	
Barbed wire		Intermittent/subsurface flow	
Railroad tracks		Freshwater marsh (Blue)	
P	Parking area	Shrub/scrub swamp (Gold)	
Paved road		Forested swamp (Green)	
Gravel road		Vernal pool (Red)	
Trail		Tree line, clearing edge	
Footpath		Significant tree	
Cellar hole		Boulder	
Borrow pit (abandoned)		Access point (red number)	

MAP SCALE:

0 500'

1 inch = 500± feet

ACREAGE SUMMARY

Upland forest – 203.9± acres
Wetlands – 30.8± acres
Clearings – 5.8± acres

ACCESS POINTS

1 – Newfields Road.
2 – Industrial Park cul-de-sac.
3 – Northern trail link to The Oaklands.
4 – Camel's Hump trail to The Oaklands.

MAP PREPARED FOR: The Exeter Conservation Commission

This map is not intended as a legal description or for legal purposes.

MAP REFERENCES:

Aerial Photos: USGS 1998; and NHDOT high resolution 2011 ortho.

Reference Surveys:

> "Henderson-Swasey Park, Exeter, N.H.", by Roger P. Sloan, 4/30/73. RCRD #D-4046.
> "Plat of Land for Exeter Industrial Commission", by Parker Survey Associates, Inc., 1/80. RCRD #D-10206.
> "Consolidation and Resubdivision of the Exeter Industrial Park", by Holden Engineering, Inc., 6/20/85. RCRD #D-15071.
> "Subdivision Plan for Watson Brook Wood Co.", by Holden Engineering, Inc., 12/24/86. RCRD #D-16287.
> "Plat of Land…Scott Carlisle III", by Durgin-Schofield Associates, 9/23/87. RCRD #D-17892.
> "Consolidation and Resubdivision Plan Ice Center of Exeter", by Jones & Beach Engineers, Inc., 3/4/98. RCRD #D-26425.
> "Subdivision of Land for I.S.S. & Associates", by Doucet Survey, Inc., 3/18/99. RCRD #D-27302.
> "Lot Line Revision…", by Doucet Survey, Inc., 7/1/99. RCRD #D-27641.

Property Reconnaissance:

Charles Moreno, Consulting Forester, May-Sept 2011.

MAP RESEARCHED and DRAWN BY:

Charles Moreno, Consulting Forester
Center Strafford, NH (603) 335-1961
September 2011

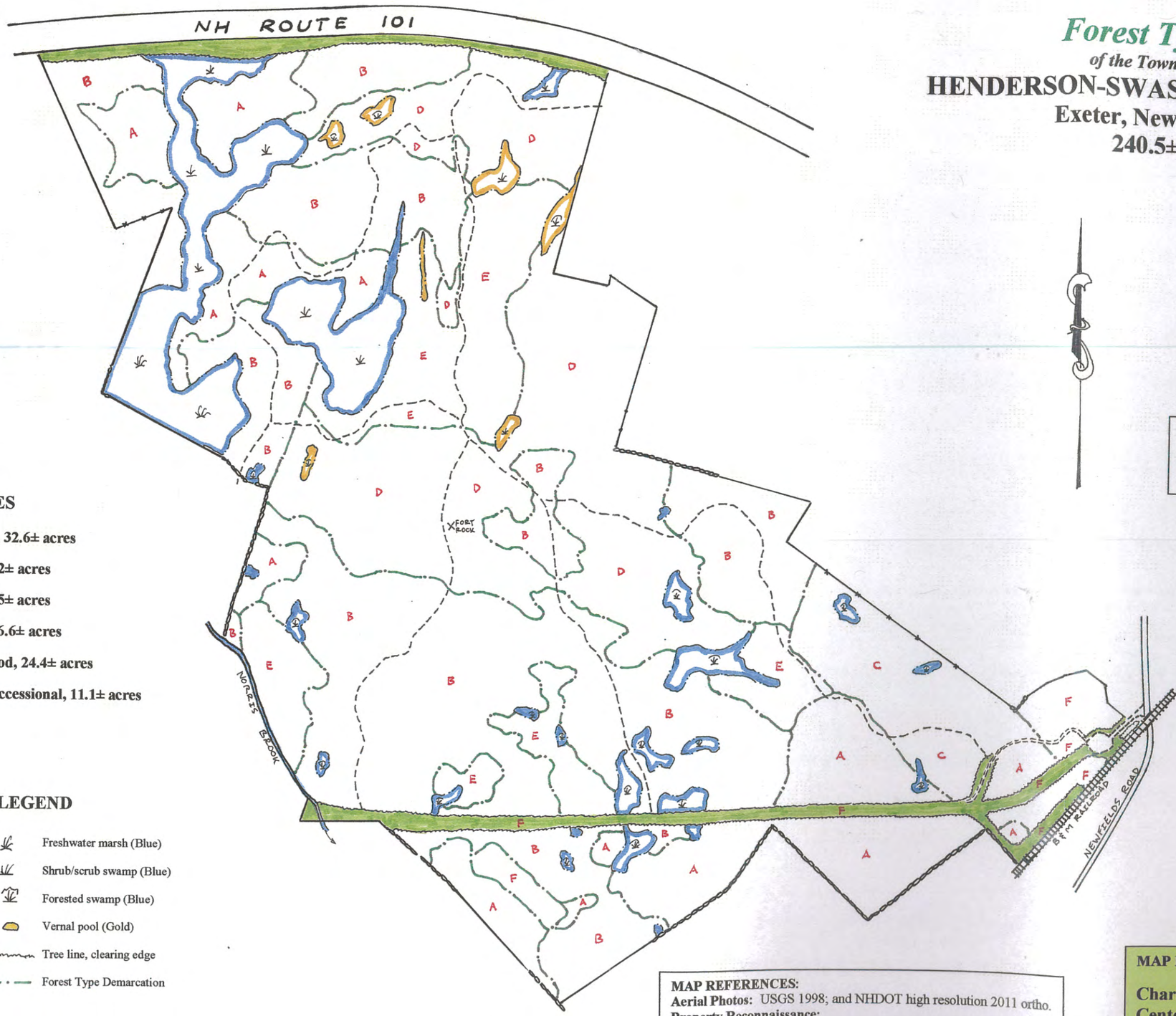
Forest Type Map

of the Town of Exeter's

HENDERSON-SWASEY TOWN FOREST

Exeter, New Hampshire

240.5± acres



MAP SCALE:

0 500'

1 inch = 500± feet

ACREAGE SUMMARY

Upland Forest –	203.9± acres
Wetlands –	30.8± acres
Clearings –	5.8± acres

FOREST TYPES

- **A – White Pine/Hardwood, 32.6± acres**
- **B – Upland Hardwood, 83.2± acres**
- **C – Mixed Hardwoods, 11.5± acres**
- **D – Hemlock/Hardwood, 46.6± acres**
- **E – Hemlock/Pine/Hardwood, 24.4± acres**
- **F – Young Forest/Early-Successional, 11.1± acres**

MAP LEGEND

- Property Line
- Stonewall
- Barbed wire
- Railroad tracks
- Paved road
- Gravel road
- Trail
- Freshwater marsh (Blue)
- Shrub/scrub swamp (Blue)
- Forested swamp (Blue)
- Vernal pool (Gold)
- Tree line, clearing edge
- Forest Type Demarcation

MAP PREPARED FOR: The Exeter Conservation Commission

This map is not intended as a legal description or for legal purposes.

MAP REFERENCES:

Aerial Photos: USGS 1998; and NHDOT high resolution 2011 ortho.

Property Reconnaissance:
Charles Moreno, Consulting Forester, May-Sept 2011.

Reference Survey:
> "Henderson-Swasey Park, Exeter, N.H.", by Roger P. Sloan, 4/30/73. RCRD #D-4046.

MAP RESEARCHED and DRAWN BY:

Charles Moreno, Consulting Forester
Center Strafford, NH (603) 335-1961
September 2011

Map *of the*

HENDERSON-SWASEY TOWN FOREST

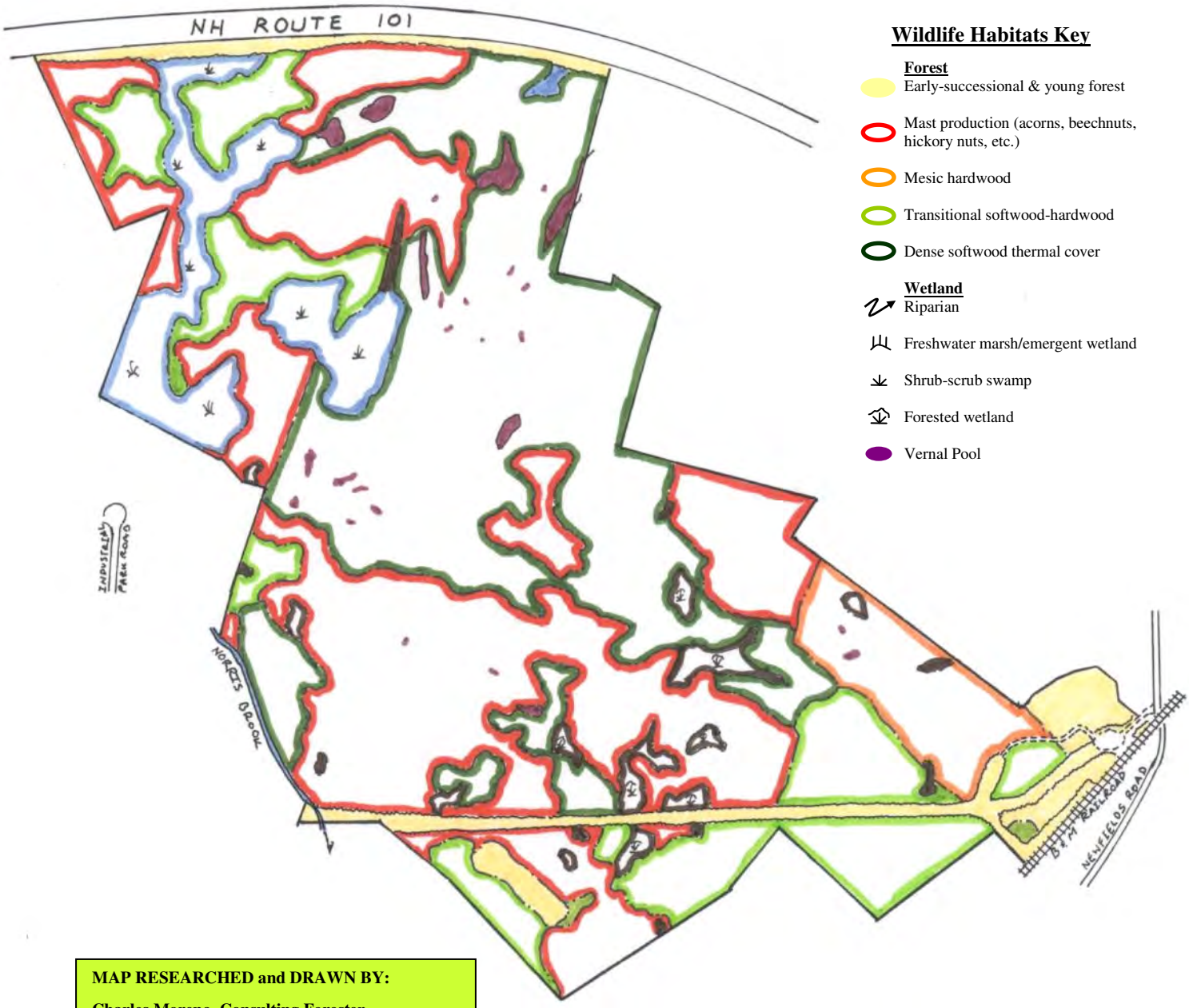
Exeter, New Hampshire

240.5± acres

SHOWING WILDLIFE HABITATS

MAP SCALE:

1 inch = 700± feet



Wildlife Habitats Key

Forest
- Early-successional & young forest
- Mast production (acorns, beechnuts, hickory nuts, etc.)
- Mesic hardwood
- Transitional softwood-hardwood
- Dense softwood thermal cover

Wetland
- Riparian
- Freshwater marsh/emergent wetland
- Shrub-scrub swamp
- Forested wetland
- Vernal Pool

MAP RESEARCHED and DRAWN BY:

Charles Moreno, Consulting Forester
Center Strafford, NH (603) 335-1961

MAP REFERENCES:

Aerial Photos: USGS 1998; and NHDOT high resolution 2011 orthophotograph.
Property Reconnaissance:
Charles Moreno, Consulting Forester, May-Sept 2011.
Reference Survey:
> "Henderson-Swasey Park, Exeter, N.H.", by Roger P. Sloan, 4/30/73. RCRD #D-4046.

Map *of the*

HENDERSON-SWASEY TOWN FOREST

Exeter, New Hampshire

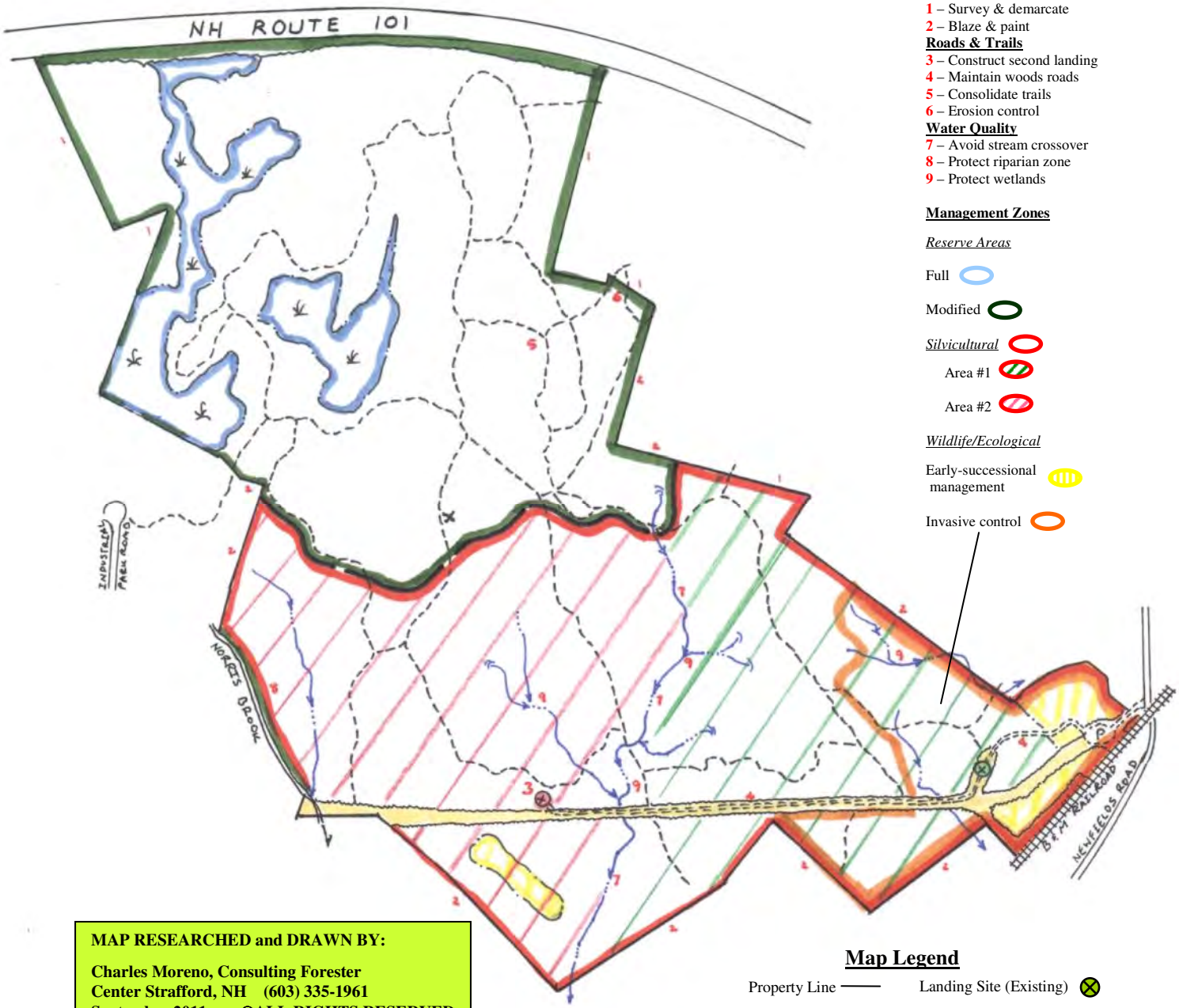
240.5± acres

SHOWING MANAGEMENT RECOMMENDATIONS

Including Management Zones

MAP SCALE:

1 inch = 700± feet



Recommendations Key

Bounds
1 – Survey & demarcate
2 – Blaze & paint

Roads & Trails
3 – Construct second landing
4 – Maintain woods roads
5 – Consolidate trails
6 – Erosion control

Water Quality
7 – Avoid stream crossover
8 – Protect riparian zone
9 – Protect wetlands

Management Zones

Reserve Areas

Full

Modified

Silvicultural

Area #1

Area #2

Wildlife/Ecological

Early-successional management

Invasive control

Map Legend

Property Line

Parking Area P

Woods Road

Trail

Tree Line

Landing Site (Existing)

Landing Site (Proposed)

Fort Rock

Marsh/Scrub-Shrub Swamp

Seasonal Stream

MAP RESEARCHED and DRAWN BY:

Charles Moreno, Consulting Forester
Center Strafford, NH (603) 335-1961

MAP REFERENCES:

Aerial Photos: USGS 1998; and NHDOT high resolution 2011 orthophotograph.
Property Reconnaissance:
Charles Moreno, Consulting Forester, May-Sept 2011.
Reference Survey:
> "Henderson-Swasey Park, Exeter, N.H.", by Roger P. Sloan, 4/30/73. RCRD #D-4046.

INTRODUCTION

The HENDERSON-SWASEY TOWN FOREST
Exeter, New Hampshire

INTRODUCTION

The Henderson-Swasey Town Forest is a 240.5± acre community-owned forest that lies about one mile north of downtown Exeter. Conserved in the early 1970's, with additional parcels added in recent years to the original acreage, the tract provides the town with valuable open space for public recreation, wildlife habitat, and watershed protection. Together with an adjacent community property, "The Oaklands", which lies north of the Route 101, Exeter owns nearly 500± acres of preeminent conservation land in close proximity to its densely-settled center.

An extensive recreational trail network passes through the Town Forest's scenic upland forest, as well as along its wetlands, and past the local landmark known as "Fort Rock." The tract contains a variety of forest/wetland cover types and habitats. The property is also a headwater watershed for the nearby Squamscott River.


The rugged rock formation known as "Fort Rock".

This forest management plan is intended as a guide for the management and protection of the Henderson-Swasey Town Forest's natural resources, as well as to address community use and recreational activity on the property. The plan is based on detailed forest analysis in concert with the objectives of the Exeter Conservation Commission, which is responsible for the management of the property. The plan is a "working" document; over time it will likely require updating to reflect ongoing management activities, unforeseen natural disturbances and conditions, as well as evolving community interests.

PROPERTY INFORMATION

LOCATION

The Henderson-Swasey Town Forest is located in Exeter, New Hampshire, west of Newfields Road, and less than a mile from the town center. The main access point is at the railroad bridge overpass on Newfields Road, north of town, where a gravel road leads to a parking area. The property occupies the open space roughly bounded by the railroad tracks and the now or former Fort Rock (Henderson) Farm on the south, Route 101 on the north, and the Exeter Industrial Park on the west. The Squamscott River flows just east of the property.

GEOGRAPHY

The land is situated on the Gulf of Maine Coastal Lowland[1], about 10± miles inland from the Atlantic Ocean, and lies near the northerly extent of the Appalachian oak-pine forest[2]. Soils in this region, where climate is moderated by the sea, are formed from glacial tills and marine deposits and are underlain by metamorphic bedrock. The land is generally level to moderately sloped, with elevations ranging from about 40 to 160± feet above sea level.

REFERENCE INFORMATION

Acreage: TOTAL – 240.5± Acres

Upland forest –	203.9± acres
Wetlands –	30.8± acres
Clearings –	5.8± acres

Tax Maps: Exeter Tax Map 39, Lots 2 and 3; Map 40, Lot 13; and Map 49, Lot 8.

Aerial Photos: 1998 USGS; NH DOT high resolution orthophotography 2010.

Deeds: Recorded at the Rockingham County Registry of Deeds (RCRD), with the Exetere Conservation Commission named as Grantee.

> Initial conveyance, 17± acres. granted by the Exeter Industrial Development Corporation on December 4, 1968; RCRD Book 1943, Page 267.

> Right-of-Way conbveyance from Newfields Road granted by Ruth D. Churchill on January 23, 1960: RCRD Book 1976, Page 428.

> Main forest conveyance including the "wooded section of the adjacent Fort Rock Farm", granted by Leona Day Henderson on February 19, 1971; RCRD Book 2056, Page 64.

> Several other deeds grant parcels in the northwestern section of the property.

Surveys:

> "Henderson-Swasey Park, Exeter, N.H.", by Roger P. Sloan, dated April 30, 1973. RCRD #D-4046.

> "Plat of Land for Exeter Industrial Commission", by Parker Survey Associates, Inc., dated January 1980. RCRD #D-10206.

> "Consolidation and Resubdivision of the Exeter Industrial Park", by Holden Engineering & Surveying, Inc., dated June 20, 1985. RCRD #D-15071.

> "Subdivision Plan for Watson Brook Wood Co.", by Holden Engineering & Surveying, Inc., dated December 24, 1986. RCRD #D-16287.

> "Plat of Land…Scott Carlisle III", by Durgin-Schofield Associates, dated September 23, 1987. RCRD #D-17892.

> "Consolidation and Resubdivision Plan Ice Center of Exeter", by Jones & Beach Engineers, Inc., dated March 4, 1998. RCRD #D-26425.

> "Subdivision of Land for J.S.S. & Associates", by Doucet Survey, Inc., dated March 18, 1999. RCRD #D-27302.

> "Lot Line Revision…", by Doucet Survey, Inc., dated July 1, 1999. RCRD #D-27641.

---

[1] Keys, J.E. and C.A. Carpenter. 1995. Ecological Units of the Eastern United States: First Approximation. U.S. Department of Agriculture, Forest Service.

[2] Sperduto, D. D. and W.F. Nichols. 2004. Natural Communities of New Hampshire. New Hampshire Natural Heritage Bureau and The Nature Conservancy.

DEED RESTRICTIONS

The Leona Day Henderson conveyance, RCRD Book 2056, Page 64, specifies several conditions for the Town Forest property held under this deed. The property is to be "administered and maintained" by the Exeter Conservation Commission following a "multi-use concept" including;

1) "As a wildlife refuge", including management and "absolute prohibition against hunting."
2) "As a recreational area", with trails, but excluding camping, open fires, and motor traffic, except for "lumbering" and fire protection. Snowmobiles and ATV's are prohibited by the deed.
3) "As a nature-study area".
4) "As a forestry area" demonstrating forestry practices and selective cutting, and guided by a plan.

OBJECTIVES, RECOMMENDATIONS, and LOGISTICS

PROPERTY MANAGEMENT OBJECTIVES

Recommendations for the management of the Henderson-Swasey Town Forest are based on natural resource findings and long-term management objectives, which the Exeter Conservation Commission has carefully considered for the property. These objectives include:

- **Designate two management zones: reserves and silvicultural. Actively manage silvicultural sections.** Proposed reserve areas cover the remote northern half of the Town Forest. Sections proposed for silvicultural management include most of the tract's southern area, covering approximately 50% of the property area. This section would be actively managed for wildlife habitat enhancement, forest health, and long-term forest productivity.

- **Maintain and enhance wildlife habitat.** As a large open space block near the town's center, the property provides valuable habitat for mammal, avian, reptile, and amphibian species. Substantial area will be withheld from active management as reserve. In these areas, older forest dominates; embedded features such as vernal pools are protected. In managed areas, silvicultural activity will complement and enhance woodland habitat over time. Increasing the forest's structural complexity is fundamental to long term habitat improvement. There are also opportunities to sustain the property's early-successional habitats. The overall objectives are to protect valuable wildlife features, while providing varied cover and remote habitat to benefit a broad diversity of wildlife.

Large woody debris provides habitat to a multitude of creatures.

- **Protect water quality and wetland/stream integrity**. The Conservation Commission and other recreational stakeholders have endeavored to protect water quality and wetland features by: 1) Mitigating potential pollution sources, including litter and pets; 2) Discouraging motorized vehicle usage; and, 3) Installing appropriate stream-crossing fords for hikers and mountain bikers. In silvicultural management areas, strict application of NH Best Management Practices (BMP's) is necessary to prevent stream siltation or despoilment of wetlands.

The Town Forest's freshwater marsh.

- **Maintain a healthy forest:** In all areas: 1) Maintain a healthy forest ecosystem which reflects the natural growth patterns and capacity of the land; 2) Respond to invasions or outbreaks of exotic plants, insects, or diseases, especially if forest ecosystem integrity is threatened. In managed areas: 1) Foster resilience to insects and disease; 2) Long-term, maintain and promote a forest stocked with valuable, high-quality timber; and 3) Encourage natural regeneration of tree species adapted to the property's various site conditions. A forest thinning in 1992 on about 30± acres of the southeastern acreage in the Town Forest served to improve forest growth and promote quality timber—a similar approach is to be applied on the forest's silviculturally managed areas.

- **Manage for public recreational uses.** The Town Forest's trail network, which traverses nearly 5 miles of the property, is one of the most popular mountain biking destinations in the Seacoast area. Trails are mostly well-maintained by a mountain biking association. The trails are also widely used by local residents for walking, often with dogs. Snowshoeing, Nordic skiing, trail running, bird watching, nature study, and photography are other common activities. Prohibited activities include hunting, and travel by ATV's and snowmobiles. The Conservation Commission does not wish to emphasize one recreational use over another, and intends to balance natural resource protection with increasing recreational usage.

- **Foster outdoor education and community interest.** The Conservation Commission would like to utilize the Town Forest for educational walks or workshops related to forest management, wildlife habitat, geology, etc. Use of the forest by local schools, conservation groups, families, and others for educational purposes is desired.

- **Sustainably manage the timber resource.** The objectives of silvicultural management are to upgrade timber quality and improve overall forest value over the long-term. Periodic harvests are for the purpose of maintaining forest health and wildlife habitat, and improving forest growth. Timber income is to be used by the Conservation Commission to self-fund Town Forest management, to minimize or avoid the use of town funds.

- **Control exotic, invasive plants.** Southeastern sections of the property contain a severe infestation of non-native, invasive plants. The property interior remains invasive-free. The Conservation Commission recognizes the seriousness of this condition, and continued, intensive control/eradication is a key recommendation of upcoming forest management. Without control, these plants will diminish the property's biodiversity, habitat, ecological functioning, and scenic beauty over time.

- **Maintain the forest's scenic beauty.** Manage for natural forest attributes. Aesthetics will be considered while preparing and implementing silvicultural practices. NH Best Management Practices (BMP's) must be implemented by contractors during forest harvest operations. Avoid damage to stone walls.

Quarried rocks with star bit marks along edges.

- **Protect the property's historic features.** The property's stonewalls, including the outstanding fitted wall along the Fort Rock Farm boundary, are vestiges of the land's agricultural past. The property also contains the remains of numerous rock quarries. These and any other historic features should be protected from damage or deterioration.

CAPSULE RECOMMENDATIONS for PROPERTY

- **Town Forest Access –** Present Town Forest access is adequate for silvicultural management of approximately half the property acreage. Further expansion of woods road into the forest interior is not recommended: Monetary cost, natural resource impact, and conflict with other recreational uses far outweigh the benefits of improving access. Also, do not expand the recreational network which canvasses almost the entire forest, and totals over 4 miles in length. Retire "rogue" trails in sections of the property. Continue to oversee trail maintenance work by recreational groups. Define a uniform color-coding system for trail identification.

- **Recreation and Educational Uses –** The Conservation Commission has worked with the New England Mountain Bikers Association to manage the property's trail system, which is heavily used by mountain bikers. Other low-impact, trail-based recreational use is encouraged. The Conservation Commission would like to increase opportunities for use of the Town Forest as an educational resource. Educational tours, field workshops, and community events may be staged at the forest. Expanded community awareness and use of the Town Forest for recreation and educational purposes builds the public's affinity for the outdoors and often rallies support for other conservation initiatives.

- **Water Quality –** Protect water quality, as the property's surface drainages flow to the nearby Squamscott River. Continue to encourage removal of litter and pet waste by community users. Apply NH Best Management Practices (BMP's) for recreational and forestry activities at stream crossings or in wetland riparian zones. Leave protective buffers around wetlands, particularly vernal pools and the marsh land areas.

- **Wildlife –** Continue management of the existing forest *towards complex structure* in terms of tree age, canopy cover, and woody debris. Promote cover type diversity, including: a) Perpetuating young forest/early-successional growth; b) Maintaining ample intermediate-aged forest (75 -125± years), with scattered older growth (140+ years) forest pockets and individual trees; and c) Maintaining a large area of older growth forest in the property interior. In addition, in managed areas, enhance existing habitat features such as mast potential, availability of cavity trees, and the continued accumulation of large woody debris. Protect vernal pool network in all areas.

- **Silviculture** – Implementation of silvicultural management on approximately half the Town Forest acreage has the purposes of maintaining forest health, enhancing habitat, improving timber growth and value, diversifying forest regeneration, and creating complex forest structure. Silviculture treatments are recommended on a *15± year harvest cycle.* A *sustainable approach is essential*—harvests should not exceed the timber volume that the forest is capable of re-growing *in 12 - 15 years*—as detailed in the silvicultural prescriptions. In managed areas, encourage tree species diversity while decreasing the proportion of beech.

- **Invasive Plant Control –** Invasive plant control efforts should be initiated prior or immediately after forest harvesting, as exotics can quickly overtake new forest openings. A strategic plan is needed due to the limited financial resources and the large area (30± acres) involved. While seed capture and complete uprooting of exotic plants is preferable, these methods are labor intensive; herbicide application by licensed contractors is likely necessary in severe areas. Well-organized volunteer help can also be effective.

- **Boundary Maintenance** – Locate property lines using existing property surveys for the property as well as for adjacent lands (see "Surveys" in the "Property Information" section). Surveying may be needed to locate lines in northeasterly areas. Long-term demarcation and maintenance of clearly located boundaries involves axe-blazing trees along the lines, followed by paintbrush application of surveyor's-grade paint on the blazes. Blazes should be re-brushed every 10 years. The Town Forest requires approximately 13,000± feet of boundary blazing.

PROJECT FUNDING

Funding sources for Town Forest management are: 1) outside grants (though not readily available for all needed projects); 2) periodic income from the sale of timber from the Town Forest; and 3) direct expenditures from the Conservation Commission's conservation fund or the town general fund. The Exeter Conservation Commission will endeavor to manage the Town Forest in a self-funding manner, from timber sale proceeds and outside grants, and avoiding use of other conservation reserves where possible.

The 1992 improvement harvest on approximately 30± acres of the Town Forest generated about $2,000 in net revenue. This conservative harvest focused on forest health and improvement, where declining, poor quality, or low-value trees were generally removed. In 1998, the clearing of mature oak and pine sawtimber from an 8-acre forest strip for gas line expansion yielded about $10,000.

Carefully rendered forest and habitat improvement work on the Town Forest's managed acreage is expected to generate approximately $12,000± in revenue every 15± years. This estimate assumes sustainable harvesting on approximately 90± acres of well-established forest. Due to factors such as timber markets; potentially high proportions of poor quality, low-value timber at first; as well as, rough terrain and long skidding distances, it is difficult to project future harvest revenues precisely, particularly without forest inventory data.

The Conservation Commission will likely use income from the sale of timber to fund other needed projects in the Town Forest such as invasive plant control, boundary blazing, and early-successional habitat maintenance. Well-organized, community volunteer efforts can also help defray property management expenses.

PROPOSED SCHEDULE of MANAGEMENT ACTIVITIES

Year	Season	Activity	Whom
2011	Fall	Forest management plan (240± acres).	F
2012	Winter	EEC meeting with NEMBA to review trail maintenance, color-coding system, and discuss upcoming forest management activities.	ECC & VO
	Spring	Begin invasive plant control in Management Area #1 (MA #1).	C
	Spring	Preparation of harvest in Management Area #2.	F
	Summer	Clear and construct second landing site. Implement timber harvest in MA #2. Clear early-successional area.	C
	Early Fall	Follow-up invasive plant control (MA #1).	C
2013	Spring	Recreational trail maintenance	VO
	Spring	Invasive plant control (MA #1 and #2).	C
	Spring	Preparation of harvest in MA #1.	F
	Summer	Implement timber harvest in MA #1. Clear early-successional areas.	C
	Early Fall	Follow-up invasive plant control (MA #1 and #2).	C
2014	Spring	Recreational trail maintenance	VO
	Spring	Invasive plant control (MA #1 and #2).	C
	Summer	Blaze and paint known Town Forest boundary lines.	F
	Summer	Town Forest educational tour/event.	E & F
	Early Fall	Follow-up invasive plant control (MA #1 and #2).	C
2015-2030	Spring	Annual recreational trail maintenance.	VO
	Spring and early fall	Invasive plant monitoring and control, as needed.	F & C
2027±	Summer or Winter	Second phase silvicultural harvest – MA #2. Re-clear early-successional areas.	F & C
2028±	Summer or Winter	Second phase silvicultural harvest – MA #1. Re-clear early-successional areas.	F & C

KEY: C = Contractor (logging or invasive plant control)
E = Exeter Conservation Commission
F = Forester
V = Volunteers
VO = Volunteer Organization

MANAGED AREAS and RESERVE AREAS

INTRODUCTION

The Exeter Conservation Commission (ECC) carefully considered the option of "doing nothing" on the Henderson-Swasey Town Forest, that is, not actively managing any section of the forest. This option excludes all forestry work—timber harvesting and habitat management—with the exception of the gas line, which is maintained as fallow herbaceous cover by the gas company(s). Recreational trail management would remain passive. The spread of exotic, invasive plants would continue unchecked, primarily due to a lack of funding to confront the problem.

The main motivation for a course of inaction is avoidance of the inevitable visual disruption caused by logging. As with almost any forest disturbance, human-induced or natural, the change in scenery in areas visited by the public generates negative reaction. The Henderson-Swasey Town Forest is high-profile, containing a heavily-used trail network. Timber harvesting in the Town Forest is likely to incite strong initial reactions both negative and positive.

The ECC toured a carefully planned silvicultural harvest in the local area and considered the ecological benefits both for forest health and habitat. They also considered the management history of the Henderson-Swasey Town Forest itself, where a forest improvement harvest was implemented in the most accessible section of the property in 1992.

Ultimately, the ECC decided that continued silvicultural management on a section of the Town Forest is desirable for the community for the following reasons: 1) To generate funding to control invasive plants and carrying-out other critical management; 2) To implement wildlife habitat enhancements; and 3) To foster an important educational dimension for the public regarding the benefits of forest management while using a readily-accessible, real-life example.

Pursuing a balanced approach, the ECC decided to exclude active silvicultural management from a substantial area of the Town Forest. This approach is easily adopted by opting not to extend the existing woods road, thus keeping much of the Town Forest acreage inaccessible to management. While timber harvesting is not planned on this half of the property, the approach is not strictly "do nothing". This forest management plan provides a baseline natural resource analysis of the entire property, including areas that are not actively managed. The ECC may someday choose to react to a future natural disturbance or forest threat in the unmanaged, or "reserve", section, as described below, thus doing "something".

MANAGEMENT ZONES

Management of the Henderson-Swasey Town Forest is divided into two zones. The intention is to focus silvicultural management in areas with feasible access, and away from sensitive and/or remote areas. The two main zones are: a) The actively managed silvicultural zone, or the "managed area", covering 120± acres, which includes the gas line; and b) The "reserve area", an extensive zone that is left to the course of nature with limited human intervention, also covering about half the property, or 120± acres. Reserve areas are differentiated as two types: "full reserve" and "modified reserve". The map entitled "Management Recommendations", on page 5, illustrates the location of the property's managed area and reserve areas.

The silviculturally managed zone is divided into two management areas (see "Management Recommendations" map). Management Area #1 covers approximately 50± acres, while Management Area #2 includes about 60± acres. The management areas correspond to access from two planned landing sites. Management area layout considers minimizing skidding distances while avoiding the crossing of a large central stream. Further discussion follows in the "Property Access" section.

The reserve area covers the more remote property interior, which includes the property's major wetlands and vernal pool concentrations, as well as, Fort Rock. Full reserve covers areas where silvicultural management is *completely excluded*, and where human intervention is limited to trail maintenance, exotic plant (and possibly insect and disease) control, and minimal impact wildlife projects (such as tracking and inventory). The property's fragile environments, such as the marshlands, forested wetland interiors, vernal pools, and the Norris Brook riparian area are recommended for full reserve status. For the Town Forest, the proposed full reserve area covers approximately 30± acres.

While modified reserve areas are not actively managed, flexibility is intended in allowing for *reaction to significant natural disturbances*. For example, if wind or ice storm damage occurs in a portion of the modified reserve area, after analysis, the Conservation Commission may decide to salvage damaged or uprooted timber and to thin additional areas, or, alternatively, leave the site entirely alone. Modified reserve areas are situated in interior sites that are normally difficult to access due to skidding distances and road-building costs, but which may be addressed in response to acute or catastrophic disturbances. Modified reserve areas may also come under active management if interior road access is someday expanded. However, the Conservation Commission has decided not to extend road access for the foreseeable future.

Chapter V, "Forest Type Descriptions and Prescriptions", provides an in-depth analysis of the entire forest, based on descriptions of the property's forest type. Forest type delineations are shown in the "Forest Type" map on page 3. Corresponding silvicultural prescriptions are summarized for the forest type areas in the silvicultural management zone.

PROPERTY ACCESS

ACCESS POINTS

The main access for the Henderson-Swasey Town Forest is via a gravel road that enters alongside the railroad overpass off Newfields Road. A sizeable parking area is readily accessed from the main road. The entrance road and parking area are well-graveled, allowing for passage of cars during virtually any season. An informational kiosk is located at the main trail head in the parking lot.

Trail to The Oaklands through the Route 101 underpass culvert.

The property may also be accessed from three other points. The northerly access is a trail connection through the Route 101 underpass culvert to the trail network in the Oaklands tract. On the south side of Route 101, the underpass trail divides and crosses a parcel owned by the State of New Hampshire. These trails enter the Henderson-Swasey tract in several locations, which are readily grouped as two access points. The southernmost of these access points is in the vicinity of "Camel's Hump", a steep trail grade over a granite outcrop.

The fourth access point is from the west via a cul-de-sac in the Exeter Industrial Park. A trail leads from the cul-de-sac across a vacant industrial park lot, presently wooded, to the Town Forest.

INTERIOR ACCESS

A woods access road leads from the parking area off Newfields Road along the gas line edge to the south central area of the property. This is the only road in the Town Forest. A 2000± foot road extension along the north side of the gas line was constructed in 2006, with the intention of creating core forest management access to the property. The road terminates at an upland site which is to be cleared for the proposed interior landing site.

2006 road construction.

Trail stepping stones across a seasonal drainage.

Despite the absence of roads, most of the Town Forest interior is readily accessible to recreational users. Since the advent of mountain biking in the Town Forest in the late 1980's, the interior trail network has expanded considerably. The network extends to nearly 5± miles in length, crisscrossing nearly all sections of the forest with the exception of the northwest property corner and the area south of the gas line. Members of the New England Mountain Bikers Association (NEMBA) maintain the trails, and have invested considerable effort on wetland crossings. While mountain bike activity dominates the trails, hikers and other pedestrian users also utilize the trails. The woods road and trail network are illustrated on the "Physical Features" map on Page 2.

ACCESS STRATEGY and RATIONALE

Forest Management Access

Silvicultural management of the forest requires truck access to a landing site. The "landing" is the location where harvested trees are gathered, processed, and loaded on trucks for marketing. There are two potential landing sites along the Town Forest woods road: The first is a small clearing just before the road reaches the gas line; a second, interior forest landing is recommended at the road terminus. The first landing site will provide silvicultural access to the area east of a seasonal stream that flows north-south through a series of forested wetlands. In addition, this landing provides access to the immediate area south of the gas line. The second landing will access silvicultural management in the south central and western area, as well as south of the gas line. The areas described correspond to the two management areas illustrated in the "Forest Recommendations" Map.

Beyond the landing sites, skidding distance (the distance required to haul harvested trees to the landing) and terrain are major factors in ascertaining access viability. Generally, skidding distance should not exceed 2200± feet. In the Town Forest's extremely rocky terrain, feasible skidding distances may be shorter. Thus management access to the Town Forest's remote northerly interior is unfeasible—at least from the current potential landings.

The property's recreational trails divide the property interior into multiple trail-less sections, or polygons. Forest improvement harvesting must take place within these polygons, with most activity in the polygon interiors, to avoid drastic changes in trailside scenery.

To access these harvesting areas, skid trail crossovers on recreational trails, seasonal streams, and to a lesser extent, stonewalls, are necessary. Pre-planning and layout of the skid trail network by a Forester minimizes the number of crossovers. Forest reconnaissance is necessary to locate low-impact, narrow-channel stream crossings, where possible; DES notification permitting for stream crossings while timber harvesting is required for the logger. Appropriate temporary fords using NH BMP guidelines must be installed, and then removed, by the logging contractor upon project completion.

To access forest areas south of the gas line, crossover permission must be sought from two separate natural gas companies. The process can be tedious, and requires substantial advance notice. At the gas line crossing point(s), the construction of a skidder berm or other protection will probably be required. It is also possible that the gas companies will request frozen ground (winter scheduling) for the crossovers.

Recreational Access

The creation of new trails requires approval from the Exeter Conservation Commission. Presently, the Commission does not desire further trail expansion. As long as NEMBA continues diligent trail maintenance, the current trail footprint can remain.

Rogue trails (a series of secondary routes) were noted in some areas, particularly at Camel's Hump and west of Camel's Hump. Around Camel's Hump, some of the trails are eroding as they climb a steep grade. West of Camel's Hump, some trails pass near several of the vernal pools in the area. In both cases, the secondary trails should be retired. Scattered rogue trails were also noted over rocks with sheer faces which are used by mountain bikers as jumps.

ACCESS RECOMMENDATIONS

General

- Do not extend the Town Forest woods road, or create additional new trails. The property's interior road and trail network already extends nearly 5 miles.
- Though it partially exists, uniform color-coding of the *entire* trail system with a corresponding map is recommended. The color-coding system should be approved by the Conservation Commission and maintained by one pre-selected entity or organization.
- Install two landings at planned locations on woods road to stage silvicultural activities.
- Stream crossings and erosion control measures on the woods roads and trails should follow NH Best Management Practices (BMP's) guidelines.
- Minimize the number of trail crossovers to access timber harvesting in the silvicultural management area. Pre-planning and layout of travel routes is important.
- Retire and/or attempt to manage use of rogue trails.

Maintenance

- Periodically maintain the woods road by mowing (bush-hogging) the edges on a 3 to 5 year schedule. The road bed should be maintained at a 10 to 12 foot width.
- Debris should be occasionally removed from the woods road culverts (3 to 5 years).
- Monitor woods road for erosion. Install erosion control measures when needed.
- The Exeter Conservation Commission should continue its effective relationship with NEMBA and other trail using groups, approving and delegating recreational trail maintenance.

RECREATIONAL USE of the TOWN FOREST

RECREATIONAL USES

Trail-based recreation predominates in the Henderson-Swasey Town Forest for several reasons. First, nearly 5 miles of trails crisscross the property. The trail network is easily accessed from the Town Forest parking lot or the Exeter Industrial Park. Furthermore, the Route 101 underpass culvert connects the Henderson-Swasey trail system to another extensive trail network in the town-owned Oaklands forest.

Secondly, the Henderson-Swasey Town Forest is nearly entirely forested. The property lacks other amenities such as open waterfront or field, which would allow for other forms of recreation such as boating, fishing, and/or community events staged in the field.

Finally, a major form of off-trail recreation—hunting—is prohibited by the property deed and by the town in this particular forest. Motorized vehicles are also not permitted in the Town Forest.

Mountain biking has evolved into the most popular recreational activity in the Town Forest since the late 1980's. The forest's trail network has expanded considerably as a result. There is nearly constant daily usage, and mountain biking events sometimes draw hundreds of bikers to the Town Forest. Due to the efforts of the Conservation Commission and the New England Mountain Bikers Association, trail maintenance is coordinated.

A variety of other activities occurs in the forest. The following table summarizes current recreational uses of the Town Forest:

Activity:	Major Use	Minor Use	Potential	Not Allowed
TRAIL-BASED				
Walking/hiking	✓			
Trail running	✓			
Snowshoeing	✓			
Nordic skiing		✓		
Mountain biking	✓			
Horseback riding				✓
Frisbee golf				✓
Ski biathlon				✓
Archery course				✓
ATV's/dirt bikes				✓
Snowmobiles				✓
NON-TRAIL BASED				
Bird watching	✓			
Nature study	✓			
Photography	✓			
Geo-caching		✓	✓	
Orienteering		✓		
Fishing			none	
Hunting				✓
Trapping*				✓

TRAIL RECOMMENDATIONS

- The Exeter Conservation Commission should met with NEMBA to formalize a trail maintenance system, simply to assure that important maintenance/repairs are done on a scheduled basis, and that efforts aren't duplicated or redundant. The association should also be informed of future timber harvesting plans and address concerns.
- See "Access Recommendations", above.

NATURAL RESOURCES

NATURAL RESOURCE SUMMARY

SOIL TYPES

Upland Soils

***Canton* (43)** gravelly fine sandy loam – This deep and well-drained glacial till underlies a small area in the northwestern section of the Town Forest near Route 101. The surface layer of *Canton* is gravelly fine sandy loam, with a substratum, below 2½ feet, of loamy sand with varying amounts of silt. While seasonal high water table is below 6 feet, the soil is wet during spring thaw or after extended rainy periods. Soil productivity is average to above average for pine and oak.

***Charlton* (63)** fine sandy loam – This well-drained, rocky till is found in the eastern portion of the Town Forest. Fine sand, which is moderately permeable, underlies the subsoil, two feet below the soil surface. The soil surface is generally stony, with some extremely rocky areas. Generally characterized by low knolls, the *Charlton* soil area also includes steep ridges. *Charlton* is favorable for the growth of white pine and red oak, and is operable through three seasons, with the exception of spring.

***Chatfield-Hollis-Canton* (140)** complex – Underlying more than half of the Town Forest, this soil complex is variable, including shallow-to-bedrock areas (*Hollis*), with exposed ledge or low ridges. Most areas consist of glacial till material (*Chatfield*) or gravelly pockets (*Canton*), which tend to be well-drained. The soil complex ranges from low productive potential on shallow soil areas, to good productivity for both red oak and white pine.

***Windsor* (26)** loamy sand – Found in one small pocket in the northwestern corner of the Town Forest, these deep, well-drained outwash sands are highly permeable. The soil is highly productive for pine and hardwood growth, and is operable almost year round.

Wetland Soils

***Boxford* (32)** silt loam – Found in a few small pockets in the southern portion of the property, this moderately-well to somewhat-poorly drained soil consists of silt loam with a substratum (3 feet down) of silty clay. Because of slow permeability, the soil becomes wet after a heavy rain, and remains wet late into the spring, as well as late fall. While productive for quality sawtimber growth—white pine, red oak, and black birch—operability on the site is challenging. Logging operations must be timed for dry summer or frozen winter conditions; however, favorable conditions rapidly deteriorate with rain or thaw.

***Eldridge* (38)** fine sandy loam – Found in a small pocket along the property's southern boundary, this moderately-well drained soil is located on level or low-rise areas adjacent to wetlands. Despite a seasonally high water table, particularly in the spring, this soil is still productive for both pine and hardwoods. Logging equipment can easily rut this soil during wet seasons.

***Greenwood* (295)**, ***Chocorua* (395)**, and ***Ossipee* (495)** mucky peat **–** These very poorly-drained organic soils underlie the property's saturated and seasonally-flooded pools, marshes, and

forested swamps. The accumulated organic material on wetland bottoms is extremely acidic and typically lies more than 5 feet over bedrock. Where plant material is still recognizable to permit identification of plant forms, the material is "peat". If plants are thoroughly decomposed, the organic material is considered "muck". Typically, only *Chocorua* soils support tree growth. A few hardwood trees and shrubs—species whose root systems can endure long periods of water saturation—are associated with this soil.

***Scitico* (33)** silt loam– This poorly drained soil, has a surface layer of silt loam, but is underlain by silty clay (within 1 to 2 feet of the surface). The seasonal high water table (within one foot of ground surface) limits forest growth to tree species that tolerate wet ground conditions, including white pine, red maple, and white ash. Trees growing on this soil are prone to windthrow due to shallow root systems.

WATER RESOURCES


Shrub/scrub swamp with snags.

The Henderson-Swasey Town Forest lies entirely within the Squamscott River watershed, with all *surface* waters flowing towards the brackish Squamscott River which lies about 1000 feet away. Surface water features include seasonal streams, forested wetlands, shrub/scrub and emergent wetlands, and vernal pools.

From a *subsurface* water resource perspective, a stratified-drift aquifer does not underlie the property. However, *glacio-estuarine silts and clays* underlie southeasterly sections (south of the gas line and along Norris Brook), which may include pockets of thinly saturated sand and gravel.[3] The presence of a bedrock embedded aquifer is unknown.

Surface water features in the Town Forest include several seasonal and intermittent flowages, most of which emanate from the Town Forest's rocky terrain and flow through a series of small forested wetlands before exiting the property in a southerly direction. During droughty periods, these drainages are dry. Many of these flowages are intermittent in the sense that water flows beneath the ground surface through extremely rocky areas, before resurfacing, typically following in a shallow channel, further downstream.


Open water and emergent vegetation in the marsh.

Norris Brook, which serves as a segment of the western property boundary, usually flows year round. This brook flows directly into the Squamscott River. The brook flows from an 18± acre marsh/shrub swamp system, which lies almost entirely in the westerly area of the Town Forest. A portion of the marsh is ponded, with signs of beaver activity. Emergent vegetation includes pickerel weed, sedges, cattails, and spirea. A patch of the invasive grass, *phragmites*, was also noted. The shrubland sections of this wetland system, which lie upstream, are densely vegetated with winterberry holly. Highbush blueberry, maleberry, and poison sumac are also found. Incipient forest growth includes white birch and red maple. The marshland and shrub swamps occupy very poorly drained soil areas consisting of muck and peat.

Most of the property's forested wetlands are found along the seasonal streams, generally occupying poorly drained soils. Certain tree species are tolerant of the seasonally high watertable and low-oxygen soil environment. Red maple dominants the species composition of these hydric soils, while hemlock is also common. Scattered white pines and black gums (tupelo) are found in some of the forested wetlands. The more enriched sites include yellow birch, American elm, and/or white ash.

[3] USGS, Water Resources Investigations Report 88-4128, by Richard B. Moore, 1990. Plate 8.

39 potential vernal pools were found in the Henderson-Swasey Town Forest, with their locations mapped in the "Natural and Physical Features" map. The pools are either isolated depressions, sections of forested wetlands, or have very seasonal outflow streams. Spring (April) examination, with species inventory, of each of the pools is necessary to determine their functionality.

Vernal pools are small, shallow depressions that dry in the summer, but inundate in early spring and after heavy autumn rains. The pools typically remain inundated through the winter. Due to this ephemeral nature, the pools are fish-free. Thus, vernal pools provide potential breeding habitat to several salamander and frog species, as well as fairy shrimp and a host of other invertebrates. The length of time a pool holds water in the spring—the spring hydroperiod—which may vary year to year, is an important determinant of breeding and fledging success. Many amphibians need at least 12 to 15 weeks after spring thaw.

The Town Forest's vernal pools vary in hydroperiod potential, as well as vegetative cover. Some are clear pools, while others contain wetland shrubs or tree islands. Shrub variety is moderate amongst the pools: Most contain highbush blueberry and winterberry holly; sweet pepperbush, buttonbush, and nannyberry were noted in two of the larger pools. Red maple is the most common tree. A few vernal pools contain remnant 150+ year old black gums. Hummocks in some of the pools may provide habitat for 4-toed salamanders. In summary, the Town Forest's vernal pools embody substantial hydrological and vegetative diversity. Coupled with their broad interspersion throughout the property, the Henderson-Swasey Town Forest's vernal pools are a valuable water resource feature for wildlife.

WILDLIFE HABITAT

Core Habitats

The Henderson-Swasey Town Forest contains several core habitats which include *open land*, *forest,* and *wetland.* Open land habitat includes: a) Early-successional growth on the gas line, which covers approximately 5± acres. Upland forest habitats include: b) Young forest habitat; c) mast forest; d) Mesic forest; e) Transitional softwood-hardwood forest; and f) Dense softwood thermal forest. Wetland core habitats include: g) Marsh and shrub-scrub wetlands, h) Forested wetlands and seasonal streams; and, i) Vernal pools.

OPEN LAND HABITAT

***Gas Line* -** The gas line was last mowed in 2005±. Dense herbaceous and shrub growth, with incipient sapling patches, have developed. Herbaceous growth includes Queen Anne's lace, small white aster, New England aster, and rough-stemmed goldenrod. Woody growth and shrubs include meadowsweet, sweet fern, blackberry, highbush blueberry, pin cherry, and staghorn sumac. Invasives are rampant in the eastern section, including bittersweet, multiflora rose, and autumn olive. Large white pines and red oaks line the edges of the gas line clearing.

The gas line's herbaceous and pioneer woody growth provides wildlife with dense cover, diverse food sources, and specialized nesting sites. The line provides a travel corridor for wildlife traveling between habitats within Town Forest.

Early-successional growth provides variety of berries and drupes, as well as browse to birds and mammals. Grassy vegetation and wetlands provide copious insects, which serve in the diet of a variety of animals. The forest edge serves as a transition zone to the adjacent stands. The taller trees provide good perch and roosting sites to birds.

Birds that likely utilize the gas line area include: Common yellowthroat, brown thrasher, indigo bunting, chestnut-sided warbler, eastern towhee, gray catbird, white-throated sparrow, and dark-eyed junco.

FOREST HABITATS

***Young and early-successional forest* –** A limited area of this habitat type is found in the Town Forest, confined to small pockets in the southern and eastern section of the property. These are characterized as containing dense sapling and small pole-sized forest growth, typified by Forest Type F. The sites occupied by this habitat were previously disturbed as borrow pits, or recently abandoned as field.

Creating and perpetuating early-successional conditions on the existing sections of young forest is recommended as a management strategy, if feasible. While this produces a valuable habitat type, the potential area is limited on the Town Forest, and cost is associated with maintaining them over the long term. Specific prescriptions are found in the Forest Type chapter.

Mast forest – Red oak is the primary source of hard mast—acorns—on the property. Beech, white oak and black oak, and shagbark and pignut hickory amplify the variety of mast sources on the Town Forest. Acorns rank among the most important wildlife foods in our local forests, utilized by a great variety of animals (turkey, blue jays, deer, flying squirrels, black bear, etc.). Older oaks with a well-developed, spreading crown are important for copious acorn production. Occasional large-crowned hardwoods, particularly beech, with a triple upper main stem branching habit provide ideal raptor nest sites. Forest Type B, covering a large area of the Town Forest, is the most prolific mast-producing area. This forest type is enhanced by extremely rocky terrain, which contains many holes and cavities for denning. Seasonal drainages, forested wetlands and vernal pools also provide enhancements.

Softwood-hardwood mix – Forest Type A represents established forest areas containing softwood cover (pine) and mast hardwood (red oak). Red oak provides supplemental mast. The open foliage of white pine provides limited thermal cover, however limby trees contain perch sites (barred owls—especially hemlock/pine areas) and occasional cavities. Scattered hemlocks contribute appreciable wildlife cover. Wildlife will often use individual hemlocks as waypoints while traveling. Cavity trees and hollow downed woody debris enhance habitat for flying squirrels, opossum, and gray fox.

Thermal softwood forest – Includes areas with heavy hemlock stocking—particularly where hemlock is found in all canopy layers—overstory, mid-story, and understory. White pine is present in some stands. Forest Types D (Hemlock/Hardwood) and E (Hemlock/Pine/Hardwood) typify this habitat. Snow depths are mitigated under the thick foliage of hemlocks, encouraging deer, grouse, and snowshoe hare to settle under their canopy. Mid-summer temperatures are also moderated under the cooling shade. In the Town Forest, this habitat is enhanced by mast-producing oaks, old trees (sometimes hollow), and numerous vernal pools.

WETLAND HABITATS

Marsh and Shrub/scrub wetland—An extensive freshwater marsh and shrub/scrub wetland system covers the northwestern section of the Town Forest. Dense emergent vegetation intermixes with small areas of open water in the marshland. Beaver, muskrat, and otter are likely to utilize this wetland. Mink, raccoon, and deer travel along or utilize the wetland edges. Bats utilize the open marsh and shrubland while hunting flying insects on summer evenings. The shrubland contains dense winterberry holly growth which provides cover and food for a variety of mammals, birds, and reptiles.

Forested wetlands and seasonal streams—The property contains several small forested swamps, and interconnecting seasonal streams, which contain moderate diversity of tree and shrub species. While red maple dominates, hemlock, white pine, white ash, yellow birch, American elm, and a few black gums are the typical species. Wetland shrubs typically include winterberry holly and highbush blueberry, which provide cover and important food sources for songbirds and mammals. Sphagnum mats, hummocks, uprooted trees, and root hollows offer sheltered crevices for mammals, reptiles, and amphibians.

Vernal pool—Approximately 39 ephemeral pools were located on the Henderson-Swasey Town Forest; springtime analysis is necessary to confirm if indicator vernal pool species such as wood frogs and fairy shrimp inhabit the respective pools. The pools are notably varied, with differences in size, vegetative type (open or vegetated), expected hydroperiod, and amount of deadfall. Winterberry holly and highbush blueberry are the most common vegetation in vernal pools with shrub cover, though buttonbush, sweet pepperbush and nannyberry were noted in others. Several pools are open.


An open, grassy vernal pool in the Town Forest.

Vernal pools are ephemeral—generally remaining flooded from mid autumn to late spring. The resulting fish-free habitat provides important breeding sites for many amphibians, reptiles, and fresh-water crustaceans. The longevity of flooding after spring thaw—hydroperiod—is an important factor in the quality of the vernal pools. Many of the species associated with vernal

pools occur in greatest abundance when the hydroperiod is reasonably long, not drying until July or later.[4] Wood frogs, spring peepers, pickerel frogs, spotted salamanders, and fairy shrimp are indicator species utilizing vernal pools. The surrounding upland forest and any nearby forested wetlands are critical to the year-round activities of several of these species.

Habitat Associations

Most wildlife on the Henderson-Swasey Town Forest is transient (local travel or migratory), though the property is large enough, with varied habitats, to contain a significant contingent of resident (nesting, denning, breeding) wildlife, including woodland birds, small and large mammals, reptiles, and amphibians. While established forest and wetland habitats are ample, open habitats, especially shrubland and early-successional forest are minimal in extent. An adjacent property does supplement some of these latter habitats. Wildlife usage of the Town Forest is dependent on the diversity of internal core habitats, as well as the open space connectivity and quality of surrounding lands. The Henderson-Swasey Town Forest is part of a 500± acre undeveloped open space block, and lies near the Squamscott River.

Habitat Management

OBJECTIVES

The Conservation Commission's interest in wildlife is broad versus species specific: the objective is to foster wildlife diversity and abundance. *Habitat* management—specifically, to maintain and enhance the property's varied habitats in order to attract a broad spectrum of resident and migratory wildlife—is a major management objective for the property. Most habitat management will be incorporated into the silvicultural practices recommended for the property's managed forest area. A key component of the forest management recommendations in this plan is the enhancement of woodland habitat features over time.

SILVICULTURAL MANAGEMENT of HABITAT

Within the forest, habitat is differentiated by the various forest types that are described in the "Forest Types and Prescriptions" section. Habitat in the Town Forest will benefit from silvicultural management. Carefully planned, periodic harvesting (as specified in the Forest Type Prescriptions) promotes a complex forest structure over time: multi-aged, stratified forest canopy, increased herbaceous layer, and greater diversity of tree and shrub species adapted to site conditions. Complexity and diversity generally concur with habitat richness.

SPECIES of CONCERN

The New Hampshire Natural Heritage Bureau was consulted in September 2011 (see Appendix A) about the potential presence of rare species (plant or animal) or exemplary natural communities on the Town Forest. A database check indicated the presence of a State-endangered plant—Sharp-flowered Mannagrass (*Glyceria acutiflora)*—in a small basin swamp within the Town Forest. This swamp is believed to lie within the reserve area of the Town Forest. As a precaution, no major human-induced disturbances, includling logging, should occur near the edge of any basin swamps or vernal pools on the property.

No other rare species or rare natural communities are documented on the Town Forest or were noted during field examinations (C. Moreno) of the property in the summer of 2011, though at -risk species such as Blanding's turtle may exist on the property.

[4] Matt Tarr and Kimberly J. Babbitt. "The Importance of Hydroperiod in Wetland Assessment". UNH.

New England cottontail is an imperiled species that is currently receiving considerable attention. Efforts to create substantial swathes of dense early-successional habitat are underway, particularly in areas within the known remnant population islands. Habitat creation involves drastic changes in the forest—i.e., clearcutting substantial acreage. Since the Henderson-Swasey Town Forest does not lie within a known New England cottontail population island, habitat creation for this species is not recommended.

WILDLIFE HABITAT RECOMMENDATIONS

- Along with gas line maintenance, occasionally mow the edges of the woods road.
- Attempt to maintain the few remaining trail-less areas on the property to allow undisturbed habitat for breeding, nesting, and denning.
- Leave a 75-foot minimal harvest and minimal activity buffer around open wetlands and the property's vernal pools to provide moist and shaded areas for reptiles and amphibians.
- In established forest areas, continue the development of multi-generational forest through silvicultural management. Forest age differentiation should occur both as groups or small pockets of trees, and as dispersed individual trees. Existing older growth (mapped as "significant trees") should be retained.
- Manage for large-crowned, mast-producing oaks and hickories.
- Retain softwood thermal cover, particularly in Hemlock/Hardwood and Hemlock/ Pine/Hardwood stands. Encourage regeneration and growth of younger hemlock within established stands.
- Retain cavity trees, snags, and large coarse woody debris for wildlife.
- Retain trees that provide good vertical structure, such as large pasture pine and large crown beech.
- Allow the accumulation of forest floor woody debris ("coarse woody debris");
- Create small woodland openings, where a diversity of young forest growth is encouraged.
- Encourage the growth of native fruit-bearing shrubs.
- Control exotic, invasive plants.

FOREST RESOURCES

ECOLOGICAL CHARACTERISTICS

Forest Structure

Forests are shaped by disturbance. Over time, random natural disturbances, as well as deliberate human disturbances, all of varying intensity, influence both individual stand structure and the mosaic of stand types in a forest. The physical structure of a forest stand includes its spatial arrangement both in horizontal (stand density, canopy closure) and vertical (canopy stratification) dimensions, and its composition (species mix, stem sizes, tree ages). Collectively, the array of variously structured stands imparts unique structural character to the overall forest.

The structure of the forest that occupies the Henderson-Swasey Town Forest reflects its disturbance history. The property's location near the Squamscott River points to early human usage of the forest, including Native American, though early traces might only be deduced through inference. The forest was probably first logged for its finest white pine sawtimber, by the mid-17th century. Selective logging of sawtimber likely continued for the next century. The land was entirely cleared by the late 1700's, converted to pasture, and grazed by domestic animals. The extremely rocky interior was quarried and used as sheep pasture.

After perhaps less than one century as pastureland, most of the land was allowed to revert back to forest, with rocky interior areas beginning about the Civil War. The first period of field abandonment lasted until the 1890's, as the 115 – 145± year age of the present-day matrix forest attests. Some areas, of course, remained as pasture into the 20th century, particularly south of the gas line and near the parking lot. Younger forest occupies these sites today, including a small former field that was open until the 1970's. Parcels in the northwest corner (now adjacent to Route 101) and the southeast section (now described as Forest Type C), were abandoned as fieldland about 1915.

Several timber harvests have occurred on the Henderson-Swasey Town Forest since field abandonment over the last 100± years, adding to the forest's complexity. White pine sawtimber was heavily harvested in Forest Type B and D areas about 1940±, perhaps in response to the Hurricane of '38, leaving relatively few pines. Other sections of these two stands appear to have been harvested in the 1950's. After each harvest, a new generation of seedlings filled the newly lit openings in the forest canopy.

A very old, 5-foot diameter red oak.

The oldest set of trees in the Town Forest are scattered remnant trees that are between 150 and 200 years of age, or older. Some of these trees regenerated in the earliest phase of field abandonment, perhaps just before the Civil War. Others may have been shade trees within an open field. A few may link back to the original pre-logged forest. These scattered older trees are an ecologically significant feature of the property.

Over time, the amount of natural woody debris on the forest floor accumulates, particularly in well stocked, dynamic stands. Woody debris are not only recycled into the earth adding valuable nutrients to the soil, but provide an important habitat component for microorganisms and wildlife. As long as woody debris are not intentionally removed from the forest and substantial numbers of decaying trees

retained, the amount of accumulation should not vary markedly between managed and unmanaged stands. Over time, as old legacy trees are retained in managed areas, and the forest continues to mature in the reserve area, the amount of large woody debris should increase on the Town Forest's forest floor.

Species Composition

While a few species dominate the property's tree species composition, the Henderson-Swasey Town Forest contains a substantial array of hardwood species for the area. Softwoods are limited to white pine, hemlock, and a few red pines and red cedars.

A qualitative approximation of the property's relative tree species abundance is:

Abundant – Red oak, beech, hemlock.
More common – White pine, red maple.
Common – Black birch, shagbark hickory.
Less common – White birch, white oak, black oak, yellow birch, big-tooth aspen.
Scarce – Pignut hickory, American elm, black gum, sugar maple, black cherry, white ash, hophornbeam, gray birch, quaking aspen.
Rare – Basswood, red cedar, American chestnut, black ash, red pine.

FOREST MANAGEMENT

Managed Areas and Reserves

Silviculturally managed areas and reserves are defined in the "Managed Areas and Reserve Areas" section of Chapter III. The "Forest Recommendations" map shows the location of these zones on the Henderson-Swasey Town Forest. Reserve areas are treated passively, with intervention such as timber salvage only allowable in modified reserve areas after an unplanned natural disturbance event. Managed areas are treated systematically, with a scheduled series of treatments applied over time.

Silvicultural Treatments

Silviculture is the science and art of working with the forest to maintain and enhance its health, value, and productivity over the long-term. The type of silvicultural treatment is dictated by landowner objectives, stand age, density, species composition, and forest regeneration. A brief description follows of the silvicultural treatments prescribed in the Chapter "Forest Types—Descriptions and Prescriptions".

TSI (Non-commercial Treatments):

- *Cleaning (inter-sapling release)* – A TSI treatment in sapling/seedling stands that releases promising young growth from competing stems.
- *Weeding and thinning* – TSI treatment of sapling/pole stand to favor certain species, remove poorly-growing trees, and release high quality trees.
- *Pruning* – A TSI treatment where the lower limbs of white pines or quality hardwoods are removed to enable valuable clear-wood growth.

Commercial Treatments:

- *Crown Thinning* – Focus is to provide growing space around the crowns of promising trees. Poorly growing trees are generally removed, with 5 to 8 feet of space provided on at least one side of the crown of favored trees. Crown thinning may be done in conjunction with liberation and/or improvement cutting.
- *Improvement cutting* – Treatment where lower-quality, diseased, and declining trees are removed to upgrade overall stand quality. Additionally, certain species, such as red oak and white pine, are favored over other competing species, such as beech, that are prone to poor-quality growth.
- *Liberation cutting* – Treatment where individual overtopping trees are removed to provide overhead light and growing space for favorable younger growth.
- *Single-tree selection* – Individual trees of various sizes and ages are removed with the purpose of initiating and encouraging forest regeneration, while developing a multi-aged forest.
- *Group selection* – Micro (2 to 5 trees) to small (6 to 15 trees) sized groups of trees are harvested to create forest openings for regeneration and to develop multi-aged forest. Larger group openings may favor the establishment of more diverse species, including those less tolerant to overhead shade.
- *Expanded Group Selection* – Removal of the trees along the edges or perimeter of a previous group selection cut to provide additional overhead light on previously established regeneration.
- *Patch Cut* – Harvest of a large group of trees or an area of young growth, usually ¼ to 5± acres in size, with the intent of creating a wildlife clearing (or view clearing) or perpetuating an existing clearing.

Silvicultural Outlook

The intent of silvicultural management on the property is to enhance wildlife habitat, diversify tree species mix, add to the structural complexity of the forest, promote the growth of healthy trees and valuable timber, and control invasive plants. The continuum of silvicultural prescriptions in this management plan conforms to these objectives. On-the-ground silvicultural decisions by the Town's Forester should regularly consider forest structure and wildlife habitat, and will ultimately reflect the degree of management success.

Habitat enhancement in established forest includes development of a varied mast resource, augmentation of forest canopy layers, and encouragement of fruit-bearing shrubs. Existing early-successional habitat can be perpetuated by contracting with a Brontosaurus contractor. These should be re-cleared every 25 to 30± years to maintain optimal habitat.

Beech dominates the Town Forest's understory presently, and will eventually dominate forest composition, which is undesirable due to the prevalence of beech bark disease, and the exclusion of other tree species. Silvicultural management aims to reduce the proportion of beech and increase the presence of other mid-successional species such as shagbark hickory, red oak, white oak, and black birch. White pine should also remain a significant species component of the future forest.

A new generation of trees will grow naturally in the openings created by each periodic harvest. A multi-aged forest is a structurally more complex than an even-aged forest. Silviculture will reflect the natural disturbance regime of the Seacoast area.

The control of non-native, invasive plants is critical because most of these species disrupt the ability of native plants and trees to regenerate. Habitat is degraded by the increasing monoculture of exotics. Some plants, such as bittersweet, have the ability to smother large trees. It is critical that the plants do not continue to spread towards the property's interior areas, as complete degradation of the Town Forest environment will result. Invasive plant management is a major focus of silvicultural management. Timber harvest proceeds may be used to help pay for invasive plant control.

Harvest Cycle

Forest harvests should follow a periodic schedule, or "harvest cycle". A systematic scheduling approach allows for an adequate period of re-growth, as well as organizes the management of the property. Silvicultural treatment with a planned harvest cycle applies only to the managed areas of the Henderson-Swasey Town Forest. Any specific forest stand in the managed area will not be harvested more than once within the specified harvest interval, permitting the forest to fully recover the volume and density of timber removed. A 15± year harvest cycle is recommended for the Henderson-Swasey Town Forest, though harvesting may occur in as little as a 12 year interval due to certain conditions such as the occurrence of a good seed year.

Treatment Schedule

	12-15 year Cycle	
Harvest Schedule	*Harvest Date*	*Elapsed Time*
Past	1992	-20± years
Future (1st)	2012-17±	0
Future (2nd)	2027-35±	15±
Future (3rd)	2040-50±	30±

Best Management Practices (BMP's)

Forest and wildlife management necessitates the use of heavy equipment to establish and maintain access, for early-successional management, and for improvement harvesting, timber processing, and transport. Depending on the project type and scale of operation, various types of heavy equipment may be employed; if thoughtlessly used, the property's water and soil resources can be adversely impacted.

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

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

- On the property's *moderately-drained soils*, harvest operations are optimally timed for summer through mid-fall *dry conditions* (June-October), or frozen/snowy ground in winter (late Dec-early March), to avoid unnecessary rutting of ground.
- During the tree marking process, Forester considers optimum stream crossing layout, as well as, buffers (minimal harvest) around vernal pools and along riparian areas. This information is then passed to the logging contractor for consideration and implementation.
- Logging contractors must file NH DES Wetland Permit for Logging Activity. Logging contractor must follow NH BMP provisions as stated on permit.
- Stream crossings require temporary poled fords or bridging.
- Chipper debris or treetops can be used as woody matting to stabilize soft soils and approaches to stream crossings.
- Logging equipment should not enter into forested wetlands.
- Tree harvesting in buffer areas, i.e., around vernal pools (75 -100± feet for a highly functioning vernal pool) or within riparian filter strips (25± feet), may range from 0 to 10±% basal area removal, and be judiciously limited to removals for forest health (diseased or declining) or for wildlife habitat enhancement purposes. For the 75-100' vernal pool protection zone, retention of at least 75% canopy cover is recommended. A Professional Forester should make on-the-ground selection decisions. Trees should not be felled into vernal pools or streams, and logging equipment within buffers should not disturb the ground surface.
- Equipment operator should employ well-maintained and serviced equipment on site, i.e., not prone to leaky hydraulic connections, etc.
- Equipment operator should use absorbent padding to protect soil from inadvertent spills when servicing equipment. Contractor should have an on-site spill kit.
- Brontosaurus operation, if any, for early-successional management should follow similar precautions.

FOREST TYPES

Descriptions and Prescriptions

FOREST TYPES – INTRODUCTION

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

Six broad forest types were defined and delineated in the Town Forest, with multiple variants, as part of the forest assessment phase of this management plan. These are illustrated in the "Forest Type Map", and described in detail in the upcoming pages of this chapter. Descriptions of each forest type explain their distinctive characteristics and natural history. Wildlife habitat, ecological, and timber attributes for each forest type are also described. The forest type descriptions are followed by prescriptions which specify silvicultural goals for each forest type, with corresponding recommendations for wildlife and forest management.

Several of the forest types have ***variant*** areas. Though these areas are broadly similar in species composition or the type of site they occupy, there are differences in the proportions of species, and/or the age and structure of the forest type. Explanation is made of these variations.

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

Please refer to the "Forest Type Map" for the locations of each forest type.

FOREST TYPES and PRESCRIPTIONS

A. White Pine/Hardwood – 32.6± acres

Description – This forest type developed on former pasturelands that were abandoned, with few exceptions, in the 1900's. Thus, the pine-hardwood type is not found in the older interior areas of the Town Forest, but rather on the northerly and southerly areas, adjacent to other former fieldlands. Trees are well-established, but forest structure is simplified—even-aged or two-aged, still reflecting stand origins.

The overstory of this forest type is typically dominated by white pine, and to a lesser extent, red oak. Red maple, shagbark hickory, and beech are common in areas, while other hardwoods are found more infrequently. While hemlock is occasionally found in the overstory, this species is generally confined to the understory or mid-story in this forest type.

Intermixed white pine and hardwood in Forest Type A.

There are at least three forest type variants, differing in predominant species, and/or age composition. Variant (A1) straddles a large area on either side of the gas line, most of which was thinned in 1992. Good quality white pine intermixes with mixed hardwoods on the loamier soils and red oak on the drier tills. Large scenic hardwoods are found in areas. Exotic, invasive plants are a major concern especially south of the gas line. (A2) Covers a small, linear area along the southwest border (south of the gas line). White pine dominants (75%+ of species mix) this area. Trees are shallow-rooted on the moist clay soils, where winterberry holly is occasionally found. (A3) White pine and red oak dominate these remote northerly stands, with species intermixing in varying proportions. Beech and witch-hazel dominate the understory with minimal pine or oak regeneration. These remote stands lie in the modified reserve area, with no plans for active silvicultural management.

Timber Potential/Wildlife Attributes – Significant volumes of white pine and red oak sawtimber are found in sections of this forest type. Timber quality for both species is generally average to above average. The moister soil areas south of the gas line are capable of tall, high quality hardwood growth. Throughout the forest type, healthy red oak provides an increasingly important source of mast for wildlife on the property. This is supplemented in areas by white oak and shagbark hickory. A few pockets of this forest type contain dense hemlock understory cover.

Species Composition –

Overstory: Primary[1] – White pine and red oak.
Secondary[2] – Beech, red maple, shagbark hickory, black birch, black oak, white birch.
Tertiary[3] – White oak, black cherry, white ash.

Regeneration: Beech. Black birch, red maple, and shagbark hickories are found in areas. Witch-hazel is a common understory shrub.

[1] Dominant tree species in main canopy layer.
[2] Fairly common to less common tree species.
[3] A unique tree species, or relatively few specimens in the forest type.

Forest Structure – Forest Type A—White Pine/Hardwood

		A1 –SE (gas line area)	A2 –SW	A3 –NW
Composition	**Stand Structure**	Even-aged; Even-aged with residuals	Even-aged	Even-aged
	Successional Stage	Late-intermediate	Mid-intermediate	Late-intermediate
	Stand Age (years)	85 - 100± years	70 -8 5± years	85-100± years
Tree Size	**DBH range**	6 – 30± inches	10 – 22± inches	8 - 22± inches
	Mean DBH	15± inches	15± inches	15± inches
	Avg. Maximum Ht.	85-100± feet	85-90± feet	85 - 90± feet
Stand Density	**Relative Stocking**	Considerable	Considerable	Considerable
	Basal Area/Acre	165± sq. ft./acre	170± sq. ft./acre	180± sq. ft./acre
	Trees/Acre	130± trees (variable)	130± trees (variable)	150± trees (variable)
	Canopy Closure	90-100± %	80-100± %	90± %
Ecological	**Canopy Stratification**	Good to excellent	Medium to good—Lacking mid-story.	Good-Understory & over-story with some mid-story.
	Woody Debris	Good to excellent; some large trunks.	Good- Substantial accumulation.	Good. Debris from February 2010 storm.
	Invasive Plants	Serious invasion of glossy buckthorn, burningbush, Japanese barberry; others.	Serious: Burningbush, buckthorn, bittersweet.	No invasive plants noted.

SILVICULTURAL PRESCRIPTION

Objectives - Northerly stands are to be withheld from active management as modified reserves, with management activity possibly taking place in response to acute natural disturbances.

Silvicultural treatment is planned for the stands in the vicinity of the gas line. Silviculture is intended to promote the growth of the healthy, mid-aged red oaks and white pines which dominate this forest type. Specifically: 1) Encourage the development valuable timber—oak veneer and high-quality white pine; 2) Continued broadening of stand age spectrum; 3) Naturally regenerate red oak and white pine, as well as promoting increased amounts of white oak, shagbark hickory, black birch, and sugar maple; 5) Restrict progression towards increased beech composition; and 6) Enhance mast-production with healthy broad-crowned oaks and diversity of species.

The control and elimination of exotic, invasive plants in these stands is of *critical* concern.

Structural Sequence: Even-aged (present condition)→Three-aged (2040±)

Silvicultural Treatments:

2012-2017±: ***Invasive plant control –*** Complete prior to or immediately after harvest.

Crown thinning/Micro-group openings – Lightly thin poorer quality hardwoods and pines to release crowns, but also to create small openings and establish regeneration. Opening size should be minimal, not exceeding the group removal of 2 to 6 trees. Remove understory beech in the openings. Harvest during/soon after a good oak and/or pine seed year, if possible. (125+ sq. ft./acre).

2027-2035±: ***Single-tree Selection/Expanded micro-group openings/Liberation***—Continue crown release. Expand previous openings by removing a few trees along edges to liberate previously established regeneration.

2040-2050±: ***Crown thinning/Expanded micro-group openings/Liberation*** – Continue crown release. Expand previous openings by removing a few trees along edges to liberate previously established regeneration. ***TSI – Inter-sapling release—***Thin sapling growth, favoring desirable species especially red oak and white pine.

B. Upland Hardwood – 83.2± acres

Description – This widespread forest type is characterized as primarily upland hardwood (>75% stocking), *with red oak as the dominant overstory species*. Beech is also common in the overstory, and generally dominates the understory. The nominal presence of white pine in this forest type is distinct: the scattered remaining tall pines in the main stand are vestiges of a denser pine forest that was harvested perhaps after the Hurricane of '38. In at least one variant of this forest type (B1), white pine was harvested as recently as 1960±.

Young beech amongst white and red oaks in Upland hardwoods variant B1.

Older red oaks occupy a rocky area in Upland Hardwoods variant B2.

Often occupying extremely rocky, but fertile, till soils, the oaks have fairly smooth-barked, high-quality form and are moderately tall. The oaks are generally healthy, showing few signs of gypsy moth defoliation from over two decades ago, and with little incidence of *Strumella* canker. Nectria canker is prevalent in the black birch. As in nearly all forests, beech bark disease is rampant, though scattered large-diameter, healthy beeches are found in the older Town Forest stands. The magnificent appearance of a large beech with disease-free bark has become a less common sight over the last half century.

This forest type includes several variants: (B1) contains areas that were more recently harvested and are therefore easily identifiable as two-aged, or even-aged with residuals. Beech dominates the younger age class. Red oak and beech are most common, with red maple and black birch secondary. Scattered hemlocks and pines are present, along with white oak, black oak, and pignut hickory in areas. (B2) is a mature variant (trees up to 140± years) in interior areas, where pine was removed 70± years ago. Red oak and beech once again dominate; beech bark disease is ubiquitous in the latter species. Red maple is not common. Remnant tall pines are scattered. (B3) is a younger variant in the western marshland area, which is dominated by red oak.

Timber Potential/Wildlife Attributes – The upland hardwood stands contain fine sawtimber and veneer red oak (14 – 22" DBH), though the quantity of these trees varies significantly from area to area. Variant (B3) has firewood-sized oaks (under 12 inches in diameter), which could develop as high-value, veneer-quality logs, however, due to the stand's remote location, it is a modified reserve. The management challenge for all accessible areas is encouraging oak and pine regeneration to ensure that these species constitute at least 10 to 25% of the future forest's composition. If the current trend continues, the future upland hardwood stands will largely consist of beech.

Oaks with sufficient growing space will continue to develop large, healthy crowns. (Forest improvement harvesting will release healthy oaks from unfavorable competition). From a wildlife habitat perspective, broad-crowned oaks produce an abundance of acorns, which are a staple food for a great variety of birds and mammals. This forest type covers substantial acreage and is well-dispersed through the Town Forest, thus representing a core habitat of mast-producing trees (acorns, especially; also beech and hickory nuts, as well as the shrub, beaked hazelnut).

This forest type also contains a number of vernal pools. Finally, the strewn surface rock provides small crevices and holes for denning.

Species Composition –

Overstory: Primary – Red oak. Beech in many areas.
Secondary – Red maple, black birch, white birch, white oak, black oak, shagbark hickory, white pine, hemlock.
Tertiary – Pignut hickory, white ash, yellow birch.

Regeneration: Abundant beech.

Forest Structure—Forest Type B—Upland Hardwoods

		B1- (easterly and central)	**B2-** (central and westerly)	**B2-** (marsh vicinity)
Composition	**Stand Structure**	Even-aged with residuals, two-aged.	Even-aged with residuals, two-aged, three-aged.	Even-aged
	Successional Stage	Mid to late intermediate	Late intermediate	Mid-intermediate
	Stand Age (years)	50- 90//100-130+ years	85 – 145± years	80 – 100± years
Tree Size	**DBH range**	5 – 20± inches	10 – 22+ inches	8 – 18± inches
	Mean DBH	12± inches	15± inches	12± inches
	Avg. Maximum Ht.	70± feet	65± feet	
Stand Density	**Relative Stocking**	Considerable	Considerable	Considerable
	Basal Area/Acre	140± sq. ft./acre	175± sq. ft./acre	140± sq. ft./acre
	Trees/Acre	160± trees (variable)	140± trees	160± trees
	Canopy Closure	100± %	90-100%	100%
Ecological	**Canopy Stratification**	Good-excellent	Good-excellent	Good
	Woody Debris	Medium-good	Good-excellent	Good
	Invasive Plants	None or few.	None observed.	None observed.

SILVICULTURAL PRESCRIPTION

Objectives - Northerly stands are to be withheld from active management as modified reserves, with management activity taking place in response to acute natural disturbances.

In silvicultural areas, the main objective is to encourage oak (red, white, and black), hickory, and white pine regeneration. In most areas, beech is well-established in the understory and represents 90 – 100% of regeneration. Much is this beech is prone to beech bark disease. Without remedial action, the stands will convert to beech.

A secondary objective is to continue the development of valuable, high quality oak.

Structural Sequence: Even-aged (w/ residuals) and two/three-aged (present condition)→ Three-aged and multi-aged (2040±)

Silvicultural Treatments:

2012-2017±: *Improvement cut/Low thinning/**Micro-group openings*** – Remove declining trees and diseased beech in overstory. Remove substantial understory beech. Create small openings to establish regeneration. Harvest during/soon after a good oak and/or pine seed year, if possible. (100± sq. ft./acre).

2027-2035±: ***Single-tree selection/Expanded micro-group openings/Liberation***—Continue to lower proportion of beech. Expand previous openings by removing a few trees along edges to liberate previously established regeneration.

2040-2050±: ***Expanded regeneration openings/Liberation*** – Continue to release favorable regeneration.
TSI – Inter-sapling release—Thin sapling growth, favoring promising trees.

C. Mixed Hardwoods – 11.5± acres

Description – Found as one stand along the southeastern property line, this forest type occupies

Aspen and maple stock this area, with burning bush and glossy buckthorn in the understory.

A patch of younger white birch within the Mixed Hardwood forest type.

the original Town Forest property conserved by the Town of Exeter. The property was abandoned as pasture in the 1930's. A more recent timber harvest in the 1970's, perhaps just prior to town acquisition, created a two-aged mosaic where pine was cut and younger hardwoods filled into the openings. While hardwoods dominate this forest type, the species mix is more diverse than the red oak-dominated Forest Type B. This is due both to moist, silty soils, as well as the described land-use history. Red maple, big-tooth aspen, white birch are common; a few declining red cedars are indicators of the former field condition.

The southerly half of this stand is seriously infested with non-native invasives including glossy buckthorn and burningbush. Control of these plants should precede any management activity.

Timber Potential/Wildlife Attributes – This forest type contains a variety of hardwoods, though the dominant species are not generally the most valuable species. However, the stand contains developing pole-sized and small sawtimber sized trees that have promise for future value growth as timber. Control of invasive plants is critical to allow their healthy development, as well as future regeneration.

For wildlife, the diverse hardwood species provide a variety of fruits, seeds and buds. Soft hardwoods such as aspen and white birch are often used by birds for cavity nesting and feeding activity. The area contains several old granite quarries that are now small depressions which fill with water. These may supplement the larger vernal pools in the stand. The area's silt/clay soils are ideal for woodcock, especially in dense understory sections.

Species Composition –

Overstory: Primary – Red maple. Black birch, white birch, and big-tooth aspen common in areas.
Secondary – White pine, black cherry, red oak, yellow birch.
Tertiary – Red cedar, sugar maple, beech, elm, apple, white ash.

Regeneration: Beech, red maple, shagbark hickory, black birch in upland sites where invasives are not dominant.

Forest Structure—Forest Type C—Mixed Hardwoods

Composition	**Stand Structure**	Two-aged w/ young inclusions and older residuals
	Successional Stage	Young-intermediate
	Stand Age	30± and 50-75± years
Tree Size	**DBH range**	3 - 14± (20±) inches
	Mean DBH	13± inches (older trees—overstory—only); 10± (both age-classes)
	Avg. Maximum Height	60± feet
Stand Density	**Relative Stocking**	Moderate
	Basal Area/Acre	145± sq. ft./acre
	Trees/Acre	155± (overstory trees); 245± (mid-story/overstory)
	Canopy Closure	80± %
Ecological	**Canopy Stratification**	Good – Well developed understory, mid-story, overstory, and occasional super-canopy tree.
	Woody Debris	Good accumulation.
	Invasive Plants	Serious/extreme – buckthorn and burningbush.

SILVICULTURAL PRESCRIPTION

Objectives – Restore forest integrity by removing invasive plants. Improve tree growth. Enhance habitat, by retaining mixed hardwood species, and possibly, creating early-successional patches.

Structural Sequence: Two-aged (present condition)→ Three-aged (2040±)

Silvicultural Treatments:

2012-2017±: ***Invasive plant control –*** Preferably prior to harvesting.

Improvement cut/Free thinning – Upgrade stand quality and species composition (from a timber standpoint), favoring red oak, black birch, yellow birch, and white ash. Retain ample trees for wildlife including hickory and potential cavity trees. Thin in all canopy layers. (Residual basal area: 100± sq. ft./acre).

Small patch cut or cuts (clearing up to ¼± acres) may be considered in poorly stocked, non –sensitive areas (outside of wetlands) to re-establish early-successional growth for wildlife.

2027-2035±: *Improvement cut/Free thinning****/Liberation***—Similar harvest, after invasive control. Also release promising incidental regeneration. Continue to lower proportion of beech. Expand previous openings by removing a few trees along edges to liberate previously established regeneration.

2040-2050±: *Single-tree selection/Micro-group* ***openings/Liberation*** – Continue to release favorable regeneration.

D. Hemlock/Hardwood – 46.6± acres

Description – This forest type covers much of the Town Forest's central interior. Hemlock (generally over 40% of species composition) and beech are primary components. Both are found in all canopy layers, with hemlock often dominating the overstory. Other common hardwood species include red oak, black birch, and red maple. As with Upland Hardwood forest type variants B1 and B2, substantial pine was harvested from these stands: presently, the remaining pines constitute only a minor species.

120± year old hemlock alongside pocket of 50 – 60 year old hemlock/hardwood mix.

Older and mid-aged oak and hemlock with younger growth in the background.

Forest structure is often "patchy", with groups of older trees interspersed amongst pockets of younger pole-sized trees. Due to the harvests of last century, the present stands contain at least two to three age classes. These range from pockets of 50 to 60± year old growth (resulting from the last harvest in the 1950's±), to a substantial 90± year age class, to 120-135± year old trees, to a few remnant trees that appear to be upwards of 200± years of age (perhaps individual trees that once stood in a long-ago pasture). Beech and hemlock run the gamut of tree ages.

Timber Potential/Wildlife Attributes: Most of this forest type lies within the modified reserve area. While hemlock has had low commercial value as timber for the past 40 years, the species is a major scenic component of our local forests, and is valuable for wildlife. Hemlock's dense foliage provides wildlife with thermal cover. In heavy snow years, deer congregate beneath this cover, where snow depths are less and where water is potentially available in seeps or wetland edges. The forest type's other habitat features include ample cavity trees, snags, tree stubs, and woody debris which provide feeding and nesting sites for birds and small mammals. There is generally good canopy layering and available oak mast.

Species Composition –

Overstory: Primary – Hemlock, beech, red maple, red oak, black birch.
Secondary – White oak, white pine, white birch, black oak.
Tertiary – Pignut hickory (north stand).

Regeneration: Hemlock, beech.

Forest Structure – Stand D – Hemlock/Hardwood

Composition	**Stand Structure**	Two-aged, three-aged with scattered old residuals.
	Successional Stage	Mid-intermediate to mature
	Stand Age	50 - 60±, 90±, and 125-145± years. Residuals 180 – 200+ years.
Tree Size	**DBH range**	6 – 26± inches
	Mean DBH	11± inches
	Avg. Maximum Height	65± feet
Stand Density	**Relative Stocking**	Moderate to considerable
	Basal Area/Acre	120± sq. ft./acre
	Trees/Acre	190± trees
	Canopy Closure	90 - 100± %
Ecological	**Canopy Stratification**	Excellent.
	Woody Debris	Good accumulation.
	Invasive Plants	No incidence noted.

SILVICULTURAL PRESCRIPTION

Objectives – Most of the area occupied by this stand is remote and will be retained as modified reserve. Looming infestation by hemlock wooly adelgid (in the next 10 to 40± years) may trigger timber salvage/insect mitigation response.

In the minor area lying within the silviculturally managed zone, the management objective is to retain wildlife and scenic attributes of the hemlock component while creating pockets of diverse species growth, with tree species suited to an upland site. Develop red oak sawtimber.

Structural Sequence: Two-and three-aged (present condition)→ Three/multi-aged (2040±)

Silvicultural Treatments:

2012-2017±: *Single-tree selection with micro-group and small-group openings* – Remove declining trees and diseased beech in overstory. Create small openings to establish mixed species regeneration. Harvest during/soon after a good oak and/or pine seed year, if possible. (90± sq. ft./acre).

2027-2035±: ***Single-tree selection/Expanded group openings/Liberation***—Crown thinning of young pockets (now 70± years of age), via single-tree removals. Expand previous regeneration openings by removing a few trees along edges to liberate previously established regeneration.

2040-2050±: ***New group openings/Expanded regeneration openings/Liberation*** – Continue to release favorable regeneration. ***TSI – Inter-sapling release—***Thin sapling growth, favoring promising trees.

E. Hemlock/Pine/Hardwood – 24.4± acres

Description – The main stand of this forest type is found deep in the forest interior. Stately pines, hemlocks, and oaks embody the older growth aspect of the Town Forest interior. Several smaller stands are located in the central forest area which also contain scenic older trees, though perhaps not as old as the forest interior. A stand along Norris Brook contains exceptionally tall white pines, with some trees exceeding 120 feet in height.

Unlike, Forest Type D, Hemlock/Hardwood, white pine was not heavily logged in this forest type. While at least one minor harvest occurred (perhaps in the 1930's—hurricane salvage?), the stands have escaped major natural disturbance and have remained intact long enough to allow for the growth of large diameter trees. Dense canopy shading on the forest floor has limited undergrowth in some areas, providing an open park-like appearance. While hemlock is a prevalent species throughout this stand, the proportion of red oak, black birch, and white pine varies from area to area. Very little beech is found in this forest type.

Timber Potential/Wildlife Attributes: The white pines and oaks in this stand are generally of above average quality, in many cases free of lower stem branches due to the protective shade of nearby hemlock. Many are maturing as high quality sawtimber. A concern is the lack of regeneration due to dense shading, which can be ameliorated by creating small openings to allow light on the forest floor, thus spurring young growth. From a habitat standpoint, this forest type also provides thermal cover, though low cover is sparse. The shaded cover and abundant perch sites are attractive to many animals including barred owls and black throated green warblers.

Species Composition –

Primary – Hemlock, red oak, black birch, and white pine.
Secondary – In areas: red maple, white oak, white birch, black oak.
Tertiary – Red pine, beech.

Regeneration: Hemlock. Sparse in areas.

Forest Structure – Forest Type E – Hemlock/Pine/Hardwood

Composition	**Stand Structure**	Two-aged w/scattered three-aged pockets with natural forest openings.
	Successional Stage	Late-intermediate to mature
	Stand Age	80 - 95±, 125-145±, and (180+) years
Tree Size	**DBH range**	6 – 26± (30) inches
	Mean DBH	14± inches
	Avg. Maximum Height	90 - 100± feet (125± feet)
Stand Density	**Relative Stocking**	Considerable
	Basal Area/Acre	170± sq. ft./acre
	Trees per Acre	150± trees
	Canopy Closure	80 - 100± %
Ecological	**Canopy Stratification**	Moderate. Minor understory and mid-story.
	Woody Debris	Good accumulation, including larger trunks.
	Invasive Plants	No incidence noted.

SILVICULTURAL PRESCRIPTION

Objectives – The interior stand, as well as areas along Norris Brook lie within the proposed reserve area. Silvicultural management is not planned for these areas, however, natural or human-induced disturbances such as a damaging wind storm, ice storm, fire, or insect attack (wooly adelgid) may trigger a response.

In managed pockets, maintain the scenic qualities of this forest type by retaining large diameter hemlocks, oaks, and pines. Create small openings to encourage the regeneration of pine and oak, as young growth is almost entirely hemlock. *Effective regeneration openings must allow enough light to reach the forest floor (remove groups of 6 to 12± trees), and lie near or adjacent to pine and oak seed trees.*

Structural Sequence: Two-/three-aged (present condition)→ Three-/Multi-aged (2040±)

Silvicultural Treatments:

2012-2017±: *Single-tree selection with micro-group and small-group openings* – Light harvest to remove declining trees. Create small openings to establish pine and oak regeneration. Harvest during/soon after a good oak and/or pine seed year, if possible. (140± sq. ft./acre).

2027-2035±: ***Single-tree selection/Expanded group openings/Liberation***—Similar harvest to previous. Expand regeneration openings by removing a few trees along edges to liberate previously established regeneration.

2040-2050±: ***No treatment.*** Skip this harvest cycle.

F. Early-successional/Young Forest – 11.1± acres

Description – This forest type includes all areas of pioneer or forest growth younger than 40 years. It includes variant (F1) the gas line areas, a long 75± foot wide strip that covers approximately 6± acres, and variants (F2) and (F3)—several pockets of young forest in the gas line vicinity.

Forest Type variant F1: Herbaceous and pioneer woody vegetation covers the gas line.

Forest Type variant F2: A stand of hardwood saplings.

When a new gas line (F1) was added in 1999±, the entire strip was widened and disturbed. Pioneer herbaceous and woody growth became established thereafter. This includes brambles and shrubs that provide valuable food sources and cover for wildlife. It is believed the gas line strip was last mowed in 2005±. A number of non-native, invasive species have overtaken the gas line, especially in the eastern section. Exotics include plants not found in other sections of the Town Forest such as purple lustrife, *phragmites*, and autumn olive. Oriental bittersweet, multiflora rose, and bush honeysuckle have also vegetated the area.

The area north of the Town Forest parking lot (F2) was a borrow pit until perhaps the early 1970's. The unnatural contour of the excavated ground is discernable under the dense vegetation that has covered the area. Growth includes early–successional forest species such as quaking aspen, black cherry, white pine, and gray birch. Red cedar, common juniper, and bayberry were also observed. The area is overrun by invasives plants. A similar condition is found south of the gas line, where a moist area between the gas line split includes young forest with aspen, birch, and maple. Invasives also heavily infest this area.

In the property's southwestern section, a small rectangular field once occupied the fertile, clay soils until the late 1970's. Young forest (F3) now covers this area, including sapling and pole-sized birch and oak, as well as aspen and pine. Invasives are also found in this area, though not as severe as in easterly sections.

Timber Potential/Wildlife Attributes: Most areas have little or no timber potential, with the exception of variant (F3). However, collectively these areas impart a valuable habitat type that would otherwise be noticeably lacking in the Town Forest. (95% of the forest cover consists of well-established and mature forest.) Early-successional and young forest growth provide food and cover to a variety of songbirds that are dependant on this habitat. Mammals utilize the gas line strip as a travel corridor; predators (hawks, owls, fox, and coyote) use it for hunting. Regionally, the early-successional habitat type has greatly declined in area, a condition which has imperiled a number of species.

Species Composition –

Gas Line(F1): Staghorn sumac, speckled alder, sweet fern, Queen Anne's lace, chicory, rough-stemmed goldenrod, joe-pye weed.

Early-successional Forest (F2):
Primary – Big-tooth aspen, black cherry, black birch, red maple, white pine.
Secondary – Quaking aspen, gray birch.

Young Forest (F3):
Primary – White birch, black birch, red oak.
Secondary – Black cherry, white pine, red oak, gray birch, big-tooth aspen, black oak.

Forest Structure – Forest Type F – Early-successional/Young Forest

		F1 – Gas line	F2 – Early - successional Forest	F3 – Young Forest
Composition	**Stand Structure**	Even-aged	Two-aged	Even-aged
	Successional Stage	Regenerating	Young-intermediate	Young-intermediate
	Stand Age	5± years	35± and 50+ years	40± years
Tree Size	**DBH range**	<1± inches	1 –12± inches	1 – 9± inches
	Avg. Max. Height	5 – 15± feet	25 – 40± (50) feet	50± feet
Stand Density	**Relative Stocking**	Dense	Dense	Dense
	Canopy Closure	<10%	70%	100%
Ecological	**Canopy Stratification**	Low	Good	Good
	Woody Debris	Low	Good	Moderate
	Invasive Plants	Severe	Severe	Moderate

SILVICULTURAL PRESCRIPTION

Objective: Maintain all current areas of Cover Type F in a pioneer or early-successional stage for wildlife, with the exception of a portion of variant (F3) which contains young oaks. Gas line areas are periodically mowed by the gas companies.

Structural Sequence: Even-aged (present condition)→ Even-aged (2040±)

Silvicultural Treatments:

2012-2017±: ***Invasive plant control –*** Complete prior to or immediately after harvest.
Small group openings and Patch cut(s) – Clear 1/10 acre to ¼+ acre pockets within Forest Type F stands to retain early-successional vegetation. Cover approximately 2 acres, which is about ½ the accessible acreage. Layout clearings away from trails. Utilize a Brontosaurus-type machine to carry-out work. This is a cost operation.

2027-2035±: *Small group openings and Patch cut(s)* – Clear a new set of patches, again covering ½ the available acreage (2± acres).

2040-2050±: *Small group openings and Patch cut(s)* – Re-clear original set of patches.

APPENDICES

New Hampshire Natural Heritage Bureau

DRED - Division of Forests & Lands

PO Box 1856 -- 172 Pembroke Road, Concord, NH 03302-1856

Phone: (603) 271-2214 Fax: (603) 271-6488

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

From: Sara Cairns, NH Natural Heritage Bureau
Date: 2011-10-12
Re: Review by NH Natural Heritage Bureau of request dated 2011-09-29

NHB File ID: 1071
Project type: Landowner Request
Town: Exeter
Location: Henderson-Swasey Town Forest (Tax Map 39, Lots 2 & 3; Map 40, Lot 13; Map 49, Lot 8)

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

Sharp-flowered mannagrass is primarily vulnerable to changes to the hydrology of its habitat, especially alterations that change water levels. It may also be susceptible to increased pollutants and nutrients carried in stormwater runoff.

NHB records on the property(s):

	Mapping Precision	% within tract	Last Reported	Listing Status		Conservation Rank	
Plant species				**Federal**	**NH**	**Global**	**State**
Sharp-flowered Mannagrass (Glyceria acutiflora)	Good	100	1996	--	E	G5	S1

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

	Last Reported	Listing Status		Conservation Rank	
Vertebrate species (For more information on animal species, contact Kim Tuttle, NH F&G at 271-6544)		**Federal**	**NH**	**Global**	**State**
Pied-billed Grebe (*Podilymbus podiceps*)	2001	--	T	G5	S2B
Great Blue Heron (Rookery) (*Ardea herodias*)	2003	--	--	G5	S4B
Osprey (*Pandion haliaetus*)	2005	--	SC	G5	S3B
Sora (*Porzana carolina*)	2001	--	SC	G5	S3B
Common Moorhen (*Gallinula chloropus*)	1999	--	SC	G5	S2B
Blanding's Turtle (*Emydoidea blandingii*)	1997	--	E	G4	S1
Northern Black Racer (*Coluber constrictor constrictor*)	1991	--	T	T5	S2

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

New Hampshire Natural Heritage Bureau

DRED - Division of Forests & Lands

PO Box 1856 -- 172 Pembroke Road, Concord, NH 03302-1856

Phone: (603) 271-2214 Fax: (603) 271-6488

Natural Community		**Federal**	**NH**	**Global**	**State**
Subtidal system	2010	--	--	--	S2
Plant species		**Federal**	**NH**	**Global**	**State**
Climbing Hempweed (*Mikania scandens*)	1984	--	E	G5	S1
Spongy-leaved Arrowhead (*Sagittaria montevidensis ssp. spongiosa*)	2003	--	E	T4	S1
Small Spike-rush (*Eleocharis parvula*)	1996	--	T	G5	S2
Slender Blue Flag (*Iris prismatica*)	1991	--	E	G4	S1

Listing codes: T = Threatened, E = Endangered SC = Special Concern
Rank prefix: G = Global, S = State, T = Global or state rank for a sub-species or variety (taxon)
Rank suffix: 1-5 = Most (1) to least (5) imperiled. "--", U, NR = Not ranked.
B = Breeding population, N = Non-breeding. H = Historical, X = Extirpated.

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

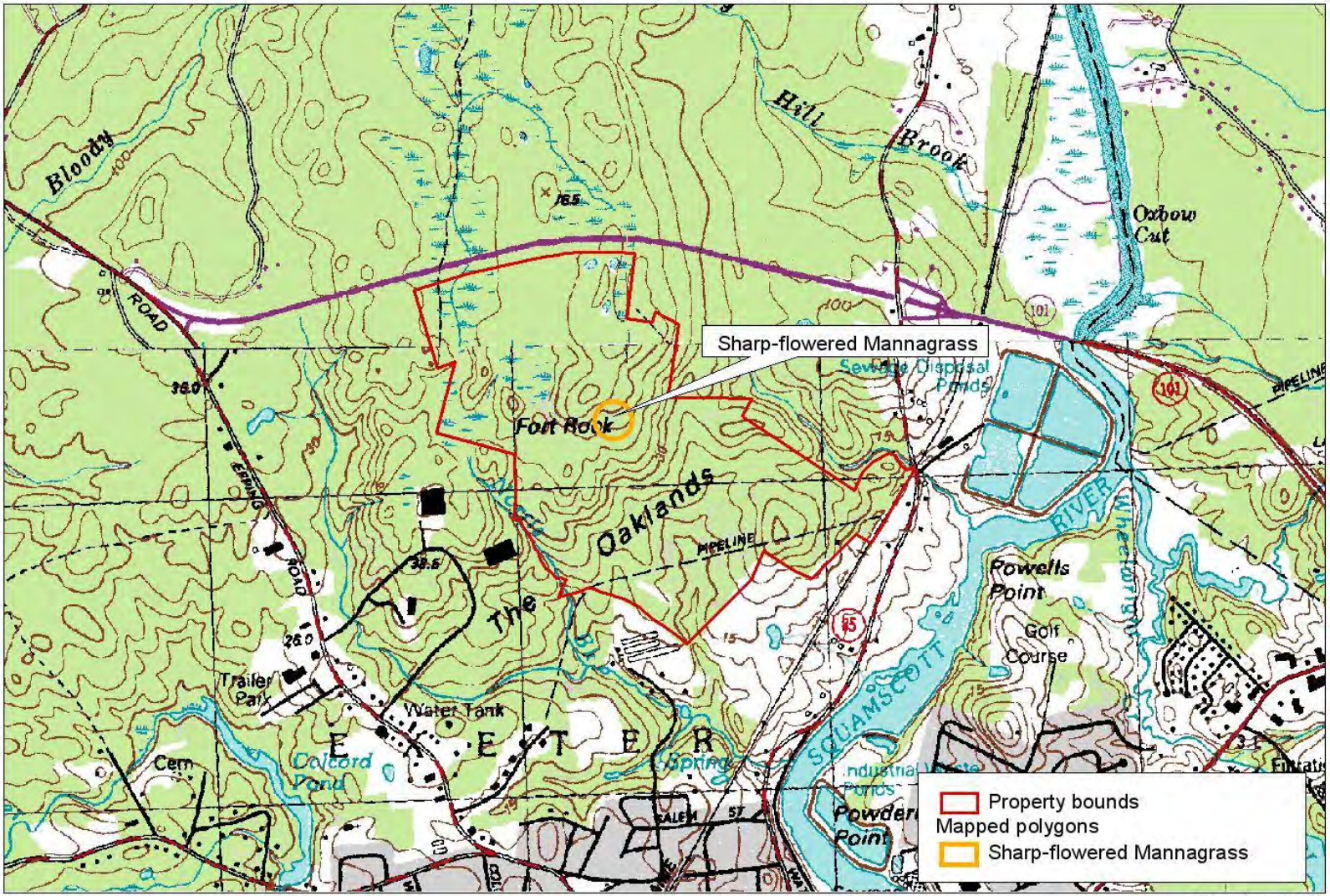
NOTE: This review *cannot* be used to satisfy a permit or other regulatory requirement to check for rare species or habitats that could be affected by a proposed project, since it provides detailed information only for records actually on the property.

NHB: L1071

NH Natural Heritage Bureau

Known locations of rare species and exemplary natural communities

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



*Historical record

Property: Henderson-Swasey Town Forest

1:18000 0.25 0 0.25 0.5 0.75 1 Miles

12 Oct 2011

New Hampshire Natural Heritage Bureau - Plant Record

Sharp-flowered Mannagrass (*Glyceria acutiflora*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Good quality, condition and landscape context ('B' on a scale of A-D).
Comments on Rank:

Detailed Description: 1996: 200 to 300 culms in several patches, covering a total of 160 square feet.
General Area: 1996: Small (0.5 acre) *Acer rubrum* (red maple)/*Vaccinium corymbosum* (highbush blueberry) basin swamp on mucky soils. Several windthrows, root mounds and hollows in the woodland swamp provided marked relief. Shrub and herb development was patchy but moderate and included highbush blueberry, *Ilex verticillata* var. *padifolia* (swamp winterberry), *Cephalanthus occidentalis* (buttonbush), *Lysimachia terrestris* (swamp candles), Sphagnum spp. (sphagnum moss) and other bryophytes, *Sparganium americanum* (lesser bur reed), *Bidens frondosa* (common bur-marigold), and several other less abundant species. Only a few small pools of water were remaining by early September in this seasonally flooded basin. *Glyceria acutiflora* was associated with *Sparganium americanum* (lesser bur reed) in the wetter depressions.
General Comments: 1996: Fort Rock town conservation land supports a variety of good quality upland and wetland communities.
Management Comments:

Location

Survey Site Name: Fort Rock
Managed By: Henderson-Swasey Town Forest

County:	Rockingham	USGS quad(s):	Exeter (4207088)
Town(s):	Exeter	Lat, Long:	425952N, 0705730W
Size:	2.8 acres	Elevation:	40 feet

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

Directions: At the Rte. 101/Rte. 85 junction north of Exeter head south on Rte. 85 ca. 0.3 miles. At the railroad crossing park on the northwest side of the track at the Henderson-Swasey Town Forest. Go west ca. 0.75 miles to site.

Dates documented

First reported:	1996-09-04	Last reported:	1996-09-04

Nichols, Bill. 1996. Field survey to Fort Rock on September 4.

Nichols, B. & D. Sperduto. 1997. Ecological Assessment of Selected Towns in the Great Bay Area. New Hampshire Natural Heritage Program, Concord NH. 141 pp.

CHARLES MORENO, LPF
Consulting Forester, Forest Ecologist

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

EDUCATION

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

PROFESSIONAL SERVICE and AFFILIATIONS

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

WORK EXPERIENCE

1980 - Present	FORESTRY CONSULTANT, founder and proprietor of Moreno Forestry Associates. Thirty years experience managing private and public forests in New Hampshire. Projects include forest and wildlife management planning and implementation, ecological assessments, forest inventory and appraisals, timber sales, mapping, forest taxation and litigation, forest improvement and habitat enhancement, and conservation plans for towns, corporations, and private landowners. 30,000+ acres under management.
1984- Present	TOWN FOREST MANAGER for the Towns of Exeter, Londonderry, Candia, Plaistow, Brentwood, East Kingston, Deerfield, Epping, Brentwood, Sandown, Rye, Pittsfield, Derry, Dover, Madbury, Strafford, and Rochester developing/implementing multiple-use plans for publicly owned forests.
1985- 1992	ALTON TOWN FORESTER. Consultant to the Town on Current Use Assessment and NH Timber Tax matters.
1980- 1988	K-F TREE FARM, Forest Manager. Experience in all areas of woodland and wildlife management in this intensively managed, 700-acre property in Alton, New Hampshire. Selected as 1988 Belknap County Tree Farm of the Year.

PROFESSIONAL RECOGNITION

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

Charles Moreno, Consulting Forester
Center Strafford, New Hampshire
(603) 335-1961