

# FOREST MANAGEMENT PLAN

*for the*

## Wells Lot

Deerfield, New Hampshire

82.8± acres



Commissioned by:

The Deerfield Forestry Committee and  
The Deerfield Conservation Commission

Prepared by:

Charles Moreno, LPF  
Moreno Forestry Associates  
PO Box 60, Center Strafford, NH 03815  
(603) 335-1961  
May 4, 2016



Charles Moreno, NH LPF #115

Consulting Forester

Report Copy # \_\_\_\_\_

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Formidable beaver dam in the northeastern section of the Wells Lot.

Front cover photo: One of a series of Wells Lot beaver ponds. Note the beaver lodge in the center.

May 4, 2016

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

The purpose of this plan is to provide natural resources information and forest and wildlife management recommendations to the Deerfield Forestry Committee and the Deerfield Conservation Commission, citizens of Deerfield, and others interested in the management of the Wells Lot in Deerfield, New Hampshire. This document is a work for hire done by Moreno Forestry Associates for the Town of Deerfield, New Hampshire, and may be used by the Town of Deerfield, New Hampshire for any purpose. Copying of this plan by any other individual or organization, including all written material, plan content and format, requires appropriate citation and/or the written permission of Charles A. Moreno, Consulting Forester.



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## V. FOREST TYPES

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# MAPS

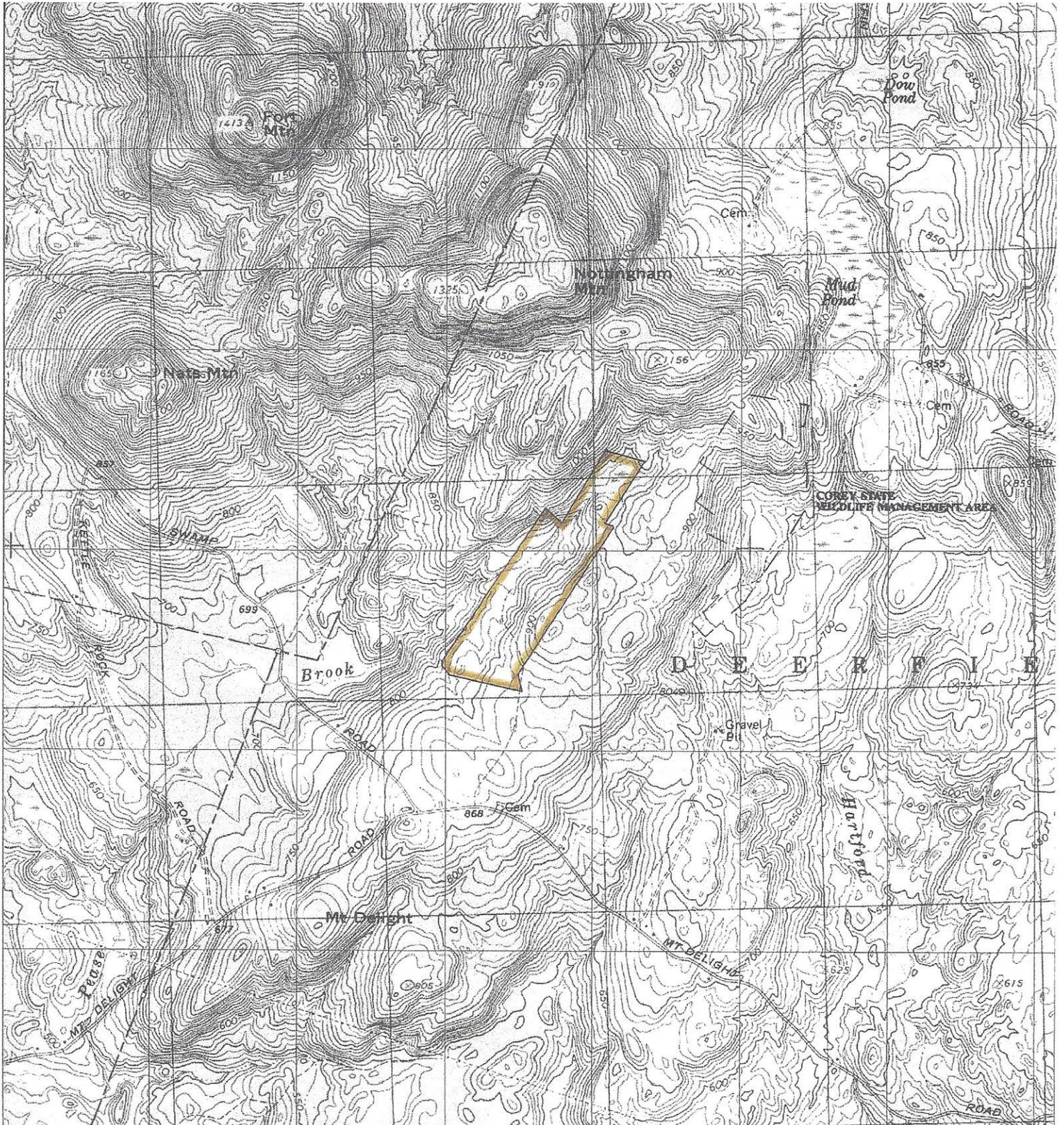


MAP SCALE:



1 inch = 2000± feet

**Locus Map of the  
Wells Lot  
Deerfield, New Hampshire  
82.8± Acres**



USGS Topographic Map, "Gosville" Quadrangle



# Map of the

## WELLS LOT

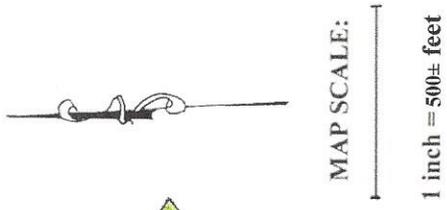
Deerfield, New Hampshire

82.8± acres

### Recommendations Key

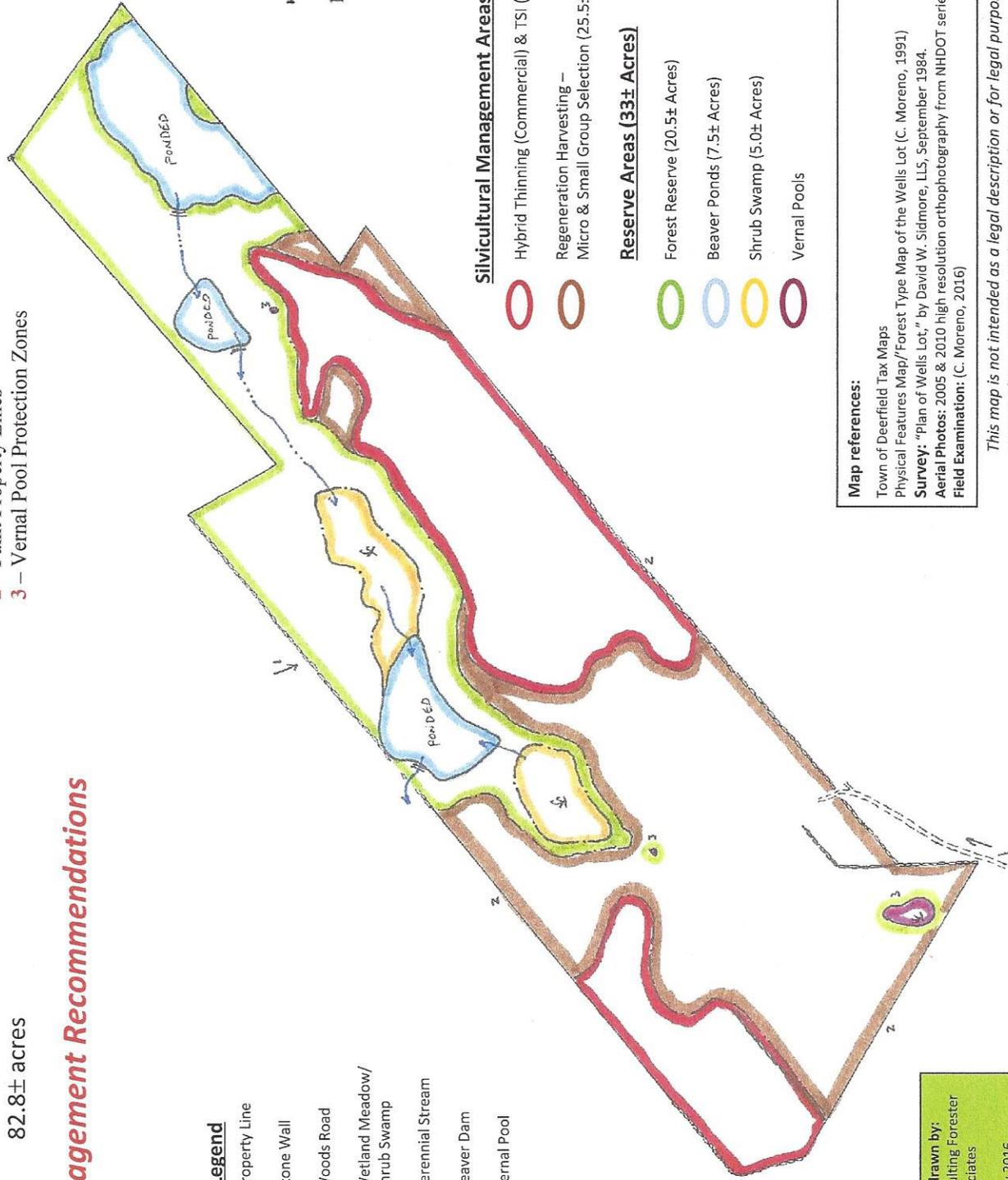
- 1 – Resolve Access Route & Upgrade Woods Road
- 2 – Paint Property Lines
- 3 – Vernal Pool Protection Zones

### Showing Management Recommendations



#### Map Legend

- Property Line
- ∞ Stone Wall
- Woods Road
- Wetland Meadow/ Shrub Swamp
- ~ Perennial Stream
- ⊘ Beaver Dam
- ⊕ Vernal Pool



#### Silvicultural Management Areas (49.8± Acres)

- Hybrid Thinning (Commercial) & TSI (24.3± Acres)
- Regeneration Harvesting – Micro & Small Group Selection (25.5± Acres)

#### Reserve Areas (33± Acres)

- Forest Reserve (20.5± Acres)
- Beaver Ponds (7.5± Acres)
- Shrub Swamp (5.0± Acres)
- Vernal Pools

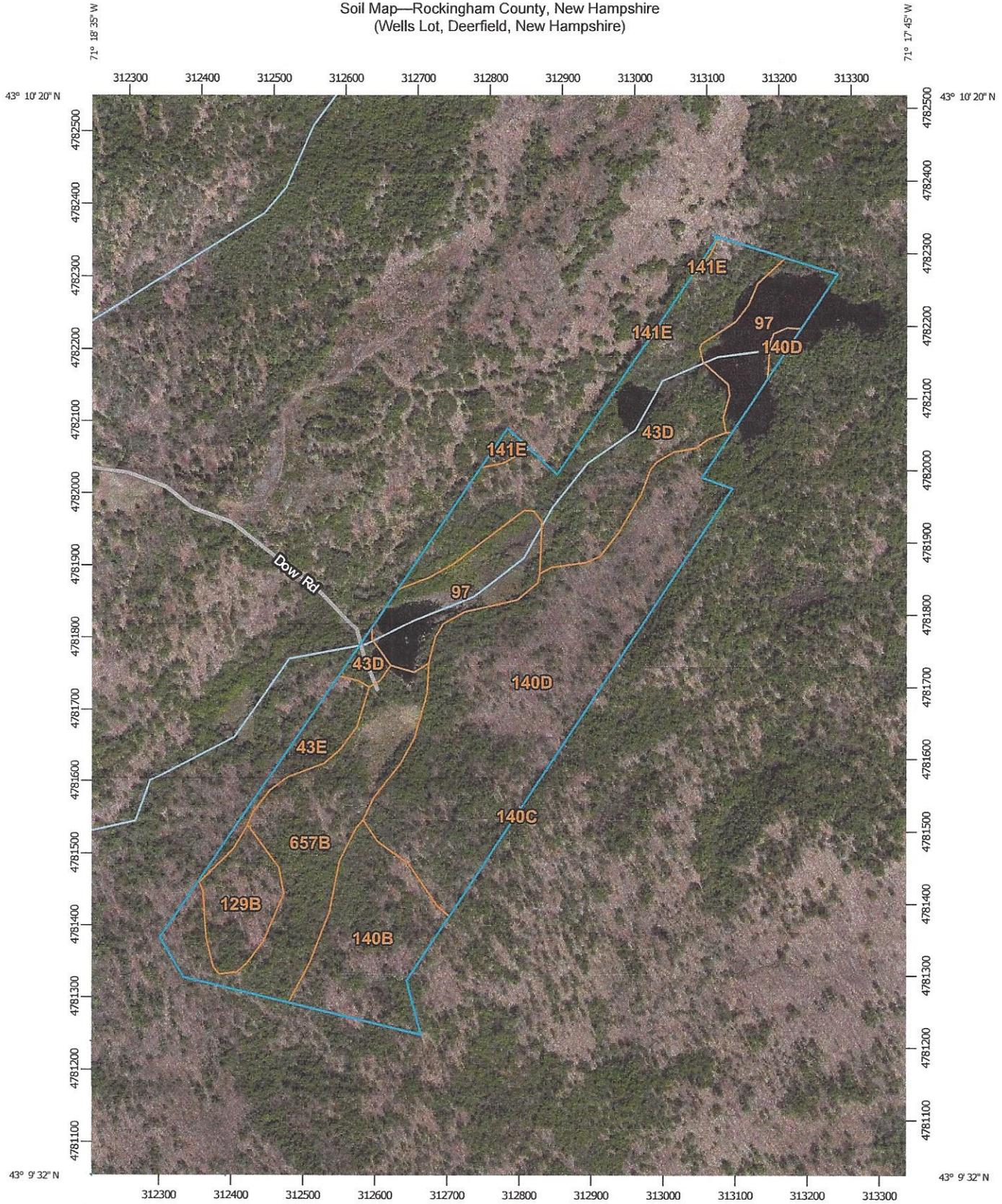
#### Map references:

Town of Deerfield Tax Maps  
 Physical Features Map/Forest Type Map of the Wells Lot (C. Moreno, 1991)  
 Survey: "Plan of Wells Lot," by David W. Sidmore, L.L.S, September 1984.  
 Aerial Photos: 2005 & 2010 high resolution orthophotography from NHDOT series.  
 Field Examination: (C. Moreno, 2016)

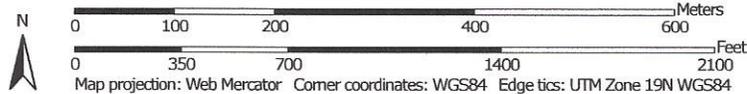
*This map is not intended as a legal description or for legal purposes. Property lines, acreages, and interior details are approximate.*

Map researched and drawn by:  
 Charlie Moreno, Consulting Forester  
 Moreno Forestry Associates  
 Center, Strafford, NH  
 (603) 335-1961 May 2016

Soil Map—Rockingham County, New Hampshire  
(Wells Lot, Deerfield, New Hampshire)



Map Scale: 1:7,280 if printed on A portrait (8.5" x 11") sheet.



# **INTRODUCTION & OBJECTIVES**

## **The Wells Lot**

### **Deerfield, New Hampshire**

## **INTRODUCTION**

The 82.8± acre Wells Lot is situated off Mt. Delight Road in the western part of Deerfield near the Epsom town line. The property is landlocked and generally not used by the community. An old woods road enters the parcel and runs along the traces of a cellarhole, however, public access rights via this route are presently unclear. The property contains the headwaters of Pease Brook, which flows through a series of beaver impoundments and shrub wetlands. Much of the property's forest was heavily harvested in the 1960's, with slow recovery since that time.

## **PROPERTY INFORMATION**

### **LOCATION and GEOGRAPHY**

The Wells Lot is situated at the base of Nottingham Mountain. Seasonal streams from this hillside form Pease Brook which then flows towards the Suncook River. The regional divide of the Merrimack River and Great Bay watersheds lies nearby to the east. The Wells Lot is embedded within a substantial open space block about 4± miles from the center of Deerfield.

The property is located in the Gulf of Maine Coastal Plain ecoregion subsection.<sup>1</sup> It lies within the first inland foothills, about 35± miles from the Atlantic Ocean where the area's climate is moderated by the sea. Lying at the northerly extent of the Appalachian oak-pine forest<sup>2</sup>, boreal species, such as red spruce, have minimal presence on the property, though just a few miles north they are more widespread.

Soils on the property are formed from glacial tills. Bedrock is not far below the soil surface. Topography ranges from level to moderately sloping, with elevations ranging from about 800± to 900± feet above sea level. Low elevation is at the Pease Brook parcel outflow and high elevation on the parcel's southeastern side.

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

<sup>2</sup> Spurduto, D. D. and W.F. Nichols. 2004. Natural Communities of New Hampshire. New Hampshire Natural Heritage Bureau and The Nature Conservancy.



## REFERENCE INFORMATION

### Surveys:

> “Plan of Wells Lot, Deerfield Town Forest,” by David W. Sidmore, LLS, September 1984. RCRD Plan #C-15346.

**Aerial Photos:** USGS 1974 photo and Google Earth images 1993, 1998, 2014, and 2015.

**Tax Maps:** Deerfield Tax Map 411, Lot 39.

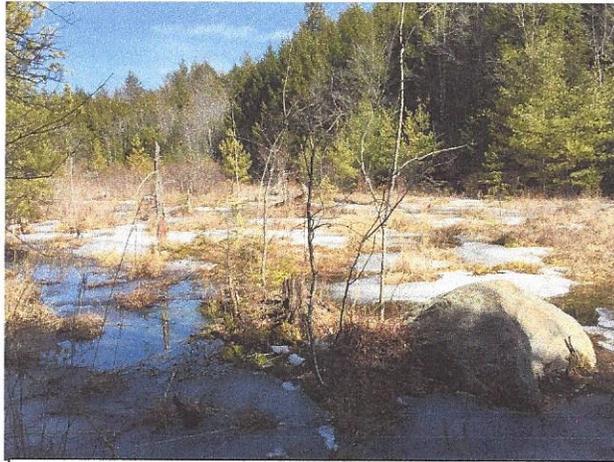
### Acreeage: TOTAL – 82.8± Acres

Upland forest – 70.3± acres  
Wetlands (shrub swamp) – 5.0± acres  
Wetlands (beaver ponds) – 7.5± acres

Reserve forest (recommended): 20.5± acres  
Silviculturally-managed forest: 49.8± acres  
Productive forest acreage (total): 70.3± acres

## PROMINENT PROPERTY FEATURES

- Pease Brook and the associated series of three beaver ponds and two shrub/emergent wetlands.
- A scenic, cascading brook between the northernmost beaver ponds.
- At least three vernal pools.
- A few scattered old trees, including relic 140 – 180± year old hemlock and red oak.
- At least three vernal pools.
- Extensive stonewalls.
- Potential cellarhole site.



Shrub/emergent wetland on the Wells Lot.



## **MANAGEMENT OBJECTIVES with SUMMARY RECOMMENDATIONS**

Management objectives for the Wells Lot are based on the natural resource findings for this study and corresponding long-term management objectives which the Deerfield Forestry Committee and Deerfield Conservation Commission have considered for the property. In this section management objectives are itemized, with summary recommendations which respond to each objective.

### **ACCESS: Establish basic forest management access.**

- There are two potential routes: 1) From Mt. Delight Road, a narrow woods road winds 2000+ feet across private land to the parcel's southeast corner, or 2) Via discontinued Dow Road which was recently used for logging, but crosses several private parcels.
- Access must be negotiated for either route, and both require substantial expenditure for road upgrading.

### **RECREATION: Improve public access to the property. Manage for low-impact recreation.**

- Utilize the same access route as for forestry, and establish as a permanent route.
- Manage property for non-vehicular, back-country uses: Hiking, nature observation, hunting.
- Possibly add an internal trail, once access to the property is improved.

### **FOREST: Manage forest to improve forest health and species diversity, expand structural complexity, and enhance timber value.**

- Reduce prevalence of trees afflicted with beech bark disease.
- Maintain property free of exotic invasive plants.
- Encourage mixed species regeneration, especially pine and oak. Discourage an over-abundance of beech.
- Grow and retain large, older trees.
- Improve property's timber quality and value.
- Utilize low-impact logging methods.
- Manage forest with a long-term outlook towards a valuable, scenic forest in 50 years.
- Forest management depends on creating adequate access to the property.

### **WETLANDS/STREAMS: Protect beaver ponds, shrub wetlands, vernal pools, and stream water quality.**

- The parcel's remote location and present light usage affords protection to surface water features.
- With improved access, implement forestry and recreational trail BMP's to protect water quality (siltation or pollution), hydrologic function.
- Retain minimal harvest buffers (50± feet wide) along wetlands and stream riparian edges.

### **WILDLIFE: Enhance habitat through long-term forest management.**

- The Wells Lot lies within a large open space block.
- Retain trees of wildlife importance.
- Increase oak mast resource.
- Over time, manage for mixed tree and shrub species, and complex forest structure—



mixed-aged forest, complete canopy layering, accumulation of downed woody material, etc.

**FINANCIAL: Over long-term, approach break-even finances for property management.**

- Investment must be made to improve recreational access to the property, as well as to initiate forest management. Estimated cost of access improvements to the property: \$10,000 to \$15,000±.
- Further investment is likely needed to improve forest growth. Revenue from an initial improvement harvest should largely offset the cost of follow-up non-commercial thinning (TSI).
- Over the long-term, a more valuable forest may yield harvests that generate enough revenue to repay present access and forest improvement investments.

**OTHER: Protect property integrity.**

- Re-paint and blaze boundaries every 10 years.
- Occasional (5-year) monitoring for exotic invasive plants and follow-up removal.

<b><i>Summary Recommendations – Priority Level</i></b>		
<b>High</b>	<b>Medium</b>	<b>Low</b>
Improve access. Financial investment is required.	Improve forest health, growth and value.	Create internal trail.
Wetland/stream protection.	Habitat management with enhancements.	
Property line maintenance.	Breakeven finances over long-term.	



## **PROPERTY FEATURES**

## **PROPERTY FEATURES/CONDITIONS**

### **PROPERTY LINES**

Local surveyor, David Sidmore, LLS, surveyed the Wells Lot in 1984, while also axe-blazing and painting (red) the property lines. Now, over 30 years later, the lines are in need of re-painting, though re-blazing is largely unnecessary. In the future, repainting should occur every 10± years.

### **WOODLAND ACCESS**

- **Forest management access:** The property currently lacks forestry access. Road access must be negotiated and established through an abutting property. Access development costs may be considerable.
- **Recreational access:** There is no defined public access to the property. Snowmobilers and occasional ATV's utilize the old woods road leading in from Mt. Delight Road through abutting private property. Other public use is minimal.

### **RECREATIONAL USE**

The Wells Lot has only very occasional recreational usage. In addition to its difficult access, few persons are informed of its presence. The property also lacks highly scenic or unusual features, such as a mountain view, to attract the public. The property receives some attention during hunting season.

In the future, the Wells Lot may provide an entrance route to an extended loop trail through the Nottingham Mountain area, though this requires coordination with a number of area landowners.

### **CULTURAL FEATURES/SPECIAL SITES**

- A slight depression alongside the old trail from Mt. Delight Road suggests the location of a primitive cellar hole. Stonewalls are found on the parcel perimeter as well as in southern areas where cultivated fieldland was once present.
- The remains of a sawdust pile from the 1960's logging operation is still found on the edge of the southernmost shrub swamp.
- A scenic feature is the cascading brook between beaver ponds in the northern property area.

### **HIGH CONSERVATION VALUE FOREST**

The Wells Lot lacks the presence of a rare natural forest community and is not specifically recognized as high conservation value forest. However, the property is embedded within a large, contiguously undeveloped area spanning several thousand acres between Deerfield and



Epsom. In addition to Nottingham Mountain and Fort Mountain, this open space area contains headwater streams for two major watersheds. The Wells Lot, along with two other nearby town-owned woodland properties, the Freese Lot and the Hart Lot, are an integral part of what is arguably one of the New Hampshire Seacoast's most significant remaining forest areas.

### **THREATENED and ENDANGERED SPECIES**

No threatened or endangered species, or rare natural communities were noted in field visits to the property. The NH Natural Heritage Bureau database has a 2006 reported wood turtle sighting on the property. Wood turtle, listed as a New Hampshire species of concern, may utilize the Pease Brook riparian areas, though the species prefers slow-moving streams with sandy bottoms. The presence of tree-nesting bats, several species which are now threatened, is unknown, though they may be present in any of the property's numerous cavity trees or snags.

*Hemlock-beech-oak-pine forest* is the natural community type found on the property's uplands.<sup>3</sup> This is a common and widespread forest community in New Hampshire.

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<sup>3</sup> Sperduto, D. D. and W.F. Nichols. 2004. Natural Communities of New Hampshire. New Hampshire Natural Heritage Bureau and The Nature Conservancy. Page 59.



# **NATURAL RESOURCES**

## NATURAL RESOURCE SUMMARY

### WATER RESOURCES

- The Wells Lot's surface waters are part of the Suncook River watershed.
- The property contains the headwaters for Pease Brook, with an associated series of wetlands. Three sizable beaver ponds are found, all largely devoid of snags (dead standing trees, often used for nesting or roosting by a variety of birds).
- At least three vernal pools are found in the Wells Lot. Two are small and open. The southeastern corner contains a large, densely vegetated vernal pool.

### SOILS

The property's soils are delineated in the *Soil Survey for Rockingham County, New Hampshire*<sup>4</sup> as well as the NRCS Web Soil Survey.

**Chatfield-Hollis-Canton (140)** underlies most of the property's uplands. These soil types are intermingled. Most areas consist of reasonably well-drained *Chatfield*, a glacial till with bedrock 2 to 3 feet below the surface. *Hollis* areas include exposed ledge and low ridges that are shallow to bedrock. Gravelly lenses of *Canton* are interspersed. The soil ranges from low productive potential on thin soil areas, to good productive potential for both red oak and white pine in deeper soils.

**Canton (43)** – A small area of this gravelly, well-drained, fine sandy loam is found in the west-central area of the parcel. This soil is productive for both pine and hardwood growth, but is prone to wetness during spring thaw.

**Woodbridge (129)** –This highly productive, moderately-drained, loamy till is found in a small area in the southwestern property corner. The soil's hardpan clay layer maintains soil surface moisture through dry periods with productive results for forest growth, including white pine and mixed hardwoods. The soil is typically too moist to operate on during wet seasons.

**Ridgebury (657)** occupies poorly drained areas around seasonal drainages and wetland swales on the property. Like Woodbridge, *Ridgebury* also contains a hardpan layer. Forest management is usually restricted in Ridgebury areas as it follows stream riparian zones.

**Greenwood and Ossipee (97)** – These very-poorly drained, mucky peats underlie the property's saturated, ponded, and seasonally flooded pools, swamps, and basins, especially wetlands with sparse or no tree growth. Ossipee's peat layer is deep, with bedrock more than 5 feet below the soil surface.

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<sup>4</sup> Kelsea, Russell J. and Gove, James P. 1994. *Soil Survey for Rockingham County, New Hampshire*. Soil Conservation Service, USDA



## WILDLIFE HABITAT

### HABITAT SUMMARY

- The property's forest provides softwood thermal habitat and developing mast forest (substantial young red oak, copious beech).

- The forest has an abundance of cavity trees, especially decaying beech that are afflicted with advanced beech bark disease. Large beech with interior decay provide potential cavity nesting and denning sites for pileated woodpecker, owls, flying squirrels, porcupine, fisher, and raccoon. Some beech also provide raptor nesting sites.



3-pronged branching junction in beech often provides raptor nesting sites.

- The parcel's relatively undisturbed setting contains the following forest habitats: Hemlock-dominated areas and open, upland hardwood (often beech-dominated) areas. A selection of the wildlife species which these forest habitats may support, include: Barred owl, broad-winged hawk; Northern goshawk; yellow-bellied sapsucker; downy woodpecker; blue-headed vireo; least flycatcher; hermit thrush; wood thrush; black-throated green warbler. Also, porcupine, gray fox, fisher, white-tailed deer, and black bear.
- Beaver are the key habitat-altering species in the property's Pease Brook wetland system. In addition to having created three significant, shallow-water ponds, beaver have caused the presence of nesting snags, cavity trees, deadfall, and small forest openings—all important habitat features of the wetland area.

- The Wells Lot's Pease Brook wetland complex supports a variety of mammals, including: Moose, white-tailed deer, raccoon, beaver, otter, mink, and little brown bat. Painted



Blueberry swamp in Wells Lot with likely vernal pool functionality.

turtle, snapping turtle, and possibly Blanding's turtle, may utilize these wetlands. Great blue heron, teal, wood duck, great horned owl, alder flycatcher, tree swallow, kingbird, and marsh wren are a sampling of the broad variety of birds that are attracted to the properties beaver impoundments and shrub/emergent swamps.

- Vernal pools on the property include a larger heavily vegetated (highbush blueberry) pool that is likely highly functioning due to a relatively long hydroperiod and numerous egg mass attachment sites. The other two pools are small and shallow, probably only supportive of freshwater arthropods.



### **HABITAT MANAGEMENT RECOMMENDATIONS**

Wildlife habitat management on the Wells Lot will be integrated as part of improvement harvesting, if harvesting occurs.

General property habitat recommendations:

- Designate a substantial older forest area, northeast of the wetland system, as reserve to allow increasingly old forest conditions to develop as a habitat type for wildlife.
- Monitor the property for invasive plants, and immediately remove any plants found.

Specific recommendations for forested, silvicultural areas include:

- Retain and encourage the growth of broad-crowned, mast-producing oaks.
- Retain pockets of beech for mast production and as cavity trees.
- Encourage alternative mast sources including white oak and black oak.
- Retain snags, cavity trees, blowdowns, and downed woody debris.
- Promote the growth of fruit-bearing wetland shrubs and early successional forest growth (aspen and birch for beaver) by clearing small patches (1/10 acre) near shrub wetland edges.
- Through improvement cutting, increase forest canopy layering over time and develop more complex forest structure.
- Retain pockets of hemlock thermal cover.
- Retain and allow the growth of old legacy trees over time (trees that reach 200 to 300+ years). These may include scattered individuals as well as ancient tree groves.
- Leave a 50± foot minimal harvest buffer around vernal pools. Within 100 feet of the vernal pools, apply low-impact practices.
- Minimize stream crossings when harvesting.



## FOREST RESOURCES

### FOREST CONDITIONS

- The Wells Lot contains an increasingly late-successional species mix, though structurally, the forest is relatively young. Logging, most recently in the late 1960's±, is the most salient form of forest disturbance.
- The 1960's logging—a portable sawmill logging operation—likely focused on the broad scale removal of white pine sawtimber. This approach has had long-term implications. Nearly 50 years later, the forest contains relatively small diameter trees and fairly low tree species diversity. Beech, much of it diseased, constitutes the majority of young growth. Large, valuable timber is lacking, with timber value lingering around \$200/acre.
- The Wells Lot contains promising stocking of red oak and black birch *polewood* (6 to 10± inch diameter). Totalling approximately 1500± trees on the upland acreage, this polewood represents the property's valuable timber stocking for the near-future (30 to 50+ years hence).
- The property contains a few scattered older trees, 140+ years, including hemlock, red oak, and a small group of yellow birch. The great majority of the property's trees are young to mid-aged: 45± to 95± years.
- The property does not contain young forest growth areas (<40± years). Early-successional tree species, such as aspen (popple), gray birch, and black cherry, are largely absent.
- Beech, hemlock and red maple are the most common tree species. Black birch, white pine, red oak, and white birch are somewhat less common, or found only in sections of the forest.
- Beech regeneration (seedling/sapling) is ubiquitous on the property, except beneath heavily-shaded hemlock areas where regeneration is sparse.

### SPECIES COMPOSITION

The Wells Lot has low tree species diversity, with eight species commonly found. A qualitative approximation of the property's forest overstory tree species abundance is:

- Abundant – Beech, hemlock, red maple.
- More Common – Black birch.
- Common – Red oak, white pine, white birch, yellow birch.
- Scarce – White oak.
- Rare – Black oak, red spruce, balsam fir, white ash.
- Not Observed – Red pine, pitch pine, black cherry, gray birch, big-tooth aspen, quaking aspen, American elm, black ash, shagbark hickory, basswood, black willow, American chestnut.



**FOREST STRUCTURE**

The Wells Lot was once farmed, with northern and eastern sections abandoned as early as the 1820’s. Hemlocks up to 140± years of age are found on the property, indicating a foundational forest age of 190+ years. The forest is much younger in southern areas and the former Dow Road (the old woods road) location, where farming lasted perhaps into the early 20<sup>th</sup> century. The matrix forest age here is less than 100 years.

Through the intervening years, sections of the Wells Lot’s forest have been harvested multiple times. The absence of white pine in areas is a consequence of past pine sawtimber removal; the most significant harvest occurred in the 1960’s. The relatively young and even-aged conditions of stands in Forest Type B and C are a result. Because some trees were retained, most areas of the property are even-aged with scattered older residuals, or two-aged.

**FOREST HEALTH**

The Wells Lot appears to be entirely free of exotic, invasive plants at present. The property’s remote location has protected it from this incursion.

Forest diseases and insects are present, or threaten, generally within the range of prevailing local conditions. Beech bark disease is rampant, afflicting over 75% of the beech on the woodlot. Over time, this disease weakens the tree causing loss of live crown and progressive interior trunk decay. While many trees eventually succumb to the disease, a small percentage (10%) may be entirely resistant. Hemlock wooly adelgid was not noted on the Wells Lot as of the winter of 2015-2016. Emerald ash borer is nearby, however, the Wells Lot forest contains few ash trees and therefore is not highly susceptible to drastic tree loss from this insect.



A beech with beech bark disease on left, compared with the smooth bark of a disease-free beech on the right.

The following table summarizes the prevalence of various conditions that affect the forest, and the Wells Lot’s susceptibility.

Pathogen or Insect	Species <i>Most</i> Affected	Prevalence	Vulnerability
Beech bark disease	Beech	High	High
Nectria canker	Black birch, yellow birch	Moderate	Moderate
Strumella canker	Red oak	Low	Low
Hemlock wooly adelgid	Hemlock	None	Moderate
Emerald ash borer	White ash, black ash	None	Low



## **SILVICULTURAL OVERVIEW**

The Wells Lot's forest has been diminished by past harvesting and agricultural practices. While forest stocking is well restored, beech (diseased) and hemlock generally dominate species composition, and beech is the most common regeneration (seedling-sapling growth). Forest structure is not presently complex, with most areas generally even or two-aged, unlike the mixed-aged conditions of a natural forest. Soil fertility is somewhat suspect as well—the overall height of the tallest trees, an indicator of soil productivity, is 15 to 20% less than comparable highly productive sites.

The oldest forest areas were those not easily accessed during the latest harvest—the section northeast of the Pease Brook wetland complex. To avoid destructive impact to Pease Brook, and to retain a substantial section of older forest, this management plan (consistent with the previous 1991 forest management plan) recommends retaining this area as a reserve outside of silvicultural management.

The current plan specifies silvicultural management for the rest of the property's forest, roughly 50± acres. The purposes are to:

- 1) Encourage a wider diversity of tree and shrub species, especially mast-producing species for wildlife and valuable timber species such as white pine;
- 2) Promote the growth of existing, potentially valuable trees, many of which are currently polewood size (6 to 10 inches in diameter)—in total, approximately 1,000 young red oak, black birch, and yellow birch stock the property, representing the forest's future value;
- 3) Reduce the abundance of beech and hemlock, both shade-tolerant species that will increasingly dominate. Allow the natural establishment of other tree species.
- 4) Improve the structural complexity of the forest, with diverse and wide-ranging tree age representation, including viable young growth as well as very old trees (200+ years).

Wildlife habitat and the forest's resilience to harmful agents (insects, disease, climate change stress, etc.) are improved by encouraging diverse species and complex structure conditions.

All Wells Lot management work hinges on developing access to the property. If access issues are resolved, a further logistical factor must be considered. If a commercial thinning is applied, that is, using logging equipment and marketing the harvested timber, extreme care must be used by the loggers to maneuver around and avoid damaging potentially valuable young trees. The use of logging equipment will invariably result in the loss of some of the aforementioned 1,000± significant trees. The alternative—thinning with a chainsaw and leaving the harvested trees in the forest (non-commercial work known as "TSI")—creates near-perfect results, however, is expensive to apply. The compromise approach is mechanical harvesting with sufficient investment to thoroughly lay-out equipment pathways, thus minimizing the loss of valuable trees.



# **FOREST TYPES**

## A. Hemlock/White Pine/Hardwood – 22.3± acres

**Description** – This forest type is found in two general areas including the southern area where the old woods road first enters the property, as well as areas surrounding the series of beaver swamps, including older forest north of the wetlands. The forest type is characterized by the presence of *overstory* hemlock, white pine, and generally upland hardwoods. The proportions of species varies; areas, or inclusions, with a strong hemlock presence are heavily shaded in comparison to areas where red oak or beech dominate. Northern areas of this stand, across the beaver wetlands, escaped the most recent heavy harvest, and therefore contain a consistently older representation of trees.



Heavy canopy cover in areas with increased hemlock.



More open hardwood-dominated patch.

Species Composition	
Primary <sup>1</sup>	Beech, red oak, black birch, hemlock, red maple, white pine—species are present in varying proportions.
Secondary <sup>2</sup>	
Tertiary <sup>3</sup>	
Regeneration (saplings)	Beech, hemlock, white pine.

<sup>1</sup> Dominant tree species in main canopy layer.

<sup>2</sup> Fairly common to less common tree species.

<sup>3</sup> Less common, or a unique tree species with only one or a few specimens in the forest type.



<b>Forest Structure</b>	
<b>Composition</b>	
<b>Stand Structure</b>	Two-aged w/ older residuals
<b>Successional Stage</b>	Late-intermediate
<b>Stand Age</b>	50- 60±//85-115± years (scattered residuals up to 140± years)
<b>Tree Size</b>	
<b>DBH range</b>	6 – 26± inches
<b>Mean DBH</b>	11± inches
<b>Avg. Max. Height</b>	80± feet (white pine)
<b>Stand Density</b>	
<b>Relative Stocking</b>	Considerable
<b>Basal Area/Acre</b>	160± sq. ft./acre
<b>Trees/Acre</b>	240± trees
<b>Canopy Closure</b>	90-100± %

<b>Wildlife/Ecological</b>																	
<b>Habitat Features</b>	Large diameter cavity trees, snags, and dead stubs. Older red oak and beech represent a substantial mast source. Partial summer and winter softwood thermal cover.																
<b>Canopy Stratification</b>	<table border="1"> <caption>Canopy Presence Data</caption> <thead> <tr> <th>Stratum</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>US1</td> <td>1</td> </tr> <tr> <td>US2</td> <td>1</td> </tr> <tr> <td>MS1</td> <td>2</td> </tr> <tr> <td>MS2</td> <td>3</td> </tr> <tr> <td>MS3</td> <td>3</td> </tr> <tr> <td>OS</td> <td>4</td> </tr> <tr> <td>SC</td> <td>2</td> </tr> </tbody> </table>	Stratum	Count	US1	1	US2	1	MS1	2	MS2	3	MS3	3	OS	4	SC	2
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SC	2																
<b>Woody Deadfall</b>	Fair to good accumulation, including some large trunks.																
<b>Invasive Plants</b>	No known incidence.																

## Forest Type A -- Prescription

### Objectives –

**Silviculturally managed areas (13± acres):** Encourage the establishment of diverse forest regeneration while reducing the proportions of understory beech and hemlock. Manage towards a mixed-aged forest structure; in addition to encouraging diverse young growth, retain substantial numbers of mid- and older aged trees, especially healthy specimens with quality timber value and/or wildlife value.

**Reserve Areas (9.3± acres):** Located around beaver wetlands—reserve from systematic management, though harvesting in response to natural disturbance may be warranted in the future.

**Silvicultural Sequence:** Two-aged (present) → Multi-aged (2050)

**Harvest Cycle:** 15± years

### Silvicultural Treatments:

2020±: **Improvement cut/Single-tree selection/micro-group selection.**

*TSI:* Remove and control understory beech.

2016 - 2030 **Monitor stands for HWA presence. Prepare a hemlock salvage response if warranted.**

2035±: *Single-tree/expanded canopy gaps (edges of previously created group selection removals).*

2050±: *Single-tree selection/Expanded group selection. Follow-up TSI (inter-sapling release) in understory.*



Charles Moreno, Consulting Forester

Strafford, New Hampshire, (603) 335-1961

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## B. Hemlock/Hardwood – 23.7± acres

**Description** – White pine is largely absent in this forest type that covers much of the middle interior of the property. Pine and hardwoods were cut from this stand area in the 1960's with the resulting release of hemlock. 8 to 12 inch hemlock is now distinctly dominant in the stand. A variety of hardwood species, mostly in the 6 to 12 inch diameter range, are also present. Due to the hemlock's dense shading, the forest understory—including regeneration—is sparse.



Hardwoods mix with hemlock in this section of Forest Type B.



Extremely rocky terrain is found under areas of Forest Type B.

<b>Species Composition</b>	
Primary	Hemlock, red maple, black birch, yellow birch.
Secondary	Red oak, white birch, beech.
Tertiary	
Regeneration (saplings)	Hemlock, primarily. Generally sparse.

<b>Forest Structure</b>	
<b>Composition</b>	
Stand Structure	Two-aged w/ older residuals
Successional Stage	Mid to late-intermediate
Stand Age	50- 60±//85+ years
<b>Tree Size</b>	
DBH range	5 – 20± inches
Mean DBH	11± inches
Avg. Max. Height	55± feet
<b>Stand Density</b>	
Relative Stocking	Dense
Basal Area/Acre	200± sq. ft./acre
Trees/Acre	310± trees
Canopy Closure	90-100± %



<b>Wildlife/Ecological</b>																	
<b>Habitat Features</b>	Summer and winter thermal cover. Partial mast source (red oak). Rocky soils with denning crevices for small mammals.																
<b>Canopy Stratification</b>	<table border="1"> <caption>Canopy Presence Data</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>US1</td> <td>1</td> </tr> <tr> <td>US2</td> <td>1</td> </tr> <tr> <td>MS1</td> <td>2</td> </tr> <tr> <td>MS2</td> <td>3</td> </tr> <tr> <td>MS3</td> <td>3</td> </tr> <tr> <td>OS</td> <td>4</td> </tr> <tr> <td>SC</td> <td>2</td> </tr> </tbody> </table>	Category	Value	US1	1	US2	1	MS1	2	MS2	3	MS3	3	OS	4	SC	2
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MS1	2																
MS2	3																
MS3	3																
OS	4																
SC	2																
<b>Woody Deadfall</b>	Good accumulation, but mostly smaller trunks.																
<b>Invasive Plants</b>	No known incidence.																

## Forest Type B -- Prescription

### Objectives –

**Silviculturally managed areas (19± acres):** Over short term, provide growing space to promising hardwoods, especially red oak, black birch, and yellow birch. Also, encourage the establishment of diverse species forest regeneration by creating canopy openings. Over time, allow the development of mixed-age conditions.

**Reserve Areas (5± acres):** Located near beaver wetlands—reserve from systematic management, though harvesting in response to natural disturbance may be warranted in the future.

**Silvicultural Sequence:** Two-aged (present) → Multi-aged (2050)

**Harvest Cycle:** 15± years

### Silvicultural Treatments:

2020±: *Improvement cut/ Single-tree selection/micro and small-group selection.*

2016 - 2030 *Monitor stands for HWA presence. Prepare a hemlock salvage response if warranted.*

2035±: *Single-tree/expanded canopy gaps (edges of previously created group selection removals).*

2050±: *Single-tree selection/Expanded group selection. Follow-up with TSI (inter-sapling release) in understory.*



Charles Moreno, Consulting Forester

Strafford, New Hampshire, (603) 335-1961

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### C. Mixed Hardwood, Young – 17.9± acres

**Description** – This forest type describes a single stand that was clearcut in the late 1960’s/early 1970’s, and has grown back as birch-beech-red maple polewood. Beech re-stocked the area both as seedlings and root coppice. It is an increasingly prevalent species, and much of it is diseased. Of the remaining species, 6 to 10 inch black birch and red oak show considerable promise as future high-quality timber. Stocking of these trees averages 20 to 25 stems per acre. With careful thinning to provide space for tree crown development, the future value of this stand can be increased considerably.



Beech, birch and red maple dominate *Forest Type C*.



An 8 inch diameter red oak holds promise as high-value, future veneer in *Forest Type C*.

<b>Species Composition</b>	
Primary	White birch, black birch, beech, red maple.
Secondary	Yellow birch, red oak, hemlock.
Tertiary	White pine.
Regeneration (saplings)	Hemlock. Generally sparse.

<b>Forest Structure</b>	
<b>Composition</b>	
Stand Structure	Even-aged w/ scattered older residuals
Successional Stage	Young to mid-intermediate
Stand Age	35-45//65-80+ years
<b>Tree Size</b>	
DBH range	3 – 20± inches
Mean DBH	9± inches
Avg. Max. Height	45± feet (older residuals to 55± feet)
<b>Stand Density</b>	
Relative Stocking	Dense
Basal Area/Acre	130± sq. ft./acre
Trees/Acre	300± trees
Canopy Closure	90-100± %



<b>Wildlife/Ecological</b>																	
<b>Habitat Features</b>	Increasing red oak and beech mast supply. Beech with raptor nesting branch structure.																
<b>Canopy Stratification</b>	<table border="1"> <caption>Canopy Presence Data</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>US1</td> <td>1</td> </tr> <tr> <td>US2</td> <td>1</td> </tr> <tr> <td>MS1</td> <td>2</td> </tr> <tr> <td>MS2</td> <td>3</td> </tr> <tr> <td>MS3</td> <td>3</td> </tr> <tr> <td>OS</td> <td>3</td> </tr> <tr> <td>SC</td> <td>1</td> </tr> </tbody> </table>	Category	Value	US1	1	US2	1	MS1	2	MS2	3	MS3	3	OS	3	SC	1
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MS1	2																
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MS3	3																
OS	3																
SC	1																
<b>Woody Deadfall</b>	Generally low accumulation, though some scattered older trunks on ground.																
<b>Invasive Plants</b>	No known incidence.																

## Forest Type C -- Prescription

**Objective/Methods** – Encourage the growth of potentially valuable trees, especially red oak, black birch, and yellow birch polewood. Remove diseased beech and poor quality white birch and red maple to provide growing space and upgrade overall stand quality. Initial treatment may be breakeven if done as a biomass or small scale firewood harvest. However, pre-commercial (i.e., cost incurring) TSI work may be preferable to thin this stand in order to minimize damage or loss of promising growing stock.

Retain older residuals and trees benefitting wildlife (though harvest of at least some older beech is recommended to limit the re-seeding of this species) for wildlife use.

Begin control of understory beech to allow re-establishment of white pine and a more diverse set of hardwood species.

**Silvicultural Sequence:** Even-aged (Present)→ Three-aged (2050)

**Harvest Cycle:** 15± years

### **Silvicultural Treatments:**

2020±: **Improvement cut/Crown thinning.** May be as commercial or pre-commercial harvest.

2035±: **Crown thinning/Improvement cut.**

2044±: **Single-tree selection/Micro-group selection.**



## D. Hemlock/Pine/Hardwood, Inclusions – 6.4± acres

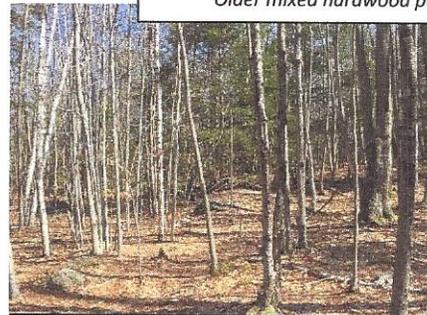
**Description** – This forest type, found in the southwest section of the property, was a more recently abandoned field area that has been variously harvested over the last 85± years. The resulting structure is an amalgamation of forest patches or “inclusions”. These include: a 2± acre area with fine quality mixed hardwoods; smaller patches of dense hemlock/pine/hardwood, not older than 85 years; and pockets of mixed hardwood polewood, somewhat dominated by beech in a manner reminiscent of Forest Type C. Due to the relatively small size of these inclusions and their intermingled locations, these pockets are best described as a single, interrelated stand.



Older mixed hardwood pocket.



Hemlock/Pine/Hardwood inclusion.



Beech dominated polewood patch.

Species Composition	Mixed Hardwoods	Hemlock/Pine/Hardwood	Young Hardwoods
Primary	Red maple, red oak, black birch	White pine, hemlock, red maple	White birch, black birch, beech, red maple
Secondary	Beech, yellow birch, white pine	Yellow birch, beech, red oak	Yellow birch, red oak, hemlock
Tertiary	White oak, black oak		White pine
Regeneration (saplings)	Beech. Some hemlock.	Sparse.	Some hemlock, generally sparse.

Forest Structure	Descriptions of Within-Stand Inclusions or Patches		
	Mixed Hardwoods	Hemlock/Pine/Hardwood	Young Hardwoods
<b>Composition</b>			
<b>Stand Structure</b>	Two-aged w/ older residuals	Even-aged w/ older residuals	Even-aged w/ residuals
<b>Successional Stage</b>	Mid to late intermediate	Mid-intermediate	Young to mid-intermediate
<b>Stand Age</b>	35-45±//45-65±//Residuals over 85+ years	45 – 65±//85+ (residuals)	35-45//65-80+ years
<b>Tree Size</b>			
<b>DBH range</b>	7 – 20± inches	5 – 22± inches	3 – 20± inches
<b>Mean DBH</b>	11± inches	12± inches	9± inches
<b>Avg. Max. Height</b>	70+ feet (white pine)	55 - 70± feet	45± feet (residuals 55± feet)
<b>Stand Density</b>			
<b>Relative Stocking</b>	Considerable to dense	Dense	Dense
<b>Basal Area/Acre</b>	120± sq. ft./acre	200± sq. ft./acre	130± sq. ft./acre
<b>Trees/Acre</b>	190± trees	260± trees	300± trees
<b>Canopy Closure</b>	100± %	100± %	90-100± %



<b>Wildlife/Ecological</b>																	
<b>Habitat Features</b>	Red oak mast; beech with raptor nesting branch structure; hemlock patches with summer and winter thermal cover.																
<b>Canopy Stratification</b>	<table border="1"> <caption>Canopy Presence Data</caption> <thead> <tr> <th>Category</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>US1</td> <td>1</td> </tr> <tr> <td>US2</td> <td>2</td> </tr> <tr> <td>MS1</td> <td>3</td> </tr> <tr> <td>MS2</td> <td>3</td> </tr> <tr> <td>MS3</td> <td>3</td> </tr> <tr> <td>OS</td> <td>4</td> </tr> <tr> <td>SC</td> <td>3</td> </tr> </tbody> </table>	Category	Value	US1	1	US2	2	MS1	3	MS2	3	MS3	3	OS	4	SC	3
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US2	2																
MS1	3																
MS2	3																
MS3	3																
OS	4																
SC	3																
<b>Woody Deadfall</b>	Fair accumulation—generally low amounts of forest floor deadfall.																
<b>Invasive Plants</b>	No known incidence.																

## Forest Type D -- Prescription

**Objectives** – Manage inclusions individually as a mixed composition/structure stand. Improve overall stand quality and allow for development of high quality timber. Initiate regeneration of older inclusions, encouraging mixed species young growth. Discourage beech and hemlock species dominance.

**Silvicultural Sequence:** Even-aged/Two-aged (present)→Three-aged (2050)

**Harvest Cycle:** 15± years

### **Silvicultural Treatments:**

2020±: **Improvement cut/Crown thinning/micro-group selection**, including some non-commercial thinning in young hardwood patches.

2035±: **Crown thinning/Improvement cut/Single-tree/Expanded micro-group selection.**

2050±: **Single-tree selection/Expanded group selection.** Follow-up with *TSI (inter-sapling release)* in understory.



# 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:** 3/25/2015

**Re:** Review by NH Natural Heritage Bureau of request dated 2/9/2015

**NHB File ID:** 2094 **Town:** Deerfield

**Project type:** Landowner Request **Location:** South of Nottingham Mtn (Tax Map 411, Lot 39)

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

NHB records on the property(s): **None**

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

Vertebrate species (For more information, contact Kim Tuttle, NH F&G at 271-6544)	Last Reported	Listing Status	Conservation Rank
Wood Turtle ( <i>Glyptemys insculpta</i> )	2006	Federal NH -- SC	Global G4 State S3

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.**

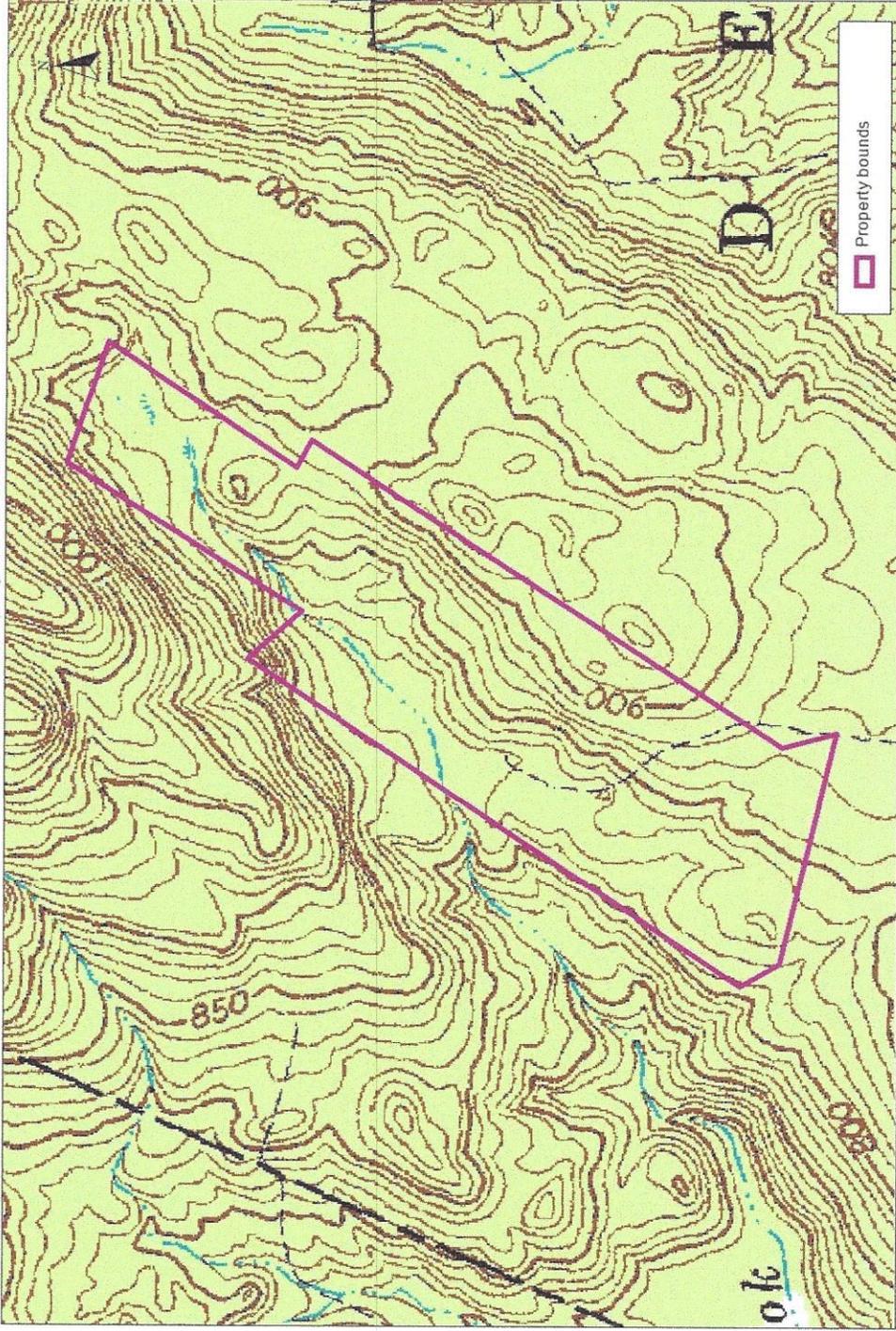
NHB: L2094



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.



Property: Town of Deerfield - Wells Lot

0.5 Miles

0.25

1:8000

25 Mar 2015

**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-six 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)



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Center Strafford, New Hampshire  
(603) 335-1961