FOREST MANAGEMENT PLAN

for the Town of Durham's



Durham, New Hampshire | 85.4± acres

Property Administrators: Trustees for the Trust Funds

Landowner: The Town of Durham

8 Newmarket Rd., Durham, NH 03824 // (603) 868-5571

Prepared by:

Moreno Forestry Associates

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Charles Moreno, NH LPF #115 Principal, Consulting Forester

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June 2025

FOREST MANAGEMENT PLAN

for the Town of Durham's

Doe Farm

Durham, New Hampshire 85.4± acres June 2025

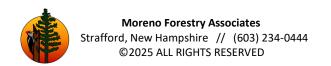


Above: The cellar hole of the Doe family cape. **Cover Page:** A scenic view of the Lamprey.

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The purpose of this plan is to provide natural resources information and forest management recommendations to the property administrators, the Trustees for the Trust Funds, and the landowner, the Town of Durham. This document is a work for hire done by Moreno Forestry Associates for the landowner and may be used by same for any purpose. Copying of this plan by any other individual or organization, including any written material, plan content and/or format, requires appropriate citation and/or the written permission of Charles A. Moreno, Principal. Any revisions to the plan cannot be made under the author's name without the author's written permission.



Acknowledgements

Funds for the Doe Farm Forest Management Plan were provided in part by the National Park Service under CFDA 15.962 — National Wild and Scenic Rivers System. Additional funding comes from NOAA's Office for Coastal Management under the Coastal Zone Management Act in conjunction with the New Hampshire Department of Environmental Services Coastal Program.

Partners include:















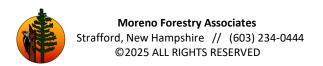




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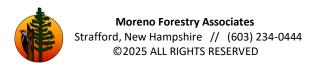
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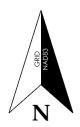
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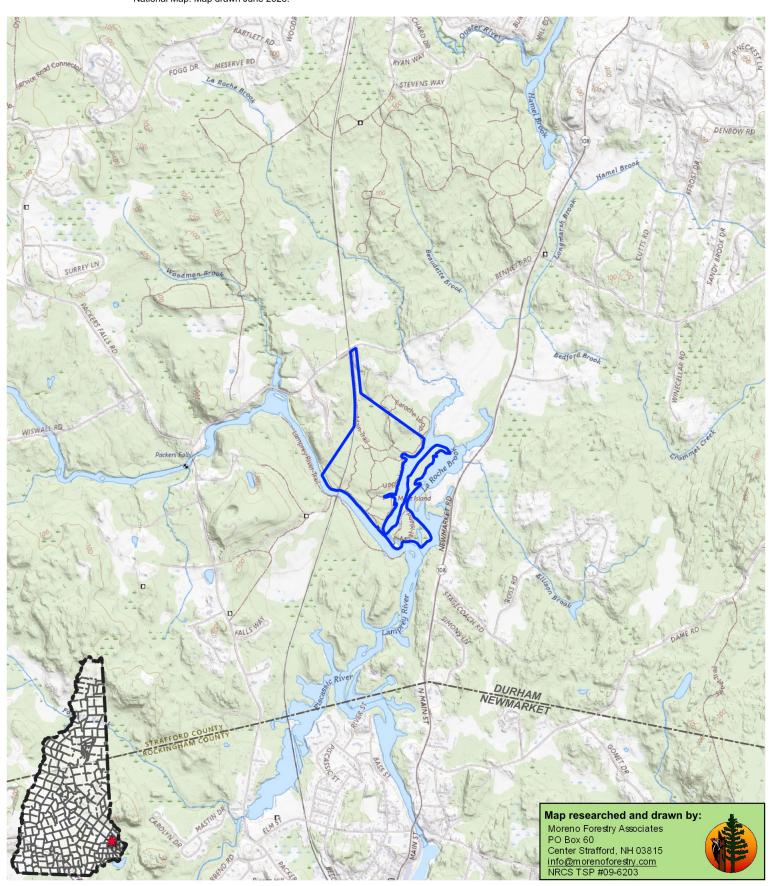


Property boundary from NH conserved lands layer, tax parcel mosaic, and LiDAR interpretation; all layers provided by NH GRANIT. USGS Topographic 1:24,000 dataset provided by The National Map. Map drawn June 2025.

Locus Map of the Town of Durham's

DOE FARM

Durham, Strafford County, NH | 87.2± Acres



Map researched and drawn by:

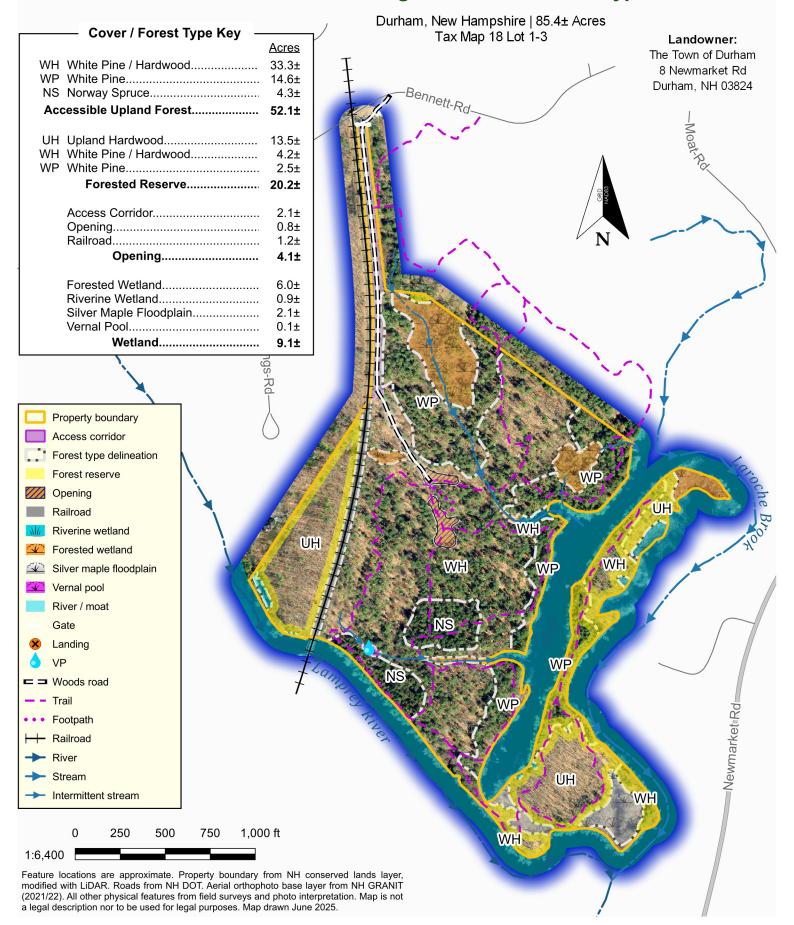
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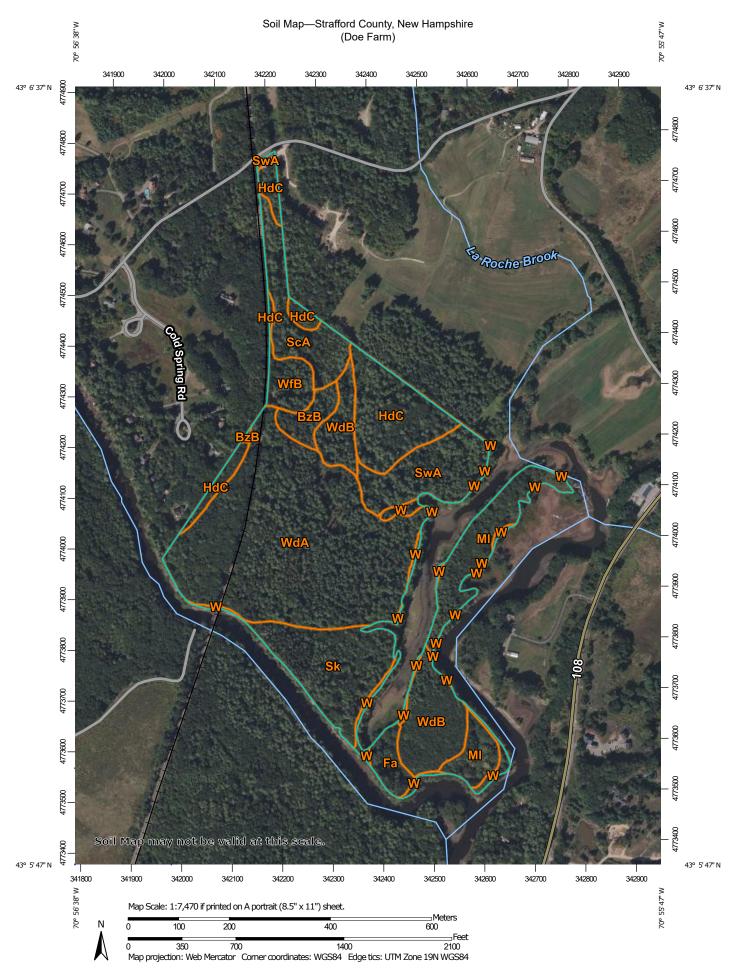
DOE FARM

Showing Forest and Cover Types

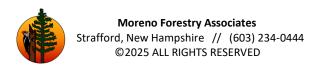


Map of Map researched and drawn by: Moreno Forestry Associates **DOE FARM** PO Box 60 Center Strafford, NH 03815 info@morenoforestry.com Showing Physical and Natural Features NRCS TSP #09-6203 Durham, New Hampshire | 85.4± Acres Tax Map 18 Lot 1-3 Landowner: Property boundary The Town of Durham Access corridor 8 Newmarket Rd Forest Durham, NH 03824 Bennett-Rd. Forest reserve Opening Significant Tree Index* Railroad Riverine wetland 1. Shagbark hickory, 26" DBH 2. Elm snag Forested wetland 3. Red oak, 36" Silver maple floodplain 4. Trio of huge red oaks 5. Red oak, 40+" Vernal pool 6. Red oak, 34" River / moat 7. Red oak, 40+", giant cavity 8. Red maple, 28' Cellar hole 9. Red maple, 30", cavity 10. Silver maple, 26", leaning Cemetery 11. Red oak, 36" 12. Double silver maple, huge Kiosk 13. White pine, 40" Bridge *Not exhaustive. Gate Landing Foundation / structure Picnic area Significant tree - hardwood Significant tree - softwood Stone ford VΡ Well Parking ■ ■ Woods road Trail Footpath Railroad River Stream Intermittent stream Stone wall → Fence 20 ft contour 2 ft contour 250 500 750 1,000 ft 1:6,400 Feature locations are approximate. Property boundary from NH conserved lands layer, modified with LiDAR. Roads from NH DOT. LiDAR base layer from NH GRANIT. All other physical features from field surveys and photo interpretation. Map is not a legal description

nor to be used for legal purposes. Map drawn June 2025.



INTRODUCTION



Forest Management Plan Doe Farm Durham, New Hampshire

INTRODUCTION

Occupying a glacial outwash plain along the Lamprey River, Doe Farm is a storied and scenic 85.4± acre forested tract owned by the Town of Durham, New Hampshire, and administered by the Trustees for the Trust Funds.

This plan was created to guide the continued sustainable management of Doe Farm's forest in the face of increasing environmental challenges. This project was funded, in part, by NOAA's Office for Coastal Management under the Coastal Zone Management Act in conjunction with the New Hampshire Department of Environmental Services Coastal Program.

The plan contains an assessment of the property's natural resources and identifies resource concerns. The plan provides climate change resilience recommendations, as well as a baseline forest carbon analysis. Grounded on the Trustees' objectives, forest management



A blue flag iris at a riverine wetland edge.

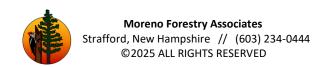
recommendations strive to meet local interests while addressing ecological concerns.

A forest management plan is a working document. Over time, updating is helpful for tracking ongoing management activities, unforeseen natural disturbances and conditions, and the Town's evolving objectives.

PROPERTY INFORMATION

Location and Geography

Located less than one mile from Route 108 (Newmarket Road) in the south of Durham, the Doe Farm tract occupies the peninsula between the Lamprey River and an abandoned river oxbow ("the Moat"), as well as a significant island ("Moat Island"). Doe Farm features nearly 3,000 feet of frontage along the Lamprey River, and another 7,500 feet of frontage on the Moat and Laroche Brook. Accessed from a parking area on Bennett Road, the tract is split by the Boston & Maine railroad.



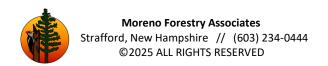
Doe Farm is situated on the Gulf of Maine Coastal Plain Lowland ecoregion¹, approximately 11 miles inland from the Atlantic Ocean (and only two miles west of Great Bay). Here, the sea moderates the climate and influences forest composition; the property lies near the northerly extent of the Appalachian oak-pine zone, and just south of the transition hardwood-conifer zone². Southerly tree species on the property include shagbark hickory and silver maple; these are rarely encountered just 15 miles north.

Doe Farm's topography is mostly level, though a minor interior terrace rises from the riverfront, possibly outlining a former riverbank edge. Besides the terrace, sloped areas include the present riverbanks, and a ledgy northern section. Elevations (above sea level) range from 24± feet in a depression in the property's far west, to 68± feet along the property boundary near Bennett Road. Soil parent materials include glacial outwash, glacial till, and marine sediments, and on Moat Island, alluvium. The local area appears to be underlain by plutonic granitic bedrock associated with the Exeter diorite formation.



Topography at Doe Farm. Darker red connotes steeper slopes.

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



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.

Reference Information

Deeds:

- Warranty deed. Strafford County Registry of Deeds (SCRD) Book 802 Page 376. Grantors: Raymond A. and Dorothy A. Laroche; Grantee: The Town of Durham. Recorded October 11, 1965.
- Initial conveyance of bulk of property from the Doe Family to the Town is unclear. (Town records may provide clarity.)

Surveys:

 A Doe Farm property survey does not exist. A survey for the Cold Springs Road subdivision describes the westernmost boundary only: "Final Subdivision Plan, Land of Genevieve M. Barry, Durham, N.H. for Douglas and Molly Hentz" dated April 2, 1985, recorded at the SCRD as Plan 27A-6.

Tax Maps:

• Durham Tax Map 18 Lot 1-3.

Conservation Easement:

The Doe Farm property is conserved by the deed conveying the land to the Town. A conservation easement does not exist. The Town owns the property in fee.

Acreage

TOTAL: 85.4± acres

CURRENT CONDITIONS:

•	Fo	rest	72.3± acres			
	0	Accessible	– 52.1± acres			
	0	Reserve	– 20.2± acres			
•	W	etland	- 9.1± acres			
	0	Forested	– 6.0± acres			
	0	Silver maple floodplain	– 2.1± acres			
	0	Riverine	– 0.9± acres			
	0	Vernal pool	– 0.1± acres			
•	● Open / non-forested - 4.1					



○ Railroad −1.2± acres

Opening / landing - 0.8± acres



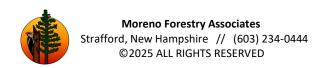
Doe Farm's entrance from the parking area.

A Concise History of Doe Farm

Doe Farm's human history dates back several millennia. Indigenous peoples undoubtedly gathered on the river's dry, fertile terraces; agriculture may have been practiced during the Woodland Period.

Post-contact history begins in the late 17th century with the logging of towering pines, and the ongoing establishment of a farm by John Doe around 1700. Known as "Moat Farm", the Doe Family, over several generations, prospered on the land, were well-educated, and became community leaders. They were farmers, tanners, bootmakers, educators, writers, and legislators. In 1909, Olinthus Newton Doe granted the farm in his will to the town, to be managed under the supervision of the Trustees for the Trust. The land was mostly field and pasture at the time, except for the Doe's "woodlot" patch on the ledgy north boundary area.

In the 1920s, Durham Boy Scouts planted thousands of red pine, white pine, and Norway spruce, many of which persist to the present time. Pastures were abandoned, and Doe Farm reverted to forest. Timber harvesting occurred in the 1950s, including 1954 hurricane salvage. A forest management plan was first prepared in 1972 (J. Sargent, NH Div. of Forest & Lands), who suggested that Thompson School forestry students might harvest timber, which was followed through. Recreational use of the land by the community increased dramatically to include walking, skiing, fishing, boating, and snowmobiling.



Silvicultural management was formalized about 2000 with the creation and implementation of a forest management plan (Moreno-2001), and improvement harvests in 2000, 2011, and 2021. The latter harvests were triggered by a damaging winter storm, and later, the salvage of dying red pine.

A stewardship plan was prepared (Snyder-2009) addressing ecological features, public uses, and general management. Based on this plan, extensive work was done to improve the property's trails, protect historic features, and foster community awareness about the land's environmental value and health. Invasive plant management efforts were organized in 2015 with mapping and planning, and contracted control work. These efforts carry through to the present and have been highly effective.

Further details about Doe Farm's forest history are presented within this plan. A detailed history of the property and the Doe Family, written by the Lamprey River Advisory Committee, is found in *Appendix F*.



An historic stone ford near the cape.

Management Logistics

Woodland Access

The parking area for Doe Farm lies immediately off Bennett Road at the railroad overpass. A gated, well-maintained gravel road leads south from the parking area, along the tracks, into the property interior. At 2,070± feet, visitors arrive at a small clearing which contains an informational kiosk. This clearing has long served as the forest management hub or "landing site." The location of the Doe Family's homestead is a short walk south, where cellar holes are the remnants of the family's cape and barn. The family graveyard lies nearby, surrounded by an iron pipe fence.

Trails break off in three directions from the landing site. An extensive trail network lies beyond, settling into several scenic loops which traverse along the property's extensive waterfront. The southeast trail continues to Moat Island, which is accessible across a narrow passage for much of the year, except during periods of high water. Moat Island contains a walking trail that runs almost the entire island length.

Forest management access is well-served by the tract's gravel road and central landing site. During past forestry operations, harvested logs and pulp have been stacked in impressive, organized piles in this staging area, awaiting transport. After a couple of summers, signs of this activity are obscured by regrowing vegetation.

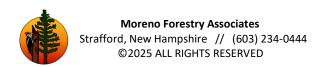
Two sections of Doe Farm are inaccessible to forest management: Moat Island and the triangular parcel lying west of the railroad tracks. This latter parcel is also officially inaccessible to recreation, though minor rogue trails have appeared connecting the Cold Springs Road neighborhood to the rest of Doe Farm.

Doe Farm's forest management access and recreational trail system are fully developed. Further improvements are unnecessary for future forestry work. Extensive work was invested 8 to 10 years ago in locating and signing the current trails, with wooden bridging and a stone ford installed to appropriately ford at seasonal stream crossings. Trail expansion is not planned or desired.

Management Compartments

To organize the management template—silvicultural areas and reserve areas—the property is broadly divided into three units, or *management compartments* ("MCs"). MC borders are defined by physical features (e.g., the railroad, wetlands) which create natural divides to management continuity. On Doe Farm, the MCs include:

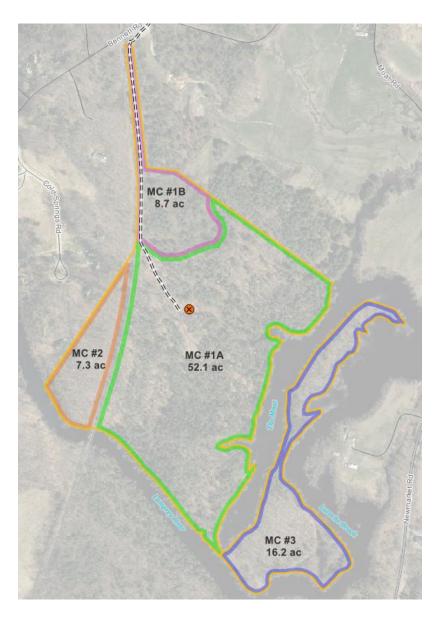
- MC #1 The area accessible via the main woods road, from Bennett Road. This MC is divided into MC #1A, which is the "core" forest management area, and MC #1B, which is difficult to access due to its narrow footprint and wet *Scantic* soils.
 - o 1A: 52.1 acres total, 50.5 acres accessible/productive forest.
 - 1B: 8.7 acres total, 0 acres accessible/productive forest.
- MC #2 The triangular parcel west of the railroad. This parcel lacks a right of way from Cold Springs Road and is otherwise rendered inaccessible by the railroad tracks and the Lamprey River. Consequently, MC #2 is designated as reserved from management. Allegedly, an historic "cattle

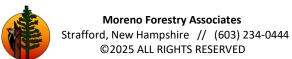


tunnel" built by Benjamin Doe provided access to this parcel in the 1800s, though the "tunnel" location has been obscured by railroad upgrades. **7.3 acres total**, **0.0 acres accessible/productive forest.**

MC#3 – Moat Island. Forest management access is precluded by an occasionally flooded, narrow connecting strip that allows only foot travel. The potential damage by logging equipment attempting to navigate this connecting passage far outweighs any forest management benefits. Thus, Moat Island, MC #3, is designated a full reserve. 16.2 acres total, 0.0 acres accessible/productive forest.

The Management Compartment Map below shows the property's MCs, and the primary access route into the tract interior which leads to the small clearing used as a forest landing site (orange circle with an "x").





Reserve Areas

Substantial areas of Doe Farm are reserved from silvicultural management ("reserve areas" or "reserves"). Due to access limitations, these areas are considered "full" reserves, where timber harvesting is excluded, likely in perpetuity. Even as full reserves, some management activity should occur, especially invasive plant control, occasional trail maintenance, and potential management for species of concern. Disturbance to rare natural communities is to be avoided, though invasive plant management is practiced.

The property's reserve areas include:

- The area west of the railroad, aka MC #2. There is no vehicular or official trail access to this area.
- The entirety of Moat Island, aka MC #3. The floodplain's water-saturated soil does not permit heavy equipment travel, nor does the narrow passage to the island. Moat Island is accessible to on-foot travel as well as boaters. The southern area of Moat Island contains the rare natural community, silver maple-false nettle-sensitive fern floodplain forest.
- Forested wetland interiors. It is noted that the wetland interior of MC 1B (see above) contains the rare natural community, *red maple-black ash swamp*, with black ash now lost to the emerald ash borer.







Moat Island, accessible by this footpath, is a forested reserve.

Sectors

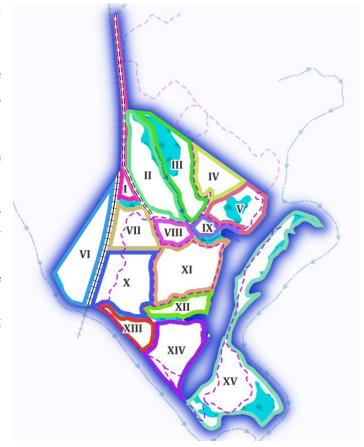
In 2015, Moreno Forestry suggested a second approach for organizing Doe Farm, expressly to manage the property's burgeoning invasive plants. Using physical boundaries where possible, 15 areas were delineated and termed "sectors".

The division into sectors was intended to create reasonably small, manageably-sized areas. The sectors average about 6 acres each. The map below shows the initial attempt to delineate the sectors, though

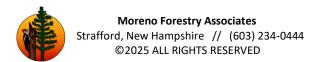
these can be modified if certain areas are prone to heavy invasive plant densities and need further subdivision.

After completing the initial phase of intensive invasive plant control—which has now been largely accomplished—the idea was to assign volunteer stewards, or small teams, to manage remaining invasives in each sector. By regularly monitoring and maintaining invasives in their assigned sector, the stewards would collectively deter invasive plants from overtaking the property once again.

Obviously, this approach needs a number of trained and dedicated volunteers on an ongoing basis, with an overarching coordinator. Where problem areas recur, outside contractors or volunteer crews can be enlisted to bring the area under control, before handing back ongoing maintenance to the steward team.



MANAGEMENT OBJECTIVES & SUMMARY RECOMMENDATIONS



LANDOWNER MANAGEMENT OBJECTIVES

Landowner Objectives

The following management objectives, as articulated by the Trustees for the Trust, the 3-person board that oversees management of Doe Farm, updates and continues the stewardship vision and efforts for the property that has been applied for the last 30+ years.

DOE FARM FOREST MANAGEMENT GOALS AND OBECTIVES

10 June 2025

Healthy Forest Ecosystem Goal

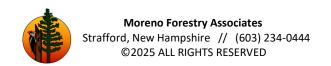
Maintain a healthy forest ecosystem through sustainable forest management, focusing on forest health, biodiversity, and wildlife.

- Objective: Sustainably harvest timber to maintain a healthy forest and to generate income for land management purposes in accord with the Olinthus Doe Fund Trust.
- Objective: Maintain the Town's status as manager of a sustainable forest resource by continuing certification by the American Tree Farm System.
- Objective: Maintain diversity of forest types as well as tree and shrub species diversity within forest types and protect and promote uncommon tree and shrub species.
- Objective: Provide horizontal and vertical structural habitat diversity for wildlife. Horizontal diversity is
 provided by means of areas of early, mid, and late seral stages. Vertical diversity is provided by retaining
 and recruiting coarse woody debris, cavity trees and snags, shrub and herbaceous layers, soft edges, and
 other features.
- Objective: Protect and manage habitats of rare, threatened, and endangered species and, where appropriate, modify activities to protect such species.
- Objective: Control invasive plant species populations.
- Objective: Reduce tree mortality and associated increased risk of fire due to insect and disease infestations.
- Objective: Protect water quality on the property and the adjacent Lamprey River by mitigating potential
 impacts on water quality from human activities such as recreation, trail maintenance, and silvicultural
 treatments.

Sensitive Lands Goal

Conserve and protect lands which are either sensitive to disturbance, subject to legal requirements, or are not common in New Hampshire.

Objective: Identify and delineate areas for unmanaged status in which active forest management is
generally limited to protective actions. Such lands will support public use, protect water quality, mitigate
impacts of climate change, and provide wildlife habitat.



- Objective: Protect streams, wetlands, vernal pools, fragile soils and the shoreline of the Lamprey River in accord with state regulations and Best Management Practices (BMPs).
- Objective: Identify, protect, and manage exemplary and uncommon natural communities.

Public Use Management Goal

Manage public use of the district's lands to protect the health of the forest ecosystem.

- Objective: Provide low impact recreation opportunities that are consistent with natural resources goals.
- Objective: Guide and educate users about appropriate public use of the property and about ongoing management activities.

Climate Change Goal

Mitigate impacts of climate change on the forest and sequester and store carbon via natural climate solutions.

- Objective: Mitigate impact of climate change on forest composition and manage insect, disease, invasive species outbreaks and fire risks exacerbated by climate change.
- Objective: Contribute to climate change mitigation by sequestering and storing carbon on the property and in long-lived wood products via natural climate solutions.

Collaboration and Outreach Goal

Collaborate with local, regional, and state agencies and organizations and provide community

education in accord with natural resources goals and objectives.

- Objective: Collaborate with other town committees and departments to maintain consistent practices and policies across town properties.
- Objective: Provide education opportunities for local schools and volunteer activities for the community on the property as appropriate.
- Objective: Collaborate with regional and state agencies and organizations for mutual benefit and to ensure compliance with laws and regulations.



A great blue heron fishes in The Moat.

SUMMARY RECOMMENDATIONS SCHEDULE

2025

- A. Trustees adopt newly prepared forest management plan.
- B. Prepare updated GIS mapping of the extent of Doe Farm's invasives.
- C. Update invasive management strategy, scheduling, and budgeting. Decide on strategy for ongoing maintenance (contractor?, sector stewards?, volunteer team events?)
- D. Professional contractor treats priority invasive control area(s).

2026

- E. Prepare GIS mapping of regeneration openings.
- F. Assess regeneration conditions in the openings.
- G. Update kiosk information.

2027

- H. Blaze and paint property lines. Coordinate with abutters.
- I. Initiate FSI treatments in regeneration openings.
- J. Plan and implement supplemental planting to enhance diversity.

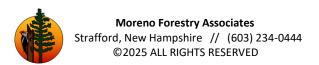
2027 - 2035

- K. Continue annual professional contractor treatment of priority invasive areas.
- L. Sector stewards and/or volunteer teams are set up to treat lightly infested invasive areas.
- M. Ongoing management of regeneration (FSI) in openings.
- N. Continue supplemental planting in regeneration openings (annual or biennial).

2040±

- O. Update management plan and inventory data, including timber and carbon data.
- P. Plan and prepare next commercial improvement harvest.

FOREST RESILIENCE TO CLIMATE CHANGE



Forest Carbon

The uptake and retention of atmospheric carbon, and the replenishing of clean air, are major ecological services that forests provide. Optimizing both carbon uptake (sequestration) and retention (storage) is an important consideration in forest management. Managing for well-stocked, mixed-aged woodlands can optimize a forest's carbon services, while improving resilience to climate change.

A young, densely-stocked, vigorously-growing forest, with medium-to-tall trees, sequesters (absorbs) carbon from the atmosphere at high rates. A well-stocked, mid- or older-aged forest stores substantial carbon—20 to 60± tons in collective tree biomass per acre. All tree sizes sequester and store, though the rates are somewhat opposing—generally young, vigorous trees sequester more but store less than old, established, but slower-growing trees. By establishing a diverse-age structured forest, with healthy young trees, ample mid-aged and older trees, and large ancients, the balance of both carbon sequestration and storage is optimized.

The silvicultural objective of growing high-quality timber products translates to augmented carbon storage. High-quality products such as sawtimber, veneer, plywood, and laminated panels are *durable*-continuing to store carbon in their end use as building materials and furniture.

Carbon storage on Doe Farm has been estimated for the above- (tree) and below-ground (root system) biomass of the forest by using the Van Doren modeling methodology³. Basal area averages for the property's core forested area (MC #1A), indexed to an ecological region subsection, results in a live-tree carbon storage estimate of 1,860± metric tons.

Carbon storage from dead standing and downed trees (coarse woody debris, CWD) was also sampled and represents a significant part of the forest carbon picture. (Full details and methodology are seen on page 31.) Total CWD carbon is estimated at 1,037± metric tons.

Total Forest Carbon, MC #1A (52.1 ac)

Туре	Metric tons of carbon per acre	Metric tons of carbon total	Metric tons of CO2 equivalent
Living above- and below-ground VD	35.77	1,860.04	6,826.35
Dead, standing ^{MFA}	9.18	477.20	1,751.32
Dead, downed ^{MFA}	10.77	560.08	2,055.49
TOTAL	55.72	2,897.32	10,633.17

VD = Van Doren method MFA = Moreno Forestry method

³ https://www.northeastforestcarbon.org/forest-carbon-estimators-and-calculators/



Climate Change Impacts on Local Forests

Broadly defined, climate change is the long-term shift in global weather patterns and average temperatures, generally resulting in a warming planet. The increase in atmospheric greenhouse gases, including carbon dioxide (CO₂), traps heat, causing the Earth's surface temperatures to warm.

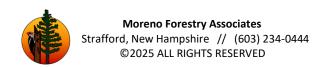
The earth's forests are a major carbon sink. Through photosynthesis, CO₂ and water are converted to sugars (carbohydrates) and oxygen. Oxygen is released into the atmosphere, while much of the captured atmospheric carbon is stored by the photosynthesizing plant, including trees. Forests are critical for sustaining air quality—producing oxygen while reducing atmospheric CO₂ and other pollutants. Through their vast contributions to storing carbon and reducing greenhouse gases, forests are critical players in tempering the rate of climate change.

Some of the ways that climate change affects local forests include:

- Trees are experiencing temperature stress. Annual mean temperatures have increased, as have pronounced spikes in temperature and extended periods of hot weather. Snowpack and the average snow-cover period have decreased over the last 75 years.
- Trees experience hydrologic stress. Recent years of extreme drought have followed years with record precipitation. These severe and repeated fluctuations take a toll on tree health.
- Storm events appear to be more pronounced and frequent. An early spring storm on April 3-4, 2024 brought heavy, moisture-laden snow and high winds, which caused widespread loss of young pine, hemlock, and hardwood of young polewood size (30± year old trees). Severe windstorms, ice storms, and flooding have caused physical damage to regional forests numerous times over the past three decades.
- Increasing temperatures are conducive to non-native, invasive plant growth, with many species originating in milder climates.
- Warming temperatures are also conducive to the proliferation of non-native insect pests. Hemlock wooly adelgid, for example, is spreading across the hemlock-rich forests of southern New Hampshire, unchecked by cold weather spikes (~-20°F) that until a few decades ago occurred nearly every winter.
- The displacement of some native species by others better-adapted to warmer climate, or by species able to withstand multiple stresses, is likely underway. Sugar maple is an example of a local species, near the edge of its natural range, that is sensitive to cumulative stressors. Invasive Norway maple readily fills its niche.
- In recent years, New Hampshire has experienced extremely dry spring conditions and extended droughts that have lasted over half a year, elevating wildfire risks in forests.

Climate Change Resilience and Forest Carbon Management Strategies

Forest resilience is a forest's ability to withstand and recover from detrimental conditions or events, including, in large part, climate change impacts. Resilience is a key attribute of a healthy forest. Silvicultural strategies that improve forest resilience and maintain forest health typically involve measures for the following purposes:

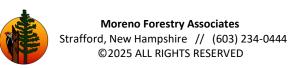


Doe Farm, Durham, New Hampshire Forest Management Plan June 2025

- Promote plant species diversity (SD),
- Improve forest structure (FS),
- Improve forest growth and vigor (FG)
- Protect soil health (SH),
- Protect the land's hydrological functioning (HF),
- Promote a full, native faunal suite (wildlife-WI), including vertebrates, invertebrates, and microorganisms, and
- Protect, strengthen, and/or re-establish ecological linkages (EL) within the "web of life."

The following table of 17 silvicultural strategies are based on our decades of forest management experience, utilizing as a template a series of approaches captured by Ali Kosiba in a 2023 Northern Woodlands magazine article⁴. These strategies, incorporating climate change resilience and a carbon-conscious approach, have been broadened and adapted to fit regional forest conditions, and to convey our history of locally applied practices, including at Durham's community forest, Doe Farm.

⁴ Kosiba, A. 2023. Managing Forests for Carbon. Northern Woodlands. Autumn. Pages 34 – 41.



Strategy	Forest Resilience Purpose	Carbon Benefit	Application on Doe Farm	
1. Designate no-cut reserve areas within the forest property.	FS, SH, HF, EL	Storage	Reserves cover about 34% of the property. MC #2 (the area west of the railroad) and MC #3 (Moat Island) have been maintained as no-cut reserves for decades. Logging inaccessibility locks in this status, regardless of changes in future management goals. Forested wetlands are also de facto reserves, as is the river riparian area which is managed as a buffer with minimal harvest. Over the next century-plus, these areas will continue to evolve towards old growth conditions.	
2. Retain large trees both individually and in groups.	FS, EL	Storage	The property's significant trees have been mapped and recorded since the 2001 forest management plan. An increasing inventory of particularly large, centuries-old trees is desired over the long term, providing a biological link to the past. Silviculture aims to expand the age range between the youngest and oldest trees, specifically seeking to preserve large, old trees. A forest rotation age is intentionally not specified for silvicultural management.	
3. Enhance tree species diversity.	SD, FS, EL		Healthy tree specimens and less-common tree species are preserved as natural seed sources. Conditions for their regeneration are optimized through silvicultural harvests. Between harvests, tending of regeneration and supplemental planting of native and near-native species can augment a dwindling species suite. Invasive plant control is also essential.	
4. Increase the forest's structural complexity in both vertical and horizontal dimensions.	FS, WI, EL	Sequestration and Storage		
5. Thinning to provide growing space.	SD, FS, FG	Sequestration and Storage	Light crown thinning has been applied during the last three harvests at Doe Farm providing 8 to 10± feet of growing space to the crowns of promising, mid-aged trees in particular. Thinning improves the growth rate and vigor of the released trees.	
6. Improvement cutting to remove weaker trees.	FG, EL	Sequestration and Storage	The retention of high-quality trees and the removal of weaker trees has been	



			Market and the literature of the latest and the lat
7. Forest health: Insects and disease.	SD, FG, WI, EL	Sequestration and Storage	Various silvicultural approaches have been applied on Doe Farm to manage the ongoing arrival of damaging exotic insects and disease. These have ranged from removal of needlecast-weakened white pine first recognized as "pine decline" in the early 1990s, to ongoing management of hemlock and ash, to the salvage of dying red pine in the most recent harvest. Beech leaf disease presents an existential crisis for beech, with universal loss expected over the next few years. Silvicultural management promotes heathy specimens, diverse natural regeneration, identification of naturally resistant trees, biological controls if available, and possible future species reintroductions.
8. Forest health: Control of exotic invasives.	SD, FG, WI, EL	Sequestration and Storage	Invasive control has been undertaken on Doe Farm since 2010±, with ever-improving technique, strategy, and budgeting. Impressive gains have been achieved in the core area of severe infestation over the last 10 years. Invasive control is essential for the forest's long-term health, diversity, resilience, and renewal.
9. Promote storm- hardiness.	FS, FG, WI, EL	Sequestration and Storage	A multi-aged silvicultural system has been applied over the last 30 years. Over the next century-plus, the ongoing introduction of new tree generations results in a more resilient mixed-age forest structure, with ample representation of younger, mid-aged, and older trees. Other measures are: maintaining windbreaking forest buffers along the riverfront, and retaining well-stocked stands where individual trees remain less exposed.
10. Forest renewal: Natural regeneration. SD, FS, WI, EI Sequestration		Sequestration	The multi-aged system emphasizes the continual establishment of new forest growth with every harvest and natural disturbance. Natural regeneration of the full suite of native species is preferred, however, planting to assure the presence of rare species, or for possible introduction of near-native climate-adapted species, or re-introduction of lost species, is also an increasingly attractive silvicultural strategy.
11. Ensure forest regeneration success.	SD, FS, FG		Various measures, depending on conditions, are applied to ensure the establishment and continued development of forest regeneration. This includes timing harvests during seed years for specific species, soil surface scarification (humus and topsoil), and releasing seedlings from competition and overhead shade. Planted stock may need shelters for protection.
12. Tending of regeneration and young growth. SD, FS, FG, WI Sequestration		Sequestration	Non-commercial forest stand improvement (FSI) is essential for the favorable development of robust, diverse young growth. Tending is beneficial across the spectrum of young size classesseedling, sapling, and polewood growth. Commercial harvest proceeds may be invested in FSI to promote a healthy, diverse, and resilient future forest.
13. Managing snags and forest floor debris.	FS, SH, WI, EL	Storage	Cavity trees, overstory biomass sheds, uprooted trees, dead standing trees (snags and stubs) and their fallen remains, are as important to forest health as the living tree and shrub component. In addition to their value for nutrient cycling and carbon storage,



			these elements are critical to wildlife. Wildlife, from micro-organisms to pollinators to birds and mammals, is essential to sustaining a forest. Doe Farm's silviculture incorporates the retention of potential cavity trees and snags, while allowing the accumulation of forest floor debris (aka, coarse woody debris or "CWD").	
14. Conducting sustainable management.	SD, FS, FG	Sequestration and Storage	Silvicultural management of Doe Farm's core area includes periodic, light-magnitude harvests. Improvement cutting and crown thinning as well as the management of regeneration openings are intended to promote forest health, growth, species diversity, and continuous renewal. Harvesting levels are intended to be well below the forest growth increment during the harvest cycle period. Generally, a 15± year harvest cycle is intended, however, lengthening to allow improved recovery, or shortening to enable salvage and restoration are acceptable adjustments of the harvest cycle over time. Forest inventory is important to gauge sustainable management.	
15. Growing high- quality forest products.	FS, FG, WI, EL	Storage	In managed areas, the development and eventual harvest of high-value, high quality trees is a notable objective. It is emphasized that not all specimen trees are eventually harvested, however, the production of valuable forest products is an important outcome for this renewable natural resource, a resource that is used universally and is essential for humanity. Durable wood products such as materials for structures, dwellings, and furniture, are long-term end products that continue to store carbon for many years. This represents a multiplier effect for the forest's stored carbon.	
16. Minimize soil and hydrological impacts.	FG, SH, HF	Storage	Activity on the land, whether recreational or for management, invariably induces soil and wetland impacts. Over the last 10 years, trail locations were carefully studied and adjusted, and appropriate stream crossings installed to minimize recreational impacts this heavily-visited community forest. Logging impacts are unavoidable given the use of heavy equipment, though three high-quality operations have been conducted since 2000, using the various harvesting systems—cable logging, biomass harvesting, and cut to-length mechanical harvesting. Many measures were taken to minimize impact including seasonal timing, the use of talented and capable loggers, and importantly marking of the trees, layout, and project management by professional foresters.	
17. Managing for wildlife.	SD, FS, FG, HF, WI, EL		Managing the forest for diverse tree/shrub/herbaceous species, complex structure, and with protection of highly sensitive areas, is beneficial for the wide array of wildlife that utilizes Doe Farm. The <i>Wildlife</i> section of this plan discusses habitats and management measures in detail.	



Coarse Woody Debris

Standing and downed dead woody material, collectively referred to as "coarse woody debris" or CWD, represents a significant carbon pool in most forests⁵. Understanding the current dead carbon resource at Doe Farm provides a baseline metric which carbon-increasing projects and activities can reference⁶. Repeated surveys can illuminate how carbon stocks from CWD change over time. CWD was sampled within the core forested area (MC #1A) of Doe Farm in June 2025.

Methodology

Overstory cruise points were provided by UNH, which were then visited by Moreno Forestry Associates. At each of the 29 point locations, a 50^{th} -acre circular fixed area plot was established (radius $\approx 16.65'$), within which CWD pieces larger than 5'' in diameter were tallied and categorized into a variety of classes:

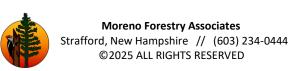
- Standing or downed
- Degree of decay
 - None / minimal (corresponding to class 0 or 1 in Pyle/Brown⁷ method)
 - Moderate (corresponding to class 2 or 3)
 - Advanced (corresponding to class 4 or 5)
- Diameter class in 5" increments, e.g., 5-10", 10-15", etc.
- Height (for standing) or length (for downed) class in 5' increments, e.g., 0-5', 5-10', etc. For downed pieces, only the portion of the CWD within the plot circumference was recorded.

Due to difficulty in identifying CWD species, this information was not recorded. It can safely be assumed, due to overstory conditions (see *Forest Inventory Data* section, page 41), that the majority of CWD is from white pine, red maple, and red oak.

A cubic foot volume figure for each diameter/height or diameter/length combination was computed (tapered cylinder formula), using the arithmetic average for each class (e.g., a 15-20" diameter was treated as 17.5" for this step). An exception was that a 1-foot height average was used for standing dead CWD pieces in the 0-5' height class, as these were mostly observed to be stumps from harvesting and were thus lower to the ground than a 2.5' average would have assumed. In all cases, the assumption was made that log diameter decreased by 10% for every 10' of length.

Next, a dry weight figure for each piece of CWD was computed using species-specific volume/weight data from Penn State Extension⁸. The top three overstory tree species at Doe Farm (white pine, red maple, red oak) were used to compute an average lbs/ft³ figure to be used for all CWD. (Red maple was not available in the data, so silver maple was substituted.) Because of the preponderance of overstory white pine, it is likely the CWD species breakdown leans heavily toward white pine, so a lighter dry weight of 25 lbs/ft³

⁸ https://extension.psu.edu/calculating-the-green-weight-of-wood-species



⁵ Kosiba, A. 2023. Managing Forests for Carbon. Northern Woodlands. Autumn. Pages 34 – 41.

⁶ Greg Jordan, UNH Extension, Rockingham County Forester. Personal correspondence, 6/18/2025.

⁷ Pyle, Charlotte and Brown, M. A Rapid System of Decay Classification for Hardwood Logs of the Eastern Deciduous Forest Floor. The Journal of the Torrey Botanical Society, Vol. 125, No. 3 (Jul. - Sep., 1998), pp.237-245.

was used rather than the average which contained the heavier red maple and red oak. (White pine alone weighs 22 lbs/ft³.)

Finally, a carbon concentration figure could be applied to each piece of CWD, based on its dry weight and degree of decay. At least one study reveals that carbon concentrations of dry wood varies based on how decayed the wood is, with (perhaps counterintuitively) more advanced degrees of decay expressing higher amounts of carbon concentration⁹. Average figures from Harmon et al. were used, assuming the following carbon concentrations, after which a total carbon weight could be calculated for each piece of CWD tallied and the forest as a whole:

None / minimal: 48% carbon concentration

Moderate: 49.5%Advanced: 52%

Results

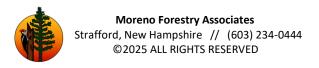
Type (standing / downed)	CWD C per acre (tons)	Total CWD C, core forested area (MC #1A) (tons)
Standing	10.1	525.9
Downed	11.9	617.2
Total	22.0	1,143.1

Note: Root masses were tallied (each standing dead piece of CWD was assumed to have an associated belowground root mass; separate above-ground root masses, for example from tip-ups, were also counted). These also represent a not insignificant amount of carbon storage, but difficulty in estimating volume (due to a variety of biometric challenges) precludes their inclusion in the above carbon figures.

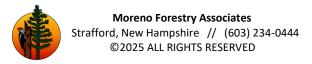


A variety of standing and downed CWD is encountered on Doe Farm.

⁹ Harmon, Mark E., Fasth, B., Woodall, C.W., and Sexton, J. Carbon concentration of standing and downed woody detritus: Effects of tree taxa, decay class, position, and tissue type. Forest Ecology and Management, Vol 291 (2013), pp. 259-267.



NATURAL RESOURCES



FOREST RESOURCES

Species Composition

A total of 29 tree species were observed within Doe Farm's forest—some frequently, others occasionally. Three species—white pine, red oak, and red maple—comprise the majority (79%) of species composition (by basal area). The other 25 species complete the forest overstory's remaining composition profile. A qualitative inventory of species is as follows:

Abundant – White pine

More Common – Red oak, red maple

Common – Norway spruce (in plantations)

Less Common - Black birch, black oak, American elm, white birch, sugar

maple, white oak, shagbark hickory

Scarce - Red pine, pitch pine, hemlock, white ash, basswood, yellow

birch, gray birch, quaking aspen, big-tooth aspen,

hophornbeam, beech, speckled alder, silver maple

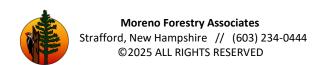
Rare – Pignut hickory, ironwood, black ash, eastern red cedar, apple

Not observed (potentially present) - American chestnut, black gum, butternut, sassafras, eastern

cottonwood, black willow, swamp white oak, boxelder

A transformation in the region's forest species composition is occurring due to the advent of exotic insects and pathogens. At this writing, white ash, black ash, and red pine are rapidly disappearing from local forests, with few expected to survive beyond 2030. A similar fate awaits beech. First appearing in 2023, a foreign pathogen is now ubiquitously attacking beech; near-universal loss may be expected in the coming decade. Meanwhile, hemlock is declining in southern New Hampshire, as slower-acting insects progressively impact hemlock health. Widespread loss (but not universal) is likely by 2040. A less-common native species—butternut—has largely disappeared over the last 30 years.

Progress is occurring towards disease-resistant American chestnut, with broad availability for reintroduction predicted in 25 years. Supplemental planting of less common or near-native/climate adapted species is a possible hedge against the impending loss of tree species diversity.



Forest Structure and History

Forest structure describes the presence and spatial arrangement of various tree-age classes, as well as forest density, canopy layering, and forest floor material. Structure evolves with the age of the forest, from young, even-aged stands (simple structure) to highly integrated, well-established, mixed-age stands

(complex structure). Changes in forest structure are ongoing during stand development and aging, with occasional dramatic alterations caused by disturbance events, both natural and man-made. A summary of Doe Farm's land history sheds light on today's forest structure.

Documented history of the Doe Family suggests that their farm was established in 1700±. It is likely that the entire pre-settlement forest, including Moat Island, was cleared by the mid to late 1700s, with fields and pastures replacing primeval conditions. Over a century of open agricultural land followed. A handful of ancient trees remain in the forest today; these once stood within the former fields. Beginning in the late 1800s, sections of Doe Farm's pastures were abandoned, reverting to forest. The land around the Doe homestead remained open through 1909, when the town acquired the property. While farming may have continued for a short time under the town's ownership, the remaining field land was also soon vacated. Durham Boy Scouts planted thousands of red pine, white pine, and Norway spruce in the homestead's vicinity, while forest naturally returned



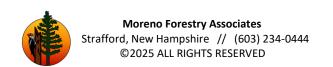
An enormous double silver maple on the Moat Island floodplain.

in adjacent areas. Thus, the overstory of most of Doe Farm's core area (MC #1) now consists of century-old trees.

While the Hurricane of '38 may have created some overstory gaps in the returning young forest, a more significant early disturbance was the coastal hurricane of 1954 and logging that followed. This project was conducted by young county forester Roger Leighton, and is believed to have covered the southern section of Moat Island, and the connecting southeast section of MC #1. An even-aged, 75± year old oak stand (with older residuals) is found on this section of Moat Island, possibly corresponding to this harvest.

In the early 1970s, Thompson School students under instructor Mel Jenkins conducted logging and TSI work in the northeast area towards Laroche Farm, though other sections of the core area may have been lightly cut. 50± year old polewood growth, mostly hardwood, resulted from this work.

Much of Doe Farm's core area continued to develop as dense, heavily-shaded softwood forest, particularly the Norway spruce stands. A series of silvicultural harvests were then conducted by Forester, Charlie



Moreno, between 2000 and 2021. The table below records the dates, logging method, logging crew, and volumes of the three operations.



A forested wetland area in the north.

After considerable planning and preparation, a light improvement harvest occurred on MC #1's core area in the winter of 2000. Subsequently, a new generation of trees, now 25± years old, were established in small openings created by the harvest.

A February 2010 windstorm uprooted, tipped, and snapped trees throughout Doe Farm. A forest improvement/salvage harvest was conducted in February 2011; many of the downed trees were removed to address the storm's visual impact on the popular community forest. Trees were also cleared from the cellarhole and cemetery area. Regeneration from

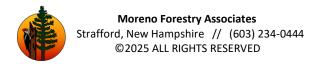
the previous harvest was released, and new growth resulted, now in sapling stage.

The widespread decline and death of Doe Farm's red pines triggered a salvage operation in January 2021. Though 143,700 board feet of red pine was salvaged, the overall harvest was light in magnitude, compensating for the accelerated harvest schedule caused by red pine's damaging insects. This most recent harvest also released previous young growth and set the stage for the establishment of another age cohort.

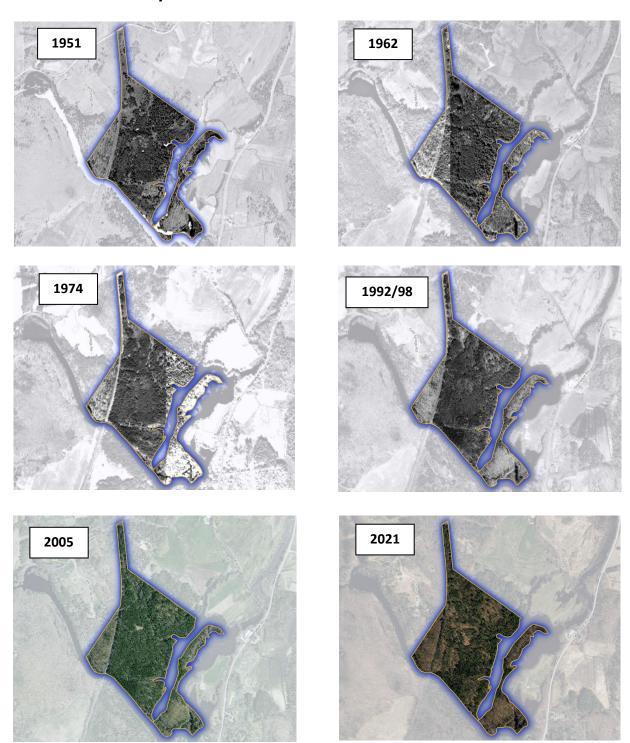
The following table summarizes the three improvement/salvage harvests that occurred on Doe Farm between 2000 and 2021.

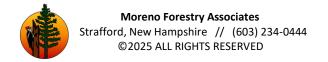
Harvest History Summary 2000-2021			Harvest Volumes					
Date	Method	Logger	Harvest Acreage	Sawtimber (BF)	Pulp (Tons)	Chips (Tons)	Firewood (Cords)	Gross Revenue
Feb 2000	Cable skidder	Leighton Logging	50±	86,570	407.27	-	-	\$13,171
Feb 2011	Biomass	GC Morse & Sons	50±	78,530	ı	1,127.66	-	\$16,003
Jan 2021	Cut-to- Length	HHP, Inc.	50±	197,851	118.40	ı	-	\$16,919
	GRAND TOTALS 15			362,951	525.67	1,127.66		\$46,093

Consequent to the harvest activity over the last 50 years in the core area of Doe Farm, MC #1A, this forest area now contains at least 3 age classes, with a 4th developing.



Visual Forest History





Silvicultural Outlook

The last three forest harvests (2000 – 2021) accomplished several silvicultural objectives:

- Created gaps in the high canopy to allow the establishment of natural regeneration.
- Directed a substantial forest area towards multi-aged conditions, with three new age-cohorts of young growth established.
- Promoted diverse species regeneration by retaining a variety of seed sources, increasing forest floor light, and prescribing invasive control to be applied in tandem with harvesting.
- Salvaged hundreds of dying trees—exotic insect causalities—to avoid an overabundance of deadfall, which would hinder invasive control and pose trail hazards, and to mitigate wildfire risk.
- Promoted a healthy forest by improving growth conditions while removing diseased, weak, and/or unstable trees.
- Encouraged complex structure with the retention of older trees and an abundance of healthy midaged trees, while establishing young growth. The degree of canopy layering has increased as a result.
- Retained forest floor woody debris structure.
- Retained a substantial, valuable, and healthy forest inventory to ensure sustainable management
 of the forest over time.

The next commercial harvest (involving a logging contractor and the sale of timber) is not envisioned to occur on Doe Farm for about 15 years hence (2040±). The previous two harvests (2011 and 2021) were implemented ahead of the scheduled 12- to 18- year cutting cycle due to pressing, natural disturbance circumstances. Consequently, the inventory of mid-aged and older trees needs more time (20± years) to recover a sustainable stocking level.

The purpose of continuing silvicultural management on Doe Farm is to promote a healthy, resilient forest, encourage biodiversity, enhance wildlife habitat and timber resource value, and optimize the carbon sequestration/storage ratio. The continuum of silvicultural prescriptions in this management plan conforms to these objectives. On-the-ground silvicultural decision-making by professional foresters is necessary, regularly considering forest structure, regeneration, and habitat.

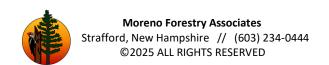
Several silvicultural considerations to be applied are summarized below:

Harvest Cycle

The interval between commercial harvests is the cutting or harvest cycle. A 15± year harvest cycle (broadly, 12-to-18-years) is recommended for Doe Farm, though natural disturbances may alter the schedule.

Harvest Cycle Record and Projection

Schedule	Harvest Date	Elapsed Time from Present	Notes
Past (1 st)	1970s	-50 to 55± years	Parts of MC #1 – UNH Forestry students
Past (2 nd)	2000	-25 years	MC #1A, Comprehensive improvement cut
Past (3 rd)	2011	-14 years	MC #1A, Improvement cut/Storm salvage



Past (4 th)	2021	- 4 years	MC #1A, Improvement cut/Red pine salvage
Present	2025	0 years	
Future (5 th)	2040±	15±	MC #1A, Comprehensive improvement cut
Future (6 th)	2052-2060	27-35± years	MC #1A, Comprehensive improvement cut

Commercial Improvement Cutting

In this chapter, the term "improvement cutting" refers to commercial harvesting that maintains forest health and improves growth by remove lower quality and declining trees, while providing growing space for promising timber and regeneration.

Non-commercial Timber Stand Improvement (FSI)

After a commercial harvest is completed, non-commercial ("pre-commercial") forest stand improvement (FSI) helps establish regeneration and sets the course for long-term forest growth. FSI involves the thinning and release of trees that are too young to have commercial value, including seedling and sapling growth that regenerates after a harvest, or pole-sized (4 to 10-inch diameter) trees. Since marketable forest products are not produced, FSI is a cost operation.

Forest Harvesting and Regeneration Openings

Forest harvesting creates planned canopy openings that allow the establishment of a new generation of trees. With FSI tending, these regeneration openings help sustain the diversity of species that the forest contains in the overstory but increasingly lacks as young growth. It is important to GPS the location of regeneration openings and track their condition to plan FSI work and invasives monitoring.

Tending of Regeneration Openings

Once seedlings are established, the regeneration openings are revisited to ensure that the desired seedlings advance to the sapling stage and beyond. Competing vegetation is removed mechanically as a form of FSI. Additionally, invasive plants must be detected and removed from the openings.

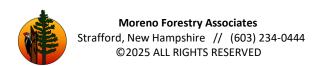
Supplemental Planting

Supplemental planting of seeds or seedlings can be done in the regeneration openings to augment natural regeneration. Plantings may include scarce species on the property, such as sugar maple, white oak, and shagbark hickory, or local or near-range southerly species such as red cedar, sycamore, and tuliptree, as well as blight-resistant American chestnut, to name a few possibilities. The intent is to maintain and expand the diversity of species, particularly as some species are lost.

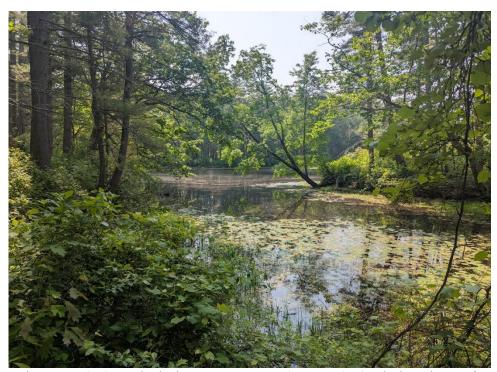
Best Management Practices (BMPs¹⁰)

Best Management Practices for logging are published standards and techniques for avoiding and/or mitigating impacts to water, wetlands and soils that may occur during a harvest operation. The following BMPs are recommended for Doe Farm's managed forest.

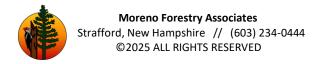
¹⁰ Francher, S., Smith, S., et al. New Hampshire Best Management Practices for Erosion Control on Timber Harvesting Operations, University of New Hampshire Cooperative Extension *and* NH Division of Forests and Lands, 2016.



- Schedule harvest operations for reasonably dry or frozen/snowy ground conditions.
- Minimal harvest buffers (harvesting not to exceed 10% of basal area) are maintained along the Lamprey River, Laroche Brook, and The Moat (100' buffer), vernal pools (75'), and forested wetlands/seasonal streams (25'). Tree removals within the buffers are generally for forest health (diseased or declining) or wildlife habitat enhancement purposes.
- Previous stream crossing sites are preferred locations for reuse, with appropriate temporary fording.
- Stream crossings require temporary poled fords or bridging. 3 to 4 timber mats installed side by side over a stream create an effective bridge crossing.
- Chipper debris, treetops, and corduroy are used by the logger as woody matting to stabilize soft soils and approaches to stream crossings.
- Project equipment should not enter wetlands, except where a permitted crossing is necessary.
- Where possible, service equipment off-site, prior to the project.
- Logging contractors must file the NH DES Forestry Statutory Permit-By-Notification (SPN). The logging contractor commits to following NH BMP provisions as stated on the permit.



The Moat: A riverine wetland, where emergent vegetation meets riparian shrubs at the water's edge.



FOREST INVENTORY DATA

FINDINGS

Timber Volume and Data

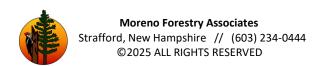
- > The forest at Doe Farm collectively contains the following approximate standing timber volumes:
 - o 733.9± thousand board feet (MBF) of sawtimber:
 - Softwood 566.4± MBF
 - Hardwood 167.5± MBF
 - 3,911± tons of chipwood and softwood/hardwood pulp
 - 434± cords of firewood
- ➤ As of June 2025, the total timber stumpage value on Doe Farm's core area is estimated at \$146,400.
- ➤ On a per acre basis, including all accessible forested acreage (52± acres), timber value averages \$2,810±/acre.
- ➤ White pine sawtimber accounts for nearly seven tenths (69.5%) of the core forest area's timber value.
- ➤ Red oak sawtimber accounts for just over one tenth (10.9%) of timber value.
- > Cumulatively, all other sawtimber, pulp, firewood, and chipwood on Doe Farm's accessible forest account for the remaining 19.6% of timber value.

Coarse Woody Debris

> The average acre within the core forested area of Doe Farm (MC #1A) contains 146 pieces of downed CWD and 102 pieces of standing CWD (snags, stubs, and stumps), across a variety of diameters and lengths/heights.

Tree Species Composition

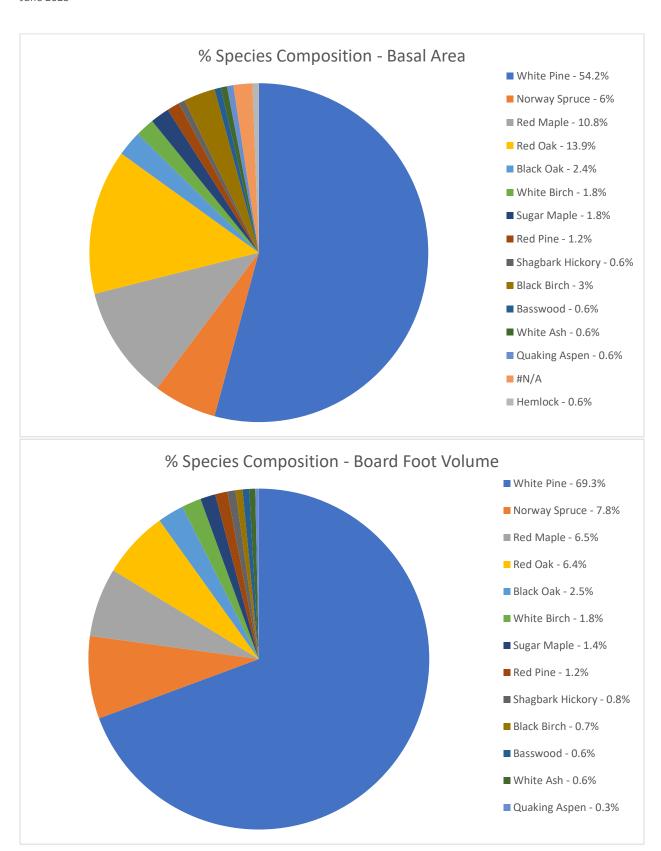
- ➤ Overstory: White pine, red oak and red maple are the property's dominant overstory species, accounting for 54.2%, 13.9%, and 10.8% of tree species composition (by basal area), respectively. Norway spruce, planted during two efforts in the 1920s and 1930s, represents 6% of tree species composition.
- ➤ **Understory:** White pine, red maple, and red oak are common regeneration on Doe Farm, especially in regeneration openings and skid trails. Spruce seedlings and saplings are encountered near the plantations.

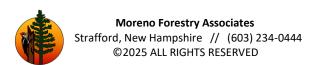


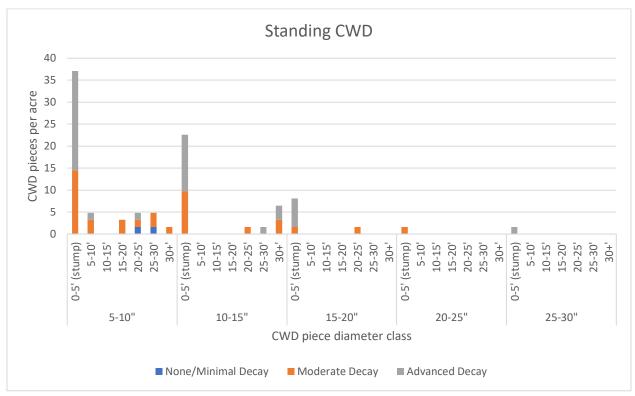
Tree Quality and Density

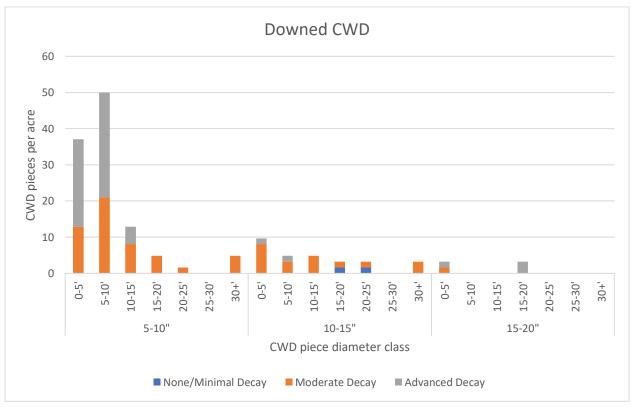
- ➤ White pine quality is generally average to above average—many pines are notably tall (100+ feet); most are reasonably straight with variable amount of branching.
- ➤ Hardwoods are common in the pole- to small sawtimber-sized range. White pine is by far the most common species encountered in larger diameter classes.
- The quality of red oak and the various hardwoods is very good, including future veneer-quality trees. The estimated hardwood sawtimber volumes include veneer, grade, and pallet logs.
- The forest within MC #1A is generally moderately stocked, with some areas of light stocking and others of dense conditions.
- > The soils on Doe Farm are capable of growing quality white pine and hardwood sawtimber.

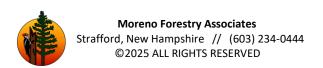


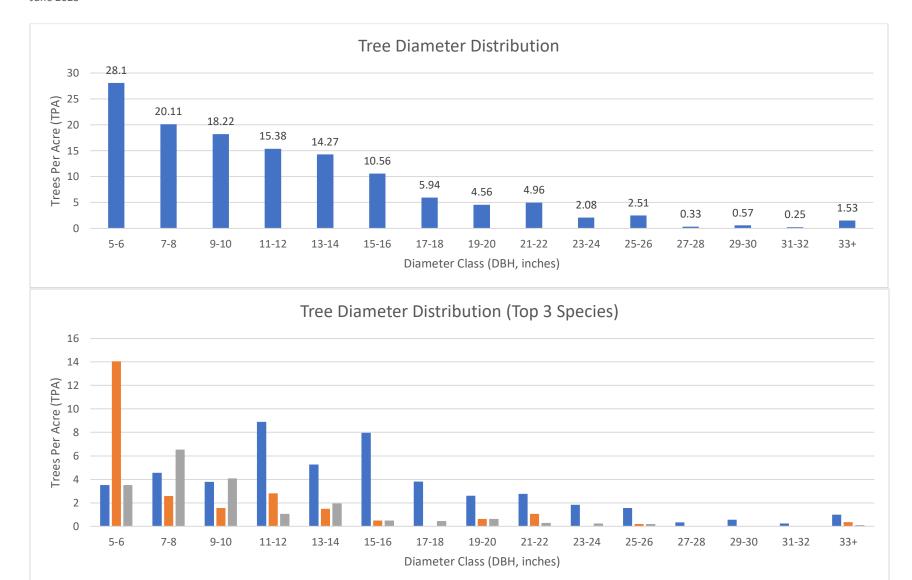


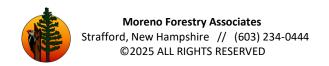












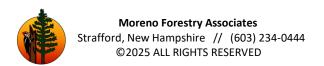
■ WP ■ RO ■ RM

Timber Valuation Core Forested Area (MC #1A)

Product/Species

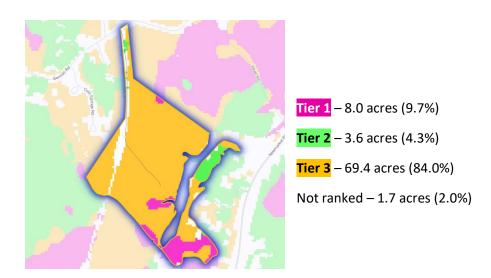
<u>Sawtimber</u>	Total Volume (MBF)	% of Volume	Unit Price (\$/MBF)	Total Value	% of Value
WP	508.9	69.3%	200	\$ 101,775	69.5%
NS	57.5	7.8%	100	\$ 5,749	3.9%
RM	47.9	6.5%	75	\$ 3,592	2.5%
RO	47.0	6.4%	340	\$ 15,974	10.9%
ВО	18.3	2.5%	220	\$ 4,032	2.8%
WB	13.5	1.8%	40	\$ 540	0.4%
SM	10.5	1.4%	300	\$ 3,157	2.2%
RP	8.5	1.2%	30	\$ 255	0.2%
SH	5.7	0.8%	125	\$ 718	0.5%
BB	4.8	0.7%	140	\$ 672	0.5%
BASS	4.6	0.6%	75	\$ 343	0.2%
WA	4.2	0.6%	175	\$ 737	0.5%
QA	2.4	0.3%	30	\$ 73	0.1%
	733.9			\$ 137,617	94.0%
Chipwood/Pulp	3,911	Tons @	\$0.25 / Ton	\$ 978	0.7%
Firewood	434	Cords @	\$18 / Cord	\$ 7,812	5.3%
			Grand Total	\$ 146,407	
Value per acre:	\$ 2,810		Rounded	\$ 146,400	

June 2025 (inventory figures from December 2023)



WILDLIFE HABITAT

NH Wildlife Action Plan Ranking



The NH Wildlife Action Plan (WAP)¹¹ was developed by NH Fish & Game and a team of partners. In addition to describing the habitat requirements for wildlife species of greatest conservation need, WAP provides coarse filter mapping of habitat value for the entire state.

Doe Farm contains forested and wetland habitats. WAP ranked the bulk of the property as Tier 3 habitat (supporting landscapes). Small areas are classified as Tier 1 (highest in NH) or Tier 2 (highest in biological region).

Landscape Context

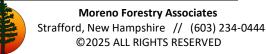
Doe Farm is situated adjacent to, or nearby, several conservation parcels. Most significant is the 240± acre Lamprey River Preserve (Nature Conservancy) which lies across the Lamprey River on the south side of Doe Farm. Collectively, the two properties protect over ½ mile of pristine riverfront. NH Fish and Game and the University of New Hampshire own other important forestland in the immediate area.

Habitat Enhancements

Doe Farm features a diversity of habitats, both upland and aquatic. Forest habitats are enhanced by:

- Tree and shrub species variety. In addition to roughly two dozen trees species, there is also an abundance of fruit-bearing shrubs including silky dogwood, highbush blueberry, maleberry, maple-leaf viburnum, mountain holly, winterberry holly, and beaked hazelnut.
- The presence of cavity trees, snags, and coarse woody debris (CWD) on the forest floor. Snags and cavity trees of various diameters are well-represented throughout the forest. Forest floor

¹¹ NH Wildlife Action Plan. https://www.wildlife.state.nh.us/wildlife/wap.html



- woody debris provides important habitat to microorganisms, insects, salamanders, snakes, and small mammals. There is a preponderance of small-diameter woody material on the forest floor.
- A relatively high degree of forest canopy stratification, containing dense foliage/cover in several
 or all its canopy layers, including the herbaceous layer, forest understory, mid-story, and
 overstory. Overtopping pines create a supercanopy layer. A well-layered forest canopy meets
 habitat needs for a variety of birds and mammals. Past forest management work has greatly
 enhanced canopy layering.
- The uplands contain scattered older remnant trees that add interesting vertical structure for wildlife.

Doe Farm's spectacular Lamprey River frontage provides outstanding wetland habitat. The property's surface water habitats include seasonal streams and small forested wetlands that are embedded in the forest, providing specific features and enhancement to the surrounding woodlands.

Habitat Descriptions

Upland Forest Habitats

- Well-established, mixed softwood-hardwood occupies most of the property, with white pine generally dominating the high canopy, and with varying proportions of red oak and red maple rounding out the trio of main species. Upper canopy trees are generally 85 to 110± years of age, with pines ranging 80 to 100± feet in height, and hardwoods 65 to 85± feet. Forest canopy is reasonably well layered, with an often dense understory and lower mid-story, variably dense upper mid-story and a well-stocked overstory. The understory contains fruit-bearing shrubs such as maple-leaved viburnum and brambles.
 - Wildlife regularly utilizing these forest areas include white-tailed deer, gray fox, southern flying squirrel, wild turkey, barred owl, pileated woodpecker, downy woodpecker, hermit thrush, white-breasted nuthatch, black-capped chickadee, American redstart, and black and white warbler.
 - Tall pines provide perching and nesting sites. Oaks are an important mast source. Hickory and beech (now dying) provide supplemental mast. Native shrubs and brambles provide soft mast and cover.
 - Scattered hemlocks provide thermal cover waypoints.
- Two areas of well-established *oak mast forest* are found on Moat Island and covering the triangle northwest of the railroad tracks, respectively. Both stands are fully stocked with a largely unbroken upper canopy dominated by red oak, but also containing black oak, white oak, occasional shagbark hickory, and a few beech.
 - In addition to most of the species listed in the mixed forest habitat, broad-winged hawk, scarlet tanager, red-eyed vireo, great-crested flycatcher, Eastern wood pewee, and ovenbird often inhabit upland hardwood forest.



- These stands produce copious volumes of hard mast, with acorns a staple food for a wide variety of mammal and avian species. Additionally, the oaks support a multitude of forest pollinators.
- The property's Norway spruce stands provide thermal cover. Dense overhead shade limits understory density in areas. Some birds such as pine siskin may utilize the stands during migration. Others, possibly barred owl, may find it a substitute for native hemlock. Red squirrels utilize the spruce.
- Areas of white pine forest are found particularly along the Moat shoreline and on Moat Island. 80
 to 100-foot pines provide nesting sites for red-shouldered hawk and raven, and roosting for
 turkey. Red squirrels, red-breasted nuthatch, and pine warbler are also regulars.

Riverine, Stream, and Wetland Habitats

- Doe Farm's most notable wetland habitat is its extensive undeveloped *riverfront*, which includes the steadily flowing waters of the Lamprey River, and the slow-moving waters surrounding Moat Island. The Macallen Dam in Newmarket, site of the Lamprey's first natural falls, separates brackish waters from fresh. A fish ladder enables alewives, American eel and sea lamprey to bypass the dam and navigate upriver, passing along Doe Farm's shoreline¹². The riverfront forest and shoreline are utilized by belted kingfisher, great blue heron, green heron, red-shoulder hawk, as well as osprey and bald eagle. Snags offer perches for raptors and nesting opportunities for a variety of birds. Mammals utilizing the riverfront riparian area include beaver, mink, otter, and raccoon. Wood turtle use sandy riverfront embankments for nesting.
- The inundated portion of the Lamprey River, essentially an oxbow, surrounds Moat Island and includes emergent and scrub/shrub swamp in its still waters, which also extend as two flooded fingers into the main property. Emergent vegetation includes pond lily and cattails; downed trees lie in shallow waters. All provide structure for invertebrates (e.g., insects, mollusks), amphibians, fish, reptiles (e.g. painted turtle), birds (e.g. wood duck), and mammals (e.g. little brown bat).
- The shoreline has dense shrub growth including sweet pepperbush, winterberry holly, silky dogwood, highbush blueberry, maleberry, and speckled alder. These thickets may attract yellow warbler and common yellowthroat. Deer seek daytime refuge in the dense vegetation.
- Moat Island's connection point with the mainland features a rare natural community—a silver maple floodplain forest. In its natural setting—riverfronts and alluvial forest—silver maple is a rare find in New Hampshire, where it exists at the northern limit of its range.
- Doe Farm contains several *seasonal streams* that gather into two separate drainages into the Lamprey. The streams are shallow with clay/stony beds, hosting a multitude of invertebrates.
- Three notable *forested wetlands* are associated with these streams. One is a long finger that lies at the base of the terraced slope between the Norway spruce stands. Another is an enriched

 $^{^{\}rm 12}$ Snyder, E. 2009. Doe Farm Stewardship Plan. Page 9.



Doe Farm, Durham, New Hampshire Forest Management Plan June 2025

shallow swamp in the property's northern tip which contains black ash (recently decimated by the emerald ash borer) along with red maple. This swamp was recently freed from an extreme invasion of glossy buckthorn. A third small, forested swamp lies near the Scout's riverfront campsite. These wetlands offer habitat for reptiles (e.g., northern water snake¹³), birds (e.g., winter wren, veery, Louisiana waterthrush), and mammals (e.g., mink, short-tailed weasel, raccoon). Forested wetlands tend to have increased numbers of cavity trees, snags, and woody deadfall.

A small vernal pool is located where the linear wetland originates. Though not technically a vernal
pool as it has a connecting outflow to other waters, this shallow impoundment can function as
one, holding water until early summer. The pool harbored amphibian egg masses in the spring of
2025.

WATER RESOURCES

Doe Farm's singular character is largely defined by its 2,800± feet of frontage on the Lamprey River, as well as extensive waterfront around Moat Island. All surface waters on the property drain into the Lamprey, which flows south and east through Newmarket into Great Bay. A stratified drift aquifer is found under Packers Falls Road, a short distance to the southwest.

Interestingly, the Moat Island portion of the property is almost completely surrounded by a river oxbow (aka "The Moat"), which remains inundated by the Lamprey River Dam in Newmarket. Technically, this oxbow was formerly part of the Lamprey River, though it arguably belongs with Laroche Brook, depending on where the confluence of the two streams is defined. The southerly end of the oxbow contains shallow, still waters where emergent marsh and scrub/shrub conditions have developed. The Moat and Laroche Brook contribute an additional 7,500± feet of water frontage to Doe Farm.

Two seasonal streams in Doe Farm's core area empty into the oxbow. Three notable forested wetlands are associated with the streams, with further description in the *Wildlife* and *Forest Types* sections. A vernal pool is located near the end of the linear, southerly wetland.

The conservation of adjacent properties, including The Nature Conservancy's Lamprey River Preserve property across the river, ensures that a significant stretch of this scenic waterway remains in its natural state, unmarred by development. This segment of the Lamprey River belongs within a 12-mile section that was designated under the National Wild and Scenic River System in 1996¹⁴.

The property's water features are illustrated on the *Physical and Natural Resources Map* (page 8).

¹⁴ Snyder, E. 2009. Doe Farm Stewardship Plan. Page 10.



¹³ Snyder, E. 2009. Doe Farm Stewardship Plan. Page 12.

SOILS

Soil Types

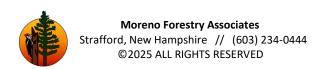
The tract's component soils are illustrated on the **Soils Map** (page 9). The forest soils underlying Doe Farm are of varied origin, including glacial tills and outwashes, alluvial soils, and organic depositions. The degree of water permeability and water table height are highly variable between soils. Soils are summarized as follows:

Upland Soils

- Windsor (codes WdA, WdB and WfB) 43.3± acres, 49.7% of property: Found beneath much of
 the core forested area, as well as under Moat Island, these sandy loam soils are characterized as
 deep, well-drained outwash sands, which are highly permeable. Windsor soils are highly
 productive for pine and hardwood growth, and are operable almost year-round.
- Hollis-Charlton (code HdC) 9.6± acres, 11.1% of property: This upland complex is a close intermingling of two soil types: areas with a thin mantle of loam over ledge (Hollis) intermixed with areas of deeper glacial till (Charlton). In the Hollis areas, ledge is within 1½ feet of the soil surface; ledge outcrops are a common surface feature. Charlton soils are reasonably well-drained rocky till. Fine sand, which is moderately permeable, underlies the subsoil, two feet below the soil surface. This soil complex is found in the northern, more topographically-diverse area of Doe Farm. These soils are reasonably productive for forest growth, with white pine, red oak, red maple, and hemlock commonly found.
- Suncook (code Sk) 8.7± acres, 10.0% of property: Similar to Windsor, Suncook soils are well-drained sandy loams typically situated on floodplains, with the average water table closer to ground surface. Suncook soils are productive for both softwoods and hardwoods, though shallow rooting may occur.

Mesic and Hydric Soils

- Scantic (code ScA) 5.3± acres, 6.1% of property: This soil type, formed from thick marine clay and silt, underlies a band in the north which includes much of the main access road. This soil type will generally not support travel by farm or logging equipment, though the woods road is well built and allows wet-season access.
- **Buxton (code BzB) 1.9± acres, 2.2% of property:** This soil is characterized as a silty clay loam with slow water permeability. The soil is dry during droughty periods, but prone to seasonal wetness. **Buxton** soils tend to run deep; bedrock is not found anywhere near ground surface. This soil underlies much of the forested area north of Horn Brook. **Buxton** is productive for both white pine and hardwood growth.
- Mixed Alluvial, Wet (code MI) 7.7± acres, 8.9% of property: This complex underlies a floodplain band on Moat Island. These soils, deposited by the moving waters of the Lamprey River and Laroche Brook, vary from silt loam to sand and gravel. This soil type will not support travel by logging equipment.



- Swanton (code SwA) 6.5± acres, 7.5% of property: This poorly drained soil underlies a flat forested area in the north of Doe Farm. The upper horizons of the soil consist of sandy loam, while the silt and clay substratum has low water permeability. Swanton soils are generally low-lying with a high watertable. Resulting low-oxygen soil conditions limits tree growth, with roots generally confined to the soil surface. Thus, trees growing in Swanton soil areas may be prone to blowdown, creating a generally dynamic environment. At Doe Farm, red maple, highbush blueberry, and winterberry holly typically occupied the Swanton soil sites.
- Fresh Water Marsh (code Fa) 1.8± acres, 2.0% of property: This wet, very poorly drained organic soil is found underlying the silver maple floodplain band on the southwest of Moat Island, effectively preventing forestry access to its wooded upland area. Indeed, Moat Island is not accessible by foot during periods of flooding or seasonally high precipitation.

Site Index

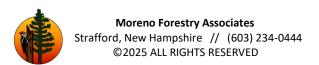
Site index is a measure of projected tree height growth (in feet) at 50 years of age. This number reflects soil productivity potential, with higher numbers corresponding to more productive soils. Data are sourced from NRCS Web Soil Survey¹⁵.

		Site index	
Soil type	White pine	Red oak	Red maple
Buxton	n/r	n/r	n/r
Fresh water marsh	n/r	n/r	n/r
Hollis-Charlton	62	58	57
Mixed alluvial, wet	n/r	n/r	n/r
Scantic	n/r	n/r	n/r
Suncook	n/r	n/r	n/r
Swanton	n/r	n/r	n/r
Windsor	57	52	55

n/r = rating unavailable

¹⁵ https://websoilsurvey.nrcs.usda_gov/app/WebSoilSurvey.aspx

ECOLOGICAL CONCERNS & OTHER MANAGEMENT RECOMMENDATIONS



ECOLOGICAL CONCERNS

Exotic, Invasive Plants

History and Extent

Doe Farm's rich soils and long history of invasive presence conspire to increase the property's susceptibility to an invasive resurgence. The property harbors at least 10 non-native invasive species, with glossy buckthorn (**GB**—*Frangula alnus*) and Oriental bittersweet (**OB**--*Celastrus orbiculatus*) the most numerous and ecologically concerning. (A full list of observed invasive plants is found in **Appendix A**, page 78.)

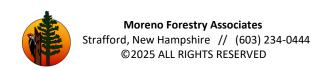
Exotic, invasive plants may have first arrived at Doe Farm in the 1950s. The multiplying exotics went unnoticed over subsequent decades, until the severity of the problem was recognized in the early 2000s. Volunteer teams were organized by Malin Clyde of UNH Extension and the Durham Conservation Commission to uproot glossy buckthorn, large and small, in heavily infested areas along the woods road and around the landing site. Ellen Snyder's 2009 Stewardship Plan recommended specific actions and financial support for controlling invasives. In 2015, Charlie Moreno mapped the relative severity of invasives throughout the property to inform a control strategy (see the map below). In places, stem counts of glossy buckthorn had reached 20,000/acre. Contractors representing various control methods, including mechanical, chemical, and grazing, submitted proposals to the Trustees; options were then weighed, and a cut stem/treatment approach selected. Invasive control contractors have been engaged ever since, systematically treating the most severely infested areas of the forest, with RCCD contractors making excellent progress in recent years.

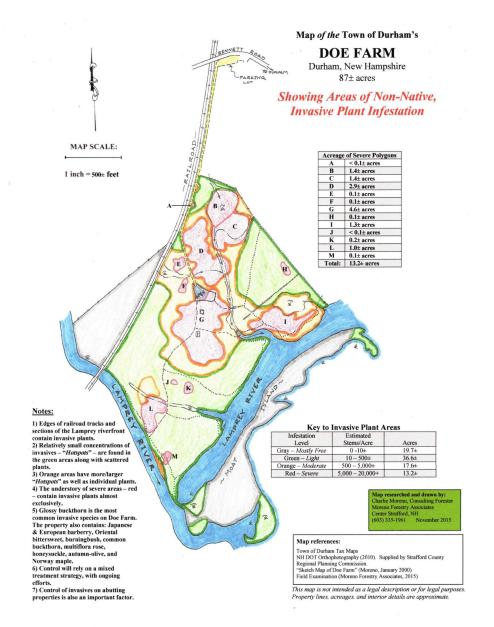
An important finding of the invasive mapping is that the infestation, though severe in areas, did not cover the entire property. In fact, nearly 2/3rds of Doe Farm was only lightly infested or invasive-free in 2015. Since intensive control began roughly 9 years ago, the infestation may now lightly cover a larger footprint, but severely and moderately infested areas have been significantly curtailed. An updated mapping analysis of the extent of infestation is recommended to guide future control strategies and budgeting. A similar system, as annotated on the map below, categorizing invasive presence as "severe-moderate-lightmostly free" based on numbers of invasive stems per acre, can be used to maintain consistency.

Impacts

Invasive control is integral to forest resilience and ecosystem health. Since invasive plants inevitably multiply and spread, continued and timely control staves off a widespread invasion that is increasingly difficult and expensive to contain. The ecological threat posed by severe invasive presence cannot be overstated.

Negative impacts include: increasingly altered wildlife habitat, impacted insect and microorganism communities, changes in land hydrology and water quality, diminishing plant diversity, and a forest that increasingly loses its ability to self-regenerate. When invasives multiply unchecked for decades, the forest is eventually compromised—the overstory ages and the native young growth that replaces it is no longer present. Examples of this unwelcoming condition already exist locally—forests with an aging overstory and a sea of invasives in the understory.





A 2015 map shows invasive species concentration areas. It provides a baseline of conditions as treatments progress and may help inform future invasive control planning.

Key for Invasive Plant Levels		
Infestation Level - Key Stems per Acre		
Mostly free	0 – 10±	
Light	10 – 500±	
Moderate	500 – 5,000±	
Severe	5.000 - 20.000+	



Methods

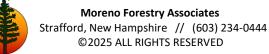
Control of invasive species on Doe Farm has involved both mechanical methods (uprooting) and targeted herbicide (cut/paint stem, foliar spray) treatment. Though herbicides are not favored, they greatly reduce the effort and augment the success of mechanical methods. Herbicides can only be applied under the supervision of a NH licensed applicator and require a special permit¹⁶ within 250' of the Lamprey River (which supplies water to the town of Newmarket) or any streams. An integrated pest management approach, where the least impact/most effective methods are employed, is the overarching control strategy.

The Trustees have retained licensed professional contractors to carry-out herbicide treatments primarily in severely infested areas. There is conspicuous progress—the number of invasive stems per acre has greatly diminished, while native plants and forest regeneration are flourishing. While the initial round of intensive invasive control has been largely completed, professional contractors are still critical for the treatment of any remaining severe and moderate infestation areas.

Contractors or trained volunteers can canvass and remove plants in more lightly invaded areas. This methodology requires a systematic approach so that pockets are not missed, as well as GIS mapping to document treated areas and any remaining plants. This work must rely largely on mechanical treatments-uprooting of invasives and gathering of seeds. If large plants are found, their locations are GPS'd and a licensed applicator must return to chemically treat the plant(s).

On-going maintenance is a key aspect of managing invasives. If budget and staffing allow, treatment should be applied annually, at least on sections of Doe Farm. In time, maintenance becomes much easier as plant size and numbers decline. A possible method to continue regular maintenance is to assign volunteer stewards to monitor and treat specific sections of the property. The **Sectors Map** on page 19, shows a potential layout for invasive plant management areas.

¹⁶ https://www.agriculture.nh.gov/publications-forms/documents/watershed-brochure.pdf



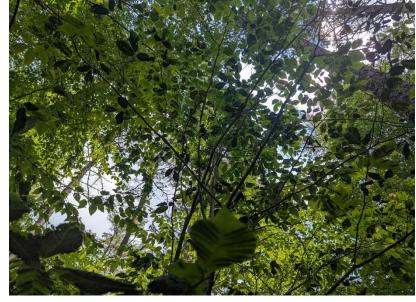
Forest Insects and Pathogens

Several destructive insects and diseases have advanced over the past decade that are seriously affecting New Hampshire's forests, altering species composition and regional ecology. In the span of five years since 2020, white ash and black ash, as well as red pine, have been lost in Doe Farm, while beech is imminently imperiled. Hemlock is threatened over a longer period.

Emerald ash borer (EAB) is currently eliminating all white, black, and green ash in the region. Doe Farm contained white and black ash; as of this writing, they are mostly dead, or near death. While the dying trees provide wildlife value as snags and forest floor material, ash's ecosystem relationships are not wholly appreciated, nor are the implications of their loss fully understood.

Red pine has been decimated by the red pine scale insect. Most of Doe Farm's red pine were salvaged in 2021 in various stages of decline. A small amount of red pine was retained with the outside hope that a few might survive, but most now appear to have sucuumbed.

Beech faces the grave threat of beech leaf disease, caused by a recently imported nematode that has rapidly spread across the region. This microscopic pest is expected to cause near-universal loss of beech in the upcoming 5 years, with no practical recourse in forest settings. As with white ash and red pine, beech constitutes less than 2% of Doe Farm's overstory; however, it is common in the forest understory. The nematode does not distinguish by age; all beech, old and young, are vulnerable.

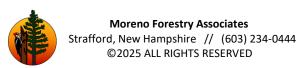


Looking up through a beech tree showing severe impact from beech leaf disease.

The hemlock wooly adelgid (HWA), also a scale insect, threatens the

future of hemlock—a foundational forest species. HWA, in combination with elongate hemlock scale (EHS), progressively destroys hemlock foliage, diminishing photosynthetic capacity. Though hemlock crown dieback attributable to HWA is not fully advanced on Doe Farm, defoliation and mortality may occur in coming years. While not a major species on the property, hemlock holds good wildlife value. Consequently, all the property's healthy hemlock were retained in the latest salvage harvest, with the hope that they bridge to the future when a biological control becomes effective.

White pine is the property's most common tree species, constituting over 50% of the overstory. Unlike the previously described species, Doe Farm's white pine is mostly healthy and not existentially imperiled.



However, two widespread pathogen types can affect growth. Needlecast fungi cause early-season foliage losses before white pine can fully photosynthesize over the course of the summer. *Caliciopsis* canker is often present in conjunction, especially on drier sites. Affected pines may be weakened, and in severe cases, succumb to the combined pathogens. Silvicultural practices over the last 25 years emphasized the removal of severely declining pines to manage these diseases and improve overall forest health.

Doe Farm's oaks constitute roughly one sixth of the overstory, with red oak most common at 14%. Historically, spongy moth (formerly known as gypsy moth) was a major threat to oak (as well as hemlock). A naturally-occurring virus and a bacterium, respectively, have diminished the spongy moth's ability to build outbreak populations, though in recent years this exotic insect reappeared and defoliated a few thousand acres in New Hampshire. This trend has now diminished. Oak wilt, not yet present in New Hampshire, may be a future threat. Managing for tree species diversity and monitoring forest health are preventative measures.

The table below summarizes the *current* prevalence of various pathogens and insects affecting local forests, and the susceptibility of Doe Farm. Over time, silvicultural management can improve the forest's resilience to pathogens and insects.

Pathogen or Insect	Species Most Affected	Prevalence	Susceptibility
Beech bark disease	Beech	Widespread	Moderate
Beech leaf disease	Beech	Widespread	High
Nectria canker	Birches, basswood	Moderate	Moderate
Strumella canker	Red oak	Low	Low
White pine blister rust	White pine	Low	Moderate
Caliciopsis pine canker	White pine	Moderate	Moderate
Needlecast diseases	White pine	Moderate	Moderate-High
Hemlock wooly adelgid	Hemlock	High	Moderate
Elongate hemlock scale	Hemlock	Increasing	Moderate
Spongy moth	Oaks, birches, hemlock	Low	Moderate-High
Emerald ash borer	White ash, black ash	High	High

Forest Composition, Structure, and Regeneration

Doe Farm is compositionally diverse and is developing complex structure. However, as with nearly all regional forests, it faces diminishing diversity as several key species are lost. In addition to the largely unknown ecological costs of losing entire tree species, the narrowing species suite increases the vulnerability of the forest if additional species become threatened.

The forest has benefited from silvicultural management, as evidenced by the abundance of young growth occupying the understory. However, young growth requires overhead light and release from competition to persist and thrive. The current diversity of overstory species can be encouraged in the understory by applying forest stand improvement (FSI). The broad suite of species would be released, including white pine, red oak, white oak, yellow birch, and sugar maple. At a minimum, FSI would be applied in the core area's regeneration openings. Additionally, less common or missing species might be introduced through supplemental planting.

Due to its logging history, areas of Doe Farm's forest have three distinct age cohorts. Looking ahead towards future decades of management, silviculture can improve the age range and the dispersal of various aged trees, thereby optimizing the forest's age-structure, which is an important attribute of resilience and habitat richness.



An impressive red oak cavity tree.

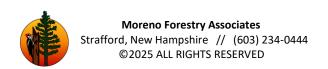
OTHER MANAGEMENT RECOMMENDATIONS

Recreation

Doe Farm is a popular recreation spot, with many hikers, birders, and bikers using the property on any nice day. The trail system, including a well-maintained access road, spans nearly 3 miles, providing access throughout (except for the parcel west of the railroad). Doe Farm's trails connect to another ¾ miles of trail on the neighboring Laroche property. Parking for about 10 vehicles is available at the Bennett Road entrance. Trails are depicted on the *Physical and Natural Features Map* (page 8), and official Town-made maps are available at a



The kiosk, with trail map and other information of interest to visitors.



kiosk near the historic Doe cellarhole, as well as on the Durham town website¹⁷.

Three picnic areas are found on Doe Farm, each overlooking the Lamprey River.

Cultural / Historic Resources

Doe Farm is rich with historic evidence; indeed, the cellar hole of the eponymous Doe cape is a highly visible archaeological feature of the property. A variety of additional historic features are found near the cellar hole (at least three partial foundations, the Doe cemetery, and a well with a "donut" stone cap). Elsewhere, the property contains nearly 3,000 feet of stone wall, and a pit once used as part of the Does' tannery business.



The large central chimney of the former Doe house is prominently visible (now sporting a stylish sumac "hairdo").



A large depression once served as a rinsing tank for the Does' leather tannery.



A partial foundation near the former Doe house, perhaps once part of an agricultural structure.



A circular cap tops this well just north of the former Doe house.

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https://www.ci.durham.nh.us/sites/default/files/fileattachments/conservation_commission/page/19571/doefarm _trailmap_kiosk_final.pdf

Property Maintenance

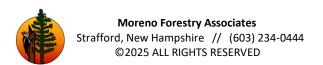
A significant portion of Doe Farm's property boundary is shared with abutters (~2600' with Laroche, ~1200' along the Cold Springs subdivision), with another ~1500' defined by the railroad. The Lamprey River, the Moat, and Laroche Brook define the rest of the property boundary.

Maintaining shared property lines protects against abutter incursions and wrongful timber harvesting. For the long-term, lines should be axe-blazed and brush-painted according to surveying protocol. Weather-resistant, brush-on red paint (Nelson's or Rustoleum) is used on the axe-blazes. The blazes need rebrushing every 8 to 10 years to remain clearly visible.



Crossing an historic stone wall to enter Doe Farm from the Laroche property.

FOREST TYPES AND PRESCRIPTIONS



FOREST TYPES – INTRODUCTION

The forest of Doe Farm varies in species composition and structure. Forest types define the distinctive character of various forested areas: A *forest type* represents forest areas with a distinctive set of overstory tree species that results from similar soils, hydrology, former land uses, and disturbance history.

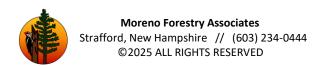
Four broad forest types, and their variants, were defined and delineated on the property as part of the forest assessment phase of this management plan. These are illustrated in the *Forest and Cover Types Map* (page 7) and are detailed in the upcoming pages. Descriptions of the forest types explain their distinguishing characteristics. Forest health, timber attributes, productive potential, and wildlife values are summarized. The long-term silvicultural management objectives of each forest type are discussed, with corresponding prescriptions.

Forest types often have *variants*. Though variant 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 spatial structure of the forest type. Some explanation is made of these variations, with the main variant(s) described in detail.

An *inclusion* is a pocket within a forest type that differs from the forest type but is too small to be separated and described as a distinct forest type.

A **stand** is a pocket of a forest type, which is located separately from other pockets of the same forest type. In the **Forest Types Map**, the forest types are delineated as stands with the cumulative acreage calculated for each forest type.

The management of a forest involves applying a mosaic of approaches. Silvicultural treatments are nuanced due to within-stand variation. Additionally, forest types may have multiple silvicultural prescriptions corresponding to their variant areas. While prescriptions vary between forest stands, stands are typically treated concurrently, each to their own specification.



A. WHITE PINE / HARDWOOD (WH) – 37.5± ACRES

Description: The widespread White Pine / Hardwood (WH) forest type occupies the majority (64%) of the 52-acre accessible forest area, as well as a portion (21%) of the 20-acre forested reserve. White pine constitutes 40% to 80%± of the species composition in this forest type. The pine component is varied, including large pasture pines up to 48± inches in diameter, as well as ample 10 to 24" pine. While red oak and red maple are the most common overstory hardwood species, a variety of other hardwoods are common in pockets, including birches and hickory. Past disturbances (windstorms, logging) in this forest type have created small openings where abundant 2-20± year old pine, birch, oak, beech, hemlock, and maple saplings and seedlings now grow, in addition to a varied shrub and herbaceous community.

A considerable portion of today's WH forest type was recently heavily stocked with red pine, which was salvaged in 2021 following infestation by the damaging red pine scale insect. Some red pine saplings are still encountered. Residual basal area in this stand is lower than surrounding forest, but is regenerating with ample white pine, mixed hardwood, and shrub densities.



Species Composition	
Primary ¹	WP, RO, RM
Secondary ²	BB, BO, WB, SM
Tertiary ³	RP, ELM, SH, WA, HM, BTA, PP, NS, BASS
Regeneration	BE, RO, BB, NS, HM, WP, WO, RM
Shrubs / Herbaceous	Large variety. HZ, WH, SF, HBB, many others.
Site	Mesic to xeric

¹ Dominant tree species in the high canopy layers.

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

Forest Structure	
Composition	
Stand Structure	Three- to four-aged
Successional Stage	Mid- to late-intermediate
Stand Age	Overstory: 75-150± years
Stand Age	Understory: 10-30± years/ seedlings 2 to 5 years
Tree Size	
DBH Range	2-34± inches (48" outliers)
Mean DBH	13± inches
Max. Height	100± feet
Stand Density	
Relative Stocking	Moderate to considerable
Basal Area/Acre	110± ft²/ac (range: 20 to 240)
Trees/Acre	115± trees (range: 35 to 277)
Canopy Closure	60-100%

Wildlife / Ecological	
Habitat Features	Hard mast, soft mast, CWD, canopy layering,
Canopy Structure / Stratification ¹	
Woody Deadfall ²	Moderate to high
Invasive Plants	Variable. Zones of none, other areas with intense presence

¹ CANOPY DENSITY (Rows): Not present (no fill); Light (blue); Moderate (gold); Substantial (green); Dense (red) CANOPY LAYER (Columns): 1 = Understory 2 = Mid-story 3 = Overstory 4 = Supercanopy

² A fairly common to less common tree species.

² Degree of Forest Floor Woody Debris Accumulation

Management Recommendations White Pine / Hardwood Forest Type

Objectives: Release promising pine and mixed hardwood regeneration. Continue to develop white pine and oak sawtimber. Retain large-crowned red oaks and shagbark hickory for mast production. Encourage a diversity of species. Control invasive species.

Silvicultural Sequence: Three and four-aged (present) → Multi-aged (2050)

Silvicultural Treatments:

- 2026-2030±: FSI: Inter-sapling release of white pine and other desired regeneration as encountered, primarily in existing regeneration openings, but also in areas of filtered light. Using brush saw or chainsaw, remove competing hardwood saplings in selected pockets. FSI: Release regeneration from overtopping seedlings/saplings.
- 2026 and on: Invasives control: <u>Annual</u> monitoring for and treatment of invasive species. Handpulling/uprooting individual stems is an effective method; dense patches may require herbicide applied by licensed applicator.
- 2030-2035±: FSI: Polewood release. Using chainsaw, thin polewood, selecting healthy trees of desired species to retain.
- 2040–2045±: Single-tree selection/Expand micro regeneration openings/Liberation cut to release favorable understory/Create new micro regeneration openings.
- 2055–2065±: Single-tree selection/Liberation cut to release favorable understory. FSI: Weeding and thinning of pole-sized pine and favored hardwoods from poorer growing competitors. FSI: Intersapling release and cleaning to release regeneration.

B. WHITE PINE (WP) $-17.1 \pm ACRES$

Description: The White Pine (WP) forest type occupies 28% of the core forested area and 12% of the reserve. This forest type is distinct because white pine constitutes at least 80% of overstory stocking. Overstory is generally high-quality, with the exception of the northernmost stand on *Scantic* soil, where crowns are less healthy. The understory species mix and density are variable; mesic vegetation is common in the northern WP zone, with sensitive fern and invasive glossy buckthorn as prominent components; on drier sandy sites (e.g., near the Lamprey and The Moat), lowbush blueberry and sweetfern are common.

Pines are susceptible to a variety of afflictions such as *Caliciopsis* canker, blister rust, and needlecast. Wet conditions in the spring of 2025 have created conditions conducive to needlecast. Less vigorous pines can be fatally weakened by needlecast, so some mortality in the *Scantic* soil areas is expected.



Species Composition	
Primary ¹	WP
Secondary ²	RO
Tertiary ³	RM, ELM, QA
Regeneration	RM, RO, WP (in patches)
Shrubs / Herbaceous	Dense, varied. LBB, bracken fern, WH, many others
Site	Hydric (e.g., in <i>Scantic</i> soil area) to xeric

¹ Dominant tree species in the high canopy layers.

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

Forest Structure	
Composition	
Stand Structure	2- to 3-aged with residuals
Successional Stage	Mid to late-intermediate
Stand Age	10-30 / 60-80 / 115± years (150± residuals)
Tree Size	
DBH Range	6 - 30± inches (42" outlier)
Mean DBH	14± inches
IVICALI DDH	13± inches
Max. Height	100± feet
Stand Density	
Relative Stocking	Moderate to considerable
Basal Area/Acre	120± ft²/ac (range: 60 to 240)
Trees/Acre	125± trees/ac (range: 18 to 214)
Canopy Closure	70-100%

Wildlife / Ecological	
Habitat Features	Canopy layering, wetland edge
Canopy Structure / Stratification ¹	
Woody Deadfall ²	Low to high (variable)
Invasive Plants	Low to severe

¹ CANOPY DENSITY (Rows): Not present (no fill); Light (blue); Moderate (gold); Substantial (green); Dense (red) CANOPY LAYER (Columns): 1 = Understory 2 = Mid-story 3 = Overstory 4 = Supercanopy

² A fairly common to less common tree species.

² Degree of Forest Floor Woody Debris Accumulation

Management Recommendations White Pine Forest Type

Objectives: Continue to develop high quality white pine sawtimber. Release white pine and desirable hardwood regeneration (red oak, black birch, shagbark hickory). Control invasive species.

Silvicultural Sequence: Two- and three-aged (present) → Three- and four-aged (2050)

Silvicultural Treatments:

- 2026-2030±: FSI: Inter-sapling release of white pine and other desired regeneration as encountered, primarily in existing regeneration openings, but also in areas of filtered light. Using brush saw or chainsaw, remove competing hardwood saplings in selected pockets. FSI: Release regeneration from overtopping seedlings/saplings.
- 2026 and on: Invasives control: <u>Annual</u> monitoring for and treatment of invasive species. Handpulling/uprooting individual stems is an effective method; dense patches may require herbicide applied by licensed applicator.
- 2030-2035±: FSI: Polewood release. Using chainsaw, thin polewood, selecting healthy trees of desired species to retain.
- o **2040–2045±:** Single-tree selection/Expand micro regeneration openings/Liberation cut to release favorable understory/Create new micro regeneration openings.
- 2055–2065±: Single-tree selection/Liberation cut to release favorable understory. FSI: Weeding and thinning of pole-sized pine and favored hardwoods from poorer growing competitors. FSI: Intersapling release and cleaning to release regeneration.

C. NORWAY SPRUCE (NS) – 4.3± ACRES

Description: Found as two stands together comprising about 8% of Doe Farm's accessible forest, the Norway Spruce (NS) forest type is unique in that the majority of stocking originates from historic planting efforts. The "upper" stand on the *Windsor* plain appears to be older, with spruces ranging from 12 to perhaps 24 inches in diameter, and has appreciable white pine intermixed; the "lower" stand occupying *Suncook* soils closer to the Lamprey River is younger and denser, ranging from 9 to 16 inches in diameter, with 80+% of composition made up by spruce. Recent harvests have largely avoided cutting spruce, in recognition of the species' unique presence and the forest type's characteristic dark feel.

The stands are relatively healthy, though the lower stand is exhibiting signs of crown degradation from overstocking. Additionally, spruce is susceptible to *Rhizosphaera* and other conditions. Spruce is regenerating slowly. Few other species can thrive in the dark conditions beneath the spruce canopy, so attaining a more diverse species mix is a goal which will require at least thinning efforts during the next silvicultural entry.



Species Composition	
Primary ¹	NS
Secondary ²	WP
Regeneration	Limited; NS, HM, BE, WP
Site	Mesic to xeric

¹ Dominant tree species in the high canopy layers.

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

Forest Structure	
Composition	
Stand Structure	Even-aged
Successional Stage	Mid-intermediate
Stand Age	70-100± years
Tree Size	
DBH Range	6-24± inches
Mean DBH	17± inches (upper stand); 12± inches (lower stand)
Max. Height	90± feet
Stand Density	
Relative Stocking	Moderate/Considerable
Basal Area/Acre	150± ft²/ac
Trees/Acre	90± trees/ac
Canopy Closure	80-100%

Wildlife / Ecological	
Habitat Features	Dark forest
Canopy Structure / Stratification ¹	
Woody Deadfall ²	Low to moderate
Invasive Plants	Low incidence

¹ CANOPY DENSITY (Rows): Not present (no fill); Light (blue); Moderate (gold); Substantial (green); Dense (red) CANOPY LAYER (Columns): 1 = Understory 2 = Mid-story 3 = Overstory 4 = Supercanopy

² A fairly common to less common tree species.

² Degree of Forest Floor Woody Debris Accumulation

Management Recommendations Norway Spruce Forest Type

Objectives: Continue to grow straightest, healthiest spruce as legacy trees. Begin to diversify regeneration through micro-openings. Control invasives species when encountered.

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

Silvicultural Treatments:

- 2026 and on: Invasives control: <u>Annual</u> monitoring for and treatment of invasive species. Handpulling/uprooting individual stems is an effective method; dense patches may require herbicide applied by licensed applicator.
- 2028-2038±: Light crown thinning/improvement cut. Critical overstory densities within NS stands may necessitate small-scale crown thinning to ensure adequate growing space of best specimens.
- 2040–2045±: Single-tree selection/Liberation cut to release favorable understory. Retain spruce overstory.
- 2055–2065±: Single-tree selection/Liberation cut to release favorable understory. Retain spruce overstory. FSI: Weeding and thinning of pole-sized pine and favored hardwoods from poorer growing competitors. FSI: Inter-sapling release and cleaning to release regeneration.

D. UPLAND HARDWOOD (UH) $-13.5 \pm ACRES$

Description: Found exclusively in the reserve areas (west of the railroad and on Moat Island), this forest type has nearly complete crown closure. Composition is mostly red and black oak, with some contributions from white oak and white pine. Hazelnut, lowbush blueberry, and sweet pepperbush (at the water's edge) are common shrubs. Limited light restricts regeneration, but pockets of pine and oak seedlings and saplings are encountered. This stand appears to have originated in the early 1900s, and a mid-century harvest targeted pine, resulting in a well-stocked oak canopy.



Species Composition	
Primary ¹	RO, BO
Secondary ²	WO, WP
Tertiary ³	BC, RM
Regeneration	RO, WP
Shrubs / Herbaceous	LBB, pepperbush, sweetfern, sarsaparilla, ground cedar, others
Site	Mesic to hydric

¹ Dominant tree species in the high canopy layers.

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

Forest Structure	
Composition	
Stand Structure	Even- to two-aged
Successional Stage	Mid-intermediate
Stand Age	75-110± years
Tree Size	
DBH Range	5-24± inches
Mean DBH	15± inches
Max. Height	75-80± feet
Stand Density	
Relative Stocking	Considerable to dense
Basal Area/Acre	150± ft²/ac
Trees/Acre	120± trees/ac
Canopy Closure	100%

Wildlife / Ecological	
Habitat Features	Hard mast, wetland edge
Canopy Structure / Stratification ¹	
Woody Deadfall ²	Low to moderate
Invasive Plants	Low incidence (Moat Island)

¹ CANOPY DENSITY (Rows): Not present (no fill); Light (blue); Moderate (gold); Substantial (green); Dense (red) CANOPY LAYER (Columns): 1 = Understory 2 = Mid-story 3 = Overstory 4 = Supercanopy

² A fairly common to less common tree species.

² Degree of Forest Floor Woody Debris Accumulation

Management Recommendations Upland Hardwood Forest Type

Objectives: All UH stands are found in silvicultural reserve areas in which commercial harvesting is impossible. Small-scale, non-extractive habitat enhancements are possible, as is invasive species control.

Silvicultural Treatments:

 2026 and on: Invasives control: <u>Annual</u> monitoring for and treatment of invasive species. Handpulling/uprooting individual stems is an effective method; dense patches may require herbicide applied by licensed applicator.

E. FORESTED WETLAND/FLOODPLAIN FOREST – 4.2± ACRES

Description – This forest type includes all forest areas with poorly-drained soil. Forested wetlands are often ecologically dynamic. Tree roots are generally confined to the soil surface and are thus vulnerable to tip-ups or full uprooting during storms. Young forest growth and/or dense wetland shrubs then fill the canopy gaps.

The hydric soils of forested wetlands generally preclude the use of equipment. Therefore, the interiors of the tract's forested wetlands have reserve status, without active management. However, wildlife openings or thinnings can be created on the edges of forested wetlands (without equipment damage to the wetland) to promote the growth of fruit-bearing shrubs.

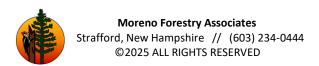
The southern tip of Moat Island contains an interesting maple floodplain forest area. Seasonally flooded by the Lamprey River, this sensitive area is designated as a reserve. It is accessed and appreciated from the existing trail system.

Objectives – Enhance wildlife attributes of vegetation on accessible wetland edges. No treatment or intervention is recommended in wetland interiors, except to control invasive plants.

Silvicultural Treatments: No treatment.



APPENDICES



APPENDIX A – List of Observed Species

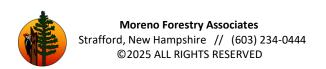
Native Trees

Coniferous

Spp Code	Common Name	Scientific Name
HM	Hemlock	Tsuga canadensis
NS	Norway Spruce	Picea abies
PP	Pitch Pine	Pinus rigida
RC	Red Cedar	Juniperus virginiana
RP	Red Pine	Pinus resinosa
WP	White Pine	Pinus strobus

Deciduous

Spp Code	Common Name	Scientific Name
EL	American Elm	Ulmus americana
AP	Apple	Malus spp.
BW	Basswood	Tilia americana
BE	Beech	Fagus grandifolia
BTA	Bigtooth Aspen	Populus grandidentata
BA	Black Ash	Fraxinus nigra
ВВ	Black Birch	Betula lenta
ВС	Black Cherry	Prunus serotina
ВО	Black Oak	Quercus velutina
GB	Gray Birch	Betula populifolia
НН	Hophornbeam	Ostrya virginiana
IW	Ironwood (Blue Beech)	Carpinus caroliniana
PH	Pignut Hickory	Carya glabra
QA	Quaking Aspen	Populus tremuloides
RM	Red Maple	Acer rubrum
RO	Red Oak	Quercus rubra
SH	Shagbark Hickory	Carya ovata
SIM	Silver Maple	Acer saccharinum
SM	Sugar Maple	Acer saccharum
WA	White Ash	Fraxinus americana
WB	White Birch	Betula papyrifera
WO	White Oak	Quercus alba
YB	Yellow Birch	Betula alleghaniensis



Native Shrubs and Vines*

Spp Code	Common Name	Scientific Name
ARR	Arrowwood	Viburnum recognitum
	Black Huckleberry	Gaylussacia baccata
	Blackberry	Rubus allegheniensis
	Bristly Dewberry	Rubus hispidus
	Bush Honeysuckle	Diervilla lonicera
	Climbing Nightshade	Solanum dulcamara
	Currant / Gooseberry	Ribes spp.
	Common Juniper	Juniperus communis
ELD	Elderberry	Sambucus spp.
GR	Grape	Vitis spp.
	Gray (Red-Panicled) Dogwood	Cornus racemosa
	Greenbrier	Smilax spp.
HZ	Hazelnut	Corylus spp.
HBB	Highbush Blueberry	Vaccinium corymbosum
	Hillside Blueberry	Vaccinium pallidum
LBB	Lowbush Blueberry	Vaccinium angustifolium
MLV	Maple-leaved Viburnum	Viburnum acerifolium
	Mountain Holly	Ilex mucronata
	Partridgeberry	Mitchella repens
	Poison Ivy	Toxicodendron radicans
	Red Raspberry	Rubus idaeus
	Serviceberry (Juneberry, Shadbush)	Amelanchier spp.
	Silky Dogwood	Cornus amomum
SA	Speckled Alder	Alnus incana subsp. rugosa
	Spiraea	Spiraea spp.
	Staghorn Sumac	Rhus typhina
SF	Sweet Fern	Comptonia peregrina
	Sweet Pepperbush	Clethra alnifolia
	Virginia Creeper	Parthenocissus quinquefolia
	Wild Rose	Rosa spp.
WG	Wintergreen	Gaultheria procumbens
WH	Witch Hazel	Hamamelis virginiana
	Winterberry Holly	Ilex verticillata

Native Ferns / Mosses / Herbaceous Plants*

Common Name Scientific Name



American Hog-Peanut Amphicarpaea bracteata

American Groundnut Apios americana

Artemisia (Mugwort,

Wormwood) Artemisia vulgaris
Bitter Dock Rumex obtusifolius

Blue Wood Aster Symphyotrichum cordifolium

Blue Flag Iris versicolor
Bracken Fern Pteridium spp.
Bulrush Scirpus spp.
Canada Clearweed Pilea pumila

Canada Mayflower Maianthemum canadense
Canadian Wood Nettle Laportea canadensis

Christmas Fern Polystichum acrostichoides

Cinnamon Fern Osmunda cinnamomea

Cleavers
Clover
Clover
Climbing False Buckwheat
Common Milkweed
Common Mullein
Meadow Buttercup
Curly Dock
Climbing False Buckwheat
Fallopia scandens
Fallopia scandens
Verbascum thapsus
Ranunculus acris
Rumex crispus

Deer Tongue Grass Dichanthelium clandestinum

Enchanter's Nightshade Circaea lutetiana

False Solomon's Seal Maianthemum racemosum

Fringed Loosestrife Lysimachia ciliata
Golden Ragwort Packera aurea
Goldenrod Solidago spp.

Ground Cedar Diphasiastrum digitatum
Ground Elder Aegopodium podagraria
Hay-Scented Fern Dennstaedtia punctilobula

Horsetail Equisetum spp.

Interrupted Fern Osmunda claytoniana
Jack-in-the-Pulpit Arisaema triphyllum
Jewelweed Impatiens capensis
Lady Fern Athyrium angustum

New York Fern Parathelypteris noveboracensis

Orpine Hylotelephium telephium

Pennsylvania Sedge Carex pensylvanica
Pink Lady Slipper Cypripedium acaule
Ragged Robin Silene flos-cuculi



Royal Fern Osmunda regalis Sarsaparilla Aralia nudicaulis Sensitive Fern Onoclea sensibilis Skunk Cabbage Symplocarpus foetidus Solomon's seal Polyganatum spp. Sphagnum Moss Sphagnum spp. Starflower Lysimachia borealis Stinging Nettle Urtica dioica

Stinging Nettle Urtica dioica
Tall Blue Lettuce Lactuca biennis

Tall Meadow-Rue Thalictrum pubescens

Tower-mustard Turritis glabra

Tree-clubmoss Dendrolycopodium spp.

Wild Violet Viola spp.

Whorled Yellow-loosestrife
Wild Geranium
Wood Anemone

Lysimachia quadrifolia

Geranium maculatum

Anemone quinquefolia

Woodland Strawberry Fragaria vesca
Wrinkle-leaved Goldenrod Solidago rugosa
Yellow Wood Sorrel Oxalis stricta

Non-Native Invasive Plants*

Common Name
Autumn-Olive
Burning Bush
Common Buckthorn
Common Privet
Glossy Buckthorn
Honeysuckle (unknown

Scientific Name
Eleagnus umbellata
Euonymus alatus
Ligustrum vulgare
Frangula alnus
Lonicera spp.

species)

Japanese Barberry

Multiflora Rose

Norway Maple

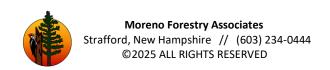
Oriental Bittersweet

Berberis thunbergii

Rosa multiflora

Acer platanoides

Celastrus orbiculatus



^{*} Shrubs, vines and non-native invasives were sought but not exhaustively catalogued for the purposes of this plan.

Map Unit Legend

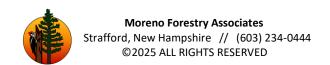
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI		
BzB	Buxton silt loam, 3 to 8 percent slopes	1.9	2.2%		
Fa	Fresh water marsh	1.8	2.0%		
HdC	Hollis-Charlton very rocky fine sandy loams, 8 to 15 percent slopes	9.6	11.1%		
MI	Mixed alluvial land, wet	7.7	8.9%		
ScA	Scantic silt loam, 0 to 3 percent slopes	5.3	6.1%		
Sk	Suncook loamy sand	8.7	10.0%		
SwA	Swanton fine sandy loam, 0 to 3 percent slopes	6.5	7.5%		
W	Water	2.2	2.5%		
WdA	Windsor loamy sand, 0 to 3 percent slopes	33.0	37.8%		
WdB	Windsor loamy sand, 3 to 8 percent slopes	8.1	9.3%		
WfB	Windsor loamy fine sand, clay subsoil variant, 0 to 8 percent slopes	2.2	2.6%		
Totals for Area of Interest		87.2	100.0%		

<u>APPENDIX C – Forest Inventory Specifications</u>

The core forested area of Doe Farm (MC #1A), comprising 52.1± acres of accessible forest, was cruised in December 2023 by students from the Forest Management course at UNH using the variable-radius plot sampling technique. Data were collected from 29 prism points arranged in a grid pattern covering the entire forested acreage. The average sampling intensity was 1 sample point per 1.8± accessible productive forested acres.

A summary of inventory and statistical specifications follows:

- 1) Statistical error around the total sawtimber volume estimate: 70,027 board feet
 - a. Total sawtimber includes grade logs, veneer, and pallet logs of all species.
 - b. 733,862± board feet ±119,124 BF (90% confidence interval)
- 2) Statistical error around the total firewood volume estimate: 61.1 cords
 - a. 434.3± cords ±104.0 cords (90% confidence interval)
- 3) Confidence level: 90% (α = 0.1)
- 4) Sample plot layout
 - a. Systematic sample
 - b. Spacing: approx. 263' x 263' grid
- 5) Plot type and number: 29 prism plots
- 6) Angle-gauge: 20-factor prism
- 7) Tree scaling/grading specifications:
 - a. Diameter: All merchantable trees > 5 inches DBH measured
 - b. Stem DBH measurements: 1-inch increments
 - c. Heights: 16-foot log increments estimated (in whole and half increments). UNH students recorded optimistic figures for many of the larger trees; forester reassessment in spring 2025 downgraded these, artificially capping heights at 3.5 logs.
 - d. Top diameters (merchantable heights)
 - i. Firewood: 4", straight stem
 - ii. Sawtimber:
 - 1. White pine: 8"
 - 2. Other softwoods: 10"
 - 3. Hardwoods: 10"
 - e. Grades:
 - i. Veneer (ash, birch, maple & oak)
 - ii. Grade sawlogs (hardwood and softwood)
 - iii. Pallet logs (hardwood and softwood)
- 8) CWD sampling was conducted by Moreno Forestry in June 2025 by visiting the overstory cruise sample points and using 50th-acre circular fixed area plots to inventory standing and downed CWD. Diameter, length/height, and degree of decay were measured.



<u>APPENDIX D – Inventory and Carbon Data from UNH</u>

The US Forest Service's Northeast Decision Model v3 (aka NED3) was used by UNH to translate inventory figures into the following summaries:

Forest Carbon

Biomass	Live	Dead	Total	Seedlings	Saplings	Poles	Small	Medium	Large
(tons)	trees	trees					saw	saw	saw
Foliage	96	8	104	0	0	15	32	26	31
Stem	1,550	113	1,663	0	0	257	494	405	507
Branch	447	33	480	0	0	116	145	103	116
Bark	294	21	316	0	0	53	94	75	93
Total	2,387	175	2,562	0	0	441	765	609	747
aboveground									
Root	482	36	517	0	0	87	155	124	151
Total biomass	2,869	211	3,080	0	0	528	920	733	898

Composition

	All	WP	RO	RM	NS	BB	во	ELM	WB	SM	RP	НМ	WA	BASS	SH	QA
	species															
Basal area (sq.ft./ac.)	114.5	62.1	15.9	12.4	6.9	3.4	2.8	2.1	2.1	2.1	1.4	0.7	0.7	0.7	0.7	0.7
Percent of stand basal	100	54.2	13.9	10.8	6	3	2.4	1.8	1.8	1.8	1.2	0.6	0.6	0.6	0.6	0.6
area (%)																
Stems/area (stems/ac.)	113.7	36.8	25.2	18.2	5.2	12	1.1	6.1	2	1.7	1.1	2	0.9	0.6	0.6	0.4



Diameters

	All	WP	RO	RM	NS	BB	ВО	ELM	WB	SM	RP	нм	WA	BASS	SH	QA
	species															
Medial DBH (in.)	19	21.5	18.4	15.5	16.6	7.8	24	8	14	16	16	8	12	14	15	17
Merchantable Medial DBH (in.)	19	21.5	18.4	15.5	16.6	7.8	24	8	14	16	16	8	12	14	15	17
Quadratic Mean DBH (in.)	13.6	17.6	10.7	11.2	15.6	7.3	22	7.9	14	15	15	8	12	14	15	17
Merchantable Quadratic DBH (in.)	13.6	17.6	10.7	11.2	15.6	7.3	22	7.9	14	15	15	8	12	14	15	17
Mean DBH (in.)	12.1	16.5	9.1	10.1	15.3	7.2	21	7.8	14	15	15	8	12	14	15	17

Volumes

	All	WP	RO	RM	NS	ВВ	ВО	ELM	WB	SM	RP	нм	WA	BASS	SH	QA
	species															
Gross sawtimber volume	17,020	11,748	1,165	1,061	1,508	0	447	0	269	237	209	0	93	105	119	59
(bd.ft./ac.)																
Net sawtimber volume (bd.ft./ac.)	17,020	11,748	1,165	1,061	1,508	0	447	0	269	237	209	0	93	105	119	59
Gross pulpwood volume	1,365	610	269	206	26	64	33	48	20	32	16	11	7	9	4	11
(cu.ft./ac.)																
Net pulpwood volume (cu.ft./ac.)	1,092	488	215	164	21	51	26	38	16	25	13	9	5	7	3	9
Gross total volume (cu.ft./ac.)	4,044	2,394	468	387	277	83	93	48	75	68	46	11	24	26	26	20
Net total volume (cu.ft./ac.)	3,235	1,915	374	310	222	67	74	38	60	55	37	9	19	20	21	16



New Hampshire Natural Heritage Bureau

DNCR - Division of Forests & Lands
172 Pembroke Road, Concord, NH 03301

Phono: (602) 271 2214 Fav. (602) 271 645

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

To: Nick Lanzer

Moreno Forestry Associates

12 Ambler Way Durham, NH 03824

From: NH Natural Heritage Bureau

Date: 2025-06-17

Re: Review by NH Natural Heritage Bureau of request dated 2025-06-05

NHB File ID: 4591 Town: Durham, NH

Project type: Landowner Request Location: Tax Map 18, Lots 1, 2, & 3; Town of Durham (c/o Conservation

Commission)

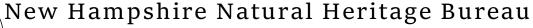
We have searched our database for records of rare species and exemplary natural communities on the property(s) identified in your request. Our database includes known records for species officially listed as Threatened or Endangered by either the state of New Hampshire or the federal government, as well 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):

TAILE RECORDS WARRING SHE BEST AND PROPERTY CO.	Last Reported	Listing Status		Conservation Rank	
Plant Species		Federal	NH	Global	State
crested sedge - Carex cristatella	2015		Е	G5	S1
Vertebrate Species	S. 1	Federal	NH	Global	State
Pied-billed Grebe - Podilymbus podiceps	2016		Т	G5	S2B
Least Bittern - Botaurus exilis	2014		SC	G4	S1B
Sora - Porzana carolina	2021		SC	G5	S3B
Common Gallinule - Gallinula galeata	2006		SC	G5	S2B
Marsh Wren - Cistothorus palustris	2020	//		G5	S3B
Banded Sunfish - Enneacanthus obesus	2007		SC	G5	S3

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



DNCR - Division of Forests & Lands 172 Pembroke Road, Concord, NH 03301

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

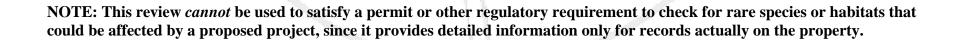
New England Cottontail - Sylvilagus transitionalis	2016		Е	G3	S1
Spotted Turtle - Clemmys guttata	2022		Т	G5	S2
Blanding's Turtle - Emydoidea blandingii	2016		Е	G4	S 1
Northern Black Racer - Coluber constrictor constrictor	2013	-	Т	T5	S2

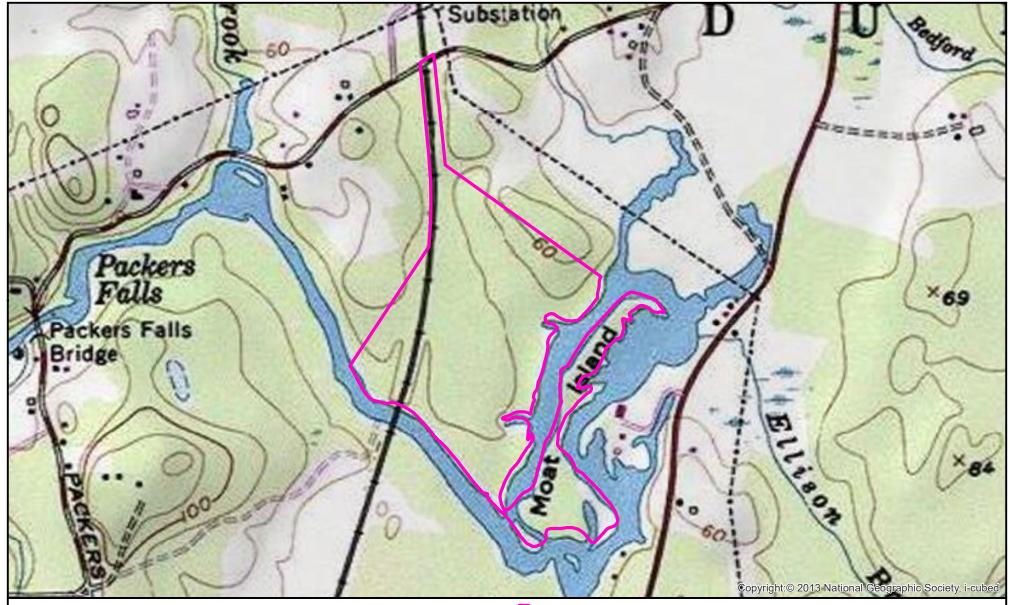
Listing codes: T = Threatened, E = Endangered SC = Special Concern

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.







Natural Heritage Bureau Landowner Report

Project ID Number: 4591

NOTE: Any rare species and/or exemplary natural communities in this area are not shown unless they occur, at least in part, within the property bounds.

0 0.1 0.2 Mile

Property Bounds # of Records

Plant Occurence:

Animal Occurence: 0

Natural Community: 0

Ecological System: 0





<u>APPENDIX F – Property History from LRAC</u>

Reproduced here with permission from the Lamprey River Advisory Committee (www.lampreyriver.org).

The Doe Farm (formerly known as the Moat Farm)

Doe House and Barn

Nicholas Doe left England sometime before 1663 and in 1668 moved his family to Oyster River, purchasing the Martin Farm in the Lubberland neighborhood on Great Bay. After his death, Nicolas' eldest son John elected to give his younger brother Sampson the established farm.

John Doe (born 1669) built his new farm c.1700 at this site by Moat Island on the Lamprey River. His farm was 130 acres on land inherited from his father. The size of the Moat Farm varied during the six generations it was owned by the Doe family. A trail leading northeast from the house site was formerly the road to the farmhouse at Laroche Farm, once part of the Moat Farm.

The Doe farmhouse was a full Cape style with a massive central chimney; its foundation can be seen in the cellar hole, in the woods just beyond the kiosk.

Town of Durham, 1909

Upon his death in 1909, Olinthus Newton Doe left his farm to Durham in trust for the benefit of the common schools (grades 1 through 8).

The population of Durham was about 850 residents. College students were not counted as residents until the 1950 U.S. Census. In 1909, Durham had only 219 voters, as the 19th amendment, giving women the right to vote, was not ratified until 1920.

147 students attended the common or district schools, and 14 students attended high school in Dover or Newmarket.

From Farm to Forest

During 1841 the Boston & Maine Railroad laid track across the Doe farm and built a cattle tunnel under the track near the river so Benjamin Doe could access his land west of the track.

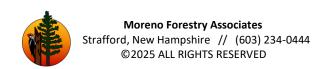
When Olinthus Newton Doe left his farm to the Town for the benefit of the common schools, the land was fields and pastures that had provided food for generations.

The town auctioned the contents of the farm in 1914 and the house and barn burned before 1916. The large barn was northwest of the house, its gable end facing east as was customary, and there were other farm buildings. Today, Doe Farm is about 87 acres, including Moat Island, and mostly forested.

Leather Tanning

In addition to farming, the Does also engaged in tanning, cordwaining, teaching, and writing the Doe almanacs.

Tanning was highly regulated during colonial times due to the importance of leather, used for breeches, blacksmiths' aprons, saddles, harnesses, bags, buckets, shoes, boots, gloves, caps, shot pouches, trunks,



90 of 92

Doe Farm, Durham, New Hampshire Forest Management Plan June 2025

book covers, and more. Benjamin Doe (born 1708) started the Doe tannery, which employed hired men and apprentices.

Soaking pits used by the Doe tannery can still be seen about 800 feet south of the farmhouse cellar on the lower terrace near the river.

Tanning involved scraping, then soaking hides in lime and later with hemlock bark. After the hides were tanned, some of the leather was used to make boots.

A cordwaining or boot-making shop was operated by the Doe brothers during the 1800s. Benjamin Doe (born 1755) sold their boots to the U.S. Army during the War of 1812. The boots were similar to those worn by Hessian soldiers during the Revolutionary War and these boots later evolved to become the American cowboy boot.

Teachers, Legislators, Selectmen

The generations of Does living at the Moat Farm were well-educated and often worked as teachers, later returning to the home farm. As early as June 3, 1817, Sergeant Ebenezer Doe (born 1758) petitioned the NH Legislature to incorporate Durham Academy, a private high school. He served as town selectman for five terms between 1804 and 1817.

Ebenezer's son Joseph graduated from Dartmouth, taught school and later became a publisher in Boston. His son Benjamin (born 1791) was a teacher of 'mathematics, natural and experimental philosophy, astronomy and languages'. Benjamin was preceptor of Kingston Academy before returning to live at the Moat Farm. Benjamin served two terms as town selectman, two years in the NH Legislature and served for many years on the superintending committee that administered Durham's ten district schools.

Benjamin Doe published 'Doe's Newtonian Almanac' during the 1820s. 'Newtonian' referred to the philosophical and scientific methods of Isaac Newton which laid the groundwork for modern science. Doe also published instructional pamphlets for the teaching of mathematics, land surveying and use of a new improved slide rule.

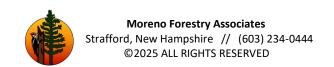
Olinthus Newton Doe

Benjamin's son, Olinthus Newton Doe (born 1835), was named for Olinthus Gregory, a British mathematician, author and founder of the Royal Astronomical Society. Olinthus, or Newton as he preferred to be known, also served on the school superintending committee, visiting and evaluating Durham's district schools and teachers.

At that time there were more farms in Durham and town residents owned many more farm animals. The 1909 Town Report lists the types and values of farm animals.

Doe Family Burial Ground

Members of the Doe family who lived and died on the farm were buried about 150 feet south of the house site. There are 11 engraved stones, all dating after 1800. The earlier graves were marked with field stones, the common practice on farms before the 19th century. The town installed an iron pipe fence in 1916.



APPENDIX G – Forester Professional Qualifications

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 AFF Study Tour Germany/France/Switzerland — Mixed-aged silvicultural methods, Oct 2016

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

WORK EXPERIE	NCE
1980 - Present	FORESTRY CONSULTANT, founder and proprietor of Moreno Forestry Associates. Forty-five 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. 40,000+ acres under management.
1984 -	TOWN FOREST MANAGER for the Towns of Exeter, Londonderry, Candia, Plaistow, Atkinson, East Kingston,
Present	Deerfield, Epping, Brentwood, Sandown, Rye, Pittsfield, Chichester, Derry, Dover, Strafford, Northwood, Rollinsford, and Rochester developing/implementing multiple-use plans for publicly-owned forests.
1988 - Present	FOREST MANAGER for multiple forest properties owned by conservation organizations, land trusts, and schools. Prepared and presented numerous workshops and field tours teaching silviculture, wildlife habitat management, natural history, forest ecology, low impact harvest techniques, and other topics.
1990 - Present	FOREST CONSULTANT for environmental studies, forest appraisals, and/or project management including Pease Tradeport (Newington, NH), Emerald Necklace (Boston, MA), Trust for Public Lands, Southeast Land Trust, and Siemon Family Charitable Trust.
2009 - Present	TECHNICAL SERVICE PROVIDER (TSP) for Natural Resources Conservation Service (NRCS). Approximately 150 management plans completed, as well as project management for forest improvement, habitat enhancement, invasive control, & woods road construction.

PROFESSIONAL RECOGNITION

SELT Conservationist of the Year – 2022

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

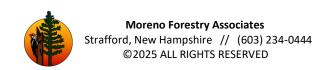
NH Wildlife Stewardship Award – 1995

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)



NICHOLAS LANZER, LPF Consulting Forester, Forest Ecologist

New Hampshire Licensed Professional Forester #512
New Hampshire Licensed Commercial Pesticide Applicator NHPC #785

EDUCATION

- A.A.S. FOREST TECHNOLOGY University of New Hampshire Thompson School, Summa Cum Laude, Class Marshal, May 2014
- M.S. NATURAL RESOURCES (FORESTRY) University of New Hampshire, Summa Cum Laude, December 2016

PROFESSIONAL MEMBERSHIP

- Forest Stewards Guild
- Society of American Foresters (SAF)

WORK EXPERIENCE

Present

2022 - PRINCIPAL PESTICIDE APPLICATOR at FORESTORE, LLC. Perform site evaluations, Integrated Pest

Present Management planning, and targeted application of pesticides to treat and control forest diseases, invasive

species, and other undesired vegetation.

2017 - **FORESTER** at Moreno Forestry Associates. Perform and assist with suite of consulting forestry tasks, including Present all aspects of intensive silviculture and restoration ecology, timber harvest administration, GIS mapping,

all aspects of intensive silviculture and restoration ecology, timber harvest administration, GIS mapping, writing forest management plans, addressing invasive plants, deed/survey work and boundary maintenance,

research and data analysis, contracting and permitting, client relations.

2017 - ADJUNCT INSTRUCTOR at the University of New Hampshire Thompson School. Teach FORT 581 "Applied

Geospatial Techniques," a 4-credit course exploring the history, theory and natural resource applications of

GIS and related technologies.

2017 EASEMENT STEWARD, BASELINE DOCUMENTATION SPECIALIST at the Southeast Land Trust of New

Hampshire (SELT). Monitored conserved lands for compliance with terms of conservation easement; produced reports and GIS maps. Completed baseline documentation reports for major land acquisitions including Stonehouse Forest (1500+ acres) producing detailed narratives, GIS maps, and associated legal

documentation.

2014 - 2017 RESEARCH ECOLOGIST at the University of New Hampshire. Conducted research on impacts of invasive glossy

buckthorn on forest ecology and management. Performed data and statistical analysis, field sampling.

Prepared scientific manuscripts for publication.

2014 FOREST TECHNICIAN at NH Division of Forests and Lands. Performed general forestry tasks on NH state lands

including boundary and trail maintenance, forest mapping, timber sale marking and administration.

2013 - 2014 FOREST TECHNICIAN at UNH Office of Woodlands and Natural Areas. Performed various forestry operations:

timber cruising, CFI, boundary maintenance, data processing, harvesting/silvicultural implementation,

operating equipment (skid steer, forwarder), invasive plant control.

PUBLICATIONS

Lanzer, N., Lee, T., Ducey, M., Eisenhaure, S. (2017) "Sapling white pine (Pinus strobus L.) exhibits growth response following selective release from competition with glossy buckthorn (Frangula alnus P. Mill) and associated vegetation." Forest Ecology and Management 404, 280-288.

RECOGNITION

Society of American Foresters Granite State Division – Student of the Year - 2014 Council of Eastern Forest Technician Schools Honors Society - 2014

