Forest Stewardship Climate Plan 2022-2032
Pelham Lake Park
Town of Rowe

Total Forested Acres: 1,264.14

Beautiful woods transition from the shores of Pelham Lake to the highlands around it.

June 22, 2022

Prepared by Alex Barrett, Long View Forest, 31 Ferry Road, Hartland, VT 05048
MLF#460

Original 2020 Forest Stewardship Plan Lead author: Mary Wigmore, MLF#250 with Alex Barrett, Co-author

Forest Management Plan

Submitted to the Massachusetts Department of Conservation and Recreation for enrollment in CH61/61A/61B and/or Forest Stewardship Program

CHECK-OFFS					Administrative Box	
CH61	CH61A	CH61B	STEWARDSHIP	Cost Share	Case No.	Orig. Case No.
cert ☐	cert ☐	cert ☐	new ☐	EEA ☐	Owner ID	Add. Case No.
recert ☐	recert ☐	recert ☐	renew ☐	Other ☐	Date Rec'd	
amend ☐	amend ☐	amend ☐	Climate ☒	Birds ☐	Plan Period	
			Conservation Rest. ☐		Rare Spp. Hab.	
Plan Change ____ to ____			CR Holder ____			

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Rowe- Pelham Lake Park- c/0 Select Board
Mailing Address 321 Zoar Road, PO Box 462, Rowe MA 01367 Phone 413-339-5520
Email Address admin@rowe-ma.gov

Property Location Town(s) Rowe Road(s) Zoar Road, Davis Mine Road

Plan Preparer Alex Barrett (with Mary Wigmore on original FSP) Mass Forester License # 460
Mailing Address 31 Ferry Road, Hartland, VT 05048 Phone 413-717-0210

RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A 61B *Excluded* Acres	Ch61/61A 61B **Certified** Acres	Stewshp *Excluded* Acres	Stewshp Acres
			TOTALS					1345.29

Excluded Area Description(s) (if additional space is needed, continue on separate paper)

Data and descriptions on the Front-Page Overflow Page- refer to the document page.

HISTORY Year acquired 1955 Year Management began 1955

Are boundaries marked: Yes ☐ blazed/painted/flagged/signs posted (circle all that apply) No ☐ Partially ☒

What treatments have been prescribed, but not carried out (last 10 years if plan is a recert.)?
stand no. ____ treatment ____ reason ____
(If additional space is needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date

Remarks: (if additional space is needed, continue on separate page)

2022 saw the beginning of implementation on climate-smart forestry practices- see plan.

Front Page Overflow-Assessor's Records Data Sheet

Assessor Map Number	Assessor Lot Number	Deed Book	Deed Page	Total Area-Acres Tax Maps	Total Area-Acres GIS	Stew Exclusion Area-Acres	Stew Certified Area-Acres by Tax Maps
201	35	3857	293	34		0	
201	37	3014	324	13.9		0	
201	38	3262	186	1.9		0	
201	39	2322	148	39		0	
201	40	1032	383	20		0	
201	48	1515	161	.29		0	
204	6	1032	383	27		0	
204	7	1410	329	12.4		0	
204	23	1306	58	212		0	
204	24	1032	383	51		0	
204	25	1032	383	33		0	
204	26	1032	383	30		0	
204	27	1032	383	19		0	
204	28	1032	383	19		0	
204	29	1032	383	20		0	
204	30	1032	383	23		0	
204	31	1032	383	77		0	
204	32	1306	58	13.5		0	
204	36	1900	209	45		0	
403	69	3857	297	10		0	
403	70	1551	248	214		0	
403	71	1032	383	11		0	
408	38	2046	283	147		0	
408	45	1345	195	127		0	
408	46	1032	383	64		0	
Pelham Lake				81.3	81.3	0	
Totals				**1345.29**	**1345.44**		

Note: The working maps in this Forest Stewardship Plan have been computed using the GIS acres.

Landowner Goals-Pelham Lake Park

Landowner Goals

Please **check** the column that best reflects the importance of the following goals:

(goals may change over time and this table may be updated to reflect any changes)

Goal	Importance to Me			
	HIGH	MED	LOW	N/A, Don't Know
Improve access for walking/skiing/recreation	✓			
Improve hunting or fishing	✓			
Maintain or enhance privacy				✓
Preserve or improve scenic beauty	✓			
Protect special features, including those of historical or person significance		✓		
Enhance the quality and/or quantity of forest products*				✓
Practice agroforestry				✓
Produce income from timber products, or other products and services				✓
Produce firewood for personal use				✓
Enhance habitat for birds	✓			
Enhance aquatic habitat in streams, ponds, and other wetlands	✓			
Enhance habitat for wildlife	✓			
Promote diversity of plant species and habitat types	✓			
Increase forest resiliency	✓			
Minimize damage from forest pests	✓			
Protect water quality	✓			
Sequester and/or store carbon to mitigate climate change			✓	
Suppress or eradicate invasive plants	✓			
Lower property taxes				✓
Protect land from development				✓

*** This goal must be checked "HIGH" if you are interested in classifying your land under Chapter 61/61A.**

Owner(s) (print) Laurie Pike, Rowe Park Commissioner for Pelham Lake Park (This page will be included with the completed plan.)

Page ___ of ___

In your own words please describe your goals for the property:

In keeping w/ the original covenant to protect and preserve the park land for wildlife and recreational use for perpituity, the park strives to care for and protect the function of the forest ecosystem. To this end important goals include maintaining healthy wildlife habitat to enhance and maintain biodiversity, promote forest resiliency in the face of climate change, and to enhance recreational use of the Park's resources for current and future generations.

Stewardship Purpose

By enrolling in the Forest Stewardship Program and following a Stewardship Plan, I understand that I will be joining with many other landowners across the state in a program that promotes ecologically responsible resource management through the following actions and values:

1. Managing for long-term forest health, productivity, diversity, and quality.
2. Conserving or enhancing water quality, wetlands, soil productivity, biodiversity, cultural, historical and aesthetic resources.
3. Following a strategy guided by well-founded silvicultural principles to improve timber quality and quantity when wood products are a goal.
4. Setting high standards for foresters, loggers and other operators as practices are implemented; and minimizing negative impacts.
5. Learning how woodlands benefit and affect surrounding communities, and cooperation with neighboring owners to accomplish mutual goals when practical.

Signature(s): Laurie Pike, Rowe Park Commission **Date:** 7/20/2022

Owner(s) (print) Laurie Pike, Park Commission for the Town of Rowe and Pelham Lake Park (This page will be included with the completed plan.)

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Acknowledgements from the 2020 Forest Stewardship Plan

This work was made possible with the support of the Massachusetts Executive Office of Energy and Environmental Affairs and the Mohawk Trail Woodlands Partnership. Thank you for that support- it has made this process possible and yielded a great final result and basis for moving forward. The Franklin County Regional Council of Governments also provided invaluable help coordinating and helping this project come together.

The authors would also like to thank the Pelham Lake Park Commission, the Rowe Selectboard, the people of Rowe, Walt Quist in his role as the Mohawk Trail Woodlands Partnership Representative for Rowe, and Janice Boudreau and Paul McLatchy for all their engagement, help, input, and enthusiasm. Lastly, we would like to thank Park Manager Sean Loomis. Sean shared his vast knowledge of all things Park and was a consistent, helpful, and insightful presence and influence on this whole process.

Acknowledgements from the 2022 Update

This work is funded through a Municipal Vulnerability Preparedness Grant Administered by the New England Forestry Foundation and Mass Audubon. Josh Rapp and Andrew Randazzo have provided guidance and edits to help make this Plan a reality. From Rowe, Park Commissioners Laurie Pike and Hannah Poplawski and Park Manager Sean Loomis have also provided valuable input and guidance as we update this Plan to reflect the Town's increased focus on Climate change awareness and planning.

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Executive Summary

Figure 1: Bog bridges that were replaced with a more resilient boardwalk through a wet section of the property provide wonderful access and the opportunity to experience the forest.

Pelham Lake Park is a treasured forest and lake landscape located in the heart of Rowe. From the shores of Pelham Lake, the forest stretches up the mountainside providing a range of ecotypes, places to explore, and habitat for wildlife. The ~15 mile trail network throughout the Park provides excellent access and is how most people experience the amazing forest here.

The Park began in 1955 with a generous and visionary gift of land to the Town by Percy Whiting Brown. Inspired by Baxter State Park in Maine, Brown laid out a set of Covenants designating this core area as a wild nature preserve. Since then, the Town has added hundreds of additional acres, some with the Covenant stipulations, some not, to make the Park the amazing resource that it is today. Governed by an elected Park Commission that delegates much of the day-to-day management to the Park

Manager, Pelham Lake Park is an excellent model for a community-run forest where multiple values, management goals, and a sense of shared management interest overlap.

The impacts of climate change on Pelham Lake Park are predicted to center around the following broad themes whose impacts on the Park will be highlighted throughout this Plan:

- Changing precipitation patterns and extreme weather events affecting trails, forest ecology, and hydrology
- Invasive insects impacting hemlock, which is currently the most common tree on the Park
- A lack of diverse regeneration leading to questionable long-term resilience of the forest system
- The threats of invasive plants to native plant diversity

This Forest Stewardship Climate Plan builds upon the 2020 Stewardship Plan that was itself the result of a 5 month, community-centered planning, outreach, education, and consensus building process. In this Climate Plan, we continue to synthesize, condense, and add-to the community's ideas, visions, and goals into an actionable set of 15 stewardship recommendations with an increased focus on climate change adaptation and forest resilience.

These recommendations largely center around four key management areas:

1. Trails and Recreation
2. Forest Protection
3. Active Management
4. Forest Carbon

The last 2 years since the original Plan have been transformative for the Park as the Park Commission and Staff have moved to implement a number of important practices, and community outreach and engagement have continued. The next 10 years have the potential to be quite transformative yet again for the Park as its stewards seek to enhance the trails, get out ahead of a variety of forest threats, plan for the future, and begin some active forest management work focused on diversifying the age class structure and enhancing the old growth characteristics of this memorable forest.

Figure 2: The bridge over Pelham Brook is an example of climate-smart trail infrastructure since it keeps trail up and away from potential flooding.

Section 2: Overview of the Pelham Lake Park- Town of Rowe

2.1 Landscape and Regional Context

Northern Franklin County along the Vermont border is a heavily forested and sparsely populated region with large blocks of interior forest habitat. Rowe is one of the least populated Towns in Massachusetts with a population of around 400 people. Rowe lies along the eastern bank of the Deerfield River, which is dammed near the Vermont border to form the Sherman Reservoir. The town is hilly, with two main ridges on either side of Pelham Brook. Near the southwest corner of town is Negus Mountain, along the western ridge, and along the eastern ridge lie Todd Mountain and Adams Mountain, the highest point in town.

2.2 Property's History, and History of Disturbance

The history of Rowe is remarkably well-documented in The History of Rowe Massachusetts, 4th Edition, by Percy Whiting Brown and Nancy Newton Williams, et al. published by the Rowe Historical Society in 2006. It is a rich, historical narrative of Rowe beginning in 1744 with King George's War and the establishment of Fort Pelham, and on through the pre-revolutionary war days, through the Revolution, the Town's mining history, Rowe Yankee, and on to today.

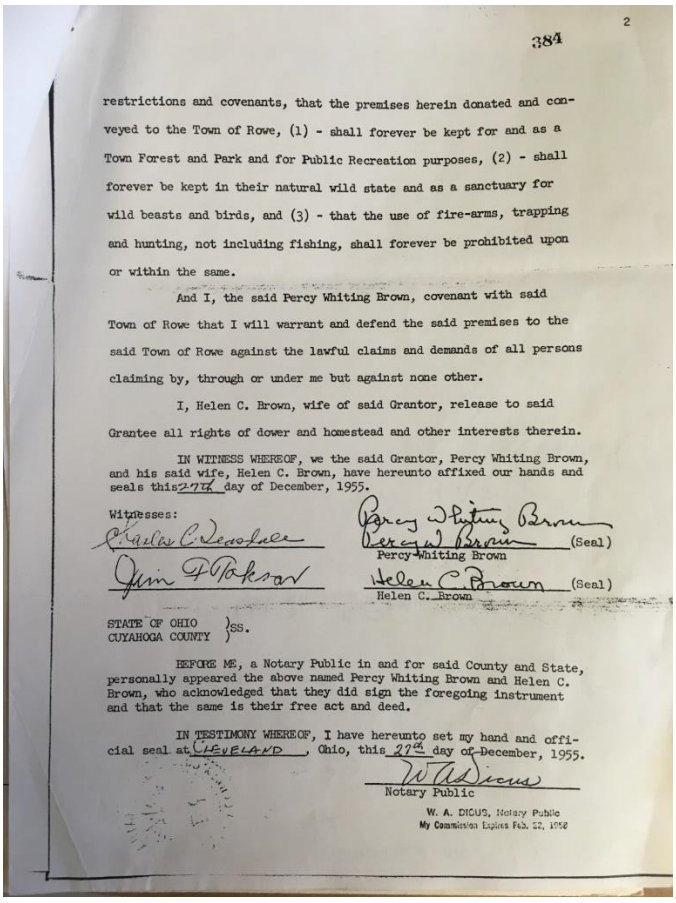
The anthropogenic impact of European settlement on Rowe dramatically altered the vegetation on the landscape here and we continue to work with these impacts today. Susan Alix Williams' Wildflowers of Rowe, Massachusetts begins with a valuable discussion of how clearing, agriculture, and animal husbandry altered the vegetative assemblages on the Park. As the returning forests mature over the decades post-agricultural and mining abandonment, we see native plant communities building as well.

Much of Rowe was cleared in the 1800's for sheep pasture and other agrarian pursuits. Old photos show fields, hedgerows, and dirt tracks crisscrossing what is now thick forest. The Town also has a significant history of mining. Apart from the physical alteration of the landscape, mining required massive quantities of fuelwood whose harvest furthered the clearing in and around what is now the Park. The Davis mining camp closed in 1911, at which point the pressure on the surrounding forests for intensive cutting would have receded. The forest ecosystem would have begun its natural succession phase at this point.

In 1955, Percy Whiting Brown gifted the town 475 acres that would become the core area of the Park. His story is a wonderful and inspiring one whose legacy is very much with the Town to this day. Inspired himself by Percival Baxter's work in Maine, he donated this core area of the Park to *"forever be kept for and as a Town Forest and Park for*

Public Recreation purposes…..[and] *kept in their natural wild state and as a sanctuary for wild beasts and birds."* Baxter designated 14% (29,537 acres) of what would become Baxter State Park to be a "Scientific Forest Management Area" where sustainable forestry practices are tested and perfected. Brown did not make a similar designation and while some areas of Pelham Lake Park have been added to the Park outside of the original covenant restrictions, the core ethos of the Park and its management hue closely to Brown's original words.

With climate change, this core reserve area presents both huge opportunities, but also vulnerabilities. Naturally developing, large swaths of contiguous forest provide a place for a diversity of species to flourish and the lower ratio of edge forest decreases invasive plants' disruption of the ecosystem. However, the core reserve area also has its management options constrained by the covenant language and this may reduce the Town's ability to react appropriately to climate change-induced management needs such as how to respond to hemlock mortality caused by invasive insects that are thriving in warmer winters.



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restrictions and covenants, that the premises herein donated and conveyed to the Town of Rowe, (1) - shall forever be kept for and as a Town Forest and Park and for Public Recreation purposes, (2) - shall forever be kept in their natural wild state and as a sanctuary for wild beasts and birds, and (3) - that the use of fire-arms, trapping and hunting, not including fishing, shall forever be prohibited upon or within the same.

And I, the said Percy Whiting Brown, covenant with said Town of Rowe that I will warrant and defend the said premises to the said Town of Rowe against the lawful claims and demands of all persons claiming by, through or under me but against none other.

I, Helen C. Brown, wife of said Grantor, release to said Grantee all rights of dower and homestead and other interests therein.

IN WITNESS WHEREOF, we the said Grantor, Percy Whiting Brown, and his said wife, Helen C. Brown, have hereunto affixed our hands and seals this 27th day of December, 1955.

Witnesses:

Percy Whiting Brown (Seal)
Percy Whiting Brown

Helen C. Brown (Seal)
Helen C. Brown

STATE OF OHIO)
CUYAHOGA COUNTY) SS.

BEFORE ME, a Notary Public in and for said County and State, personally appeared the above named Percy Whiting Brown and Helen C. Brown, who acknowledged that they did sign the foregoing instrument and that the same is their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and official seal at CLEVELAND, Ohio, this 27th day of December, 1955.

Notary Public

W. A. DICUS, Notary Public
My Commission Expires Feb. 27, 1958

Figure 3: Page 2 of the Brown Covenant

Figure 4: Stonewalls evidence much of the Park's agrarian past.

2.3 General Property Overview

Pelham Lake Park, The Park, is a relatively large tract of land, assembled carefully over time beginning with the Brown Gift in 1955. For a Town Park or Forest in Massachusetts, it is large and covers a wide array of ecotypes from the shores of Pelham Lake up to the rocky outlook on the side of Adams Mountain.

Occupying most of the northern triangle of land between Pond Road and Davis Mine Road, the Park covers an altitudinal gradient from ~1400' at Pelham Lake up to Adams Mountain at ~2,100'. Across this gradient we find an array of mostly hardwood forest featuring beautiful, and quite large, hardwoods, significant hemlock inclusions, and white pines towering over the main forest canopy in many areas. This gradient provides opportunities for species to move up or down the slope as they try to occupy changing niches under different climate change scenarios.

The central feature of the Park is its extensive and amazing network of recreational trails that are beloved by the Townspeople who use them for walking, mountain biking, snowshoeing, cross country skiing, horseback riding, and trail running. A section of the trail network also serves as a connector for the regional snowmobile network of trails. Many of the trails are historic in nature- beginning with the Old Kings Highway in the southwestern part of the Park- and many follow old stone walls, pass by sheep pens, and cellar holes, or go near old mines.

From a management perspective, the Park can be thought of in 2 ways:

1. The core, Covenants Area of the Park where Percy Brown's gift anchors all the parcels that the Town voted in under these restrictions. This includes the Brown, Stamford, Sibley, and Bouille Parcels.

2. The non-Covenants area where hunting is permitted and there is more latitude for forest stewardship decision-making. These include The Oliver, Atwood, Cersosimo, Parkies, Kuzdizal, Esip, and Grieco Parcels.

The theme of Covenants and Non-Covenants areas will run deep throughout this entire Forest Stewardship Climate Plan as we seek to balance the spirit and intents of all these different parcel gifts and acquisitions with the Town's consensus stewardship goals as articulated during the 2020 planning process and subsequent revisiting of these goals with the 2022 Climate Plan Update.

2.3.1 Location and Property Size:

Located in the northwestern corner of Franklin County in Western Massachusetts, Rowe is a heavily forested Town that borders Vermont and is part of a forest corridor stretching from west-central Connecticut to the Canadian border. Aside from a few significant east-west highways, this is a relatively intact landscape with globally important forest connectivity, biodiversity, and wildlife habitat. The Green Mountain National Forest is a green keystone in this corridor, but many other conserved, or semi-conserved ownerships, State Lands, Town Lands, and simply undeveloped forest make this swath of green what it is.

The 1,345.44-acre Park occupies most of the northern triangle of land between Pond Road and Davis Mine Road. 1,264.14 of these acres are forested or part of the Park Headquarters and forested beach area with the remainder in Pelham Lake itself.

2.3.2 Topography, Land Formation and Hydrology:

The Park covers an altitudinal gradient from ~1400′ at Pelham Lake up to Adams Mountain at ~2,100′. Around the Lake, and near roads, the topography is gentle,

although rock outcrops still protrude. Across most of the property, however, the topography is quite severe with lots of steep slopes, some small talus fields, and lots of small cliffs and outcrops.

Geologist Norman Hatch, Jr. provides a wonderful description of Rowe's geology in his Chapter "Geologic History of Rowe" in The History of Rowe Massachusetts, 4th Edition. Most of the Park sits atop Moretown Formation bedrock with some areas north and east of the Lake featuring more prominent glacial deposits of sand and gravel.

The hydrology of the Park is complex and includes many flashy mountain streams draining off the peaks of Adams and Todd, a set of more established brooks and wetlands in the lowlands, vernal pools, marshy areas, and of course, the Lake. Climate change modeling scenarios indicate a high likelihood of increased and more flashy rain, and rain on snow events that will test the hydrologic limits of the natural system here. Potter Brook and Tuttle Brook join forces right along the Park's boundary and then flow together southwest into the Lake. Exiting the Lake, Pelham Brook then flows on to join the Deerfield River. Davis Mine Brook has its headwaters in the eastern uplands of the Park.

Figure 5: The Brook along the eastern edge of the Park- note the boundary sign on the hemlock.

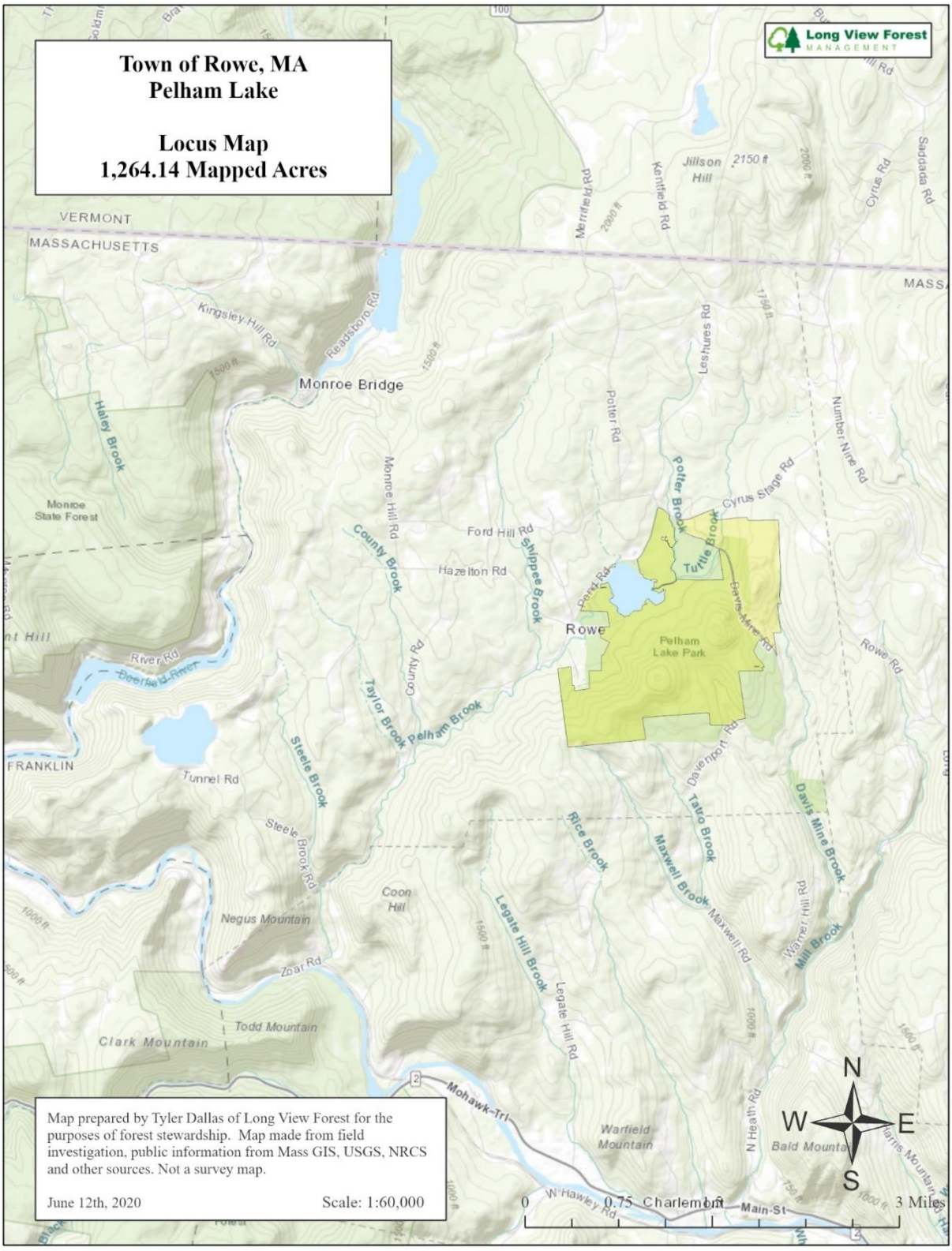


Figure 6: Locus Map

2.4 Forest Soils and Site Productivity

The United States Department of Agriculture classifies and rates soils, which they record in a Soil Survey for Franklin County. Site Index is a term used to describe the potential for trees to grow at a location or "site." The higher the index, the better the growth site is. The site index numbers vary across the Park with much of it having Red Oak Site Index of 60, and Sugar Maple Site Index 73. Site Index numbers are presented in Section 5: Stand Descriptions of this document. These metrics indicate the site's suitability for the productive growth of the tree species found here. Overall, these are fertile, hill town soils that can grow great trees.

Nearly 50% of the acres on the Park have soils in the Millsite-Westminster complex with steeper slopes and rocky conditions throughout. Swaths of Wonsqueak muck occupy the beaver complexes and wetlands. Across the rest of the property, the glaciers left an intricate array of stony, glacial tills, and fine sandy loams. The soil map below shows this complexity. It is also interesting to note the relative homogeneity of the soils in the uplands as compared to the increasing complexity lower on the slopes of the mountains.

All these soils derive from acidic glacial till that weathered in varying ways over time. The Marlowe, Peru, Shelburne, Ashfield, Berkshire, and Colton soils are deep, rich loams, which support productive growth of all trees. The Westminster-Millsite and Tunbridge-Lyman Series are shallow, droughty soils found on high slopes and mountain tops, which usually sprout extensive ledges, cliffs, and rock outcroppings. Trees grow slowly on these marginal soils. The Wonsqueak and Peacham organic muck soils anchor the wetlands and swamps throughout the Park.

These soils have good structure and functionality, which makes all other forest ecosystem services possible. The soil functions beneath the forest floor include temperature regulation, carbon and nutrient cycling, water cycling and quality, natural "waste" (decomposition) treatment and recycling, and habitat building for most living things and their food.

Current scientific consensus is that soil moisture patterns will likely change under climate change scenarios with drier soil conditions expected later in the growing season. For Pelham Lake, the shallow soils in the uplands already support beech and oak, two species which can handle droughty conditions and which are projected to do well under a changing climate. However, these same conditions present a hindrance to more mesic species such as ash and sugar maple and to regeneration of trees in general as seeds struggle to germinate successfully on a drier substrate.

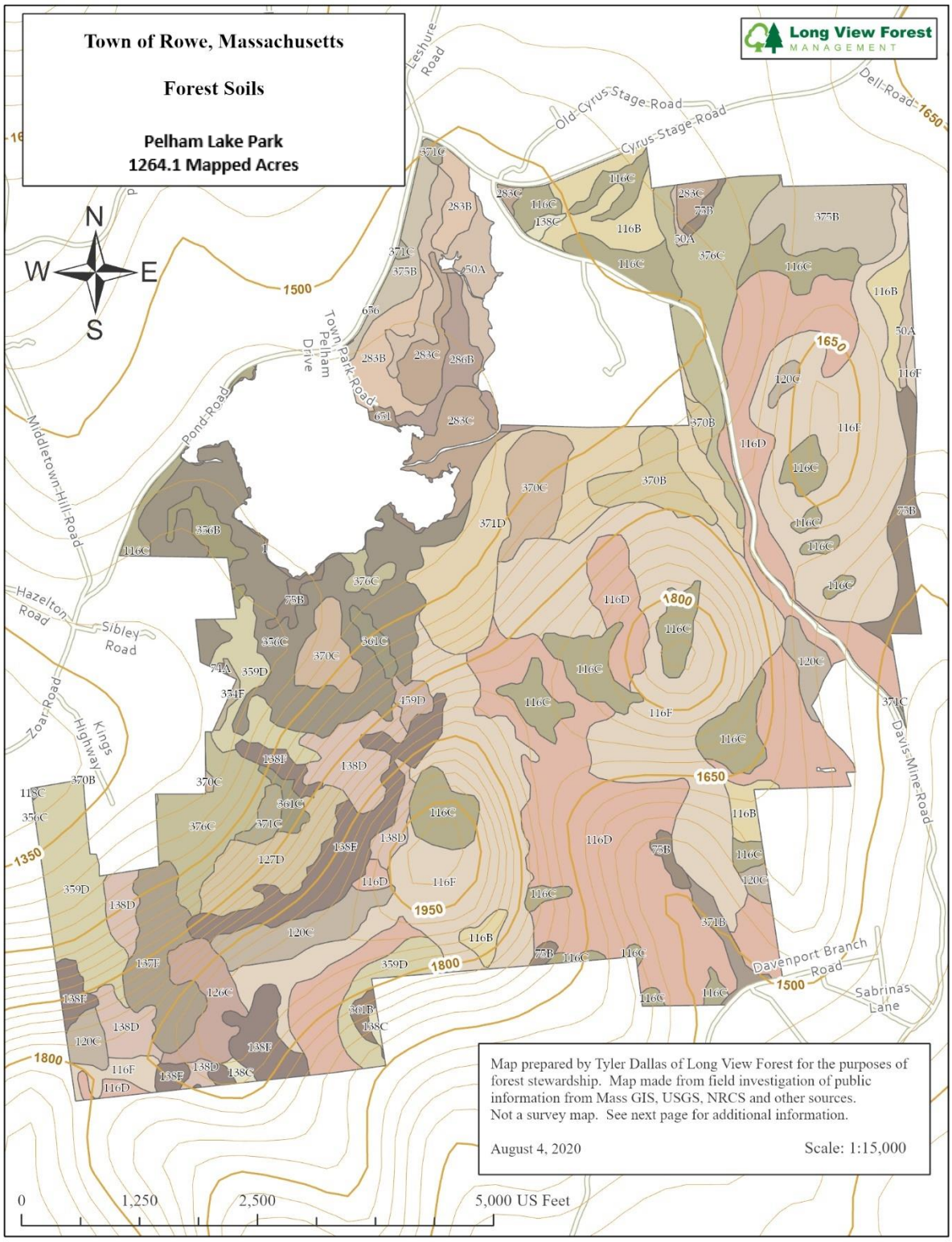


Figure 7: Soils Map

Soil Types for Pelham Lake Park

Soil Symbol	Soil Name	Percent Cover
116B	Millsite-Westminster complex, 3 to 8 percent slopes, rocky	2.5%
116C	Millsite-Westminster complex, 8 to 15 percent slopes, rocky	7.3%
116D	Millsite-Westminster complex, 15 to 25 percent slopes, rocky	17.2%
116F	Millsite-Westminster complex, 25 to 50 percent slopes, rocky	22.9%
118C	Colrain-Millsite complex, 8 to 15 percent slopes, rocky	0%
120C	Millsite-Westminster complex, 8 to 15 percent slopes, very rocky	2.4%
126C	Lyman-Rock outcrop-Tunbridge complex, 3 to 15 percent slopes	1.1%
127D	Berkshire-Tunbridge complex, 15 to 25 percent slopes, very stony	1.6%
137F	Westminster, Lyman and Rock outcrop soils, 25 to 90 percent slopes	1.8%
138C	Tunbridge-Lyman complex, 8 to 15 percent slopes, very rocky	0.3%
138D	Tunbridge-Lyman complex, 15 to 25 percent slopes, very rocky	2.8%
138F	Tunbridge-Lyman complex, 25 to 60 percent slopes, very rocky	4.1%
283B	Colton-Adams complex, 3 to 8 percent slopes	1.5%
283C	Colton-Adams complex, 8 to 15 percent slopes	2.1%
286B	Sheepscot fine sandy loam, 3 to 8 percent slopes	0.9%
354F	Marlow-Monadnock complex, 25 to 45 percent slopes, very stony	0.1%
356B	Marlow fine sandy loam, 0 to 8 percent slopes, very stony	0.5%
356C	Marlow fine sandy loam, 8 to 15 percent slopes, very stony	6%
359D	Marlow-Peru complex, 15 to 25 percent slopes, very stony	4.4%
361B	Peru fine sandy loam, 0 to 8 percent slopes, very stony	0.2%
361C	Peru fine sandy loam, 8 to 15 percent slopes, very stony	0.5%
370B	Shelburne fine sandy loam, 3 to 8 percent slopes	1.3%
370C	Shelburne fine sandy loam, 8 to 15 percent slopes	2.1%
371B	Shelburne fine sandy loam, 3 to 8 percent slopes, very stony	0.4%
371C	Shelburne fine sandy loam, 8 to 15 percent slopes, very stony	0.4%
371D	Shelburne fine sandy loam, 15 to 25 percent slopes, very stony	4.2%
375B	Ashfield fine sandy loam, 1 to 8 percent slopes	2.6%
376C	Ashfield fine sandy loam, 8 to 15 percent slopes, very stony	5%
459D	Monadnock and Berkshire soils, 15 to 25 percent slopes, very stony	0.3%
50A	Wonsqueak muck, 0 to 2 percent slopes	1.8%
651	Udorthents, smoothed	0.1%
656	Udorthents-Urban land complex	0%
74A	Peacham mucky peat, 0 to 8 percent slopes, very stony	0%
75B	Pillsbury fine sandy loam, 0 to 8 percent slopes, very stony	1.6%

Table 1: Soil Legend-Pelham Lake Park

2.5 The Forest Ecosystem: Dominant Forest Types, Ages, and Adaptability

The Park supports a mostly northern hardwood and oak forest that features a strong hemlock component with occasional pine and red spruce. Much of the understory has a distinctly northern hardwood feel to it with beech, hobblebush, and striped maple dominating. They represent the common red oak-sugar maple -mixed hardwood transition forest mixed with the hemlock-northern hardwood forest and a small component of the true hemlock forest.

The combination of all these distinct natural communities adds a diversity to the species composition, resiliency, and adaptability in the face of a changing climate. The black birch and red oak components bode well for climate adaptation here as these are generally lower elevation and more southerly species that are projected to fair well under various climate change scenarios.

The species composition across the property is distributed by basal area as follows: Hemlock (20.6%), northern red oak (17.8%), red maple (13.3%), red spruce (12.8%) and white pine (11.7%). 11 other prominent tree species round out the species composition here.

CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES
MASSACHUSETTS

GOOD CAPABILITY	
American basswood	Northern red oak
American beech	Pignut hickory
American holly	Post oak
American hornbeam	Red maple
Black oak	Sassafras
Blackgum	Scarlet oak
Chestnut oak	Shagbark hickory
Eastern redcedar	Sugar maple
Flowering dogwood	White oak
Ironwood	Yellow-poplar
Mockernut hickory	
NEW HABITAT WITH MIGRATION POTENTIAL	
Chinkapin oak	Sweetgum
Common persimmon	Sycamore
Loblolly pine	Virginia pine
Shortleaf pine	Water oak
Southern red oak	

POOR CAPABILITY	
Atlantic white-cedar	Paper birch
Balsam fir	Pitch pine
Black ash	Quaking aspen
Black spruce	Red pine
Black walnut	Red spruce
Boxelder	Slippery elm
Bur oak	Swamp white oak
Eastern hemlock	Sweet birch
Eastern white pine	Tamarack (native)
FAIR CAPABILITY	
American elm	Green ash
Bigtooth aspen	Silver maple
Black cherry	White ash
Gray birch	Yellow birch

www.forestadaptation.org

NIACS
Northern Institute of Applied Climate Science

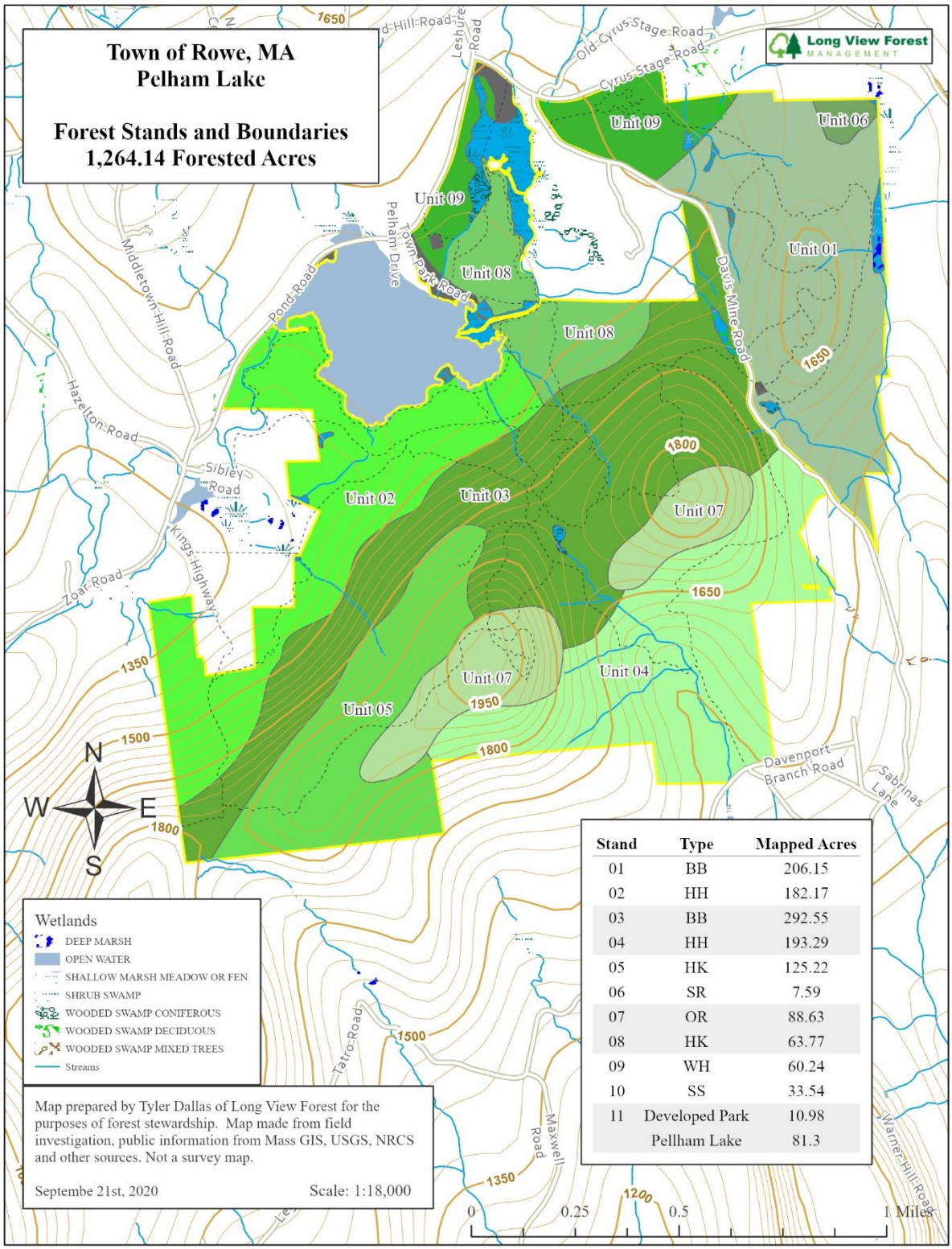
Figure 8: Tree Species Climate Change Adaptation Capability

Source: Managing Forests for Climate Change in Massachusetts. Janowiak, et. al, 2022.

While the species composition here is generally skewed toward species which are projected to be capable of persisting, adapting and even thriving under projected climate change impacts for our region, hemlock is the notable exception. With hemlock wooly adelgid and elongate hemlock scale present on the property, hemlock will likely fare poorly in the coming years. Planning for this demise will be an ongoing discussion for the Town. For example, along stream corridors, hemlock provides temperature regulation which in turn impacts Pelham Lake and fish habitat. What to do about hemlock decline in these areas is an open question.

The structure of the forest is varied. Most is solidly closed-canopy, multi-layered and diverse. There are pockets where hemlock, oak, or spruce are nearly monodominant, but these seldom exceed a few acres in size.

In terms of age, much of the core, covenant forest is likely ~100-120 years old with some pockets of likely older hemlock on the ridges and older legacy hardwoods scattered throughout. On the slopes of Adams and Todd Mountains, some majestic, monster yellow birch, white ash, and red oak give a sense of what these trees can become given lengthy periods of time. Outside the core area, some forest management 30-40 years ago has added in some younger forest. There are pockets of white pine, birch, and beech regeneration that is perhaps a bit younger, but overall, this forest is lacking in young forest.



Stand	Type	Mapped Acres
01	BB	206.15
02	HH	182.17
03	BB	292.55
04	HH	193.29
05	HK	125.22
06	SR	7.59
07	OR	88.63
08	HK	63.77
09	WH	60.24
10	SS	33.54
11	Developed Park	10.98
	Pellham Lake	81.3

Figure 9: Forest Stands and Features Map

Table 2: Forest Stands

Stand #	Acres	Stand Type	Description
1	206.15	**BB-Beech/Birch/Maple**	A nice northern hardwood forest with oak and swaths of younger forest developing after the most recent harvesting that took place prior to the Town's ownership in the later seventies. There is a significant hemlock component throughout as well.
2	182.17	**HH-Hemlock/Hardwood**	This is a complex mixed wood stand around the shores of Pelham Lake that gently climbs the lower elevations of Mt. Adams. Large pines figure prominently here, but hemlock and northern hardwoods share most of the growing space.
3	292.55	**BB-Beech/Birch/Maple**	This is the classic Pelham Lake Park Forest woods with lots of beech, red maple, and oak. Red oak still contributes 16% of the growing stock here. Pockets of hobblebush and beech abound and some of the largest yellow birches, ash and oak are found.
4	193.29	**HH-Hardwood/Hemlock**	The backside of Mt. Adams features a significant oak component, mixed terrain, and several small streams.
5	125.22	**HK-Hemlock**	This is an odd mixture where higher elevation hemlock dominates with red oak and other hardwood associates holding their own as well.
6	7.59	**SR-Spruce (Red)**	This small corner of the property features a completely distinct mix of large spruce with super-dominant pine mixed in.
7	88.63	**OR- Northern Red Oak**	Spanning two summits, this oak forest features lots of red oak, but also many small diameter maples, birch, cherry, and hophornbeam.
8	63.77	**HK- Hemlock**	In the lowland's northeast of the Lake, hemlock and yellow birch dominate this flatter terrain.
9	60.24	**WH- White Pine and mixed hardwoods**	Large white pines, oak, and beautiful pockets of white pine regeneration occupy this roadside Stand.
10	33.54	**SS- Shrub Swamp**	Concentrated mostly in the northern part of the property, these beaver-meadow wetlands feature old dams, ponds, alder, and other shrubs. The birding here is excellent.
11	10.98	**Park, Beach Area, tennis Courts, and Horse Ring**	This is the area around the driveway, the beach, riding ring, and park headquarters.
12	81.30	**Pelham Lake**	This is the lake- renowned for its fishing and birding.
Total	**1,345.44**		

2.5.1 The neighborhood forest context

The Land Use Map (below) highlights the mapped and remotely sensed land uses of the area around Pelham Lake Park. It shows the forested nature of the region and the Parks' centrality to it all at a neighborhood level.

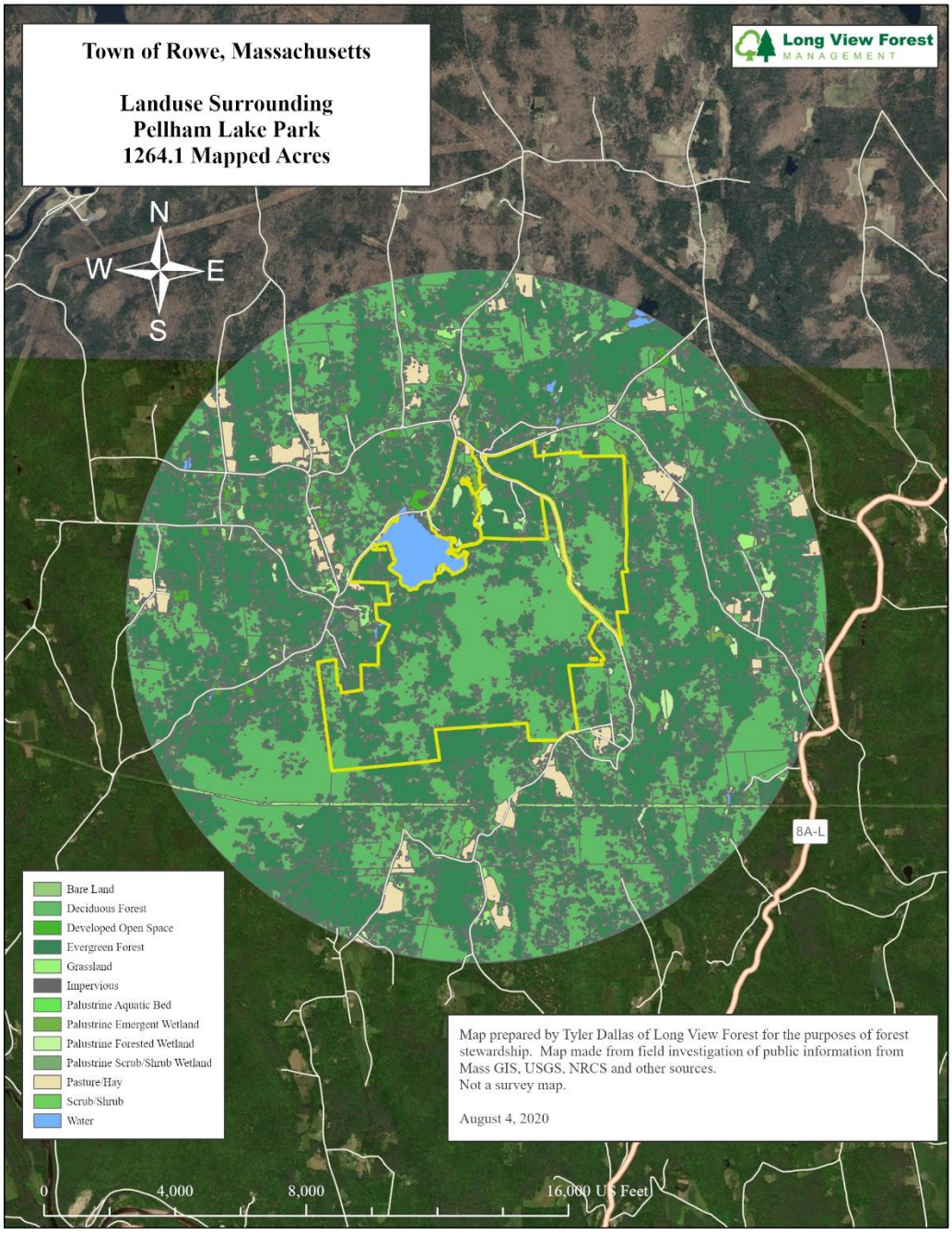


Figure 10: Neighborhood scale- land use and cover type map

2.6 Forest Health and Threats

Trees grow and thrive by photosynthesis; therefore, more vigor equates to a generally healthier forest. In crowded forests trees compete for sunlight, water, and nutrients for their sustenance. This forest is crowded and overstocked within the sub-canopy layers of the forest stands. Overstory trees (the oldest trees here) have space around their crowns for expansion, the lower canopy layers are tightly packed with immature stems. Natural dominance forces the strongest and best hardwood and hemlock trees into the older cohorts through time, as the weaker or damaged stems die-off.

More traditional forest health concepts have broadened as our understanding of the interconnectedness of the forest ecosystem has grown. Not only are pests and diseases considered threats to forest health, but we consider many other agents as health threats today. For examples, invasive plant intrusions to the native plant community threaten the symbiotic relationship of trees and their herbaceous, fern, fungal, and microbial associates in their ecosystem and prevent new tree growth. The extreme weather conditions driven by a changing climate in some cases threaten forest structure, tree vigor, and tree crown health as well.

The two main forest health concerns for Pelham Lake Park are vulnerability of the hemlock component to Hemlock Wooly Adelgid (HWA, *Adelges tsugae*) and Elongate hemlock scale (EHS, *Fiorina externa* Ferris) and the trajectory of much of the forest toward a diseased beech forest. Eastern hemlock represents just over 20% of this forest and it occupies some of the most sensitive and vulnerable sites. It is a valuable species for habitat cover and nesting sites. Hemlock wooly adelgid and elongate hemlock scale are both present and have increased in abundance over the last 2-3 years. Our 2020 inventory did not find them, but they are now all over.

Since we are early in the infestation, the hemlock appears to be doing alright- crowns are thick. See Figure 11 below. Monitoring the hemlock here will be of utmost importance since a rapid decline would significantly impact the forest ecology here- from the light environments in the vernal pools, and along streams, to the overall aesthetic of the forest itself. In 2022, the Park installed 4 hemlock health monitoring plots near Park headquarters in order to track hemlock health and have the data to support management decisions in the future.

Unfortunately, thousands of immature beech suffering with beech bark disease linger in the forest, taking precious nutrients from other stems. Beech Bark Disease (BBD) is widespread, and severe on the property where beech is a component. BBD is the outcome of an insect-fungus complex, which results when a non-native beech scale insect (*Cryptococcus fagisuga*) feeds on beech bark, creating cracks through which native canker fungi (Nectria canker) can enter the tree. 50-85% of infected beech trees generally die within 10 years of infestation. The effects of the disease are severe cankering on

beech trees, deformation of the stem, and eventual tree death. Many beeches, both large and small, are infected with this disease across the property. However, there is the occasional, larger beech that seems to have some resistance. These trees should be protected from any management activities. Many have years of bear claw marks on them.

While beech is projected to persist and do well on a population level under climate change, BBD complicates this story. A persistent forest of diseased stems is not the diverse forest that the Town would like to encourage here. Furthermore, diseased beech often do not provide the wildlife habitat value traditionally associated with beech since they don't grow large enough to make cavities, or mature enough to make beechnuts. In Stand 1, the Town is planning some small patch cuts with beech control and deer exclusion in order to shift the species composition toward a more diverse and resilient mix that will hopefully stand up well under climate change.

A third area of forest health concern is the small infestation of exotic invasive plants in the northern tip of the Park. State-wide, exotic invasive plants are a serious management concern and significant threat to the biodiversity of our woods, fields, and ponds/lakes. Climate change, with earlier leaf out and less extreme winter temperatures, will likely favor these exotic plants. The Park is almost entirely invasive-free, and it would be great to keep it that way to protect the broad array of plant diversity that thrives here and to properly support the creatures that feed on these plants. With that in mind, we recommend a focused control effort to remove these plants.

During the spring of 2016, a dramatic decline of eastern white pine was observed throughout Southern New England. Needles of mature trees become straw-colored to brown before they are prematurely shed from the canopy. In some cases, only a few main branches are symptomatic, whereas on other trees, the entire canopy exhibits the symptoms. On this property, the pines appear to have retained their vigor nicely- this is likely due to their being generally well-spaced which allows for airflow and reduced fungal threat. As small pockets of pine regeneration, like those in Stands 6 and 9, grow larger, we recommend thinning them to allow rapid, well-spaced development and hence more vigor in the face of these threats. This will likely be an activity for the 2032-2042 planning period.

Figure 11: Hemlocks regulate water temperature by providing shade to streams like this one in Stand 1

2.7 Climate change impacts and vulnerabilities

Climate change impacts for Pelham Lake Park will likely revolve around the following broad themes with myriad possible permutations based on current forest conditions and the decisions that the Town makes in response to them:

Extreme and more frequent precipitation events: Immediately, these will primarily challenge the trail network on the park as well as legacy roads and disturbed areas where soil erosion is more possible. Longer term, increased moisture will likely shift species composition as well.

Changing soil moisture: While increased precipitation may help vegetation in the Park, the predicted irregularity of the precipitation will likely result in more dramatic swings in soil moisture patterns. Late summer droughts would hinder seedling germination success while quicker seasonal transitions such as early and rapid snow melt, would stress vegetation at some of its more vulnerable times.

Forest insect pests: We have already discussed hemlock's invasive pests and warming winters' effects on their populations. This will be a repetitive drumbeat throughout this plan. A native pest, hemlock looper, also erupted in southern New Hampshire in the summer of 2021. Overall, insects often form part of a tree's stress environment and withclimate change, we expect that these stresses will become more pronounced and potentially more lethal as insects attack trees already stressed by drought, saturated soils, or fungal diseases.

Changing habitat for plant species: Climate change will bring changing habitat for trees. Since we have a wide array of tree species on Pelham Lake, these effects will likely result in range and distribution shifts between species as opposed to the wholesale loss of forest. Having a diverse forest adds to forest resilience as some species will thrive whileothers will decline. Invasive plants are also a concern here. Luckily, the Park has few, but those that are here will thrive under longer growing seasons unless they are controlled.

Wildlife habitat: Wildlife relies on forests so a changing forest will mean stress on current wildlife populations and potential opportunities for new species. Deer populations will likely fare well under warmer winter conditions. This will in turn result in higher herbivory pressure, particularly in the Covenant areas where hunting is prohibited.

System diversity and resilience: In general, Pelham Lake Park is a diverse forest system and should fare well under the increased unpredictably of climate change. However, some monodominant stands, like hemlock ones, are quite vulnerable and will likely transition to a more hardwood dominated condition over the next 20-50 years.

2.8 Quality and Variety of Habitat

Forest habitat connotates the idea that Pelham Lake Park is a place in which trees and other organisms live. Our acceptance of the community-level and biodiversity conservation approach to forest habitat frames the following discussion. This site supports an array of habitat types, some of which can be enhanced via thoughtful stewardship work.

Tall, maturing hemlock and white pine trees provide terrestrial habitat elements in unique ways. As a food source, they provide seeds, needles and buds, bark, and the insects that can be gleaned from their substrates. Seed provides a food source for bird species such as red-breasted nuthatch, common grackle, and evening grosbeak. Black-capped chickadees glean insects from white pine bark, needles, and twigs. Pine and hemlock seeds are a food source for eastern chipmunk, gray squirrel, red squirrel, northern and southern flying squirrels, and white-footed mouse. They are an emergency winter food source for herbivores such as white-tailed deer, and the

porcupine is well-known for its tree-barking habits on white pine and winter needle browsing on hemlock. In many trees, the rectangular-shaped excavations of foraging pileated woodpeckers searching for carpenter ants are easily seen as well.

The Eastern hemlock stocking significantly increases the shelter and foraging value of the resulting overstory canopy and as well as horizontal cover value for wintering white-tailed deer. The large white pine stems (usually > 18 inches diameter) with a decaying central core are valuable habitat elements to large-bodied cavity excavators such as pileated woodpecker and other cavity dwellers such as the barred owl, tufted titmouse, bats, red and gray squirrels, and flying squirrels. Exfoliated plates of white pine bark often shelter to many bat species. Northern goshawk, great horned owl, and common raven all use larger white pine trees, among others, in which to nest up against the tree bole. Red squirrels will often construct stick nests in the upper canopy of white pine stands. The scattered hardwood inclusions improve avian habitat diversity compared with pure pine stands.

Coarse woody material (CWM) lying on the ground slowly recycles nutrients trapped in the wood and provides food and habitat. It also is a key forest carbon pool and often a moisture-rich germination site for seedlings that is increasingly important under droughty climate change conditions. The list of organisms dependent on this CWM for habitat or as a food source includes bacteria, fungi, lichens, mosses, invertebrates (termites, ants, beetles, and snails), amphibians, birds, and mammals. Large fragments of CWM that provide such habitat for herbs, shrubs, and trees are called nurse logs.

Dotting the forest is a rich array of vernal pools. These provide specialized habitat for an array of vernal pool obligate creatures such as fairy shrimp, salamanders, and frogs.

The stratified forest on this site currently supports particularly strong bird habitat values. Outside the Covenants Areas, timber harvesting 30-40 years ago added structural diversity to the forest. Some of this structure, the young forest habitat found in the north end of the Cersosimo Parcel, is aging out of usefulness for the wildlife that uses it during this stage of development.

During our early spring inventory in 2020, we observed black throated green warbler, robin, oven bird, wood thrush, hermit thrush, crow, winter wren, and scarlet tanager. Local birders keep close tabs on the avian residents and visitors here- during our inventory work one birder clued us in to an American Bittern that was calling in the northern reaches of the wetlands by Cyrus Stage Road.

Other important songbird habitat attributes found here include: a thick, rich, partially decomposing leaf and needle layer (supports invertebrate and insect populations for substrate foraging), the dense thickets of young hardwood and white pine seedlings

and saplings (cover and nesting sites for birds such as chestnut sided warblers), and the statuesque white pine trees (owl and bird of prey nesting and perching sites).

One measure of this forest ecosystem's functionality is the richness and diversity of habitats. Species diversity (high number of species), ecosystem diversity (the variety of physical environments and biotic communities on this landscape), and genetic diversity (unique organisms within a species necessary for long term survival against climate change) all interconnect here.

The Massachusetts Department of Fisheries and Wildlife and The Nature Conservancy developed the BioMap2 project- a strategic tool for the support of biodiversity protection. It defines landscapes that are most critical for the long-term sustainability of rare and other native species and their habitats and natural, diverse communities. The BioMap2 identified the Park and surrounding area as Critical Natural Landscape. Furthermore, most of the Park is Core Forest Habitat. These valuable, resilient landscapes across Pelham Lake Park are necessary for the long-term persistence of rare species, exemplary natural communities, intact ecosystems, and Species of Conservation Concern (species that meet the criteria for protection under the Massachusetts Endangered Species Act).

2.9 Unique Physical and Cultural Features

This common farm abandonment land use pattern played out across much of the Pelham Lake Park Woods. Stonewalls, wire fencing, and modified soil profiles attest to the agricultural past. These old fields grew into dense, complex, and highly resilient forests. The historic legacies of stone piles in old mowing, animal pens, cellar holes, and barn foundations all tell the tale of European Settlers' past here. Before that, indigenous peoples of the Mahican tribe used these uplands as fishing and hunting grounds. These peoples' presence on the land is less obvious today, but it is important to remember and acknowledge their presence here.

The property is currently used by the Rowe Elementary School community for educational programs, which connects it to the children of Rowe's sense of place. Wandering out of your school and into the enchantment of the vernal pools and quiet beauty of spring wildflowers stays in a child's mind. We recommend enhancing and increasing the frequency of this experience for the children. In the spring of 2022, they installed a set of hemlock monitoring plots which will be measured annually moving forward.

Figure 12: An outdoor classroom in the thick hemlock along Davis Mine Brook.

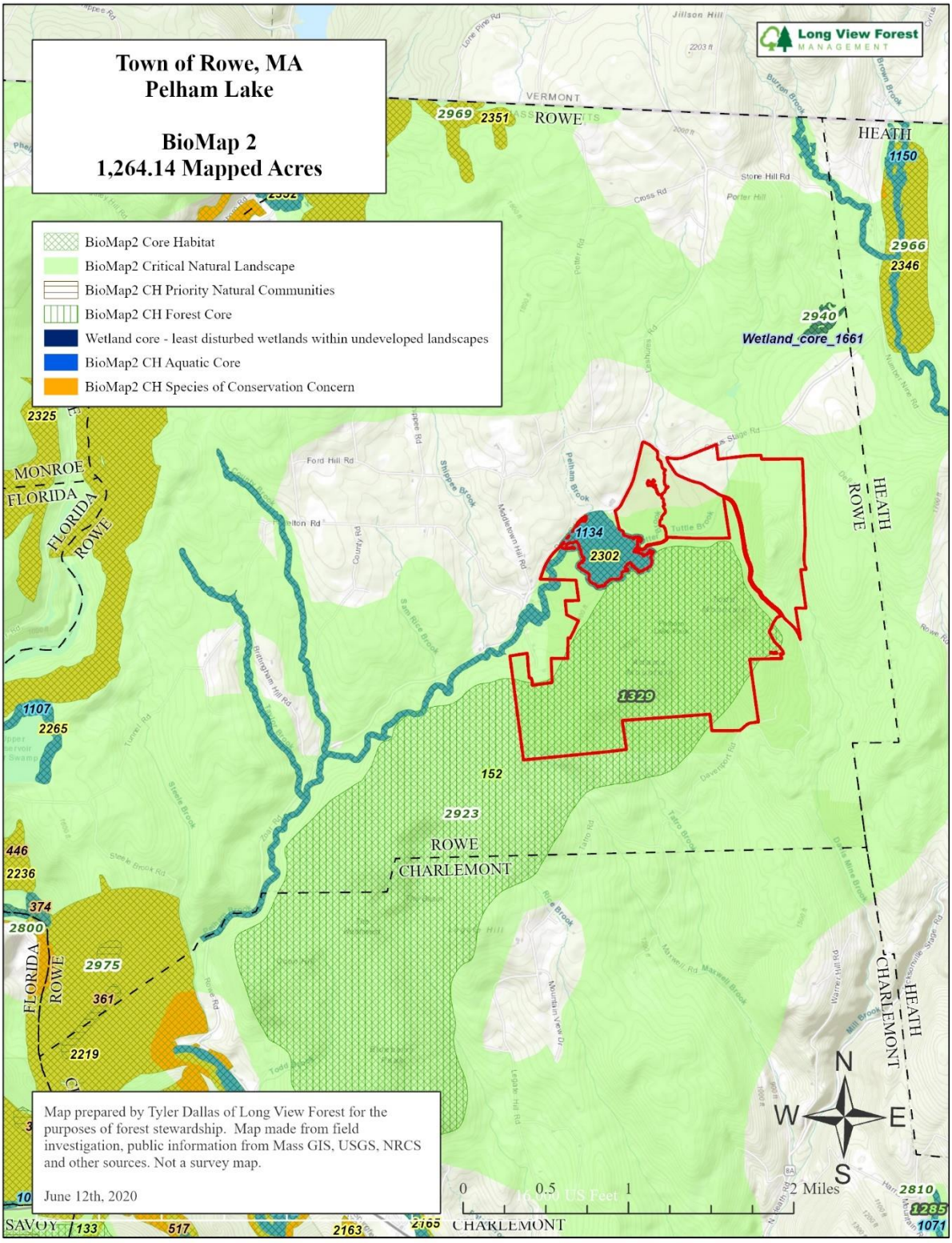


Figure 13: BioMap2 displaying the landscape-wide habitat conditions for protection

2.10 Recreational Uses

There are three primary recreational areas of the Park:

1. The beach and surrounding picnic areas, tennis courts, and riding ring area.
2. Fishing on the Lake and some hunting in the Non-Covenant Areas, and
3. The extensive recreational trial network

While the beach is the most visible and gets the most intensive use, the trail network is the heart and soul of the Park that connects all its unique features, forest types, history, and recreational uses. The trails are also the feature that is most relevant to a Forest Stewardship Climate Plan.

On the trails, the people of Rowe walk, run, mountain bike, fat bike, horseback ride, snowshoe, and ski. The trails cover all types of terrain and all forests and provide for 1,000's of annual recreation hours for the Townspeople. Walking the woods, you are never more than 1500' from an established trail- this means that while much of the woods remains relatively wild and untrodden, by walking the trails, you can gain a comprehensive appreciation of all the forest types that this property supports.

A trail project in 2021-2022 produced an updated trail map along with a trail maintenance database that identifies and maps trail sections and features that are vulnerable to climate change. This database will be increasingly important because trail maintenance and improvement are two key practices that the Town can pursue to keep the Park resilient and adapt to climate change's effects on the trails.

Maintenance of the trails is currently a year-round and nearly all-consuming task for the Park Manager and for summer seasonal staff when available. Practices to help keep the trails more resilient are:

- Improve drainage where trails overlap with water features
- Develop built trail infrastructure such as bridges or boardwalks to keep recreational traffic out of potential erosion zones
- Increase trail monitoring during and after extreme weather
- Consider trail re-routing where legacy trails exist in vulnerable areas or on unsustainable slopes

Figure 14: One of many bridges that protect small streams and wetlands in the Park

Figure 15: A custom-cut boardwalk along Pelham Brook provides stream-side access

Figure 16: The Tuttle-Potter Brook confluence, a bridge connects the beach area to the rest of the trails

2.11 Property Boundaries

Pelham Lake Park is composed of 11 parcels acquired over a 65-year period. As such, the boundaries are complicated, sometimes not immediately clear, and exhibit varying levels of evidence. A review or mapping of the perimeter was not conducted under the mandate of the Forest Stewardship management Plan project.

Stonewalls, old wire fence, and some blazes provide evidence. Also, the Park has installed a series of Park signs along many exterior boundaries as well as along the interior boundary between the covenant and non-covenant areas.

2.12 What value or role does the Pelham Lake Park play in relation to other protected lands and the broader forested landscape?

The Nature Conservancy designated the 76,499-acre block south of the Pelham Lake Park as Tier 1 Matrix Forest Block (TNC Tier 1 Matrix Forest) Matrix sites are large

contiguous areas whose size and natural condition allow for the maintenance of ecological processes, viable occurrences of matrix forest communities, embedded large and small patch communities, and embedded species populations.

Matrix community types are often influenced by regional-scale disturbances such as hurricanes, insect outbreaks, or other extreme weather events. These larger forest blocks increase in importance with the added stress climate change places on our natural communities. They are important as "coarse filters" for the conservation of most common species, wide-ranging fauna such as large herbivores, predators, and forest interior birds. The size and natural condition of the matrix forest allows for the maintenance of dynamic ecological processes and meets the breeding requirements of forest interior songbird species. Furthermore, they aid in climate change adaptation by allowing species to move across gradients of ecological values.

Somewhat oddly, TNC's analysis did not reach north to include the Park. However, the Park is clearly part of a large network of vast, relatively unfragmented forest blocks- an increasing rarity in New England. As such it is important at a regional scale that this Park be maintained as a diverse, forested place.

The Surrounding Land Use Map (below) highlights the greenspace connectivity of the area as well as the importance that this forest plays in it. This map demonstrates this land's proximity to numerous other properties with long-term protection through Conservation Restrictions and classification under Chapter 61/61A/61B inclusive of woodlots, farms, abandoned farms, and habitat refuge zones.

The Covenants areas enjoy the protections offered by the Brown Gift, and all parcels have clear stipulations under which they were voted into Town ownership by the people of Rowe. However, the entire property could benefit from more formal conservation via a Conservation Restriction if the Town were ever interested in that type of forest protection.

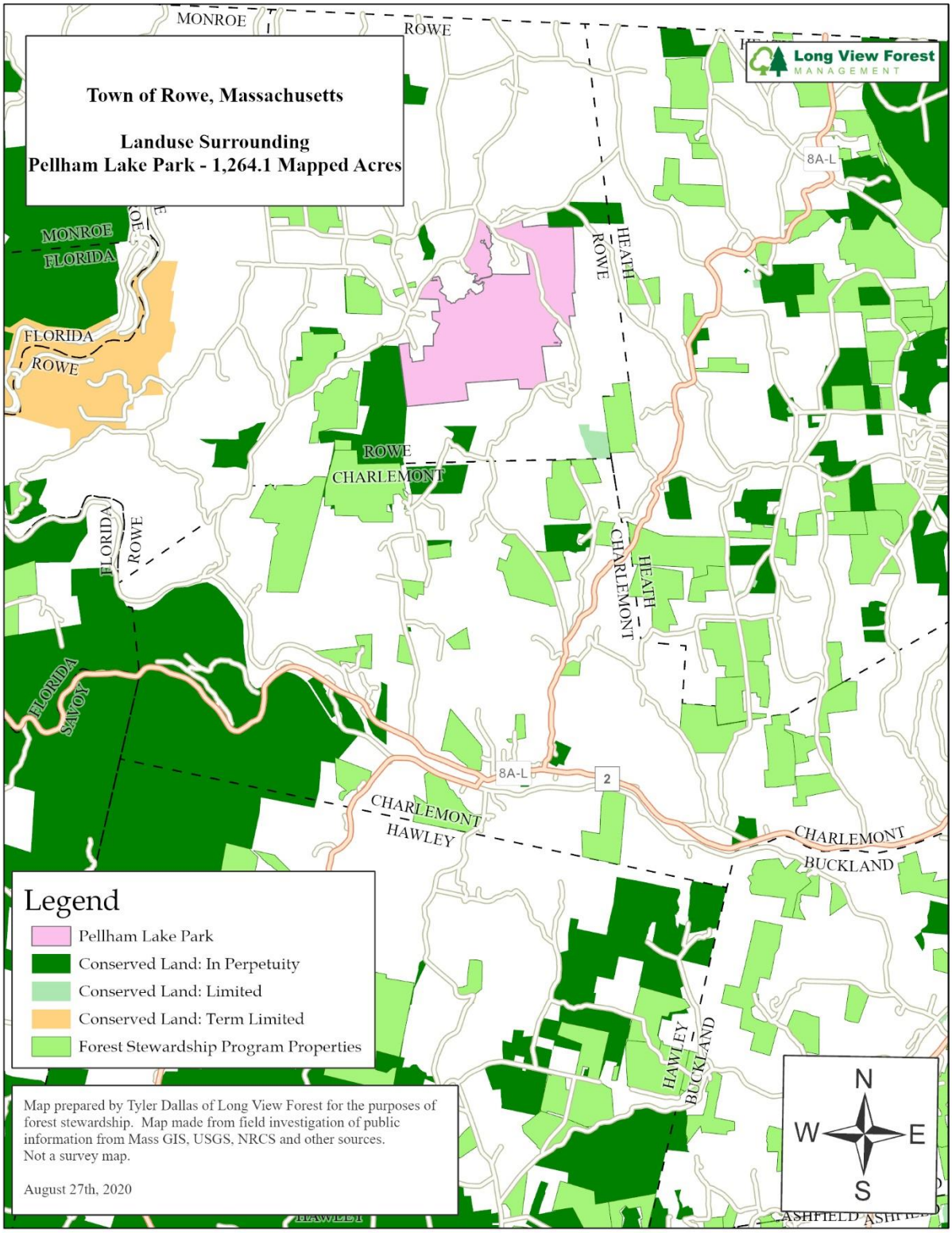


Figure 17: Surrounding Land Use Map

2.13 Property Impact of Proposed Forest Stewardship and Sustainable Forestry Practices

Throughout our Stakeholder Outreach and Listening Session Process in 2020 that drove the initial creation of this plan, Rowe residents articulated their vision of the future forests on Pelham Lake Park. In 2022, we augmented that outreach by leading woods walks with Townspeople, park staff, and the Park Commission to solicit input for the Climate Plan based on the fast-evolving forest science around climate change impacts. The proposed stewardship of these lands will have a positive impact on the surrounding habitat reserves and the ecosystem services and goods that they provide. The proposed sustainable forestry practices detailed in this plan increase the vigor and health of the forest ecosystem and strive to mitigate anticipated climate changes. Forest condition and health improvement measures also enhance the quality of native habitat attributes.

2.14 How will Management impact the local and regional rural economy?

The local and regional economy may benefit from an increase in recreational use of the site and its positive influence on the health and well-being of the community. Folks from outside Rowe increasingly use the trails that provide a wonderful space to enjoy nature and healthy exercise. With its proximity to nearby conserved areas and State Forests, this forest could be an additional stop for a birding tour, or a day of activity for a family vacationing in the region.

If, and when, forest goods are harvested in the future, local mills, contractors, and firewood processors could benefit from this local, sustainable resource growth and wealth creation. Climate change disruptions to supply chains, think about hurricanes disrupting the wood basket that is the US South, have the potential to make local wood producers increasingly important for the local economy. As an example, the Park already purchases local hemlock lumber for trail projects. It could also consider feeding logs into this system itself or the purchase of a bandsaw mill to produce its own lumber.

Many of the recommendations in this Plan revolve around trails. Building trails, trail signs, kiosks, and bridges all generate economic activity in the area. During the summer, the Park employs a seasonal staff of local young adults who in turn contribute to the local economy. Furthermore, the year-round position of Park Manager creates its own economic effects. Carrying out the Stewardship activities in this plan will generate more work in this regard and contribute meaningfully to the local and regional economies.

2.15 Forest Resilience (FR) and Climate Change

As humans understand more about the importance of our forests to our health and our ability to mitigate the coming crisis of climate change, forest resilience (FR) becomes critical for forest ecosystems. FR means the capacity of a forest to respond to disturbances (natural and fabricated) by resisting long term damage or stress and recovering quickly to full functionality and the provision of the goods and benefits that all life needs.

Climate change puts a bright spotlight on a forest's resilience, or lack thereof. For Pelham Lake Park, resilience hinges on trees and how they are arrayed across the forest- in age classes, by species, and in terms of how they are mixed together.

FR has historically been high on the Park property as evidenced by the relatively quick reversion to forest after agricultural abandonment and mining wood supply pressure reduction. These woods currently have minimal insect and pest invasions, and even mitigatable invasive plant issues. However, hemlock wooly adelgid, elongate hemlock scale, and emerald ash borer all present threats to forest resilience.

One cannot forget the loss of forest as forest (either through unsustainable harvest practices or development) as a threat in the future. We have determined FR is medium-high on this forest because of a set of conditions that are summarized in the following chart. Rowe residents rank this FR as one of their top stewardship goals.

Table 3: Forest Resilience Indicators in Pelham Lake Park

Forest Condition	**Why and how this supports High FR**	**Vulnerability to Climate Change**
Long term legal protection	Town owned and largely preserved from change of use- will always support a forest. -See the Discussion of Covenant vs. Non-Covenant areas.	Legal protections may limit options for mitigation or adaptation responses climate change threats and events
Good soil structure and integrity	No recent excessive compaction or erosion so it cycles nutrients, holds water, provides stable banks to wetlands, and supports microorganism activity to build fertility	Trails, streambanks and places where soil is disturbed will be particularly vulnerable to more intense rain events or rain on snow events.

Forest Condition	Why and how this supports High FR	Vulnerability to Climate Change
High biodiversity	Linear relationship to FR, tree species thriving here are well- suited to increasing temperatures of future. The black birch and oak components are particularly promising.	20% of the forest is highly vulnerable hemlock
Connectivity	Forest is a part of a large forest block where animal and plant species can move relatively freely	Invasive insects can easily move through a connected forest landscape
High water quality	Trail system respectfully avoids and protects vernal pools, spring seeps, water courses and wetlands, dense forest cover in all riparian filter strips	None. However, water temperature increases due to loss of hemlock cover will have significant impacts and erosion is possible with extreme weather.
Community support	Vocal and engaged residents who care about the future of this forest and are willing to learn and advocate for its stewardship	The science of forest management under climate change stress is a developing field. Differences of opinion on where scientific consensus is headed may result in significant disagreements over management approaches.
Size and range of habitat	Assisted migration is possible across the wide gradient of conditions here	Invasive Plants spread by wildlife will be hard to find and control.
Older forest	Well-established and aging forests provide refugia on the landscape and act as sources for forest recovery by providing seed, nutrient, wildlife breeding grounds, and aesthetic anchors in a changing world.	Older forests established under climactic conditions which no longer exist.

2.16 Pelham Lake Park and Carbon

Scientists have known for a long time that trees suck CO2 out of the air to live and build their structural tissues. Even though scientific research is ongoing at a furious pace, there is still no consensus for exactly how to treat forest for their use as optimal carbon sinks. Some of the science we know now is:

- Mature forests hold more carbon
- Young forests accumulate carbon fast

- Stable, well-structured soils hold a high percentage (~50%) of the carbon that is in the forest carbon pool
- Letting forests grow maximizes carbon storage as the forest grows older, but it opens a vulnerability to dramatic and rapid loss of carbon in the event a major natural catastrophe occurs, and loses some of the sequestration effects of younger forest growth
- A balance of different aged trees, growing at different rates, is good for a carbon sink's functionality
- The embodied carbon of long-term wood products has a positive replacement effect when they substitute for steel, plastics, or concrete
- There is much we do not know, and keeping a resilient portfolio of trees of many species and sizes likely remains a very solid strategy

Across the Park, the forests here hold on average ~53.8 tons of carbon per acre. This is in the 70th percentile for our region which tells us that these are well-stocked forests from a carbon perspective.
Pelham Lake Park is also acting as a good carbon sink right now, but this condition could be enhanced. Close monitoring and a thoughtful diversification of age classes over time will enhance this value. The Town's commitment to extended periods between intentional forest disturbances and minimization of economics as a decision criterion for forest stewardship guarantee high functionality for both carbon accumulation and storage.

Discussions of our region's contribution to fighting climate change is often focused on the carbon our forests currently hold and their capacity to sequester and store more. However, a singular focus on forest carbon can miss larger questions of biodiversity, social justice and equity. Community discussions of how to use Pelham Lake Park's forest to mitigate climate change will be ongoing as the Town stewards these woods.

Northeastern Highlands

Table 9: Predicted Live Tree Carbon Stock by Basal Area

BA (ft²/ac)	C Prediction (ton/ac)
0.0	0.0
10.0	3.2
20.0	6.5
30.0	9.7
40.0	12.9
50.0	16.2
60.0	19.4
70.0	22.7
80.0	25.9
90.0	29.1
100.0	32.4
110.0	35.6
120.0	38.8
130.0	42.1
140.0	45.3
150.0	48.6
160.0	51.8
170.0	55.0
180.0	58.3
190.0	61.5
200.0	64.7
210.0	68.0
220.0	71.2
230.0	74.4
240.0	77.7

Table 10. Percentile Live Tree Carbon stocks in Northeastern Highlands by Basal Area

Percentile	BA (ft²/ac)	C Prediction (ton/ac)
0	0.0	0.0
1	22.1	7.2
2	39.9	12.9
3	52.9	17.1
4	59.2	19.2
5	66.3	21.4
10	78.5	25.4
15	92.1	29.8
20	102.1	33.0
25	109.7	35.5
30	114.4	37.0
35	121.2	39.2
40	126.6	41.0
45	133.7	43.3
50	140.4	45.4
55	145.8	47.2
60	153.3	49.6
65	159.3	51.6
70	166.2	53.8
75	174.6	56.5
80	184.9	59.8
85	194.0	62.8
90	208.7	67.6
95	231.0	74.8

Figure 18: Predicted Carbon Stocks for MA Northeastern Highlands

Source: Estimating Carbon for Forest Stewardship Climate Plans, MA DCR, Spring 2022

Section 3: Forest Stewardship Overview

3.1 A New Paradigm for Community-based Forest Stewardship

Thanks to the financial and logistical support from the Massachusetts Executive Office of Energy and Environmental Affairs, the 2020 Forest Stewardship Plan and the community outreach, education, and listening processes that drove its creation together created a new paradigm for community-based forest stewardship in Massachusetts. The 2020 Plan formed part of the pilot project here and yielded many promising results for future work. The 2022 Update, funded by a MA Municipal Vulnerability Preparedness (MVP) Grant, continues this valuable work as it draws on community engagement to formulate resistant, resilient, and adaptive responses to climate change. Here, we summarize what is new and special about this work.

3.1.1 Community-based forestry is a participatory approach to forest management that strengthens communities' capacity to protect and enhance their local forest ecosystems.

Although community forestry is difficult to define, the Forest Stewards Guild has identified some important characteristics:

- Community forestry begins with protecting and restoring the forest.
- Residents have access to the land and its resources and participate in land management decisions.
- Resource managers engage the knowledge of those living closest to the land in developing relationships with the forest.
- Forestry is used as a tool to benefit and strengthen community ties to the forest.
- Cultural values, historic use, resource health, and community needs are considered in management decisions.
- Decision-making is open, transparent, and inclusive.

The Mohawk Trail Woodlands Partnership funding for the 2020 Forest Stewardship Management Plan mandated community discussions for the identification of the goals for their forest ecosystems and their education about sustainable forestry practices upon them. Through these efforts we determined that public participation is a necessary component of sustainable forestry practices in Rowe. Town residents have a wide range of knowledge, interests, and levels of involvement regarding forestry. Yet they all share a love, an appreciation, and a desire to protect Pelham Lake Park. They live here and depend on these forests for social, spiritual, recreational, and cultural sustenance. Who is better qualified to manage their futures?

The Park Commission is uniquely well-suited to oversee the monitoring process of the forest ecosystems through time, address issues in the forest landscape as they arise, and hold future Select Boards accountable for the implementation of community-based sustainable forestry practices on these lands that reflect the Town values for and needs from the forest ecosystem today and in the future. The Park Manager is the point person on all these activities and serves as a de-facto community liaison for all things Park-related.

In 2022, the MVP Grant funded continued community outreach, this time around climate change education and a shift in management goals. This continued engagement is essential- both for educational purposes, but also to build consensus around what may be rather stark management choices in the future.

3.1.2 An Ecosystems Services Framework

Based upon the results of a community survey in 2020, this plan, and the community connectivity its creation has facilitated, introduced and piloted a new paradigm for the decision-making process about forest stewardship and the use of sustainable forestry practices. Similar processes have unfolded in other forests (For example, Deal, Smith, and Gates: Ecosystem services to enhance sustainable forest management in the US: moving from forest service national programs to local projects in the Pacific Northwest, United State Forest Service, 2017) but our work here is new in our Massachusetts

context. We think it is promising and worth expanding upon as more communitys grapple with how to manage their forests.

When viewed from a landscape scale and in accordance with the wishes of the Forest Stewardship Planning Survey (Rowe, May 2020) respondents, this document provides guidance for the stewardship of your "special place" under the framework of ecosystem services and ecological function. With this paradigm, your community can more effectively address the challenges facing forests and ensure a healthy, resilient forest ecosystem now and in future generations.

It is commonly recognized that healthy and resilient forest ecosystems deliver goods and benefits to people through their natural processes. **Your community voiced the desire to implement sustainable forestry practices only when they will support ecological function and the continual delivery of its essential services**. The Millennium Ecological Assessment (MEA 2005- www.milleniumassessment.org) defined these benefits and services with the following four categories:

1. Provisioning - the "goods" such as timber products and fuelwood that humans rely on

2. Regulating – the cycles that maintain our livable world with water purification, oxygen production, climate stabilization (CO2 uptake), and pollination

3. Cultural- these make our world a place we want to live in -aesthetic and spiritual enjoyment of nature, recreational opportunities, solace, and educational opportunities

4.Supporting- the underlying natural processes in a forest that maintain the conditions for life on earth such as soil formation, nutrient cycling, carbon uptake

The Forest Stewardship Planning Survey (Rowe, May 2020, LV and WFRM) and the Rowe Forest Stewardship Planning Workshops (Zoom Platform, June 3, 2020, and August 27, 2020) supplied a clear, condensed set of goals and aims for the stewardship of your Town forests. This plan proposes a set of sustainable forestry practices (SFPs) that are realistic given the Town's finite human resources, time, and financial resources. It builds on the 2020 work and adds a significantly expanded focus on climate change mitigation and adaptation. These SFP's were decided in terms of ecological outcomes such as improving forest ecosystem function, increasing forest resilience, and supporting or enhancing goods and services provided to the community. Marketable timber goods were consistently ranked as the lowest priority.

3.2 Management Goals 2020-2030

The community stated the following goals for the forest stewardship on Pelham Lake Park forests for 2020 to 2030 and now 2022-2032:

1. Sustain biological richness defined as all forms of life within the forest and their ecological roles and the different ecosystems, landscapes where they function, species, and genetic codes present here now.

2. Sustain the ecological services and benefits provided to humans from these forests defined as:
    a. Social and emotional goods- support well-being, relaxation, spiritual sustenance, study of nature, and recreational opportunities.
    b. Hydrologic cycle through which forests absorb water from soil and atmosphere and return it and filter it for its improved quality
    c. Soil quality and function as forests filter toxins before they enter the soils, anchor soils in place, support microbial and microorganism activity to build soils, which support all life.
    d. Climate Regulation - protect and promote the forests' use as a carbon sink that pulls CO2 out of the air via photosynthesis, accumulates and sequesters carbon, and stores it in boles, leaves, branches, and roots thereby mitigating the threats of climate change.
    e. Economic goods- timber products and fuelwood- lowest priority objective but still some members of the community value these goods and services.
    f. Cultural values-some of the history of Rowe is held on these lands.

3. Sustain forest resilience.
    a. Be proactive where possible to enhance resilience on this forest by using climate science to plan for future disturbance and the forests' responses

4. Promote the health and productive capacity of the forest trees and regenerate these forests to perpetuate their ecological benefits and function.

5. It is important to highlight the objective of the protection and enhancement of the trail system throughout the Park.
    a. Climate change threatens the trails here significantly. A 2022 trail assessment project laid the foundation for improvements in monitoring and maintenance of trails.

3.3 Sustainable Forestry Practices

This Plan represents the distillation and synthesis of the work we and the Town have done during our Forest Stewardship Planning Workshop, the Community Forest

Stewardship Survey, 2022 climate outreach efforts, and the many conversations related to this project that we have had with community members over the phone, in person, and on individual emails. It is inclusive and it is ambitious.

Your implementation of these strategies depends upon the Town's commitment to Forest Stewardship, the availability of grants and funding, and your community's ability to reach consensus and work together in the future. Individual and unique Sustainable Forestry Practices that might achieve your stated goals within the Park are presented in 4 categories below and further described in Table 4.

Bold Type indicates practices proposed in 2020 with significant progress since.

Trails and Recreation:
1. Complete a trail assessment and fine-grained mapping project- **Completed in 2022**
2. Develop a trails maintenance database and mapping system- **Completed in 2022**
3. Install updated trail signs-**Completed in 2021**
4. Install Trail Kiosks- **Begun in 2021**
5. Re-route overly steep or direct ascent trail sections and retire the older trails with maintenance challenges- **Ongoing.**
6. Install a boardwalk in beaver meadow near riding ring
7. Consider re-opening the trail that connects the Western Viewpoint with the White Tail Trail.
8. Replace bog bridges with raised boardwalks where possible

Forest Protection
1. Control the small populations of exotic invasive plants and continue to check possible hotspots annually.
2. Develop a property boundary and Covenants/Non-Covenants boundary evidence and signage maintenance program
3. Install a small guardrail along the Davis Mine Road to protect the bog
4. Develop a Park Policy Statement around land acquisition and potential partnerships to help move that forward
5. Identify 4-8 healthy ash trees with a mix of sexes to be treated for resistance to Emerald Ash Borer. **10 Trees were treated along the Sabrina Rice Trail in 2022**.
6. Install a feasible number of Hemlock Health monitoring plots to annually look for signs of Hemlock Wooly Adelgid and Elongate Hemlock Scale. **4 Plots were installed near Park Headquarters in 2022.**

Active Management
1. Where feasible outside the Covenants areas, install 10-20 acres of early successional habitat
2. Install fencing to protect larger swaths of regenerating forest from deer browse.
3. Install slash walls to protect larger swaths of regenerating forest from deer browse.

4. Within the Covenants area, install an Old Growth Forest Enhancement Area with educational signage and a new trail. **Partially completed in 2022- work is ongoing.**
5. Where pine and spruce are present, aid and enhance their vigor with the release of their crowns via fellings, girdlings, or potentially extracting some timber
6. In oak areas where regeneration is lacking, underplant red and white oak seedlings to assure oak's continued presence into the future. **200 Seedlings planted and caged in 2022.**

Forest Carbon

1. Explore the development of a forest carbon project on Pelham Lake Park

Figure 19: A diseased beech understory excludes other species in Stand 3

Table 4: Sustainable Forestry Practices Recommendations:

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
8, 9, 10	HK, WH, SS	Control exotic invasive plants	3-5 acres in northern tip of property. Work with Town to treat just across Pond Road	2021	Protect biodiversity-Restore ecological function and reduce threat to un-infested forest	Foster native plants that can freely adapt to changing conditions.
All	All	Complete a trail assessment and mapping project	Property-wide	2021	Sustain ecological benefits to people-Enhanced trail experience. Sustain ecological goods with protection of the hydrologic cycle and water quality and soil integrity and function-reduce soil erosion and reduce unnecessary trail impacts	Give Park staff adequate planning tools to care for trails under increasing extreme weather events

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
All	All	Develop a trails database and mapping system to inform and track maintenance activities	Property-wide	2021	More efficient and improved maintenance of trails to increase soil stability and enhance recreational and spiritual experience of the woods	Track and monitor climate change effects and effectively plan for response
All	All	Install updated trail signs- explore needs for directional, interpretive/educational, trail head location, and use permissions	Property-wide	2021	Enhance trail experience and reduce prohibited uses to preserve soil structure	NA
2,3,4,8	HH, BB, OH-HK, HK	Install trail kiosks	8 small kiosks 5 medium kiosks	2021	Enhance trail experience and reduce prohibited uses to preserve soil structure	Use kiosks as educational venues to explain climate change impacts and vulnerabilities
2, 3	HH, BB	Re-route overly direct trails to better fit with topography and responsible trail layout principles	2000-3000 feet of trail	2022	Water quality and soil function protection- Reduced runoff and better recreation	Upgrade trails to better withstand extreme precipitation

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
8, 10	HK, SS	Install a 1500' lollipop boardwalk into beaver meadow complex and install bird blinds and a viewing tower- ambitious and costly projects	1500'	2022	Enhanced appreciation of nature and responsible, concentrated use of delicate wetland areas	NA
2	HH	Install a 20-acre, old growth forest enhancement reserve area on the lower slopes of Adams Mountain.	20 acres	2021-2024	Accelerate development of structural complexity and provide educational opportunities in keeping with the Brown covenant.	Serve as a reference area for a self-determined forest in a changing climate
1	BB	Install a 10 acre early successional habitat area in the core of the Stand	10 acres	2025	Increased early successional habitat and forest resilience	Build a resilient cohort of tree regeneration that can adapt and grow
6	SP	A) Remove all/some of overstory to release spruce and pine regeneration, or B) Practice an irregular shelterwood system to grow new cohort of pine and spruce	6 acres	2025	Enhance pine/spruce to increase tree species diversity Increase resilience and biodiversity	Enhance diversity and give spruce a chance to grow here

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
9	WH	Expand gaps around pockets of pine regeneration by felling or girdling trees	2 acres	2023	Enhance pine component	Enhance regeneration which will be the first thing to respond to disturbance
2,3	HH, BB	Under plantings of red oak, white oak, and other future-adapted seedlings across wide swath of forest landscape	200 acres +/-	2020-2030	Increase biodiversity, enhance forest resiliency to climate change	Assisted migration of future climate-adapted species like white oak.
4	HH	Install 2, 5-acre patches to regenerate birches, oak, and pine.	10 acres	2025	Diversify age classes of trees other than beech	Assist in the establishment of black birch- a species which will likely thrive under future climates here
2	HH	Identify and treat 4-8 white ash trees to inoculate them against Emerald Ash Borer.	~6 trees	2021	Preserve ash as a component of the forest to maintain biodiversity	Maintain the ash component to increase resilience

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
9	WH	Install a guardrail along edge of roadside pitcher plant bog	100′ of guardrail	2022	Protect rare, threatened, and endangered species	Climate change will likely result in sloppier rod conditions with potential erosion/disturbance of the bog
5, 8	HH, HK	Install 3-6 hemlock monitoring plots and develop monitoring protocol	1 acre	2021	Protect biodiversity	Monitor effects of warmer winters
All	All	Develop property boundary and covenant area boundary maintenance schedule and begin replacing signs. Use Aluminum nails and leave lots of growing room.	Miles	2021-2030	Protect biodiversity values Reduce trespassing and incorrect uses	NA
NA	NA	Pursue strategic opportunities for acquisition of more Park land	NA	Ongoing	Sustain and enhance the ecosystem services and benefits that the Park provides	Increasing forest connectivity increases resilience.

Stand	Forest Type	Forest Management Recommendation	Extent of Practice	Timing	What goals and objectives will these practices enhance or promote?	Climate Change Impacts or Purpose
1,2,3,4	BB,HH, BB, HH	Plant red and white oak seedlings in the understory of the oak and mixed hardwood groves. Red oak is not germinating seed and develop seedlings here, and it is an essential and important component of the future forest ecosystem. White oak is slightly off-site here but would be a nice addition in preparation for a changing climate.	Scattered pockets through 20-60 acres	2025+	Sustain biological richness. Sustain Forest Resilience. Increase Forest Productivity. Sustain ecological function-Climate Mitigation.	Assisted migration of future climate-adapted species like white oak.
All	All	Explore the feasibility of the participation in a carbon offset program with the use of the PLP forest ecosystem as a carbon sink. If feasible gather support for implementation.	Forest ecosystem		Sustain ecological function-Climate Mitigation.	

3.3.1 Legal Responsibilities

The implementation of any of the proposed sustainable forestry practices from trail development to silviculture must comply with all Massachusetts general laws. The Conservation Commission holds jurisdiction over any activity within 100-feet of any open water, stream, or spring seep sites and 200-feet within wetlands (MGL Chapter 131). The Massachusetts Division of Fisheries and Wildlife has jurisdiction over any designated priority habitat for rare, threatened, and endangered species (MESA). The Department of Conservation and Recreation has jurisdiction of any forest landscape silviculture or timber harvest work (MGL Chapter 132).

It is understood by all parties involved in the preparation and execution of this plan that prior to the commencement of any sustainable forestry practices that impact areas subject to regulation, a review of the critical aspects of these projects will be undertaken by all appropriate agencies and Boards. Due process (form filings with appropriate offices, permit applications if necessary, notifications, site reviews, et al) by all stakeholders will be followed, and only after necessary permits are issued or permissions granted, can practices commence within the Park forests.

3.3.2 Use of Sustainable Forestry Practices

Your community clearly stated the acceptance of the use of sustainable forestry practices inclusive of silvicultural harvesting, if and only if these practices promote the achievement of the above stated goals and objectives. They do not support the use of SFP's exclusively for the goal of economic gain. Even with these criteria, it is important to conduct community outreach efforts (newsletter articles, community wide mailings, field walks though proposed sites, and any other effective tool for engagement with the community) for education and awareness purposes. This forest is owned by all the people of Rowe. Their acceptance and support will be necessary before any practices could commence.

3.4 Role of Silviculture

Sustainable ecosystem function and ecological dynamics often rely on intentional forest disturbance in the form of tree fellings and/or tree harvesting. If a future community consensus supports the use of these practices in the future, they would be conducted under the umbrella of ecological forestry (EF) and with a focus on climate resilience and adaptation. See Appendix A. Applying EF enhances the growth of desirable species, protects native plant communities, and promotes regeneration through the application of silviculture. The harvest and non-harvest silvicultural techniques, which might be used if acceptable to the community under EF, are described in Appendix A, Silviculture Harvest and Non-Harvest Techniques.

3.5 Adaptive Management

Forests are living, dynamic systems trying to thrive in a complex environment subject to the stress of a changing climate. Thus, any efforts to plan for the future of a forest resource must be designed to accommodate change. Your community is actively engaged in the debate of best use for and the future role of the Park. This document advocates the practice of Adaptive Forest Resource Management, which is a systematic approach for improving resource management by learning from management outcomes, changing climate and forest conditions, and evolving consciousness and knowledge at the individual and community scale.

If forestry is about planning, then planning is about adaptation and adjustment to what happens according to plan and what deviates from plan predictions. Climate change makes this all the more important. The diverse elements of this management plan document should be re-evaluated as new scientific information develops to ensure that management activities and directions are founded on the best available knowledge.

This is particularly true as it relates to managing forests for carbon. Economic, ecological, climate, and social elements must also be adjusted as community dynamics change. The Townspeople of Rowe in 1900 would likely have a quite different take on the woods than we do today, and as future generations will have in another 100 years. Similarly, the preservation-minded Percy Brown of the 1950's would likely have evolved his forest values substantially over the intervening years. While quite anachronistic, it is interesting to ponder what he might have thought about forest carbon markets!

An adaptive approach involves exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions. The true condition must be compared to this desired one, and necessary adjustments either to actions or to management thinking should be completed accordingly. There is no strict timeline suggested for this type of review, but some effort should be made each year. The Park Commission could oversee this work to nicely build on the ideas and strategies within this document that are here presented in the spirit of adaptation with the long-range goal of a climate-adaptive, carbon-friendly, resilient forest ecosystem development approach.

Section 4: Field Methodology

4.1 Forest Inventory

Our field methods for collecting tree data and volume per acre consisted of a nested point-sampling cruise was conducted using a BAF-20 prism for "count trees" and a BAF-20 prism for volume trees (diameter and height). We measured heights to a 6" merchantable tip across all species. Product volumes are presented in cords and were calculated using Forest Metrix, a forestry software package. Results are reported in each Stand Overview table.

We installed 134 plots across the forest to collect our data. In addition to the tree data, we collected data on:

1. Standing dead trees (snags) and cavity trees,
2. Coarse and fine woody material lying on the forest floor,
3. Leaf litter density and quality,
4. Understory plants, regeneration, and invasive plants,
5. Canopy, midstory and understory height, % cover, distribution and % at-risk species, and
6. Food sources for wildlife

In the spring of 2022, we reviewed all forest Stands with an eye toward climate vulnerability assessment using tools provided by Mass Audubon and DCR.

4.2 Site Index

Site index for each stand was estimated using data from the Natural Resources Conservation Service, U.S. Department of Agriculture, Web Soil Survey. This survey is available online at www.websoilsurvey.nrcs.usda.gov. Site index by species was determined by weighted average based on the estimated percentage of the soil types within a stand.

4.3 Soils

Soils data were obtained from MassGIS, Office of Geographic Information, and Commonwealth of Massachusetts from the layer GISDATA_SOILS_POLY_SV_MUNAME. Stand maps were georeferenced to the soils layer to delineate soil types.

4.4 Mapping

GIS data was obtained from MassGIS, Office of Geographic Information, and Commonwealth of Massachusetts. Layers included the following and the appropriate aerial imagery from the same source.

Standardized "Level 3" Assessors' Parcels

GISDATA_SOILS_POLY_SV_MUNAME
USGS Color Orthoimagery (2013/2014)
USGS Topographic Quadrangle Images
Protected and Recreational Open Space
BioMap2
MassDOT Roads
Land Use (2005)
Contours (1:5,000)
MassDEP Wetlands
National Wetlands Inventory
USGS Hydrography

Stand maps, developed from aerial imagery, and further refined during field investigation using GPS, were geo-referenced to a base layer that covered the property and surrounding area.

Section 5: Forest Stand Descriptions

At the core of any Forest Stewardship Climate Planning exercise is the delineation of the property into its most basic management unit, the Stand. Stands are the theoretical overlay of several values and factors including tree species composition, age and size, plant communities, soils, disturbance history, topography, hydrology, aspect, and often operational considerations.

Given Rowe's broad values and management goals as articulated during the planning process, we have grouped the forest into 10 Stands. Most are large blocks of forest that share core characteristics. A few are smaller, unique areas that stand out from adjacent areas. The use of the stand concept allows for intelligent planning and efficient implementation of sustainable forestry practices.

Figure 20: Old growth forest characteristics developing in Stand 2 along the Lakeview Trail

STAND SUMMARY TABLE -Climate Change and Carbon

Stand	Acres	Forest/Habitat Type	Important Observations regarding Climate Change and Carbon	Climate Risk	Predicted Carbon tons/acre
1	206.15	**BB-Beech/Birch/Maple**	Regeneration is heavy to beech which lowers resilience. Sections of younger forest from harvesting ~40 years ago add important smaller diameter forest component. Carbon stocks are lower but smaller stems have high accumulation rates and long term storage potential is high.	Lack of diverse regeneration does not bode well for a future, diverse forest that can respond to climate change.	42.1
2	182.17	**HH-Hemlock/Hardwood**	These lower slopes and lakeside areas have the broadest range of species variability. Higher carbon stocks with OK long term storage even in dying hemlock.	Hemlock is vulnerable to invasive insects which thrive in warmer winters.	51.8
3	292.55	**BB-Beech/Birch/Maple**	Beech and hobblebush dominate much of the understory leading to a lack of diverse regeneration and hence resilience. Carbon stocks are long-term stable here, but diseased beech component hinders maximal storage capacity.	High density of recreational trails on steeper slopes makes erosion risk higher	48.6

Stand	Acres	Forest/Habitat Type	Important Observations regarding Climate Change and Carbon	Climate Risk	Predicted Carbon tons/acre
4	193.29	**HH-Hardwood/Hemlock**	Oak and black birch thrive here and the Town has the latitude to proactively manage this part of the Park. Carbon stocks are stable.	Southern exposure increases drought potential and hemlock invasive insects are prevalent here. Spongy moth could threaten oak component and destabilize carbon storage.	48.6
5	125.22	**HK-Hemlock**	Ridgy, dry hemlock area contains old forest and is quite vulnerable. Carbon stocks here are immediately vulnerable.	Hemlock is particularly vulnerable here.	55
6	7.59	**SR-Spruce (Red)**	Spruce is an interesting study in potential climate change response. Here, in a flat, cool corner of the park, we expect it to do well. Carbon stocking is high here. Converting some trees into long-lived wood products line dimensional lumber would keep some of that storage, but also allow for spruce regeneration to develop and store more carbon moving forward.	This stand is dominated by spruce with a little bit of pine. As such, it is perhaps more vulnerable to disturbance than a more diverse stand.	68

Stand	Acres	Forest/Habitat Type	Important Observations regarding Climate Change and Carbon	Climate Risk	Predicted Carbon tons/acre
7	88.63	**OR- Northern Red Oak**	These are oak sites dominated by smaller statured trees that already live in a marginal environment. Droughtiness could impact them. Predicted carbon is likely lower here than modeled due to shorter tree heights. Decomposition is slower up here, so dead trees hold carbon here longer term.	These areas are perhaps the most vulnerable to wildfire on the Park.	51.8
8	63.77	**HK- Hemlock**	This lakeside hemlock stand has an important impact on maintaining cool water temperature flowing into the lake. Higher carbon stocks with OK long-term storage even in dying hemlock.	Hemlock is particularly vulnerable here with immediate subsequent impacts on water quality.	68
9	60.24	**WH- White Pine and mixed hardwoods**	These areas feature the Park's main white pine component and have nice pockets of white pine regeneration. Carbon stocking is high and securing that carbon into the future here can be helped by release of young pine to grow bigger faster sooner.	A small infestation of invasive plants near the riding ring presents a risk to forest health and biodiversity. They are also a seed source for future infestations into the Park	48.6
10	33.54	**SS- Shrub Swamp**	This is a biodiversity hotspot for the park. Aboveground carbon stocks are low and methane production in the complex is likely high.	Invasive plants nearby threaten the biodiversity here. Beaver dams could fail prematurely in extreme weather events	NA

Stand	Acres	Forest/Habitat Type	Important Observations regarding Climate Change and Carbon	Climate Risk	Predicted Carbon tons/acre
11	10.98	**Park, Beach Area, tennis Courts, and Horse Ring**	These are places with the highest human presence and could be better utilized to inform the public about climate change impacts to the Park.	With increased temperatures, the beech will likely see increased use by people looking to beat the heat. It likely won't get overused due to use restrictions, but this should be monitored.	NA
12	81.30	**Pelham Lake**	The Lake is a cherished fishing and boating spot. With cold waters supporting lake trout.	Hemlock decline in the surrounding forests has the potential to raise lake temperatures and alter the benthic environment.	NA

5.1 Stand 1: BB- Northern Hardwoods- Beech/Birch/Maple

Figure 21: The proliferation of beech in the understory characterizes much of this Stand.

5.1.1 Overview

This is a large, diverse Stand that is located east of Davis Mine Road. Although hemlock is a large component, these trees are remnants of an older stand and hold a subordinate position to the true northern hardwood trees best suited to this site. It was previously owned by a lumber company and is locally known still for a high intensity harvest that occurred there a little over 40 years ago. While the harvest did leave some ruts and residual damage that gave it the notoriety, many of the remaining trees have thrived since and new swaths of smaller hardwoods are well-established. However, many areas are also thick with beech saplings which will impose limitations of the future biodiversity here.

The primary climate vulnerability here is a long term one and revolves around beech regeneration. Currently, most of the regeneration here is beech root suckers from

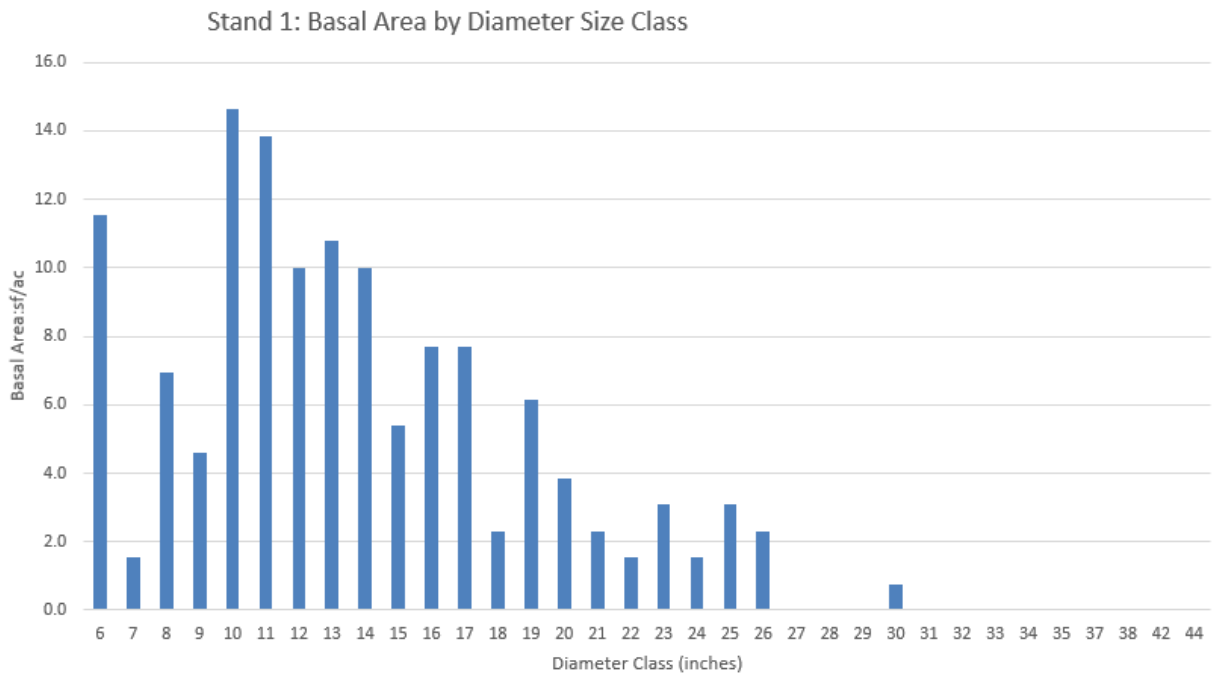
diseased beech trees. These are highly adapted to holding growing space in shady environments- leading toward a near monoculture of diseased understory trees. Unfortunately, while beech itself is predicted to do well in a changing climate, diseased beech in this forest condition delivers sub-optimal results in terms of forest diversity, resilience and carbon sequestration and storage.

Table 5: Stand 1-Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	1	BB	206.15 acres	10.9" AB:8" HE: 11"	132 ft^2	37 cords	SM 73	42.1

*Sampled volume, does not include topwood

Table 6: Stand 1: Basal Area by Diameter Size Class



5.1.2 Terrain and Soils

Steep, up-and-down terrain characterizes much of this stand except for the flatter benches and areas near the stream on the eastern side. The soils are Millsite-Westminster Complex, 25-50 percent slopes, rocky, and feature many bedrock protrusions, boulders, and generally rough terrain.

An exceptional hiking and mountain bike trail wind its way through this complex forest and challenges a rider with the rugged terrain. This is a newer trail and is well built to withstand extreme weather.

5.1.3 Canopy Layers

The upper canopy supports a two-aged structure with a mature hardwood component in the high canopy and a middle layer with pockets to larger swaths of ~40-year-old, small diameter hardwood trees, which seeded heavy into the larger openings from the past harvest. Hemlock is consistent in both layers with dense concentrations along the streambanks and low moist depressions. Beech saplings and small pole-sized trees (origin both seed and clones) with their ability to thrive in shade, fill the lower canopy.

13 tree species are present here with ~28% of the basal area held in species that are rated as at risk under climate change. The mid- and understories are not as diverse as the overstory which will leave this stand increasingly vulnerable over time.

Canopy heights here are >60 with a relatively homogenous and even distribution. As single tree or larger group disturbance takes hold here, this condition will diversify.

5.1.4 Regeneration/Ground Cover

There is truly little here in terms of tree species regeneration other than the patchy beech in trees smaller than 5" DBH. There are pockets of fern in some areas, but mostly the understory is either open, or filled with beech or in some cases, hobblebush.

While beech itself is likely going to fare well under climate change since it can tolerate shade, drought, and isn't preferred by deer, at a forest health and biodiversity level, an understory dominated by diseased beech isn't particularly healthy since it excludes other species that may be better positioned to adapt to a changing climate. Increased deer pressure, even though this area is subject to hunting, will also hinder the development of other species.

5.1.4a Coarse and Fine Woody Material

With its recent harvest history, this stand generally is lacking in larger coarse woody material that we would want to see here for wildlife habitat and as a slow-release nutrient and carbon pool. There is adequate fine woody material thanks to ice and wind damage. The duff layer is well-developed, and no invasive earthworms are present.

5.1.5 Interfering/Invasive Plants

Like much of the Park forest, there are no exotic invasive plants in this stand. The main interfering vegetation is American Beech that is plagued by the beech bark disease. Thickets of saplings dominate the small gaps in the forest canopy and exclude other vegetation.

5.1.6 Habitat and Structural complexity

This is a varied stand with an array of wildlife habitats. Along the Davis Mine Brook on the eastern edge, the hemlocks provide thick cover for mammals and birds. Moving upland, one encounters beech and oak that provide healthy food sources with their episodic seed production. aquatic habitat values are strong here- beaver meadow and streams along the eastern edge of the Stand provide an array of dynamic habitats.

There are an adequate number of large snags and wildlife trees. See Figure 20 below. The snags here likely add ~1 ton of carbon per acre.

5.1.7 Forest Health

The main forest health concern in this stand is the beech bark disease and its corollary effects on the regeneration stand wide. With its shade tolerance, ability to sucker from roots or stumps, and with the fact that deer and moose tend not to browse it, beech is slowly coming to dominate the stand. While lack of diverse regeneration is not a huge forest health threat, it does just mean that over time species diversity will decline here. To remedy this, the Commission might consider establishing some beech control zones where every beech stem is severed to yield the growing space over to a more diverse array of trees. Herbicide and deer exclosures could also augment this process.

Long term, hemlock vulnerability to the Hemlock Wooly Adelgid and Elongate Hemlock Scale is a primary concern. Careful monitoring will be required to note any infestations as early as possible.

5.1.8 Unique Features

It was in the hills of this forest stand that iron pyrite was discovered and a mine developed in 1882. The eastern section of Rowe, known as Davis, became an active mine operation for 29 years. The mine camp was large with a blacksmith shop, a butcher, electric lights, and over 100 family settlements. Today little remains except cellar holes as the 2nd growth forest overran the site.

The east branch of Davis Mine Brook forms the eastern bound of this stand. Water moves slowly through an elongated complex of wooded swamps, shrub swamp,

shallow marsh, and deep marsh before it becomes the swift moving cold-water trout stream that tumbles down into the Deerfield River basin. A first order tributary (the minor west branch of the Davis Mine Brook) also bubbles up from a coniferous wooded swamp close to Davis Mine Road in the western portion of the stand.

Another interesting riparian zone in the northern section of the stand (close to the edge of the stand and Stand 09) consists of a shallow marsh (less than 3 feet of water and dense aquatic plants) and a narrow hardwood swamp depression. They both drain to the west and form one branch of the headwaters of Tuttle Brook. An unusually placed vernal pool sits on a high plateau on the broad crest of an un-named hilltop.

The Davis Mine Brook watershed area is designated by Massachusetts Division of Fisheries and Wildlife as Primary habitat, which indicates the geographical extent of habitat for state-listed rare species, both plants and animals.

The 1980's harvest retained numerous large sized (over 24 inches in diameter) hardwood stems across the high canopy. These trees are riddled with cavities and holes that provide denning and nesting opportunities' and form the oldest stand structure (>120 years) here.

5.1.9 Climate Change: Site Features and Forest Infrastructure

The site features of this stand are generally not threatened by climate change. Slopes are gentle, trails are well-built, and the parking area off Davis Mine is well-built and armored. Erosion or other soil disturbance risks are low. The main exception here is the hemlock filter strips along the wetland and stream system to the east. The warmer winters and declining hemlock due to higher winter survival rates in hemlock wooly adelgid will impact these areas over time.

5.1.10 Climate Vulnerability and Desired Future Condition

The key climate risks for this stand are:

- Increased hemlock wooly adelgid pressure due to warmer winters
- Longer term vulnerability due to a lack of a diverse understory

In the next ~20 years, this stand will likely remain largely the same. Hemlock will likely begin to decline, but it will likely be a slow process. Longer term, the stand will be increasingly vulnerable as the more diverse overstory trees age out and die and are replaced by a diseased beech midstory.

The desired future condition is a multi-aged forest with northern hardwood trees with scattered inclusions of dense hemlock habitat zones and super dominant white pine trees, and hemlock components. The upper layers continue to mature, yet given the last disturbance was over 40 years ago, some silviculture now could introduce an immature

age class to the forest. Carbon stocks remain high as hardwoods mature although some will be lost to hemlock mortality.

The creation of open patches in the forest encourages seed germination of a diversity of species. These could be fenced or protected via slash walls. This is a stand where the Town has some leeway to manage for values that are important to everyone- increased diversity, forest resilience and a continually improving network of trails.

Management would impact carbon in the near term since removing wood would result in an immediate, small dip in carbon stocks as some carbon is lost to short-term forest products like firewood while some is stored longer term in things like hardwood floors. Longer term, however, some small patches would replicate the regeneration success of 40 years ago which has given this stand increased resiliency today.

Figure 22: The occasional massive red maple (note helmet for scale) adds structural complexity to the Stand.

5.2 Stand 2- HH- Hemlock Hardwood

Figure 23: A painted trillium and Canada Mayflowers on the forest flower of Stand 2.

5.2.1 Overview

Stand 2 occupies the lower western flanks of Mt. Adams and most of the shoreline of Pelham Lake. It is some of the most utilized terrain on the property- the Lakeside Trail winds through much of the stand. It also has the most neighbors, including Rowe Camp, and is somewhat vulnerable to exotic plant encroachment.

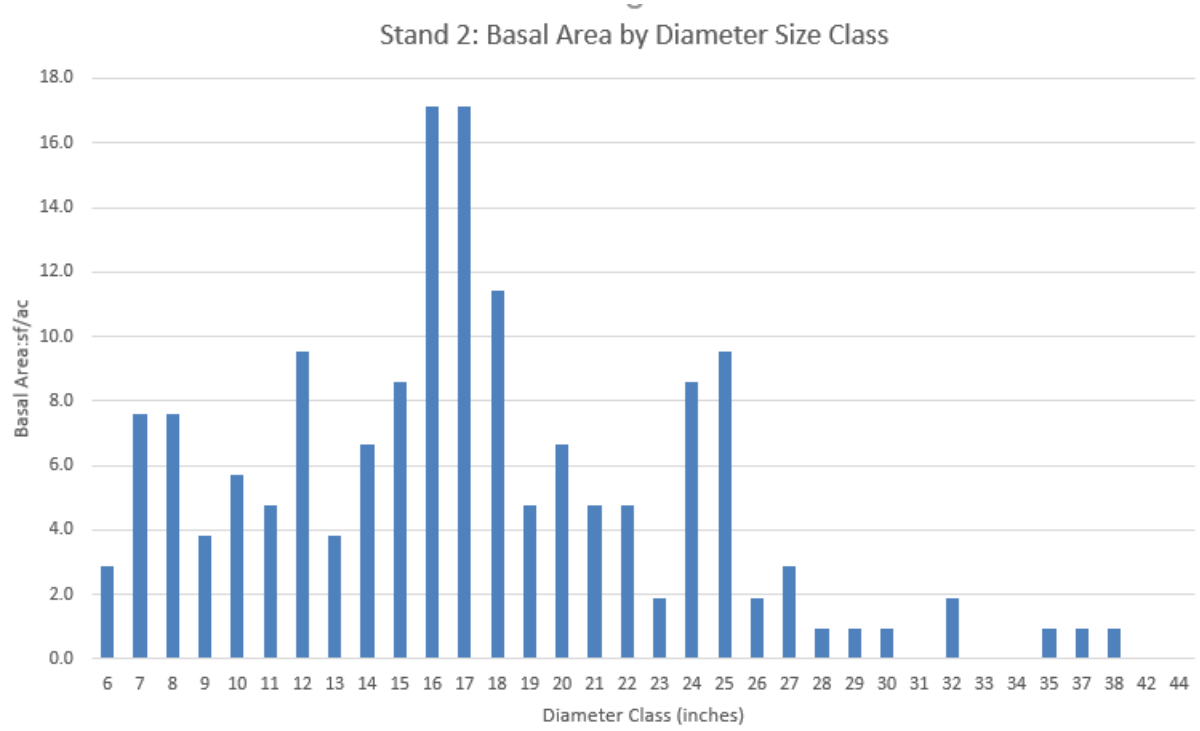
With towering, emblematic pines along the shoreline, and pockets of deep hemlock, maple, and beech, this stand includes much of the original covenant area that Percy Brown donated to Rowe. As such, it includes some areas that would be well suited to becoming enhanced, old-growth zones where Townspeople and visitors could experience older forest with its complexity, mess, large trees, and natural processes.

Table 7: Stand 2- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	2	HH-Hemlock-Hardwood	182.17 acres	13'' WP: 20" RO: 19"	160 ft^2	44 Cords	WP: 66 AB: 64	51.8

*Sampled volume, does not include topwood

Table 8: Stand 2: Basal Area by Diameter Size Class



5.2.2 Terrain and Soils

Soils-wise, this is the most complex stand on the property. Marlow fine sandy loam, 0 to 8 percent slopes, is the most common soil here, but with all the wet areas in and around the Lake, and the toe slope before the terrain climbs, there are over a dozen soil types present here. Marlow-Peru complex, 15 to 20 percent slopes, very stony, and Ashfield fine sandy loam, 8 to 15 percent slopes, very stony are the other two main types. The Marlow has a significant agricultural past with stone piles and stone walls dotting this

type lower on the slopes. These soils are the most productive combination in west County, capable of the support of vigorous tree growth.

The terrain in the stand is mostly gentle with an abundance of low-lying wetter areas. The slopes taper to a gentle outwash plain along the lake shore. Four un-named first order streams drain out of upland spring seeps and wetlands and enter the lake in isolated narrow deltas.

5.2.3 Canopy Layers

These lands were still open and just beginning their reversion to forest from farmlands when the park was created. They matured into a distinct, evenly distributed two-aged structure with an upper canopy layer with heights >60' (oldest trees that range in age from 90 to 120 years) and a middle layer of large sapling, pole-sized, and small timber-sized trees in the 20-40' range. Composition is diverse with the following species in descending order of stocking, hemlock (26%), red oak (18%), red maple (16%), white pine (12%), and the remaining proportion in beech, yellow birch, sugar maple, black cherry, white ash, black birch, and paper birch.

However, ~40% of the basal area here is at risk from climate change. This includes the large pines in wetter soils along the lake- these are at risk from increased wind/rain events. Hemlock is a main component here- along the Pelham Brook, hemlock wooly adelgid is surviving more in warmer winters and threatening the hemlock.

The rich soils support a productive forest ecosystem with minor disease and pest problems and high carbon storage and accumulation capacity. Both canopy layers are well stocked with high stem count per acre. Large sized white pine cluster in small niches along the lake shore. They provide unique habitat coves with tall perching and denning sites. The red oak trees reach high into the upper canopy with their sprawling crowns spreading across the sky.

5.2.4 Regeneration/Ground Cover

There is a fair bit of hobblebush throughout this stand, along with Canada mayflower, shadbush, maple leaved viburnum, wild oats, prince pine club moss and starflower. This forest floor cover is sparse due to the overstory shade, with dense thickets in spots along the streams and lake shore.

In terms of tree species regenerating, there is not much going on. The closed canopy, deer pressure, and developmental stage of the forest likely account for this. Moving forward, it would be nice to add in some clumps of regenerating hardwoods, spruce, and pine to the mix here. Increasing herbivory by deer in this sanctuary (no hunting)

zone has a homogenizing effect on the understory- this will likely increase as warmer winters help deer survive.

5.2.4a Coarse and Fine Woody Material

This stand has been developing for >65 years since its last significant anthropogenic disturbance. As such, it has ample coarse and fine woody material with abundant large fallen and snapped off tree trunks. These features are well distributed across the stand.

5.2.5 Interfering/Invasive Plants

This stand is thankfully free of invasive plants at this point. Given its proximity to fields, the lake, and Pond Road, close monitoring for both terrestrial and aquatic invasive plants will be essential here to keep it that way.

There are some pockets of beech where it is turning into a monodominant thicket, but overall, beech is less of a diversity problem here than it is in Stand 1.

5.2.6 Habitat and Structural Complexity

Food sources, the proximity to the water features of the lake, streams, and the outflow brook, as well as the transitional nature of the woods make Stand 2 valuable for wildlife habitat. Shrubby wetlands host a variety of bird species, while the towering lakeside pines provide perches for bald eagles that are often seen there. Away from the lake, boulder areas provide denning sites for porcupines, and bear claw marks can be seen on beech trees indicating that bears use this area as well. The trails that recreationalists use are also often frequented by deer, coyote, bobcat, and other creatures who, like people, seek an efficient and well-trod path across the forested landscape.

There are abundant snags and other standing wildlife trees here like black cherry. The snags likely contribute an additional 1-1.5 tons of aboveground carbon per acre.

5.2.7 Forest Health

Some of the pines along the lakeshore are showing signs of decline- likely from a host of factors including white pine needle diseases, root rots, and waterlogged roots. Longer term, the hemlock component is vulnerable and should be monitored closely for signs of decline. Park staff have observed hemlock wooly adelgid in 2022 along the Lakeview Trail. A rapid decline in hemlock would dramatically affect the forest here- from water temperatures, to understory light environments, and on to the habitat that the hemlocks currently provide.

5.2.8 Unique Features

This stand supports an array of unique features- both natural and man-made. The historic Bench Tool Shed is an important historic feature of the property and for the Town.

The Park has recently completed a wonderful new pedestrian bridge just below the lake outlet- this artful creation spans the brook in two sections and provides great access and a delightful place to view the water rushing along underneath.

As Pelham Lake filled up, small wetland fingers remained connecting the forest to the lake with shrubs, small trees and an abundance of non-woody plants that thrive in wet, open conditions. During the inventory, we observed a great crested flycatcher utilizing these transitional habitats.

Lastly, as the "frontside" of the park, the trail network here is heavily used and special to most users of the Park. While it is mostly in decent shape, it would benefit from increased maintenance and improvements- especially in the heavily rooted areas of the Lakeshore Trail. With increased extreme precipitation events, these heavily used trails will need to be carefully monitored to keep them in good shape. A mapping and inventory project in 2021 laid the framework to do this well.

5.2.9 Climate Vulnerability and Desired Future Condition

Percy Brown wanted the original Park lands under the 1955 covenants to remain in a wild state. The natural development of this stand since farm abandonment progressed towards more wild conditions with each year. Without disturbance the older layer began to seed in open patches from wind, ice, blowdown, or occasional harvests early in the Park's life. The forest floor grew dark as time passed and only hemlock, beech, and the occasional red maple seed found its way up towards the light. The tightly stocked grove covered the lower slopes and protected the fragile lake shore riparian zones.

The primary climate vulnerabilities of this stand are:

- Riparian buffers populated by hemlock are vulnerable to decline due to hemlock wooly adelgid and elongate hemlock scale- this would alter water temperatures and change trophic conditions
- Heavily used recreational trails are vulnerable to erosion here
- This stand has the most "edge" of any area in the park and is hence vulnerable to invasion by exotic plants or increased human encroachment/use

Hikers and walkers of all abilities flock to this stand as it is most accessible. The forest ecosystem will continue its natural development through time with many trees

succumbing to age or competition related attrition, trail maintenance will become a high priority to ensure the high-quality experience visitors expect close to the lake.

The maturing trees age well in the rich soils, as the oldest begin to widen in girth and broaden their lovely crowns, capturing more CO2 with each summer. One's sense of wonder at the beauty of an aging forest is keenly felt hiking the low slope trails throughout the next few decades. Old growth enhancement techniques could be applied here to accelerate the development of the wild and natural forest State envisioned by Percy Brown. In the spring/summer of 2022, an old growth demonstration trail is being developed along the transition from this Stand into Stand 3.

1.3 Stand 3- BB-Beech-Birch-Maple with Red Oak

Figure 24: A massive yellow birch holds onto a craggy outcrop in Stand 3

5.3.1 Overview

This stand is perhaps the most representative of Pelham Lake Park Forest. Starting up the western face climbing the lower slope of Adams and Todd Mountains, one leaves the cool moist hemlock grove and lakeshore pine niches behind and at close to 1,300 feet

enters this stand. Encountering the high stocking of beech saplings and small pole-trees, one looks up to the massive, legacy hardwood trees of a prior generation, wary of stumbling on the hobblebush and beech whips. Rocky outcrops and boulder areas, some caused by human quarrying activities, perch on the steep terrain. A slight depression perched in the high saddle between Mt Adams and Mt Todd moves pure spring water down to form the major west branch of Davis Mine Brook.

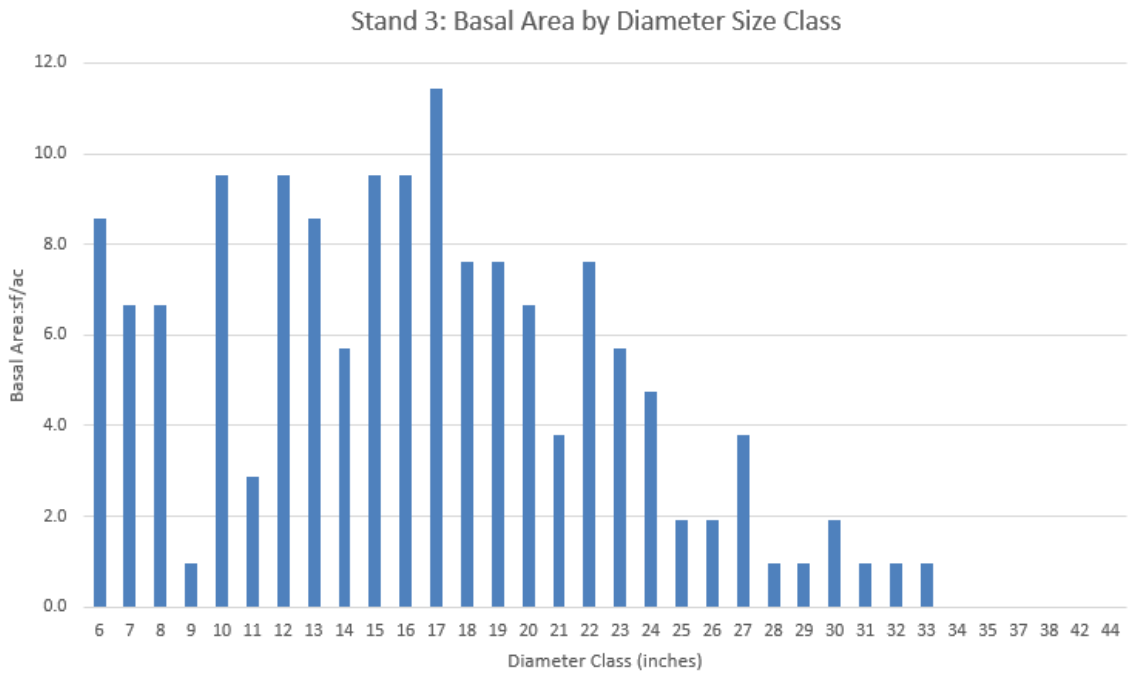
Covering a large elevational gradient and featuring an array of tree species, this Stand is relatively resistant to immediate climate change impacts. Red maple, a resilient species that performs well across moisture gradients, is the primary species. A number of steeper recreational paths are some of the more vulnerable features in this Stand.

Table 9: Stand 3 -Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	3	BB-Beech/Birch/Maple	295.55 acres	12” RO: 15”	148 ft^2	40 Cords	SM:73	48.6

*Sampled volume, does not include topwood

Table 10: Stand 3: Basal Area by Diameter Size Class



5.3.2 Terrain and Soils

The stand sits high on the slope nestled against the western summits of Adams Mountain and Todd Mountain, spilling into the narrow saddle between them. Except for the saddle between the two mountains where the terrain is more moderate, the stand is mostly made up of steep slopes with lots of boulders and the occasional talus area. The soils are varied with Millsite-Westminster complex, 25 to 50 percent slopes, very rocky, as the primary soil. Small pockets of Shelburne, Peru, and Marlow fine sandy loams fill the concave areas along the slope with some deep, rich soil pockets. Overall, it is a great stand for growing trees. With the variety of terrain and general rockiness, erosion under extreme weather events is less of a concern here.

5.3.3 Canopy Layers

Large-sized (>16" and upwards of 22+" DBH) red oak, white ash, yellow birch, red maple, and sugar maple trees tower above a densely packed middle canopy replete with beech, paper birch, black birch, red maple, and an occasional hemlock. These upper slopes reverted earlier to forest and these maturing trees range in age from 100 years to well over 125 years. The declining red oak relic stems disappear as one climbs higher on the slope. A patina of super-dominant white pine dot the high canopy (reaching over 90 feet), reminiscent of the once more extensive pine groves. Otherwise, canopy heights are in the >60-80' range.

This high canopy stocking supports 90 square feet of basal area, which is an optimal metric for the best growth of these trees. They grow above the younger trees below, efficiently photosynthesizing, storing carbon, and supplying all the ecological benefits of a maturing forest ecosystem.

Yet 30 feet beneath them a burst of green in early spring let's one know these rich high slopes can support a vigorous, second immature structure. Almost one-half of the stand density is contributed by the multitude of immature beech, red maple, paper birch, and surprisingly hemlock (appears higher upslope) sapling and small pole trees. The immature beech stems exhibit severe pocking from the beech bark disease and is widely and pretty evenly distributed. As this layer advances into the canopy, only beech seed (or clones) can start new trees on the shady forest floor potentially changing the forest composition in fifty years or more. Natural dominance and competition will weed these young trees as they advance, naturally remove stems from each acre.

In the overstory, ~12% of the trees are at risk for immediate climate change vulnerability while in the midstory, that number is lower due to the increased beech presence. Longer term, the homogenizing effect of beech growth will pose an increased problem threatening the resilience here.

5.3.4 Regeneration/Ground Cover

We noted first or second year hardwood seedlings during our inventory work, but the lack of light and the presence of deer are likely keeping many of these from reaching sapling height. Overall, the stand is seriously lacking in diverse hardwood regeneration. Beech is slowly taking over the understory in much of the stand. Deer, and moose, will browse other species before beech, which may explain the lack of oak, maple, cherry, or birch seedlings and saplings. The no hunting covenants may also influence the browse pressure.

On the ground, a diversity of plants thrive where the beech and hobblebush are not too thick. Painted trillium, Indian cucumber, wild oats, club mosses, and trout lilies abound. In one of the talus fields, we noted native bush honeysuckle.

5.3.4a Coarse and Fine Woody Material

This stand has been developing for >130 years and features abundant large coarse woody material on the ground and fine material as ice storms, wind and natural mortality drive branch fall. This in turn adds to structural complexity on the forest floor and holds a slow release of carbon while providing good wildlife habitat.

5.3.5 Interfering/Invasive Plants

This stand is thankfully free of invasive plants at this point. Beech threatens the diversity of the understory, particularly in places where the canopy trees are senescing and causing small canopy gaps to develop. Here, the beech is poised to immediately fill the growing space to the detriment of other northern hardwoods and herbaceous plants.

5.3.6 Habitat and Structural Complexity

The pockets of large oaks, which episodically produce copious quantities of acorns, and the rocky areas that provide shelter to wildlife are two main habitat features of this stand. There is also a scattered black cherry component. This is important because cherries provide soft mast for wildlife. The small streams draining the flanks of the two peaks provide water, and the perched wetland in the area where Stand 3 pokes between the two parts of Stand 7 provides denser cover, water, and shrubs that support many songbirds.

The abundance of large trees- particularly yellow birch with its plate-y bark- provide important gleaning terrain for birds, but also shelter for bat pups during summer months.

There are adequate large snags in this stand- particularly large beech and ash trees. These snags also store carbon. The Town is developing an Old Growth Reserve area and demonstration trail that touches this Stand and which features some large, significant snag features.

5.3.7 Forest Health

Most of this Stand is in the original Brown Covenant area and as such, has been developing, relatively untouched, for at least 60 years. Large trees are well established and, in some cases, are even beginning to die, fall apart, and create small gaps where northern hardwood regeneration would typically flourish. However, many of these small gaps are instead rapidly colonized by beech. This lowers overall tree diversity and leads to a less resilient forest.

Like much of Pelham Lake Park Forest, the main forest health concerns here are beech bark disease, the vulnerability of the small hemlock component to hemlock wooly adelgid and elongate hemlock scale, and the vulnerability of ash trees to the potential of an emerald ash borer infestation (recently discovered in Charlemont). While climate change and EAB are not directly linked, losing ash as a component of the forest will lower biodiversity and resilience. To that end, the Town invested in the inoculation of 10 ash trees (6 female and 4 male) in this Stand in 2022 in a bid to preserve some ash. We recommend a follow up treatment for these trees in 2024.

5.3.8 Unique Features

The rocky outcrops and talus areas of this stand support enriched sites that in turn feature neat plants like the native bush honeysuckle. Little bands of cliffs, some supporting massive oaks with trillium and Christmas fern thriving in the jumble around them, abound.

The recreational trail network on the western slopes crisscrosses this stand bringing hikers to several destinations within it. Many sections of trail here could use improvement to help make them more sustainable with less erosion and easier maintenance longer term. A trail inventory and mapping project completed in 2022 will help this process.

Previously discussed as a threat to forest resilience, the cloning behavior of the beech trees on this slope augments this threat. Beech readily clones itself from the root systems of trees after disturbance, therefore maintaining low genetic diversity. Theoretically the high inherent susceptibility to the beech bark disease in this beech grove continues into each successive generation. Each new generation of beech

seedlings and sapling will develop symptoms and reduce the overall productive capacity of the stand.

5.3.9 Climate Vulnerability and Desired Future Condition

Since it is largely within the covenant area, the future desired condition of this Stand is relatively well defined- it will continue to develop as a largely unmanaged reserve area. One might imagine that Percy Brown envisioned a future forest upon these western slopes replete with all the native northern hardwood species (maple, birch, ash, and cherry) and the elegant, broad crowned red oak well suited to growth in the lingering high elevation afternoon sun. Most of the hardwood species are long lived trees, and they are quite comfortable sharing the high canopy with the super-dominant white pine stems (remnants of the past forest).

The primary climate change vulnerabilities of this stand are:

- Steep sections of recreational trail are susceptible to increased erosion pressure
- Small clumps or single stems of hemlock are slightly offsite and prone to drought stress- hemlock wooly adelgid and elongate hemlock scale compound this stress
- The homogeneity of the beech understory does not bode well for the development of a resilient forest 50 years in the future.

The red oak trees found their way to this high slope through a history of disturbance after the white pine groves established after first farm abandonment were taken from these hillsides. Perhaps Percy Brown noted the drastic removal of those timbers when he contemplated his idea of "a natural wild state" for his legacy. Extensive logging during the world wars and the post war booms, fuelwood cuts by local farms, and decades of storm events changed the structure of this stand. Openings in the canopy were filled by red oak seed during a time when deep populations were lower, seedlings developed, and eventually these trees took their place in the overstory. Some creative efforts (non-commercial by covenants) could encourage seedling development of these oak giants and hopefully keep them on for another 200 years. Increased enrichment planting mimicking the work done in Stand 4 in 2022, could enhance the regeneration here.

5.4: Stand 4- HH-Hemlock and Mixed Hardwoods

Figure 25: Large oak with a beech thicket developing nearby.

5.4.1 Overview

The southeastern slopes of Adams and Todd Mountains form a stand rich in larger oak amongst hemlock and other hardwoods with a central drainage originating in the perched wetland in the saddle of Stand 3 above it. There is evidence of 40 year + logging here with old skid roads and decaying stumps scattered about. Smaller stems that resulted from that harvest increase the Stand's resilience. Most of this Stand belongs to the "Oliver" Parcels that were added to the Park in 1986. An old log landing just in along the Davenport Trail, still has a pile of slab wood on it- likely from a harvest of timbers turned in the forest on a portable sawmill (customary practice into the mid-1980's in West County) just prior to the Town's ownership.

This is a stand of opportunity from a climate change perspective. A significant black birch component (6% of BA, mostly in the 7-10" size classes) adds to the overstory oak

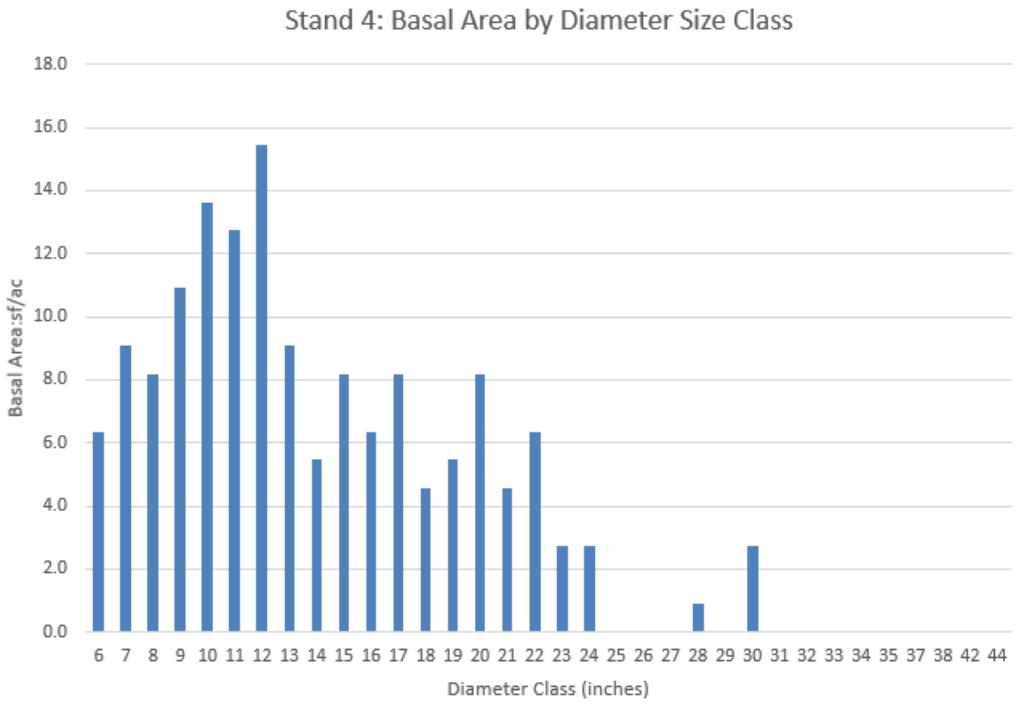
and there is a nice array of smaller diameter oak poised to mature over time and provide ongoing chances for diversification of the seedling component as well.

Table 11: Stand 4 Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	4	HH-hemlock, red oak, and other hardwoods	193.29 acres	11" RO: 13"	152 ft^2	50 Cords	RO:60	48.6

*Sampled volume, does not include topwood

Table 12: Stand 4: Basal Area by Diameter Size Class



5.4.2 Terrain and Soils

Most of this Stand is in a large, wide bowl formation sweeping across the low slope positions that surround a drainage network with road frontage on Davenport Road. The slopes are generally moderate and standing water in the flatter areas mean that

inventory work had to contend with significant blackfly and then mosquito populations. The terrain is certainly more moderate than the frontside with two lovely trails, the 1792 and the Davenport, working their way through it. The southerly aspect increases the potential droughtiness of the site under the changing moisture regimes anticipated by climate change.

For soils, the Millsite-Westminster complex, 15 to 25 percent slopes, rocky, dominates although a swath of Shelburne fine sandy loam and Pillsbury fine sandy loam nearly bisects the Stand and hosts the most productive zones along the Davenport trail. One can clearly understand why farmers worked up this drainage following the nicer loams with water nearby.

A hardwood forested wetland upslope drains water down into this stand along the narrow channel of the major west branch of the Davis Mine Brook. Two spring seep fonts nestled in low depressions amongst the rocks and ledges push more water easterly into this flow. A tiny, isolated upland wetland that perches near the southern bound collects water.

5.4.3 Canopy Layers

This stand supports a two-sized structure due to past harvest disturbances. Much of this upper canopy features a significant red oak component (21% of the stocking here) with patches of maturing hemlock (23% of stocking) as well. In the hemlock areas, there is no mid or understory to speak of- these pockets have that classic hemlock feel where you can see through them. The super-dominant white pine (greatly reduced in numbers over here on the east slope with only 2% of stand stocking) still tower above most trees. However, the main story here is the oak that abounds.

These trees are a bit younger than the oak on the western slopes perhaps due to a lag in farm abandonment and succession history. Beneath this main canopy which is >60' tall and evenly distributed, an overstocked layer of sapling and pole sized hemlock, red maple, beech, black birch, and paper birch compete for sunlight and growing space. Their seed and clones sprouted in the sunlit forest floor after a major harvest in the late 1970's or early 1980's. These vigorous immature trees contribute over 70% of the total stem count across the stand. Hophornbeam and striped maple (two small native trees) weave themselves up into this jungle. The beech crops suffer severe beech bark disease pocking.

~25% of the basal area here is held in species rated as vulnerable to climate change. The main contributor here is hemlock in the canopy, mid- and understories as well. In the summer of 2022, we found most understory hemlock riddled with hemlock wooly adelgid.

5.4.4 Regeneration/Ground Cover

Other than beech, there is not very much desirable regeneration across this Stand. Notably the aesthetically and habitat valuable red oak trees are not replacing themselves on this slope either. On the ground, we have a generally non-descript mix of plants here- hobblebush, partridgeberry, Canada mayflower, and starflower. The duff layer is nicely intact.

Digging holes for a planting project in 2022, we found the soils to be remarkably deep and quite rich. A layer of charred material may have indicated a large fire here hundreds of years ago.

5.4.4a Coarse and Fine Woody Material

The logging here decades ago had a homogenizing effect on parts of this Stand and has left it with less coarse woody material than we might like to see. There has been adequate recruitment of fine woody material and some occasional logging debris is still around- largely held in oak tops that are held up and off the ground by their branches.

5.4.5 Interfering/Invasive Plants

There are no invasive plants in this stand. Like most Stands here, beech saplings are interfering with other tree species establishing. There are also some pockets of fern that are excluding other vegetation.

5.4.6 Habitat and Structural Complexity

This is a relatively less exciting Stand from a habitat perspective. The oak component contributes an excellent food source and the central drainage provides water. Hemlock inclusions dot the Stand and likely provide good winter deer yard conditions adjacent to oak and beech food sources.

This Stand generally lacks the snag component, especially in the larger size classes, that characterizes Stand 3 so nicely.

5.4.7 Forest Health

This is a relatively healthy, diverse forest Stand. The diseased and declining beech component exists Stand-wide. As with other Stands on the Park, the hemlock will need to be closely monitored too. In the spring of 2022, we discovered an abundance of hemlock wooly adelgid in the Stand. The southern aspect may help moderate

temperatures already warmed by climate change resulting in less hemlock wooly adelgid overwintering mortality.

Also, like Stand 2, Stand 4 abuts a more parceled landscape. This parcellation usually results in increased risk for invasive plant invasion. Thus far, it seems not to be an issue, but it bears monitoring.

5.4.8 Unique Features

During our inventory, we noted a small vernal pool in the northeast of the Stand and there are doubtless others as well. Another neat, small wetland in the southern part of the Stand is easily accessible via a nice trail as well.

The black birch component, on the generally southerly aspect of the Stand, gives this Stand an interesting front-seat view for climate change adaptation. Black birch is predicted to do well under a changing climate scenario and this stand has an altitudinal gradient for birch to move about on.

This stand is overstocked for optimal growth of all the native tree species. Consequently, small diameter stems routinely die off due to shade or root competition.

5.4.9 Climate Vulnerability and Desired Future Condition

The Town has some flexibility here with how this Stand is managed and for what future condition. When it was added to the Park, there was a motion to add much of this area under the parameters of the original Percy Brown Covenant. However, a second motion prevailed, and the Oliver parcels were added in order to "establish a park for recreation." The current trails, and people's ability to hunt continues here.

The principal climate vulnerabilities of this Stand are:

- Its southerly aspect results in a warmer climate which likely favors the hemlock wooly adelgid that is already present here
- A homogenizing understory dominated by beech leading to an eventual lack of regeneration diversity and reduced resilience
- This stand is highly prone to drought and even potentially to wildfire

Left to develop naturally without disturbance, the high canopy red oak, black cherry, red maple, black oak, yellow birch, and white pine willcontinue their productive use of this site. Their crowns expand, a few die off each season adding to the woody material decomposing into soil as the stand augments its carbon storage in both forest biomass and soil. Hemlock slowly succumbs to invasive insects.

The overstocked lower layer continues its struggle with natural dominance exerting amongst yellow birch, red maple, black birch, and aspen trees as they begin to climb into the upper canopy and accumulate carbon. Attrition eventually creates the necessary canopy gaps for hardwood seed germination, and the natural succession continues across these slopes.

Minimal intentional disturbance to create small openings increases site productivity, individual tree vigor, and stand health. Diseased and dying beech sapling, pole-sized, and larger tree are removed. Small openings in the canopy allow seed germination and seedling development. Focus on their placement near superior red oak seed bearers enhance the oak's chances of perpetuation. Forest resiliency is boosted, and increased site productivity improves the carbon pooling capacity here.

This disturbance could be done at any future point, need not be commercial in nature, and only serves to expedite the natural process already underway. Over time, this will develop from a largely 2-aged forest, into a multi-aged one with oak, birches, and hemlock as the primary species. The Town could consider adding another age class of trees by installing a series of patch cuts here to enhance the climate resilience, wildlife habitat, hunting, and aesthetics of the trail experience.

5.5: Stand 5-HK- Hemlock

Figure 26: This boulder sits at the transition from Stand 4 on the right to Stand 5 on the left. The History of Rowe refers to this as the Guardian of the Mountain!

5.5.1 Overview

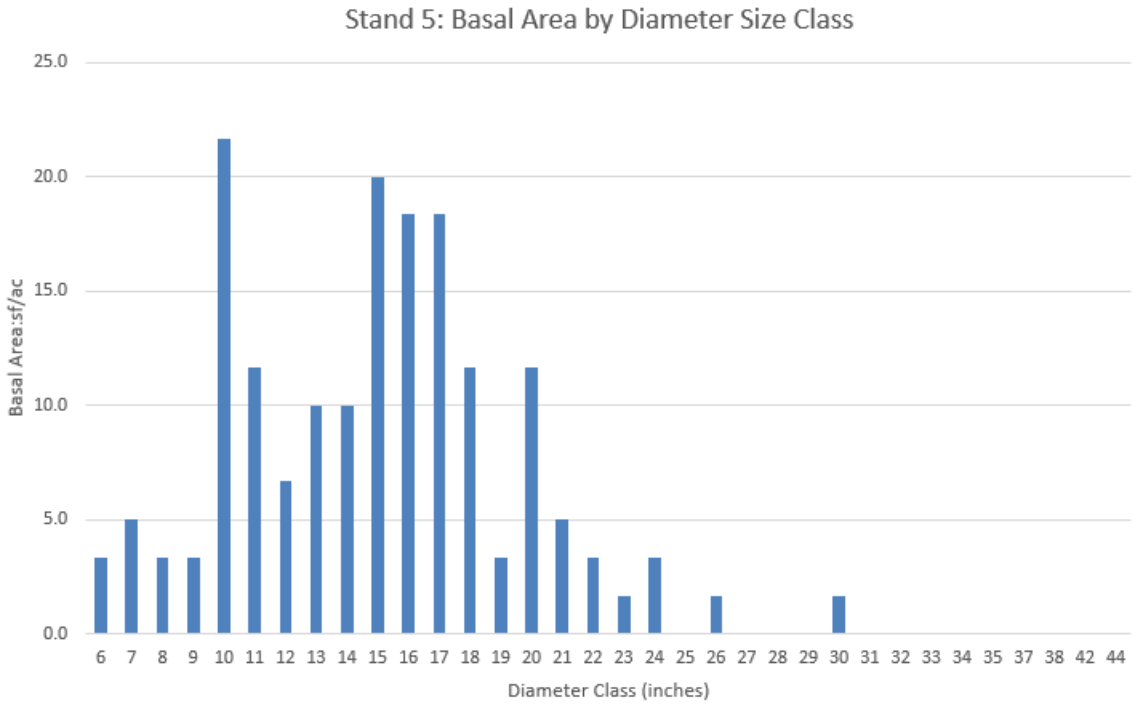
Wrapping around the western half of Adams Mountain's summit forest (Stand 7), the hemlock forest of Stand 5 is mostly composed of thick hemlock with the occasional more open patch featuring oaks. With generally steep slopes, and the western view lookout point, this Stand is a relatively unique, and climate-vulnerable assemblage of tree species at higher altitude. A magnificent stone wall reminds visitors that the agricultural past is not too far removed up here, however.

Table 13: Stand 5- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	5	HK-Hemlock	125.22 acres	13" HE: 12" RO: 16"	175 ft^2	42 Cords	YB: 54	55

*Sampled volume, does not include topwood

Table 14: Stand 5: Basal Area by Diameter Size Class



5.5.2 Terrain and Soils

This stand sweeps downslope from a false summit southwest of Adams Mountain traversing the upper slope position to the steep slopes beneath the shoulderof Adams. The terrain here is quite steep except for the relatively flat plateau that the White Tail Trail follows as it connects the Old King's Highway with the Adams Mountain summit. In many areas, the hemlock glades would make for excellent backcountry skiing fun.

The soils are mostly Millsite-Westminster complex, 8 to 15 percent slopes, very rocky and Tunbridge-Lyman complex, 25 to 60 percent slopes, very rocky. Much of the steeper hemlock occurs on the Tunbridge-Lyman. These steep slopes are vulnerable to erosion under increased extreme weather events.

5.5.3 Canopy Layers

This stand supports a similar two-sized/aged structure as Stand 4 with older trees and without the extensive harvest disturbance 30 to 40 years ago. Hemlock dominates both upper canopy (40-60' in height) and midstory layers (47% of total stand stocking). Its high slope position prevented easy access for the removal the maturing red oak, sugar maple, yellow birch, and red maple trees. The patina of over mature white pine pokes above the main canopy. The stand is overstocked (200 trees per acre) with 47% contributed by hemlock stems of all sizes and ages. Knowing what we do about hemlock vulnerability to climate change, this is a vulnerable Stand. Red maple, beech, black and yellow birch, and red spruce saplings and pole-sized trees crowd the hemlock stems in the lower canopy.

With 45% of the basal area held in hemlock, which is evenly distributed across much of Stand, this Stand ranks low in resilience and high in vulnerability to climate change effects.

Figure 27: The steep, heavily stocked hemlock slopes of Stand 5

5.5.4 Regeneration/Ground Cover

There is little ground cover or regeneration in this Stand. The largely closed canopy dominated by conifers means there is not a lot of light on the ground here. In some pockets, hemlock is regenerating in thick clumps and there are areas of smaller beech as well.

We did not note many understory plants during the inventory, but there is a thick duff layer across the stand which, combined with the tree cover, is doing an impressive job holding the thinner soil on steep slopes in place. If the hemlock declines, this protective effect will dwindle as the hemlock duff later isn't replenished and these slopes could become quite prone to erosion. Along the White Tail Trail corridor, sedges and ferns cover the ground where there is more sunlight.

This area likely sees high levels of deer yarding as they seek protection in the hemlock cover and feed on any hardwood and hemlock seedlings that poke through the snow. This in turn reduces the advance regeneration and the Stands ability to be resilient as the hemlock declines.

5.5.4a Coarse and Fine Woody Material

Snapped off hemlock and the occasional split oak stem contribute an adequate amount of coarse woody material to this Stand. As hemlock declines and dies here, it will continue to hold carbon while it is standing. However, hemlock rots relatively quickly once it is on the ground, so hemlock decline here will result in a more rapid pulse release of carbon from the Stand as hemlock wooly adelgid takes its toll.

The clear, glade-like understory in the hemlock here is also lacking in fine woody material. As hemlock declines and sheds branches, this fine woody material contribution will hopefully help to stabilize the soils here until oak and birches can establish to hold this delicate area together.

5.5.5 Interfering/Invasive Plants

There are no invasive plants in this Stand. Beech and some fern are slightly interfering, but the main factor for lower understory diversity is the lack of light on the forest floor and deer browse pressure. Oak tends to establish under hemlock, possibly since its carbohydrate-rich acorn can drive root establishment through the hemlock duff layer. Here, however, deer are likely precluding much oak establishment.

5.5.6 Habitat and Structural Complexity.

This is a steep, upland habitat with shallow soils, lots of rocks, and thick hemlock cover. While hemlock generally provides good shelter for wildlife, up here it is a more montane environment exposed to the elements. There is some red spruce scattered amongst the hemlock- spruce seed provides good squirrel food. The significant oak component (25% of the basal area) means that acorns abound and rain down on the steep slopes during mast years. A long, side slope deer trail on what used to be a recreational trail cuts through the Stand and is used heavily by deer and bear. The main habitat value of this Stand is likely as an upland feeding zone, deer yard, and as a thickly covered corridor going up and over the shoulder of Adams.

The stand supports adequate large diameter snags created by scattered old wolf trees and the occasional dying beech or wounded hemlock that persisted as a living cavity tree.

5.5.7 Forest Health

The hemlock up here is thick and relatively healthy although it is exposed to significant wind and ice stress. Some pockets of likely older oak are starting to naturally die and are being replaced by beech coming up from the understory. As on other parts of the forest where hemlock is a big component, monitoring for Hemlock Wooly Adelgid and

Elongate Hemlock Scale will be the main forest health activities here over the coming years. Beech bark disease causes decline and death among the beech crops, yet its real threat is the cloning from root systems that exploit open ground on the forest floor. Healthier, long-lived hardwood seed (red oak, yellow birch, and sugar maple) cannot make a start amongst these dense beech patches. Lack of diversity is a threat to future forest resilience.

5.5.8 Unique Features

The rolling, ridge-top section of the White Tail Trail here is special. After climbing up to elevation, the trail rolls along the ridge as it heads for the summit. A large boulder on the trail is also a special feature.

The hemlock groves themselves are unique here and have an older forest feel to them. While we did not age these hemlocks, we suspect that they are quite old where they occupy steep slopes on the northwestern side of the mountain. A tree core taken lower down the slope in 2022 found a 130 year old hemlock so I suspect that these trees may be much older than that.

5.5.9 Climate Vulnerability and Desired Future Condition

Most of this Stand is managed under the Percy Brown Covenant and will continue to develop from its hemlock and oak beginnings into an increasingly complex forest as large trees die, fall down, and make room for new trees, mostly beech and hemlock, to take their place.

The main climate vulnerabilities revolve around:

- The near-term decline of hemlock due to invasive pests,
- The lack of regeneration ready to grab the growing space this decline will free up, and
- The stability of steeper slopes and soil with hemlock decline and the lack of advance regeneration and finer woody debris on the forest floor

Forest carbon here is quite vulnerable as well since rapid hemlock decline would result in a relatively quick release of forest carbon once the hemlock begins to fall down and quickly rot. With nothing here to readily take its place, it could well be decades before this stand rebounds to the level of carbon storage that it currently supports.

5.6: Stand 6- SR- Spruce (Red)

Figure 28: Sean Loomis measures a large pine in Stand 6

5.6.1 Overview

Stand 6 is a small, completely distinct pocket of red spruce and white pine in the northeastern tip of the property on flatter ground adjacent to a beaver pond complex and a ~20-year-old clear cut on a neighboring property. This is a very neat stand that was largely passed over by the logging operation on this part of the park 40 years ago. Towering pines emerge over a thick spruce canopy. Underneath this high canopy, pockets of spruce and pine are germinating where there is light.

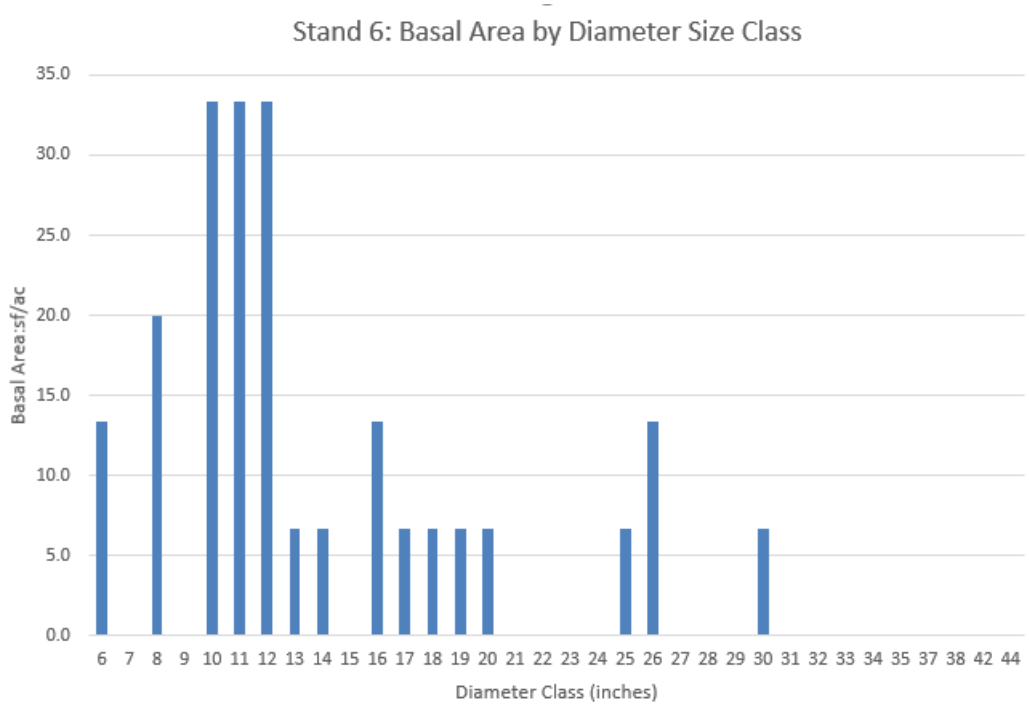
We recommend considering optional Forest Stand Improvement (FSI) work here. This FSI would focus on allowing more light to reach the pockets of regeneration that are established here already. This stand is somewhat vulnerable to windthrow and it would be nice to have a more established understory in place for the inevitable day when many overstory trees topple. This is increasingly likely under a changing climate with extreme precipitation events more common. This work could be done as a small-scale timber harvest or by simply felling and leaving trees in the woods.

Table 15: Stand 6- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	6	SP-Spruce (Red)	7.59 acres	11" WP: 21"	213 ft^2	81 Cords	WP: 71	68

*Sampled volume, does not include topwood

Table 16: Stand 6: Basal Area by Diameter Size Class



5.6.2 Terrain and Soils

This stand rest at the northern tip of the property adjacent to an elongated forested wetland depression. Unlike most of Pelham Lake Park Forest, the terrain here is flat and was likely plowed as a field. Water seeps into this area from the east supporting a mat of lycopodium. Adjacent stonewalls back up this assumption. The soils are Ashfield fine sandy loam, 1 to 8 percent slopes. These are good soils for pine growth, although the towering pine here are somewhat vulnerable to windthrow due to their tall heights.

5.6.3 Canopy Layers

The main canopy is uniform (estimated 65 to 80 feet height). A dense grove of 10-12" diameter spruce grows here with an emergent pine component towering over the spruce. There is no midstory to speak of but there are small clumps of understory regeneration where sidelight is feeding spruce and pine regeneration.

The species composition here is an interesting one from a climate perspective. Both spruce and pine have higher vulnerability ratings. The tall pine with the potential for waterlogged soils and wind events is a vulnerable combination. The spruce, however, seems ascendant here and it would be nice to encourage it since spruce was likely more represented on the landscape in the past and we are accustomed to its limited range here not because of its ability to grow, but rather because of anthropogenic disturbance targeting spruce and reducing its prevalence on the landscape.

5.6.4 Regeneration/Ground Cover

Small clumps of spruce and pine exist here where sidelight comes into the Stand. There is not much here in terms of understory plants. Nearby, a beaver meadow complex boasts a broad array of plants. The squishy mats of moss and lycopodium in and amongst the spruce and fir regeneration make for a complex microenvironment at ground level.

Deer and moose browse is currently not an issue here as they have better opportunities in nearby stands and in the beaver meadow.

5.6.4a Coarse and Fine Woody Material

The forest floor is littered with dead spruce stems that have fallen over time making for a complex environment. Finer woody material is lacking on the ground.

5.6.5 Interfering/Invasive Plants

There are no invasive plants present in this Stand. However, to the north, a regenerating clear-cut on the neighbor's land likely has some invasives. Birds tend to like pine tree perches so there is a potential seed bank in this stand that would likely include native and exotic plants. Purposefully working this Stand would help monitor and control any infestations. Otherwise, when a wind event topples some or all the Stand, the same seed bank will express itself in a less controlled fashion.

5.6.6 Habitat and Structural Complexity

Towering pines provide perches and nesting sites for crows, ravens, hawks, and eagles. The thick conifer cover of the stand makes it a natural deer yard and winter sheltering place for birds and mammals. This Stand is also at the crossroads of 3 distinct habitat types- the beaver meadow, the younger forest to the north, and to the south, a 40-year-old mixed hardwood array with legacy trees that were not logged in the 1970s. This juxtaposition provides habitat value in and of itself. The clearcut to the north on the adjoining property provides neighborhood level structural complexity as well with young trees juxtaposed to the older, taller trees of this Stand.

There are some spruce snags here, but larger snags with good cavities are generally lacking and the standing deadwood here does not meaningfully contribute to the Stand's carbon storage.

5.6.7 Forest Health

The main forest health concern here is windthrow of the more surficial rooted pine and spruce. As discussed in the overview, there are some sustainable forestry practices that could be applied here. Or, the Stand could also be left to develop as is with the knowledge that it is highly likely to experience a significant windthrow event due where it is in terms of its development but also thanks to predicted changes in weather due to climate change.

5.6.8 Unique Features

This is a small, relatively homogenous Stand that does not really have any unique features other than the startling homogeneity of the forest here.

The Stand is currently around 600' from a nearby trail. Adding a connector "Spruce Loop" would allow Townspeople to experience this part of the woods as well as the maturing clear-cut to the north.

5.6.9 Climate Vulnerability and Desired Future Condition

The desired future condition here is to sustain a mixed-species conifer stand on the site. The pine and spruce likely developed here after agricultural abandonment. They are well-established and are regenerating nicely. The key will be to shepherd this mixture along without letting too many hardwoods in. This could be accomplished via a careful overstory removal in the near term, or via an extended, irregular shelterwood harvest.

The principal climate vulnerabilities here are:

- As discussed, this Stand is vulnerable to windthrow- especially combined wind and rain events that will likely more frequently saturate the soils here
- This is the most homogenous Stand on the Park property and if the spruce-pine regeneration is unsuccessful, it would take a while for nearby hardwoods to colonize the site.

This is also one of the most densely stocked Stands in terms of carbon. Stacking big pine over tightly packed, larger diameter spruce results in this high stocking. Windthrow, or a small harvest, would not immediately reduce the carbon here, especially if a windstorm jack-strawed the spruce which would keep it up off the ground and slow the decomposition process. However, adding in some expanding gaps here would even out the carbon distribution across size classes and help make this a more stable set of carbon storage pools.

5.7 Stand 7- OR-Northern Red oak

Figure 29: Steep slopes, oak, and a diverse understory characterize Stand 7

5.7.1 Overview

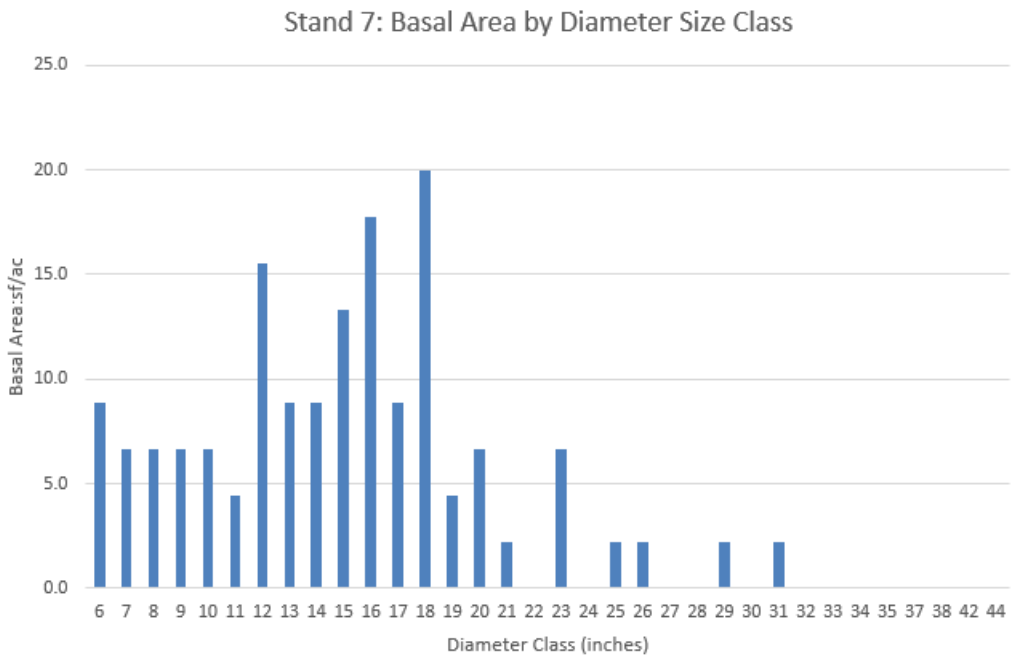
Stand 7 encompasses the summits of Adams and Todd Mountains. The southeasterly view is spectacular, and a newly built lean-to provides a great spot to stop for lunch after the strenuous hike up. Tree heights are stunted, ice damage is visible throughout, and thin soils with rocky outcrops characterize the terrain. It is prone to increased drought under climate change, but the species composition is relatively well-adapted already. Red and black oak make up nearly 75% of the basal area here and 60% of the trees per acre. There is an abundance of beech, hophornbeam, stunted sugar maple, and cherry with sedges in much of the understory.

Table 17: Stand 7- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	7	OR-Northern Red Oak	88.63 acres	12” RO: 13”	162 ft^2	42 Cords	RO: 60	51.8

*Sampled volume, does not include topwood

Table 18: Stand 7: Basal Area by Diameter Size Class



5.7.2 Terrain and Soils

At 1800' to nearly 2000' in elevation, this is the height of land for the Park. The soils are mostly Millsite-Westminster complex, 25 to 50% slopes, rocky, and 8 to 15 percent slopes, rocky. While the soils are fertile, the elevation and exposure here, and likely the lack of moisture, keep tree heights lower.

The terrain is steep around the edges and relatively flat on the summit plateaus with exposed bedrock and rocky outcrops.

5.7.3 Canopy Layers

The largely oak canopy here shows years of ice and wind damage. It is shorter stature (40-60') and is evenly distributed. Underneath it, a relatively dense mid and understory of beech, hophornbeam, stunted maple and cherry, and smaller oaks add horizontal and vertical complexity to the stand.

5.7.4 Regeneration/Ground Cover

The ground cover up here is mostly sedge. While there is an abundance of tree saplings, there is little tree seedling regeneration. This is largely due to herbivory. Judging by the diverse array of saplings, many of which are likely quite old, this site has no problem regenerating trees when the light environment and lower herbivory pressure permit.

5.7.4a Coarse and Fine Woody Material

There is not a lot of larger coarse woody material here. Finer material abounds, thanks to continued ice storm damage and the windy environment up here. These two carbon pools here do not meaningfully contribute to carbon storage in this Stand.

5.7.5 Interfering/Invasive Plants

There are no exotic invasive plants in this stand. For a refreshing change, the beech here is intermixed with an array of hophornbeam, oaks, cherry, and striped maple. There is even some stunted sugar maple here which likely won't fare well under increasingly droughty conditions, but which is for now a nice addition to the Stand.

5.7.6 Habitat and Structural Complexity

Like Stand 5, the main habitat value up here is that of an upland feeding and foraging ground. The hophornbeam adds another seed source to the cherry, oaks, and maples.

There are not a lot of larger snags. Smaller dead oak stems contribute some cavities for birds and rodents.

5.7.7 Forest Health

Ice damage appears to be the main forest health threat in this Stand. However, with nearly 70% of the basal area in oak, this Stand is also vulnerable to a potential Spongy Moth outbreak which would compound the challenging effects of the site and likely result in significant oak mortality.

5.7.8 Unique Features

Open rocky areas covered by lichens with sedges stuffed around the edges are a neat feature of this Stand. These areas add to the alpine feel.

The key features here are the beautiful view and the newly built lean-to nearby.

Figure 30: The view of Mt. Monadnock as seen from the lean-to

5.7.9 Climate Vulnerability and Desired Future Condition

This Stand will continue to develop its varied oak component over time as ice storms and wind lead to new canopy openings. Hunting is permitted in parts of the Stand (exclusive of Adams' summit) and this should help continue to support the establishment of oaks and other tree species that deer often browse heavily. As some of the tabletop vistas close with time, opening them will continue the unique aesthetic experience on these mountain tops.

The main climate vulnerabilities here are:

- Increased droughtiness due to changing precipitation patterns
- Potential defoliation events exacerbated by droughtiness
- Potential wildfire as this is a ridgy, dry oak site with significant fine fuels build up. Hikers and campers should be alerted to this situation.

While this Stand holds a relatively high carbon stocking on paper, the shorter heights here likely mean that stocking is lower than predicted. Barring an exfoliation event, the carbon storage here is relatively stable but it could quickly decline if nearby Spongy Moth infestations headed this way or if a wildlife were to spread across the summit here.

5.8 Stand 8- HK- Hemlock

Figure 31: The thickly stocked hemlock of Stand 8

5.8.1 Overview

Stand 8 is a thickly stocked hemlock forest on the relatively flat lowlands of the property. Some large pines emerge from the hemlock canopy and there is a lot of shoreline here provided by the Lake, Tuttle Brook, and the beaver meadow complex that abuts the riding ring area off Cyrus Stage Road. The Elementary School uses an outdoor classroom by an old dam on Tuttle Brook, and beautiful recreational trails cover much of the Stand. The meadow trail features some tree identification signs.

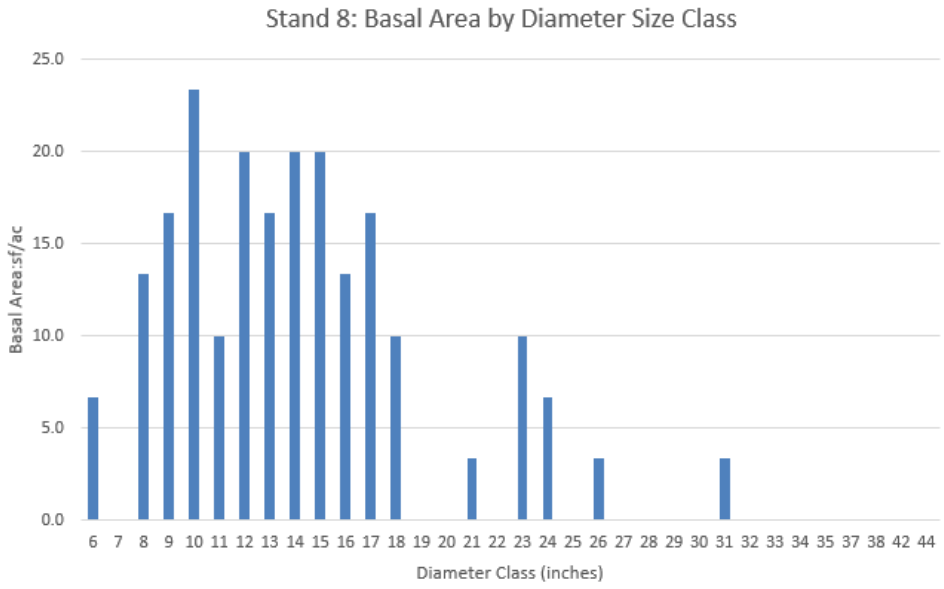
A grant funded project here in 2022 installed 4 hemlock monitoring plots to measure hemlock health and the levels of hemlock wooly adelgid and elongate hemlock scale populations. Re-measuring these plots in subsequent years will help the Park keep an eye on the vulnerable hemlock component here.

Table 19: Stand 8- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	8	HK-Hemlock	63.77 acres	12”	213 ft^2	56 Cords	WP: 62	68

*Sampled volume, does not include topwood

Table 20: Stand 8: Basal Area by Diameter Size Class



5.8.2 Terrain and Soils

This true hemlock stand surrounds the shrub swamp at the head of Tuttle Brook and gently climbs the lower slope south of the brook. This Stand is the lowlands of the Park and features mostly soils of the Colton-Adams complex, 3 to 8 percent slopes, and 8 to 15 percent slopes. Where the Shelburne fine sandy loam, 8 to 15 percent slopes picks up, you can see the remains of more active farming- stone piles scattered in the woods and stonewalls nearby.

The terrain here is relatively flat with some rolling areas. In the northern end of the stand, it appears material was perhaps excavated from borrow pits- likely for road construction.

Figure 32: Tuttle Brook and a small floodplain forest bisect Stand 8 before entering the Lake

5.8.3 Canopy Layers

This is a complex, lowland forest. Where the hemlock is thickest, there is only one layer- a 60-80' canopy of hemlock. Elsewhere, hemlock, a touch of spruce, and scattered hardwoods make up the canopy. Yellow birch and red maple are the significant hardwoods. Along the shorelines, thickets of dogwood, alder, and red maples reach out in the sunlight.

With over 50% of the basal area in vulnerable hemlock, this Stand is going to be on the forefront of climate change mitigation issues for the Park. Paper birch, another vulnerable species, adds in 3% more of the basal area.

The midstory has less vulnerable species (red maple and yellow birch) but it is a sparse midstory, irregularly arrayed, and is not well positioned to respond to the increased light that hemlock decline will provide.

5.8.4 Regeneration/Ground Cover

Under the hemlock, there is little groundcover or regeneration. Where there is sidelight, clumps of hobblebush thrive. Beech saplings are scattered throughout although there is no significant beech tree component here. On the ground, starflower, princess pine, bluebeard lily, and painted trillium can be found.

Figure 33: Hobblebush thrives in mostly lowland patches throughout the Stand

5.8.4a Coarse and Fine Woody Material

With wet pockets of soil, large trees, and decades of no human disturbance, this Stand supports ample coarse woody material. See photo above. Under the hemlock, there is not very much fine woody material

5.8.5 Interfering/Invasive Plants

There are no invasive plants in this Stand. However, next door, in Stand 9, there is a population of multiflora rose, barberry, and bittersweet as well as Japanese knotweed on the other side of Pond Road. We recommend that these plants be controlled now to prevent their penetration into the Park. We also recommend working with the Highway Department to control the knotweed patch before a flood pushes it downstream in the beaver meadow complex.

The beech here is scattered and is not interfering. In some areas, the hobblebush dominates, but given its wildlife habitat and food source value, this is probably a good thing. However, as hemlock declines and the Stand likely transitions toward more of a northern hardwood condition, regeneration of birches and maples is lacking.

5.8.6 Habitat and Structural Complexity

The thick hemlock cover and rich array of terrestrial and aquatic habitats of this Stand make it quite valuable from a habitat perspective. This stand also features the most significant yellow birch component on the forest. Yellow birch, with its complex peely bark provides exceptional gleaning sites for insect eating birds such as nuthatches, brown creepers, chickadees, and vireos- all of which use this forest.

This Stand also has a good amount of large, coarse woody material on the ground from where large trees have died and fallen over. These habitat features, and the insects, fungi, and rodents they support enrich this forest stand.

The location of this Stand also adds to its habitat value. Sandwiched between the lake, the beaver meadow complex, and the uplands, this Stand is a crossroads for the park's wildlife.

Large hemlock snags are scattered throughout the Stand- some fully dead, other partially. These add to the high carbon stocking of the Stand.

Figure 34: Yellow birch and coarse woody material add habitat value to Stand 8

5.8.7 Forest Health

The threats to forest health here are the adjacent infestations of exotic invasive plants and the threats to hemlock in general. As we have discussed in this Plan, warmer winters will result in hemlock wooly adelgid thriving here- likely accelerating the decline of hemlock. The Town could consider inoculating a small clump of hemlock here, like they have done with the ash in Stand 3, to maintain it on the landscape.

5.8.8 Unique Features

This Stand abounds in unique features- both natural and man-made.

Tuttle Brook winds its way through the Stand before emptying into the Lake. A long spit of high ground with spruce on it extends out into the wetland complex with a trail running along its crest out to the horse ring. Along the Babbling Brook Trail, natural bump outs allow birders to peer into the beaver meadows from the anonymity of overhanging hemlocks.

Along the Brook, an old mill site and dam hints at the history of the area and the Elementary School has an outdoor classroom set-up nearby.

5.8.9 Climate Vulnerability and Desired Future Condition

This Stand is mostly within the Boullie and Brown parcels and is governed by the Brown Covenants. As such, management options in the face of climate threats here are limited. The desired future condition here is for the lowland hemlock to continue to develop and for it to be augmented over time by northern hardwoods as the hemlock likely declines. Individual tree mortality will be managed where it impacts trails or the educational classroom, and small patches of regeneration will establish and hopefully thrive.

The primary climate vulnerabilities here are:

- Hemlock insect pests' higher survival rates under a warming climate and the resulting impacts this will have on hemlock health and subsequently, the streamside buffers in this Stand
- Nearby invasive plant populations could move in as the hemlock declines.

This is also one of the most highly stocked carbon stands on the property. As we discussed for other hemlock-heavy units, the risk of immediate carbon loss here in the short term isn't high. Longer term, significant hemlock mortality would lead to a loss of carbon here and leave this Stand not holding as much carbon as it might otherwise. However, since it is cooler and wetter, this stand may host healthier hemlock longer than other stands in the Park. Also, there are many unknowns here in terms of carbon dynamics- particularly in the belowground carbon pools.

5.9 Stand 9: WH: White Pine and mixed hardwoods

Figure 35: Stand 9 features a significant array of large pine

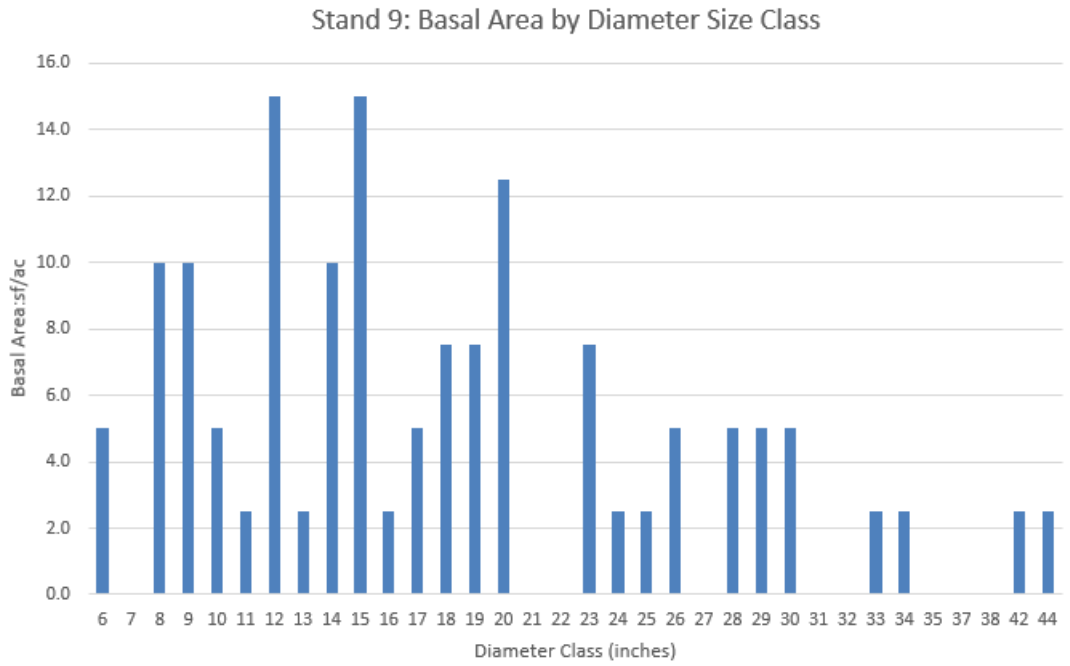
5.9.1 Overview

Located in the northern part of the park between Pond, Davis Mine, and Cyrus Stage Roads, stand 9 features many large white pines with associated hardwoods. Patches of white pine regeneration thrive in small openings and are ready to continue their development if given the chance. On the northeast side of Davis Mine Road, a well-built trail winds its way through huge pines and allows recreationalists to experience what this iconic tree species can do in terms of growth and stature.

Table 21: Stand 9- Summary Data

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Volume Per Acre*	Site Index	Tons of C per acre
Stewardship and Climate	9	WH-White pine	60.24 acres	13" WP: 20"	153 ft^2	54 Cords	WP: 71	48.6

Table 22: Stand 9: Basal Area by Diameter Size Class



5.9.2 Terrain and Soils

The terrain in Stand 9 is relatively flat compared to the rest of Pelham Lake Park Forest. Wetlands, and wet depressions dot parts of the Stand. Generally, this is not a rocky Stand, although some stonewalls indicate that there are rocks in the soil profile. There is micro-topography with steep little climbs on the trails.

The soils are mostly Millsite-Westminster, 3 to 8 percent slopes, rocky, and 8 to 15 percent slopes, rocky, with a strip of Ashfield fine sandy loam, 1 to 8 percent slopes, along Pond Road.

5.9.3 Canopy Layers

This is a heavily stratified pine stand with multiple canopy layers. A relatively evenly distributed white pine super-canopy of well over 100' stands nearly a full tree height above the other trees. This lower main canopy is made up of oak, spruce, red maple, and the most significant black cherry component of any Stand on the property. Below that, pockets of thick pine regeneration and areas of poles transition down to an understory that includes spruce, an occasional fir, hemlock, beech, and other hardwoods.

While pine is rated as vulnerable to climate change in much of our region, in this Stand I think it will do fine over time provided it gets good airflow and doesn't get mired in needle casts and afflicted by caliciopsis canker. Forest management, thinning and crop tree release, can help keep pine vigorous and the Town has the optionality here to be proactive.

5.9.4 Regeneration/Ground Cover

The pockets of white pine regeneration are exciting in this stand- see photo below. There are also areas with significant red spruce advance regeneration- some of which is likely quite old. In the areas outside the covenant, this regeneration could be favored and brought along by small expansions of their gaps.

Canada mayflower, starflower, Indian cucumber, and blueberries make up much of the ground cover and shrub layer here. Much of the ground supports a thick leaf litter and duff layer.

5.9.4a Coarse and Fine Woody Material

Portions of this Stand likely saw some extraction of pine ~40 years ago. There is some large woody material on the ground, but it is not as abundant as in other Stands. Finer material abounds as the many layers of forest here contribute branch material. Neither is currently contributing a meaningful amount to the carbon stocking in the Stand.

Figure 36: White pine regeneration colonizes a small opening

5.9.5 Interfering/Invasive Plants

In the northern tip of this stand, and adjacent to it in the wetland, multiflora rose, barberry, and bittersweet are present and should be controlled as soon as possible. Across Pond Road, where it intersects with Cyrus Stage Road, a small infestation of Japanese knotweed is poised to expand and should be eliminated now.

5.9.6 Habitat and Structural Complexity

Some dead and down larger white pines provide habitat value with both snags and coarse woody material in this Stand. The Stand's proximity to the beaver meadow complex makes it an important upland area for the waterlogged terrain there.

5.9.7 Forest Health

The invasive plants here are the primary threat to forest health and should be controlled as soon as possible. The super-dominant white pine is of course vulnerable to windthrow, but the stems currently seem healthy.

5.9.8 Unique Features

The large pines of this Stand are its most unique feature- as well as the clumps of naturally regenerating pine. In a sea of mostly hardwood and hemlock forest, this Stand adds a nice level of current and future diversity.

The beautiful wet areas in the eastern reaches of the Stand are easily visited along the Davis Mine Loop Trail as well.

5.9.9 Climate Vulnerability and Desired Future Condition

This is a place to maintain and cling to the pine that is growing here. Like Stand 6, this is both possible and desirable as the forest continues to develop. The small pockets of pine and spruce regeneration would be allowed to flourish and ascend to the canopy. Relic oak trees will continue to feed acorns into the regeneration pool. And, additional recreational trails could be constructed in and around the big pines along Davis Mine Road. The soils here are sandier and well suited to building climate resilient trails.

Climate vulnerabilities here include:

- Invasive plants taking advantage of earlier growing seasons to colonize the Stand at the expense of native vegetation
- Potential needle cast issues developing in pine if springtime weather is abnormally wet

With multiple canopy layers and the pine regeneration, the forest carbon pool here is well positioned for continued stable storage. It could be enhanced by favoring the growth of pine- perhaps by girdling, felling, or even removing some midstory hardwoods.

5.10 Stand 10- SS-Shrub Swamp- beaver meadow complex

Figure 37: Deeper pools ringed by old beaver dams dot this area

5.10.1 Overview

The main feature of this wetland type is the beaver complex in the north central tip of the property. Also included are some shoreline areas along the Lake as well as another outstanding beaver pond example on the eastern edge of Stand 1. Since the Park is mostly steep, upland forest, these wetlands provide valuable habitat and diversity to the Park itself and at the neighborhood scale.

5.10.2 Terrain and Soils

The wetland soils here are mostly Wonsqueak muck, 0 to 2 percent slopes. These are waterlogged soils with clumps of shrubs and red maples growing on elevated areas. They store high amounts of carbon. They likely also produce lots of methane, but the dynamics of this greenhouse gas in forested and wetland systems is poorly understood.

5.10.3 Canopy Layers

Alder, dogwood, willow, highbush blueberry, ilex, spicebush, and sweet pepperbush make up much of the shrub component here. An occasional pine snag dots the landscape and provides cavities for ducks and woodpeckers.

The shrubby vegetation here is not particularly vulnerable to climate change although extreme storms may threaten the beaver dams and result in rapid alteration of the terrain here should the dams fail.

5.10.4 Interfering/Invasive Plants

The invasive plant situation is the same here as for Stand 9.

5.10.5 Habitat and Structural Complexity

The wetlands of Pelham Lake Park are clearly biodiversity and habitat hotspots. Local birders frequent the riding ring and venture into the wetland complex there. The old beaver dams, lodges, and snags caused by past inundations provide habitat features and the thickets of shrubs host insects, bird nests, and perches for foraging birds. Standing water hosts crayfish, invertebrates, minnows, and small fish.

5.10.6 Climate Vulnerability and Desired Future Condition

Riparian zones provide valuable ecological services of water quality protection and habitat creation. This area will be undisturbed in its pristine condition.

The main climate vulnerabilities here are:

- Invasive plants taking advantage of earlier growing seasons to colonize the Stand at the expense of native vegetation
- Potential unpredictable hydrology given the complex nature of the waters here and climate change weather uncertainties

Section 6: Sustainable Forestry Practices Recommended for 2022-2032

Based on the community-wide listening and education work of this planning process, the vision and goals we surveyed for, identified, and refined based on community input, and on the biophysical reality of what is going on in the forest right now, we present here the set of sustainable forestry practices we recommend the Town pursue over the next decade. Some were completed based on the 2020 Plan while others are newly added and build on the climate change assessment work done in 2022.

Implementing these practices will require a sustained community effort, Town and State-level funding, and a careful, iterative, community-based consensus building and maintenance process as the Town attempts to best serve the greatest number of its residents with the most broadly acceptable set of stewardship practices.

We present each Objective as the Townspeople identified and prioritized it and in keeping with the brief summary table, Table 4, we present in this Plan. Also, see Management Summary Table Below.

Figure 38: Oak Regeneration in Stand 2

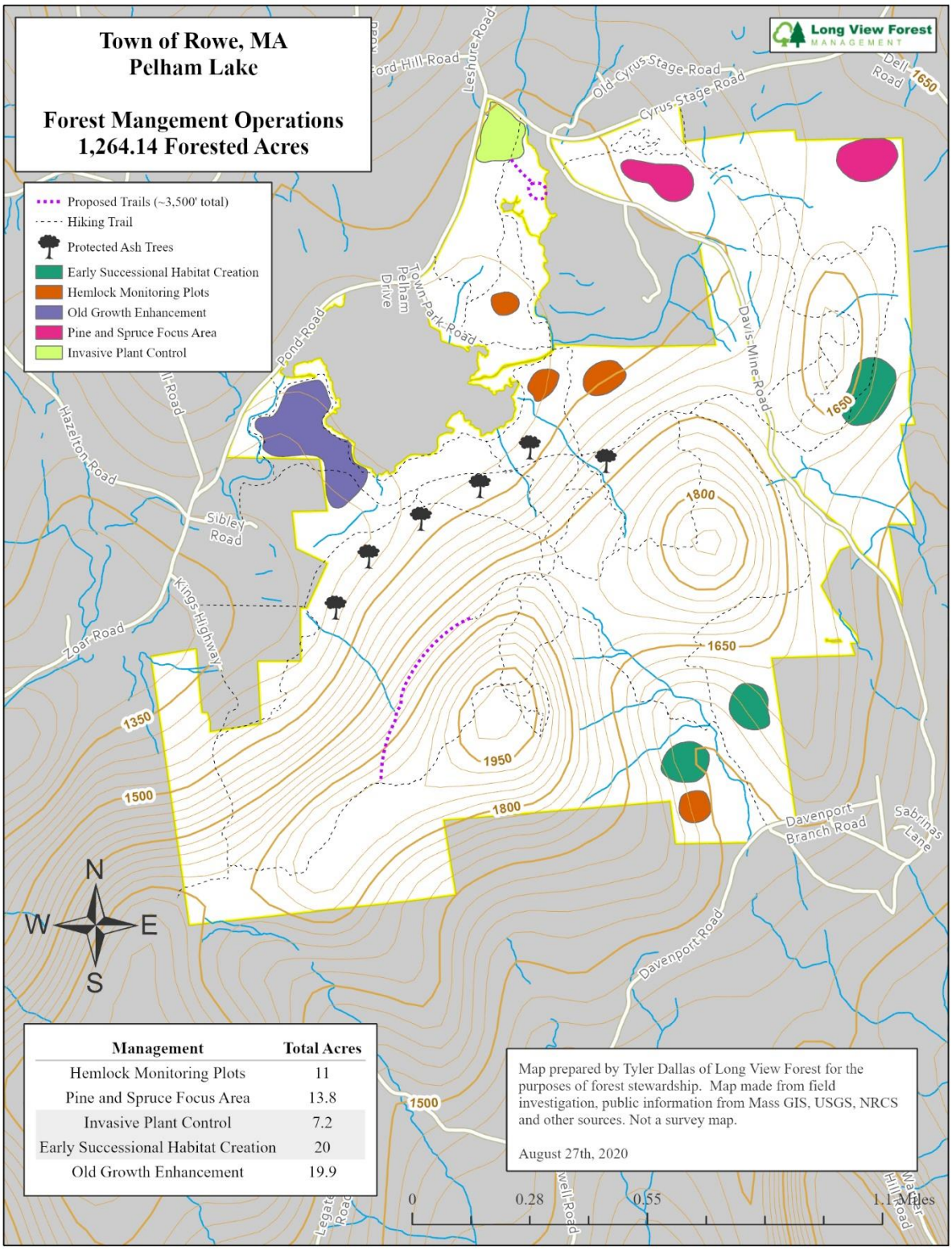


Figure 39: Sustainable Forestry Practices Map

6.1 Discussion

Your community stated in survey results and during the Forest Stewardship Planning Workshops that you are willing to implement sustainable forestry practices only when they will support ecological function, climate change resilience and adaptation, and the continual delivery of the forest's essential services. The proposals below support this premise. We strongly suggest that Rowe devise a consensus building process for the implementation of these recommended sustainable forestry practices to honor the spirit of this Community-based Forest Stewardship Planning Project.

Practice 1

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
8 9 10	HK WP SS	Invasive Plant Control Measures	~5 acres	2020-2025	Increase chances for native plant regeneration and long-term survival to aid in forest adaptation and resilience

Project Specifications: Integrative Vegetation Management (IVM) will be employed, through which each site will be reviewed, and decisions made for application of a safe, cost-effective, and environmentally sound method of control. The invasive plant communities are not extensive yet; and manual and mechanical measures might prove effective for control at this point.

Mechanics of Practice: Manual removal is expensive and time consuming but offers a chemically-free method of invasive plant control. Hand pulling or grubbing is often the quickest and easiest way to halt invaders when first spotted. However, roots that break off during extraction will sometimes re-sprout. Manual removal can also cause unwanted soil disturbance which can result in conditions favorable to invasive plant reinvasion. Frequent visits over the course of several years are often necessary for success with manual control.

One form of manual removal uses digging tools. Digging tools rely on either operator weight or strength to uproot non-native plants from the ground. Some brand names include the Weed Wrench™ Honeysuckle Popper™, Root Talon™, and Extractigator™ or a Mattocks. Mattocks are the tool of choice when manual control is required. A mattock with an ax on one end of the cutting tool and the digging tool on the other is preferred over a pickax when controlling invasive plant species. For species that readily re-sprout from the roots, the entire root system should be removed. Sometimes it is only necessary to remove the crown and any rooted vine nodules.

Hand Clippers and Loppers Hand clippers and loppers are required when mechanically controlling climbing vines or small multi-stemmed woody species. Always follow the vine or stem to the point where it emerges from the ground. If you are unable to unearth the stem, cut as closely to the ground as possible and remove debris. To effectively control most non-native species, it is necessary to apply an appropriate herbicide to the wound. When this is not an option, it will be necessary to repeatedly cut when re-sprouts appear until there is no regrowth.

For some species or densities, careful chemical control done by a licensed applicator is the recommended approach.

Target Species and Stocking Densities: There is a small infestation of bittersweet, barberry, and multiflora rose in the northern tip of the property and a small infestation of knotweed just across the road outside the park.

Stewardship Discussions: Small Towns operate on a tight budgets and shortfalls to revenues are expected for western Massachusetts in the coming years. Rowe might commit financial resources to the provision of ecosystem services. Further public outreach initiatives can discuss the invasive species problem and how climate change can exacerbate them. Perhaps residents will motivate and participate in a volunteer program for simple manual removals of some of the plants as part of a climate adaptation effort. Grant funding from both Federal and State programs will be sought for assistance with this effort.

Practice 2

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefits
All	All	Assess and Map Trails and Develop Trail Maintenance Database and Tracking System and Follow-up with Completion of Maintenance and Infrastructure Development	~15 miles	Completed in 2021	Build and maintain a trail network that is less vulnerable to extreme and irregular precipitation events.

Trail Development and Maintenance Discussion:

1. Preparation Phase: Segment the trail network into sensible zones for the record keeping system and efficient future maintenance.
2. Field phase:
    a. Conduct a thorough GPS survey of the trail network and collect data on surface condition, degree of erosion or disrepair, immediate maintenance needs and those within a 5-year window, and frequency of use.

b. Record trails or sections of the trails ready for retirement and construction of new trail routes. Current technology will allow for configurations within the tools for specific data points for the trail network.
c. Collection of photographic data for the trail system assigned to each segment.

3. Develop an updated and modern GIS database with attribute tables referencing important criteria for seasonal maintenance scheduling. Coordinate this mapping and file archive with the image data from the field assessment.
4. Complete both in-house maps and a publishable trail network map for site users.
5. Using the data and database on the trails, develop seasonal, 5-year, and 10-year maintenance plans for the park.
6. Implementation of the immediate and long-term maintenance plans by the Pelham Lake Park Commission and retain the services of appropriate businesses for help with these practices. Depending on the available resources each year, the availability of both Federal and State grant funds, prioritize the year's work.
7. When the funds have been secured, needs assessment and surveys conducted, feasibility studies done, and designs completed, the Park Commission would undertake the large-scale infrastructure changes to the park such as the proposed boardwalk into the shrub swamp/marsh site at the northern end of the park or additional bridge and wetland/bog crossing construction.

Practice 3

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefits
All	All	Design, Construction, and Installation of Signage at trail heads, along the trail system, and at appropriate points for nature interpretation and educational purposes	15 miles of trails and various sites around the park	Partially completed in 2021. Work ongoing-funding dependent	Direct recreational users to minimize disturbance to off-trail areas

Discussion:

1. Current trail signage is relatively good, but aging. New signage might be useful for directional purposes, identification of permitted uses on segments of the trail, temporary closings for maintenance, trail access points, or parking opportunities.
2. Rowe residents and broader community members use these trails extensively. Raising their awareness of the unique forest ecosystem within the Park, its role in the health and sustainability of the Park, and some of the unique eco-niches enhances their appreciation and willingness to protect this precious resource. A beautifully designed educational board near the entrance of Tuttle Brook into Pelham Lake that describes the function of a watershed, might encourage a hiker

to take all their refuse home or discourage illegal crossing of these brooks in the future.

3. The Park Commission and any interested community members can brainstorm access to funding for these projects.

Practice 4

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
2	HH	Designate a 20-acre reserve in which passive and active techniques are used to encourage old growth forest characteristics	20 acres or more	In progress 2022. Completed by 2023.	Enhanced old growth structure maximizes potential carbon storage and sequestration.

Discussion:

1. Agricultural use of the forest land in Rowe led to these relatively "young forests" (less than 125 years in general here). One cannot create an old growth forest, but old growth characteristics can be encouraged within a forest ecosystem by some simple passive or active stewardship techniques. Characteristics such as small gaps in the main canopy in which seedlings spring up, a few fallen trees on the forest floor and larger sized standing dead trees, species diversity, and high amounts of carbon storage.
2. The easy access to this stand allows use of this technique for educational purposes and the ability of Park users to witness and appreciate the efforts. The stand already supports tree and plant species diversity with some exceptional maturing red oak, hemlock, and white pine.
3. A passive or active approach could be employed here. Passive techniques simply mean "let nature takes it course". If a high wind event blows over a swath of trees, leave the mess and see what happens (except for trail opening). More active stewardship techniques include:

- Drop a few large-sized trees or a small group of 1 or 2 trees to make a patch opening in the dense main canopy to encourage seed germination. These fellings increase vigor and productivity of the remaining trees.
- Retain these fallen trees on the ground for future nurse logs and support of habitat values with woody material.
- Designate legacy trees that are protected and allowed to grow their biological lifespan.
- Girdle some large-sized, maturing trees so that there are large cavity and high perch/nesting opportunities.

4. The Park Commission could explore the establishment of a study site within this stand by local academic institutions. If this project was a part of a long-term study, stand structure development would be documented and archived.
5. Massachusetts Division of Fisheries and Wildlife takes funding applications each year for unique habitat development projects on permanently protected lands.

Practice 5

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
All	All	Install ~25 Trailhead kiosks	25 kiosks at key trailheads	2021	Educational opportunities for Park users to better understand climate change's effects on the forest here

Trail Kiosk Discussion:

1. How park guests engage with the forest depends on how well they understand the trails, the ethos of their use, and the logistics for using them well. Kiosks provide an efficient means to deliver this information as well as a posting board for lost socks, sunglasses, and jewelry. And, they can be distribution/collection centers for dog bags, maps, and donations.
2. The Park Commissioners have applied for grant funding for this extensive project. Fortunately, the Town of Rowe's participation in the Mohawk Trail Woodlands Partnership guarantees prioritization of funding for your Town and assistance with complicated grant applications.
3. Once funds have been secured, the Park Commissioners and Park manager will begin the process of research on construction materials, designs, and installation with their own resources or professional contractors.

Practice 6

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
1 4	BB HH	Enhance Habitat and Forest Structural Diversity by installing and protecting small patch openings for early successional habitat development	St.1: 6-10 acres in 1-2 patches St.4: 2-5-acre patches	2022	Add diverse regeneration to build resilience over time.

Discussion:

1. In Stand 1: Location- along the southeast section of the Davis Mine Loop trail. This allows for minimally invasive machinery access, creates a good counterbalance to the young forest that is aging out in the north of the Cersosimo Parcel, and allows the trail to be a mechanism by which people can experience the regeneration process.
2. In Stand 4: Locate them removed from the spring seep areas and the drainage channels.
3. Placement of the opening near large crowned, healthy seed-bearers like oaks, birches, beech, maples, and pine increases the chances of a good seed catch.
4. Retention of the coarse and fine woody material in the trees supports substrate development and snail feed. Wood thrushes enjoy high-calcium snail shells, and more feed will increase their numbers. Eastern towhee also requires high invertebrate populations that thrive in and around rotting logs.
5. Designation of the patch in an area with low native shrub stocking allows for the possibility of planting some native fruiting shrubs for increased late fall feed pre-migration for songbirds. This project could involve the community or school children.
6. Soil conservation districts can often help with plant procurement and the State of New Hampshire Nursey also has a broad selection available each spring
7. Equipment specifications would restrict size and acceptable weight bearing loads for use on the soils. Access road widths, road number, and road surface area would be minimized. Use of the past truck access points (landing sites) would prevent further development of roadside areas to discourage any post-project unwanted access.
8. Consider installing fencing, or slash walls, or a paired study with both, to restrict deer and moose access to regeneration.
9. Consider mechanical and chemical beech control ahead of patch creation to favor diverse regeneration.

Trees to be Removed and Trees To be Retained:

In Stand 1, fellings/removals would focus on diseased, poor quality beech in the 6-20" diameter size classes, but there would necessarily also be the felling/removal of some sawtimber-sized ash, oak, red maple, sugar maple, and yellow birch in the 14-20" size class to achieve the open-light conditions necessary to germinate a diversity of species. Trees 20" + would largely be left standing- either alive or girdled to provide habitat as they fall-apart slowly over time.

Most of the volume would be from low-grade hardwood. Around the patch, healthy beech, yellow birch, oak, and maples would be retained. In a larger patch such as this, some trees can be retained for structure, seed source, and continued growth.

In Stand 4, fellings/removals would include hemlock of all size classes, low-grade hardwood in the 6-20" size class, and some black birch and red oak. Again, larger, poor quality stems would be left standing for their habitat value. Healthy oaks, black birch, pine and the occasional cherry across all size classes would be retained in and around the openings for structure, seed source, and continued growth.

Proposed Volumes and Basal Area Removals in Treatment Sites:

In Stand 1, removals could be expected to be ~40 MBF in sawlog material and 200 cords of lowgrade material. This would remove/fell 90% of the basal area which is ~119 ft^2/acre In Stand 4, sawlog volume could be expected to be ~60 MBF and lowgrade 300 cords. This would also remove/fell 90% of the basal area which is ~137 ft^2/acre.

Practice 7

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
6 9	SP WH	Forest Stand Improvement	St.6: 6 acres one patch St.9: 2 acres	2025	Increased vigor and representation of otherwise underrepresented species

Discussion:

Their overcrowded condition suppresses seed germination, seedling development, individual tree vigor, and stand health. If some of the overstory trees were either felled and left on site or removed conservatively in a harvest project, the residual stand would improve its growth and small gaps would allow for seed germination on the forest floor. The technique might involve simple removal of trees to widen the gap around the thickets of white pine seedlings present in Stand 9. Relatively small equipment with minimal site impact could be used.

Practice 8

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
2	HH	White Ash and Biodiversity Protection	10 trees protected in 2022. Follow up recommended in 2024	2021 and 2024	Preserve ash on the landscape to maintain biodiversity and resilience.

White ash grows well in the climate within the Park. Emerald ash borer has been recorded down the hill in Charlemont. The choice of ten genetically superior, healthy white ash stems for inoculation against infestation will preserve this valuable species within the park's forest ecosystem. Since ash is dioecious, it will be important to maintain specimens of both sexes.

Practice 9

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
1 2 3 4	BB HH BB HH	Plant red and white oak seedlings (large size) within the stands to increase the stocking levels of this species for habitat, biodiversity, and economics (carbon or timber).	Dispersed planting over 200+ acres 4 acres with 200 seedlings completed in 2022.	2020-2030	Assisted migration of white oak onto the site and enhancement of the red oak component

Discussion:

1. United States Department of Agriculture Soil Conservation Districts can often help with plant procurement and the State of New Hampshire Nursey also has a great selection of seedlings available each spring. Community donations could also be looked for from Franklin County nurseries or businesses.
2. The planting could be privatized or conducted as a community forest outreach program with aid from local eagle scout candidates, high school environmental sciences classes, or interested Rowe residents.
3. Prior to the actual seedling planting exercise, it is advisable to open the seedbed to added sunlight with the removal of thick duff layer around the plant site. Seedlings could be planted within the small gap openings from the tree removals.
4. Given the herbivore populations locally, protection of the seedlings is recommended with plastic tubing or fencing.
5. Red oak will survive a warming world well, and any resource invested in its perpetuation will enhance the climate mitigation capacity of this forest.
6. Choice of planting sites should utilize natural openings with ample sunlight for healthy seedling development.
7. Grant funding for this practice could be sought from the Greening the Commonwealth Program, the DCR Community Forest Stewardship Grant Program, or future Mohawk Trail Woodlands partnership grant cycles. Given that red oak is a predicted species suitable for a warming climate, this practice may qualify for climate mitigation through forest grant sources.

Practice 10

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
9	WH	Installation of a wooden guardrail roadside near the bog	100 feet+	2021	Preserve special places and help exclude traffic impacts

The small pitcher plant community nestled in the roadside bog on Davis Mine Road is a rare treasure in the park. Although chances are low for an unfortunate accident and unintentional hazardous waste spill along this road, protective measures would guarantee this uncommon plants' sustainability in the bog.

Practice 11

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
All	All	Boundary (external and interior) Designation and Signage	Full Park	2020-2022	NA

Boundary delineation allows through hikers to understand when they have entered the Park and what your expectations are of their visit. A delineation between covenant and non-covenant bounds provides hunters with a physical barrier for their range.

Practice 12

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
All	All	Development of an acquisition strategy or Conservation Restriction development strategies for long term protection of forest landscape- explore fund raising, grant applications, and continual information seeking on available, prized properties	All	2022-2032	Expanded forest protection and contiguity would increase resilience.

Rowe practices wise and sustainable stewardship of the park for the enjoyment of current and future generations. Your neighbors may not hold your long-term vision for the sustainability of forest ecosystems. Acquiring lands or promoting the establishment of conservation restrictions upon the neighboring lands secures their protection from development and loss of forest, and it would extend the careful stewardship philosophy outside of the Park's current boundaries. For climate change, this would also help keep forests as forests- the most basic of resistance strategies to a changing climate.

The Massachusetts EAA offices sponsor various land acquisition programs for conservation purposes, and private foundation funding might also be considered if an ideal prospect is found. Local land trusts support neighborhood conservation restriction projects (one is underway with the Franklin Land Trust now with your neighbors to the west inclusive of Van Italie, Hicks, Molly Scott, Sargent family, and the Meyers family, which would establish a conservation restriction on close to 800- acres west of Mount Adams along the Davis Mine brook and Maxwell brook watersheds).

Having a documented plan for the process of purchase, research of the value, and negotiation on behalf of the park will facilitate the process when land becomes available in the future.

Practice 13

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
1 2	WK HH	Develop either Town-specific Best Management Practices (BMPs) or the codify as policy for the Town a set of BMPs	Property-wide	2022	Public engagement around any forest stewardship practices will increase buy-in and help assure project success yielding better climate outcomes

Discussion:

1. This practice supports the sustainability of the ecological services and benefits provided to humans from these forests-specifically a) the hydrologic cycle through which forests absorb water from soil and atmosphere and return it and filter it for its improved quality and b) Soil quality and function as forests filter toxins before they enter the soils, anchor soils in place, support microbial and microorganism activity to build soils, which support all life.
2. Survey results and public comments indicate that the community shares a concern for the protection of water resources and soil integrity during the implementation of any sustainable forestry practices on the Park.

3. The Massachusetts Department of Conservation and Recreation has a set of BMPs for use when a timber removal project occurs. The Massachusetts 2014 BMP Manual lists some minimal requirements for statutory compliance, and another set of suggested practices for the protection of water and soil. If silviculture is initiated on the Park, both the minimal and the additional precautionary suggested practices will be followed.
4. Written guidelines or at least a discussion of appropriate BMPs for the protection of water quality, soil integrity, rare, endangered, and protected species zones, or unique cultural sites (ice pond) are advisable for use during any future trail development or maintenance projects.
5. Concern was presented about machinery use for any sustainable forestry practice in these woods. Heavy equipment used on sensitive ground or under inappropriate conditions can change the landscape and soil function for a long time. This community process of standards documentation could consider a mandate for types of harvesting equipment permitted on the Town forests, scheduling constraints, and harvest protocol that supports minimal impact.
6. This work might also address a policy for the oversight of equipment use on Town forest lands for the completion of any sustainable forestry practices. Whether it is accomplished via a detailed contract with any contractors that are privileged to work these lands or through a private consultant or Town official, language that conveys the needs of the community and the rigor of the Town-wide BMP's must be used.
7. This process should also consider standards for the protection of culverts and commonly used roadways during any sustainable forestry practice that involves the use of equipment across these structures.

Practice 14

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
All	All	Completion of a Carbon Inventory Process and Verification of the Carbon Credit Equivalents within the organic components of this forest ecosystem and the development of a long-range, detailed Climate Mitigation Strategy	Property-wide	2020-2030	Increasing carbon storage and securing its future here would help mitigate climate change

Discussion:

1. Accurate estimates of carbon in forests are crucial for forest carbon management, carbon credit trading, national reporting of greenhouse gas inventories to the United Nations Framework Convention for Climate Change, calculating

estimates for the Montreal Process criteria and indicators for sustainable forest management and registering forest-related activities for state and regional greenhouse gas registries and programs. While the inventory we performed to write this plan is rigorous and useful as a baseline, it does not meet the standards of a carbon inventory.

2. The Commonwealth and its Executive Office of Energy and Environment are exploring the use of carbon marketing programs for incentivizing the use of our valuable forests in western Massachusetts as a climate mitigation tool. When this program is launched, the Town might consider the development of a carbon program within their Town forests. A set of guiding documents can be found here: https://www.mass.gov/guides/climate-forestry
3. The United States Forest Service offers technical assistance with the establishment of carbon friendly forestry practices (much like the ideas presented in this document) on municipal and community forest land. It may be helpful if the Town considered participating in a study or project with the United States Forest Service Northern Institute of Applied Climate Sciences case study on the Town forests. This process would provide detail about the condition of the Town forests with respect to surviving and thriving under different climate change scenarios into the future.

Practice 15

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing	Climate Benefit
1 2	WK HH	Development of a Monitoring Program and Documentation or Archive System	Stand -wide. However, principles can be applied property-wide as well	2020-2030 Hemlock monitoring plots established in 2022	Establish baseline monitoring to track climate change impacts

Discussion:

1. As discussed throughout this plan, change is an inevitable part of all-natural processes. The forest will evolve through the next ten years, and our climate will continue to change. One can wisely guess, but not completely understand today what threats or challenges this forest ecosystem will face though this period. The establishment of a record keeping system to archive the forests' current condition (this document could serve as your baseline description of the forest and its functionality

in 2020) and the changes that occur with each growing season and weather cycles provides the Town with the flexibility necessary to work on solutions if problems arise.

2. This responsibility could be hired out to a forester, a botanist, an environmental consultant or taken on by the Park Commission.
3. Good record keeping and documentation will also position the Town to take advantage of any carbon sequestration, climate mitigation, or carbon credit marketing programs that arise during the coming years. Your Town invested the initial resources to complete this Forest Stewardship Management Plan, and you can easily leverage the data, ideas, and stewardship issues presented here for future program development.
4. Monitoring hemlock will be an important task over the course of this Plan. Keeping an eye out for thick/thin crowns, dying trees, and regionwide reporting on winter Hemlock Wooly Adelgid mortality rates will help inform this effort. It is recommended to install 6 permanent monitoring plots throughout Stands 5 and Stands 8.

6.2 Community-based Forest Stewardship and Budgeting Planning

The Town of Rowe wishes to be directly involved with any decision relating to the stewardship of their forests and the use of any sustainable forestry practices upon them. With the Park Commission, Rowe is well-positioned to solicit and discuss meaningful community input. Perhaps the most important thing the Townspeople would like is to be fully informed in a timely fashion whenever forest management work is planned. As mentioned earlier in this document, one way to assure full disclosure or any discussions relating to the Park would be to continue to rely on the Park Commission in its stewardship and community representation function. On a day-to-day basis, The Park Manager gets the most input and is in close communication with the Commission as well.

Small Towns face financial dilemmas most budget cycles each year. Our current pandemic might enforce austerity measures for years. This Park Commission can stay current on grant funding opportunities (Federal and State as well as private foundations), complete applications, and supervise the direct supervision of the grant itself and all work on the Park or retain a third-party for such supervision and implementation.

Table 23: Management Summary Table

This table summarizes all the information presented above in Section 6.

Stand	Obj Code	Desired Condition	Management Action	Climate Change Adaptation Benefit	Carbon Benefit	Value (V) Cost (C) Cost Share (CS)
8,9,10	Stew	Thriving native plant communities	Mechanical or Chemical control of invasive plants	Increase chances for native plant regeneration and long-term survival to aid in forest adaptation and resilience	Maintain typical plant-soil interactions	C CS
All	Stew	Stable and climate-smart maintainable trails and trail infrastructure	Assess and Map Trails and Develop Trail Maintenance Database and Tracking System and Follow-up with Completion of Maintenance and Infrastructure Development	Build and Maintain a trail network that is less vulnerable to extreme and irregular precipitation events.	Reduce soil carbon loss due to erosion	C CS
All	Stew	Well-marked trails to reduce off-trail impacts	Design, Construction, and Installation of Signage at trail heads, along the trail system, and at appropriate points for nature interpretation and educational purposes	Direct recreational users to minimize disturbance to off-trail areas	Reduce soil compaction and vegetation impacts off trail	C CS
All	Stew	Informative kiosks highlighting Park features and climate change impacts and mitigation strategies.	Install ~25 Trailhead kiosks	Educational opportunities for Park users to better understand climate change's effects on the forest here	Spread knowledge about forests' role in sequestering and storing carbon.	C CS
2	Stew	Old growth, carbon rich demonstration site	Designate of a 20-acre reserve in which passive and active techniques are used to encourage old growth forest characteristics	Increased carbon sequestration and storage and development of a complex, resilient forest.	Increased carbon sequestration and storage	C CS

Stand	Obj Code	Desired Condition	Management Action	Climate Change Adaptation Benefit	Carbon Benefit	Value (V) Cost (C) Cost Share (CS)
1, 4	Stew	Patches of successful and diverse native regeneration protected from herbivory	Enhance Habitat and Forest Structural Diversity by installing and protecting small patch openings for early successional habitat development	Add diverse regeneration to build resilience over time.	Some storage in long-lived wood products if utilized. Otherwise, a short term carbon loss	V-Potential timber value. C/CS-Fencing or slash walls would be a cost or cost-share.
6, 9	Stew	Increased vigor on underrepresented species	Forest Stand Improvement	Increased vigor and representation of otherwise underrepresented species	Increased growth rates and carbon storage on stable, healthy trees. New patches of released regeneration rapidly accumulate additional carbon.	C CS
2	Stew	Persistence of white ash on the landscape	Inoculate white ash to protect them from emerald ash borer	Preserve ash on the landscape to maintain biodiversity and resilience.	NA-Keeping ash alive keeps them sequestering and storing carbon.	C CS
1-4	Stew	Red and white oak seedings established and thriving	Plant red and white oak seedlings (large size) within the stands to increase the stocking levels of this species for habitat, biodiversity, and economics (carbon or timber).	Assisted migration of white oak onto the site and enhancement of the red oak component	Prepare the Stands with future climate adapted species ready to sequester and store carbon	C CS
9	Stew	A protected rare plant community	Installation of a wooden guardrail roadside near the bog	Preserve special places and help exclude traffic impacts	NA	C CS
All	Stew	Well-marked property and internal use boundaries	Install boundary (external and interior) Designation and Signage	NA	NA	C CS

Stand	Obj Code	Desired Condition	Management Action	Climate Change Adaptation Benefit	Carbon Benefit	Value (V) Cost (C) Cost Share (CS)
All	Stew	Optionality to add land to the Park or pursue other conversation nearby	Development of an acquisition strategy or Conservation Restriction development strategies for long term protection of forest landscape- explore fund raising, grant applications, and continual information seeking on available, prized properties	Expanded forest protection and contiguity would increase resilience.	More permanently protected forest reserves or working forest producing high quality, long-lived wood products increases long term carbon sequestration and storage potential.	C CS
1,2	Stew	Community Consensus around forest stewardship practices	Develop either Town-specific Best Management Practices (BMPs) or codify as policy for the Town a set of BMPs	Public engagement around any forest stewardship practices will increase buy-in and help assure project success yielding better climate outcomes	Community consensus around the tradeoffs involved in balancing management, reserve areas, biodiversity considerations, and soil impacts will help clarify carbon goals and potential impacts	C CS
All	Stew	A comprehensive understanding or carbon stocks on the Park	Complete of a Carbon Inventory Process and Verification of the Carbon Credit Equivalents within the organic components of this forest ecosystem and the development of a long-range, detailed Climate Mitigation Strategy	Increasing carbon storage and securing its future here would help mitigate climate change	Knowing how much carbon the Park holds and how vulnerable that carbon is to near and longer term loss would help planning and to inform management decisions	C CS
1, 2	Stew	An established monitoring network for hemlock health and other forest variables	Develop a Monitoring Program and Documentation or Archive System	Establish baseline monitoring to track climate change impacts	Understanding hemlock decline on the Park will help drive any carbon management decisions	C CS

Section 7: Signature Page

Section 7: Signature Page

Check each box that applies

☐ CH. 61/61A Management Plan I attest that I am familiar with and will be bound by all applicable Federal, State, and Local environmental laws and /or rules and regulations of the Department of Conservation and Recreation. I further understand that if I convey all or any portion of this land during the period of classification, I am under obligation to notify the grantee(s) of all obligations of this plan which become his/hers to perform and will notify the Department of Conservation and Recreation of said change of ownership.

☒ Forest Stewardship Plan. When undertaking management activities, I pledge to abide by the management provisions of this Stewardship Management Plan during the ten-year period following approval. I understand that if I convey all or a portion of the land described in this plan during the period of the plan, I will notify the Department of Conservation and Recreation of this change in ownership.

☐ Green Certification. I pledge to abide by the FSC Northeast Regional Standards and MA private lands group certification for a period of five years. To be eligible for Green Certification you must also check the box below.

☐ Tax considerations. I attest that I am the registered owner of this property and have paid all applicable taxes, including outstanding balances, on this property.

Signed under the pains of perjury:

Owner(s) _____, Selectboard, Chair Date 7/16/2022

Owner(s) Laurie Pike Park Commission, Chair Date 7/16/2022

I attest that I have prepared this plan in good faith to reflect the landowner's interest.

Plan Preparer:

Alex Barrett Alex Barrett, MLF #460 Date

I attest that the plan satisfactorily meets the requirements of CH61/61A and/or the Forest Stewardship Program.

Approved, Service Forester _____ Date _____

Approved, Regional Supervisor _____ Date _____

In the event of a change of ownership of all or part of the property, the new owner must file an amended Ch. 61/61A plan within 90 days from the transfer of title to insure continuation of Ch. 61/61A classification.

Appendix A: Ecological Forestry

The use of Ecological Forestry (EF) principles strives to maintain the ecological processes of water filtration, carbon storage and biodiversity protection within a forest ecosystem. Ecological Forestry is a silvicultural philosophy that perpetuates forest ecosystem integrity at a landscape spatial scale while continuing to provide the full suite of ecological goods and services as discussed previously in the Forest Stewardship Management Plan. It is an appropriate silvicultural tool to meet the integrated goals of management on the Park. Ecological Forestry depends upon the continuity of the forest structure, function, and biotic communities before and after any harvest disturbance to the ecosystem. If your community accepts a silvicultural harvest, or a forest enhancement activity, it is planned and executed to mimic natural disturbances and processes. Therefore, these projects follow a wide gradient of size/shape from the individual tree to small patches/gaps to entire stands.

Each disturbance frees up growing space in the forest yet retains many of the elements of the original forest such as standing dead cull trees and legacy mature stems. Structural and compositional complexity is preserved or created during any disturbance. On the Park land, there is already a complex mosaic of species, size classes, and natural features. However, it is largely a middle-aged forest and management here can seek to guide portions of the woods toward both a younger set of forests, and an older forest condition replete with the structural complexity and messiness that this generally entails. The proposed old growth enhancement area (See Practices Map) will grow undisturbed towards biological maturity, some individual trees within stands will mature, and some sites will mimic larger scale disturbance for the creation of young forest. This process blends the preservation of refugia sites and mature forests, and could also include regeneration harvests, variable density thinning, and crown thinning for the improvement of individual tree and stand vigor, habitat, carbon reserves, and biodiversity.

Longer rotation ages (in excess of 200 to 250 years) for the best site-suited tree species and longer periods between harvest disturbances (cutting cycles set to 20 to 25 years) allow for the development of the desired structural complexity within an area post disturbance. The community plans and executes a disturbance regime schedule after a thorough identification and mapping of all the environmentally or culturally sensitive zones upon the watershed. With this approach, critical resource sites such as functional riparian zones or seep collection fonts or culturally important structures such as stone walls and cellar holes are located and protected. Longer rotations also accommodate species specific adaptations amongst the forest to climate change.

The following seven elements guide the field application of ecological forestry practices:

1) forests have intrinsic value,
2) humans need to extract products from the forest,
3) silviculture should follow natural processes as much as possible,
4) foresters should plan for the long term,
5) forestry is implemented at the stand scale but must be in balance with the larger ecosystem,
6) the social and economic context matters, and
7) science and place-based experience should guide silviculture.

These guidelines would form, if necessary, the silvicultural tenets that guide prescriptions for the stewardship of the Park

The next discussion states the harvest standards and guidelines necessary for the protection of the ecological function

Forest Management Standards for the Silvicultural Application of Ecological Forestry on Rowe's Pelham Lake Park

Goal: Use of sylvicultural-based timber harvesting within the EF context for the maintenance and development of an all-aged, species rich, structurally complex, biodiverse, natural filtration watershed forest.

Standards or Practice:
1. Apply current and generally accepted scientific principles from the 2014 Massachusetts Best Management Practices manual to conserve soil and water quality across the managed sections of the watershed forest.

2. Apply current and generally accepted Ecological Forestry silviculture principles for native biodiversity protection as a standard for the managed sections of the watershed forest.

3. Establish long term (200 to 250 year) rotations (time necessary to produce the desirable management crop on the watershed) and establish 15 to 20 year intervals between harvest disturbances within any give management unit on the watershed forest unless more frequent entries are necessary for salvage due to pathogen damage or regeneration purposes.

4. Prevent the movement of sediments into the riparian zones and its riparian corridor of seeps, streams, wetlands, and swamps during any silvicultural harvest work.

Conduct all silviculture harvests under an approved Massachusetts Chapter 132 Harvest Cutting plan and in full compliance with Massachusetts Chapter 131 The Wetlands Protection Act.

5. Establish and maintain all access/truck roads, skid roads, and landings areas in compliance with both the required and recommended best management practice guideline in the 2014 BMP Manual.

6. Avoid wetland area crossings during any harvest operation, establish and maintain appropriate stream crossings for logging machinery and operate the machinery within these crossing areas in strict compliance with both the required and recommended best management practice guidelines in the 2014 BMP Manual.

7. Locate and map all vernal pools within designated harvest areas and plan the harvest with strict compliance with all the required and recommended best management practices guidelines in the 2014 BMP Manual for vernal pools.

8. Establish ~50-foot filter strips around all designated and mapped riparian zones across the Forests, which are zones essential to the collection and movement of groundwater across the forest ecosystem and into the riparian zones. Restriction of any harvest or entrance into the riparian zones or their 50-foot filter strips.

9. Conduct annual interior service road inspections and conduct annual maintenance of the culvert system and periodic erosion control measure installations along this road system to prevent roadbed degradation and the potential for increased erosion and runoff along these road networks.

10. Survey the property (ideally in early spring) and identify in finer detail the important hydrologic features of a proposed harvest site and mitigate for water quality. Protect surface waters and wetlands by appropriately locating roads before harvesting begins and applying other all BMPs.

11. When logging in and near the forested wetlands, avoid rutting and other damage by cutting when the ground is frozen or sufficiently dry to support the type of equipment used.

12. Before harvesting within or near rare or sensitive wetlands, consult with the Massachusetts NHESP for their most recent Conservation Management Practices for site protection during harvest work and these CMP's would be implemented.

13. Comply with all Conservation Management Practices if necessary, from the Massachusetts Natural Heritage and Endangered Species Program for the protection of

any state listed and priority natural communities identified within the managed sections of the watershed forest.

14. Designate a wetland buffer adjacent to forested and non-forested wetlands. A buffer's effectiveness increases with its width. Sensitive wetlands require larger areas of upland to reduce the risk of disturbance.

15. Designate no-disturbance zones inclusive of steep slopes, highly erodible soils, known threatened and endangered species habitat, rare plants and exemplary natural communities, or nests.

16. Leave the areas closest to the stream, pond, or wetland un-harvested to provide increased protection to aquatic habitats and allow a reliable long-term supply of cavity trees, snags, and downed woody material. Larger zones will increase the protection of non-timber values; however, no-harvest zones may not always align with ecological or silvicultural objectives.

17. Retain trees with cavities, standing dead trees, downed logs, and large superior canopy trees.

18. Maintain the boundaries of the Forests for protection against trespass and illegal uses of the site.

19. Implement strategies for invasive plant control on the Park.

20. Everywhere, apply appropriate methodologies matched to site specific conditions for the protection of biodiversity.