Forest Stewardship Climate Management Plan 2022-2032
Town Farm Forest
Total Forested Acres: 107

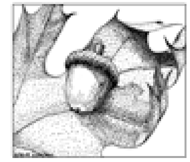
Presented to: Conway Select Board and The Residents of Conway, 32 Main Street-
P.O. Box 240, Conway, MA 01341

Revised by Wigmore Forest Resource Management

Mary K. Wigmore- 1601 West Road, Williamsburg, MA 01096
MLF #250

dcr

FOREST MANAGEMENT PLAN



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

CHECK-OFFS

CH61		CH61A		CH61B		STWSHP		C-S	
cert.	☐	cert.	☐	cert.	☐	new	☒	EEA	☒
recert.	☐	recert.	☐	recert.	☐	renew	☐	Other	☐
amend	☐	amend	☐	amend	☐	Green Cert			☐
						Conservation Rest.			☐
Plan Change:		to				CR Holder			

Administrative Box

Case No.		Orig. Case No.	
Owner ID		Add. Case No.	
Date Rec'd		Ecoregion	
Plan Period		Topo Name	
Rare Spp. Hab.		River Basin	

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) **Town of Conway**

Mailing Address **32 Main Street, Conway, MA 01341** Phone **413.369.4235**

Email Address

Property Location: Town(s) **Conway** Road(s) **Cricket Hill Road**

Plan Preparer **Wigmore Forest Resource Management** Mass. Forester License # **250**

Mailing Address **1601 West Road, Williamsburg, MA 01096** Phone **413.628.4594**

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
416	68	406	174	108				108
			TOTALS	108				108

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

HISTORY

Year acquired **1889** Year management began **1990's**

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 needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date

(Form revised April 2010)

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	X			
Improve hunting or fishing			X	
Maintain or enhance privacy			X	
Preserve or improve scenic beauty	X			
Protect special features, including those of historical or person significance	X			
Enhance the quality and/or quantity of forest products*			X	
Practice agroforestry				X
Produce income from timber products, or other products and services			X	
Produce firewood for personal use			X	
Enhance habitat for birds	X			
Enhance aquatic habitat in streams, ponds, and other wetlands	X			
Enhance habitat for wildlife	X			
Promote diversity of plant species and habitat types	X			
Increase forest resiliency	X			
Minimize damage from forest pests	X			
Protect water quality	X			
Sequester and/or store carbon to mitigate climate change	X			
Suppress or eradicate invasive plants	X			
Lower property taxes				X
Protect land from development	X			

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

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

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.

Contents

Acknowledgements

This work was made possible with the support of the Massachusetts Executive Office of Energy and Environmental Affairs and the Mohawk Trail Woodlands Partnership. We also would like to thank the partnership of Northern Institute of Applied Climate Science, Massachusetts Department of Conservation and Recreation, Massachusetts Audubon, and the New England Forestry Foundation.

Climate change and its impact on our forests present a complex challenge to the forest science community. A unique collaborative of Federal, State, and non-profit agencies are searching for practical solutions to our future forest management problems given with a warming planet. Massachusetts Licensed Foresters were trained in the science of climate change and how it will impact the forests of western Massachusetts. This training empowered local foresters to enable the Town of Conway to make wise decisions about the care of the Fournier forest ecosystem as it endures a changing climate.

The authors would also like to thank the Conway Selectboard, the people of Conway, the Conway Forest and Trials Committee, Joshua Rapp, Andrew Randazzo, Alison Wright-Hunter, and Veronique Blanchard for all their engagement, help, input, and enthusiasm.

Executive Summary

Figure 1: Retained red maple, oak, and hemlock inclusions developed in Stand 2 from natural disturbance and harvesting ~12 years ago that established a new cohort of trees.

Our climate is changing each year due to human impacts on the environment associated with the burning of fossil fuels and the emissions of other greenhouse gases. Your beloved community forests must endure the impacts of these climate changes and the escalations in the climatic driven phenomena each year. Your Town experienced the raw power of extreme wind in 2017.

Your forest survived that disaster and kept delivering its essential gifts like the filtration of your drinking water, provision of homes to songbirds and other wildlife, sequestration, and storage of carbon dioxide to clean our air, production of high-quality future lumber, a teaching moment with a 4th grader, and the comfort of a quiet walk on a sunny day. Your participation in the Massachusetts DCR Forest Climate Program may help you to support its capacity to do so forever.

Climate change might alter where tree species live, how they reproduce, and the timing of biological events, which could fundamentally transform forest ecosystems and the life that counts on them. The Massachusetts Forest Climate Program (FCP) is designed to educate your community about these potential impacts to the Town Farm forest from our changing climate. The Town Farm community forest isn't defenseless in this dynamic environment, trees and forests have inherent resiliency characteristics that support sustainability of the ecosystem.

Of course, every day will not be a picnic in the woods, your forests also have vulnerabilities and risks that work against their natural resiliency. If you understand these dynamics and the true character of the Town Farm forest ecosystem, your community would be prepared to make the right choices for the care of this land despite the chaos our changing climate might bring to Conway.

The Forest Stewardship Climate Management Plan (FSCMP) aims to assure you that the management goals that your community defined through the 2020 outreach/visioning process are still attainable in this era of climate change. The revised Forest Stewardship Climate Management Plan weaves multiple scientific disciplines and recent ideas on appropriate management actions for an uncertain future with your values and dreams for the historic Town Farm forest. Looking ahead 10, 20 or 50 years, the actions that your Town chooses now, done well despite the prediction of an acceleration of climate change phenomena, could enable the development of a diverse resilient forest capable of sustained ecological function.

Efforts were made during the completion of the 2022 management plan revision process to retain the integrity of the original 2020 community-based decisions. Your community took a journey with the vision and goal setting process in 2020. During a global pandemic, in typical Conway style, you placed a priority on the intelligent stewardship of your Town forests. This revision will read like the original plan with the focus shifted towards the consideration of our climate and its impacts on your future forest condition.

The climate change relevant material has been scattered throughout the document. For ease of review, these new, revised sections are highlighted in blue text. Our discussion starts with a summary of climate change phenomena and the impacts to the forests of Western Massachusetts. Comments on the climate and its effect your specific forest ecosystem structure and condition are then reviewed within each original subject heading and climate forestry specific sections have been added to the management plan to aid in your understanding.

The developers of the DCR's Climate Forestry Program's intended to alleviate our collective anxiety that our earth and our forests might fail us in our hour of need. Luckily, we live in a connected society today in which the facts of climate and forest science are easier to summarize and deliver in one document, which hopefully helps you to learn progressive ways to steward your forest in preparation for the changes.

The Town Farm forest ecosystem has moderate to high resiliency and low to moderate vulnerability to serious impacts from climate change. The science-based adaptation and mitigation approach encouraged by DCR's Forest Climate Program (FCP) could enable you to make management decisions and take actions that support the sustained ecological function of your forests.

The basic objective of the plan is to introduce a new direction for forest management that will hopefully sustain forest ecological function and tree vigor while they are enduring climate change impacts. With an introduction of your broad forest stewardship goals in the first section of the management plan, the FCP aspires to support your actions now which will determine the health, structure, and ability of your Town forests to thrive in a warmer climate over fifty years from now. You will gain an understanding of whether your Town forests are vulnerable or at risk to the potential impacts of climate change. The DCR Climate Forestry Program invested in this document to support your decisions for the use of climate adaptation and mitigation actions to achieve the ambitious goals your community developed in 2020 despite a changing climate.

Section 1: Conway Town Farm Property Goals Overview

The Forest Stewardship Planning Survey (Conway, May 2020, LV and WFRM) and the Conway Forest Stewardship Planning Workshops (Zoom Platform, May 26, 2020, and August 26, 2020) provided a clear, condensed set of goals and objectives for the stewardship of your Town forests. This Forest Stewardship Climate Management Plan took those goals and added the language of a newly developed paradigm known as climate adaptation and mitigation forestry.

Further on in the document, a link is made directly from these goals to the original derived set of sustainable forestry practices (full set in Appendix B), which for this revised document will be known as adaptation and mitigation actions or forest resiliency practices. Some rewording of the original work was done to align the revised plan with the objectives of the DCR Climate Forestry Program.

This document adheres strictly to the work of community efforts in 2020 with the proposal of a set of sustainable climate adaptation and mitigation actions/forest resiliency actions that are realistic given the Town's finite human resources, time, and financial resources. These actions were chosen in 2020 due to their support of ecological results such as improving forest ecosystem function, increasing forest resilience, and maintaining or enhancing goods and services provided to the community. **Marketable timber goods are consistently ranked as the lowest priority to your community during the visioning process**.

The Conway community stated the following goals for the stewardship of the Town Farm forested property for 2020 to 2032

1. Sustain biological richness (biodiversity) defined as all forms of life within the forest and the complex ecological roles they play in a diversity of ecosystems and forest landscapes where they live.

2. Sustain the ecological services and benefits that the forest provides to the community, which are defined as and presented in the order of importance to Conway residents and taxpayers:
    a. Social and emotional goods- forests support well-being, relaxation, spiritual sustenance, study of nature, and recreational activities.
    b. Hydrologic cycle in which forests absorb water from the soil and the atmosphere, filter it of impurities, and return it to the earth making some useful for human drinking water.
    c. Soil fertility and health as forests filter toxins before they enter the soils, anchors the soils on the landscape, feed tree root systems, and support microbial and microorganism activity that build up soils and support all life.
    d. Climate change impacts greenhouse gas (specifically CO_2) emissions mitigation as forests function as a carbon sink that pulls these poisons out of the atmosphere via photosynthesis (carbon sequestration) and hold it for a long time in the boles, leaves, branches, and roots of living trees (carbon storage). Climate change mitigation involves the reduction of carbon dioxide and other greenhouse gases in the air because trees remove a lot of carbon dioxide through the growing season.
    e. Cultural values- the small cemetery on the hill and the Conway Town Farm foundations, corrals, and stone walls hold an important piece of town history.
    f. Economic goods-timber products and fuelwood- designated as the lowest priority to the Town of Conway-but some members of your community did place a value of timber production. It was agreed that tree removals could occur if they are motivated by a compelling environmental reason and directly support the goals of the Town, not for commercial gain.

3. Sustain or enhance, when necessary, forest resiliency. A resilient forest is one that will continue to be an ecologically functioning forest ecosystem well into the future.

4. Promote the health and productive capacity of the forest and trees and regenerate the forest to perpetuate their delivery of essential ecological benefits and functions to the community.

Section 2: Forest Ecosystems and Climate and Carbon

2.1 Climate Change Science Summary and Its Potential Impacts on Your Forest Ecosystem

The following summary is based on a series of model simulations, several climate vulnerability assessments, and published research papers. Your basic understanding of these key concepts supports your ability to make decisions about management actions. This discussion is a general description of the regional climate change trends and impacts to the forest landscape. Table 1 summarizes the observed and projected climate changes in temperature and precipitation.

Table 1: Observed and Projected Changes in Temperature and Precipitation and Physical Processes

Changes Observed Now	Predicted Changes
• Increases mean annual temp by 2.5 degrees Fahrenheit since 1895. • Number of extreme heat days increased each summer. • More GHG emitted, more temperature increases. • Mean annual precipitation amounts increased by 7 inches since 1890's. • Extreme precipitation events have increased in intensity and frequency. • Greatest precipitation increases in the fall and spring. • Snowfall has generally decreased. • General related trends show reductions in frozen ground period, increased growing season, and shifts in plant and animal phenology.	• Temperatures expected to continue increasing. • All seasons might be warmer. • Precipitation increases occurring in winter and spring. • Additional precipitation increases in the winter, spring, and fall. • Winters will continue to become shorter and warmer. • Snowfall will continue to decline with more winter precipitation as rain. • Soils are projected to be frozen for shorter periods with some frostless winters. • Intense precipitation events are expected to continue and become more frequent. • Growing season extension continues and more and possibly drastic shifts in plant and animal phenology.

Climate change is expected to have wide-ranging effects on the forests of western Massachusetts with direct impacts such warmer temperatures that drive extreme storms. Other changes in the climate will lead to many indirect effects, including interactions with other disturbances that have the potential to drastically change your forest (remember the 2017 tornado) and your stewardship program.

A warmer winter with less snow and more rain in western Massachusetts results in a lower snowpack. This deep sponge of snow holds water in the forest well into spring at which time it can penetrate deeply into the soils for use by trees. Shorter winters bring an earlier snow melt and in combination with intense rain or ice events, force this water out of the forest ecosystem through run-off. Extreme rain events drop high volumes of high velocity water on the forest floor. The water causes intensive soil erosion, culvert failure, road washouts, flash floods over the soil floor, and sedimentation into streams that alters aquatic systems.

Warmer, longer summers bring a longer growing season, which can be good for growing trees as the carbon dioxide saturated air lets them grow more vigorously. There may be a point though at which an optimal photosynthesis point is surpassed, and reductions occur in growth if it continues to warm. The temperature is drying out and heating up forest soils making soil moisture problems acute in the summer and fall for trees. Seed germination and seedling development suffers in hot soils. Shifts in our seasons causes phenological changes to tree habits. For example, trees might bud out earlier in the season before freezing nights end, which could cause mortality. These season shifts also limit the operating windows for forest management activity historically conducted in the cold while trees are dormant, and soils are stable. The timing of insect hatches and pollen distribution are also shifting, which could affect seed formation.

2.2 Potential Climate Change Impacts to the Conway Town Forest Composition and Tree Habitat

Trees grow where they do on the landscape and in certain associations because the chemistry and properties of a given habitat provide them with necessary and unique nutrients and water. Altitude and micro-climate also determine species site suitability. The Fournier Town forest supports white pine, hemlock, red maple, white ash, red oak, black birch, paper birch, and cherry trees because these are the species that won in a competition for these basic requirements. Your community likes these trees, you understand how they grow, and you appreciate their gifts and beauty. These trees have been photosynthesizing, climbing into the high canopy, and regenerating themselves for thousands of years in west County. Your forest ecosystem and our society will miss certain species if they can't thrive here in 50 to 100 years.

Trees live in a set place and can't just pack up and leave when things get tough. Maintaining a tree species in a forest community depends on the continual replacement of the forest. If you have no new trees, you have no new future forest. After serial seed germination failures, the abundance of a tree species decreases on a landscape. Eons of genetic conditioning and environmental influences forces trees to find the best place to grow and initiates changes in their habits. Climate change impacts might cause "walking trees," or a shift in tree species composition in each area and distribution changes within historic tree ranges due to the development of unsuitable site conditions.

Forest composition could change across the Town forests with these shifts taking several decades to manifest. Habitat might become more suitable for southern tree species such as oaks, hickories, and tulip polar. The northern species that grow here (red spruce and paper birch) may be less able to take advantage of a longer, hotter growing season or drier soils. Yet other species with ranges that dips south (already thrive in warmer environment) and have some drought tolerance (red oak, black cherry, and basswood) may increase their habitat range in western Massachusetts. Certain species found abundantly and sporadically in your forest (hemlock, white pine, sugar maple, and yellow birch) would be sensitive to reduced soil moisture and may suffer habitat loss.

Table 2: Climate Change Projections for Individual Tree Species Ability to Cope or Persist with Climate Change in Western Massachusetts, serves as a quick reference for your use when monitoring regeneration success and the possible forest composition in the future.

The caution will prove unwarranted, and our society may reduce emissions and prevent some of the more dire predictions like species loss across your forest ecosystems. The intention of the DCR Forestry Climate Program is to empower you with the information necessary to choose action options in the future for the introduction and promotion of more future adapted species.

Table 2: Climate Change Projections for Individual Tree Species Ability to Cope or persist with climate change in Western Massachusetts

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

2.3 Landscape and Regional Context and How Climate Change Might Impact the Broader Forest Landscape

The Conway Town Forest property rests in the hill towns of Franklin County, Massachusetts. This area supports a rich mosaic of forest, farmland, water features, sparse development, a modest rural population, and rolling topography that gives them their name. Conway epitomizes this mosaic based on a mixture of public and private lands managed in a variety of fashions. After its incorporation in 1767, the Town was known for its agrarian pursuits, specifically sheep farming.

Regionally the Conway Town forests lie within two broad forest community categorizations with a third minor community within the riparian zones. We discuss forest stands in later sections, but on a landscape level, forest communities or types help forest ecologists compartmentalize the vast forest resource for study and review. Conway's Town forests straddle two major Northeast forest communities: The Northern Hardwoods and The Transition Hardwoods with a third broad community woven amongst them (Lowland Forested Wetlands).

The Northern Hardwoods extend northward with their peak concentration in Vermont and New Hampshire, while the Transition Hardwood community extends south towards Connecticut. Woven together in the higher elevation hills with cooler moisture soils, these two communities support a diverse mix of tree species and eco-niches across the west County forest landscape. The vulnerability to climate change impacts is rated low to moderate within this special dual forest community zone. The adaptive capacity (ability of a forest to adapt to the changing climate) is rated as moderate to high across the region due to this integration. Tree species found here could survive warmer temperatures and retain a strong viability for sed germination and species survival.

2.4 Property's History of Disturbance

Settlement of this area began in 1762 with the development of a farm community. This land was cleared for hay production and livestock pasturing. The wood removed, along with the fast rivers and streams in Town, fueled a manufacturing boom that then began its decline in the early 20th century. During its peak, many farms like this were abandoned leaving pastures and fields to be reclaimed once again by forest. As the forest succeeded the pasture, hay, and crop lands, it experienced a series of natural disturbance from Chestnut Blight's peak, the 1930 tornado winds, serial insect, and disease problems with the most recent in the hemlock wooly adelgid threats since the late 1990's, emerald ash borer, and unknown future issues as our climate warms.

The Town Farm residents used the property for fuelwood and lumber needs through the early 1900's. A red pine plantation was planted by the Civilian Conservation Corps in the later 1930's. This stand was removed in 2007-2010. Most recently the 2008 ice storm ravaged an already opened forest canopy after a Salvage Harvest and a Selection Harvest. Ice damaged trees were removed in 2009-2010.

The Town Farm was purchased by the Town in 1889 from Austin Bates for the creation of an alms farm. This was a common, inexpensive way for communities to provide for their indigent population. This practice continued for over 100 years in parts of New England. People grew, harvested their own food, and tended livestock. The intricate stone wall corrals along Johnny Bean Road near the Maynard Cemetery (historically known as 2nd Cricket Hill Cemetery) witnesses these activities. The cellar hole for the Bates homestead sits on a prominence south of Johnny Bean Road with an open view to the north across the wetland.

Figure 2: History runs deep at the Town Farm Lot. Here, the historic Bates cellar hole across from the Cemetery pays tribute to a lot of hard work that went on here.

Climate change became real for the residents of Conway on February 27, 2017. These woods were impacted by a tornado with localized blow downs and root tip-ups. The 2008 and 2010 ice storms and the Halloween snowstorm of 2011 also did a high degree of damage to the live crowns of your trees. This hilltop is susceptible to the fury of extreme wind and storm events. Although the forest ecosystem on both of your Town forests were drastically disturbed, your past management practices had enabled these ecosystems to recover quickly without any disruption to their provision of ecosystem benefits.

2.5 General Property Overview

Location and Property Size

The Town Farm Lot contains 107 acres of land as computed from the Mass GIS database system Tax Records maps. Access is gained from Cricket Hill Road extension near the Lee farm on Cricket Hill Road.

Topography, Land Formation and Hydrology

One enters the property on an unmaintained Town road (estimated one and a half miles in length of dirt road) with exposed bedrock and some low, wet depressions. The terrain of the property features rolling hilltops, a broad plain along Johnny Bean Road where the old homestead sits, and some steep slope along the southern and western bounds.

The richest soil on the property faces southerly into the direct hot sun beneath Stands 3 and 4. Despite the soils fertility, draughtiness could limit seedling starts and older tree growth. The removal of the red pine plantation upon these soils "super" heated the site and consequently forest recovery has been slower than expected.

Over two thirds of the rest of the forest landscape sits in the shade of northerly facing slopes. Here trees and plants find a cooler and moister climate within the upper soils, which provides good conditions for seedling development. Three major spring seep fonts pump water across the forest floor. Extensive buffer sones along these seeps protect soil and water temperatures within these sensitive riparian zones.

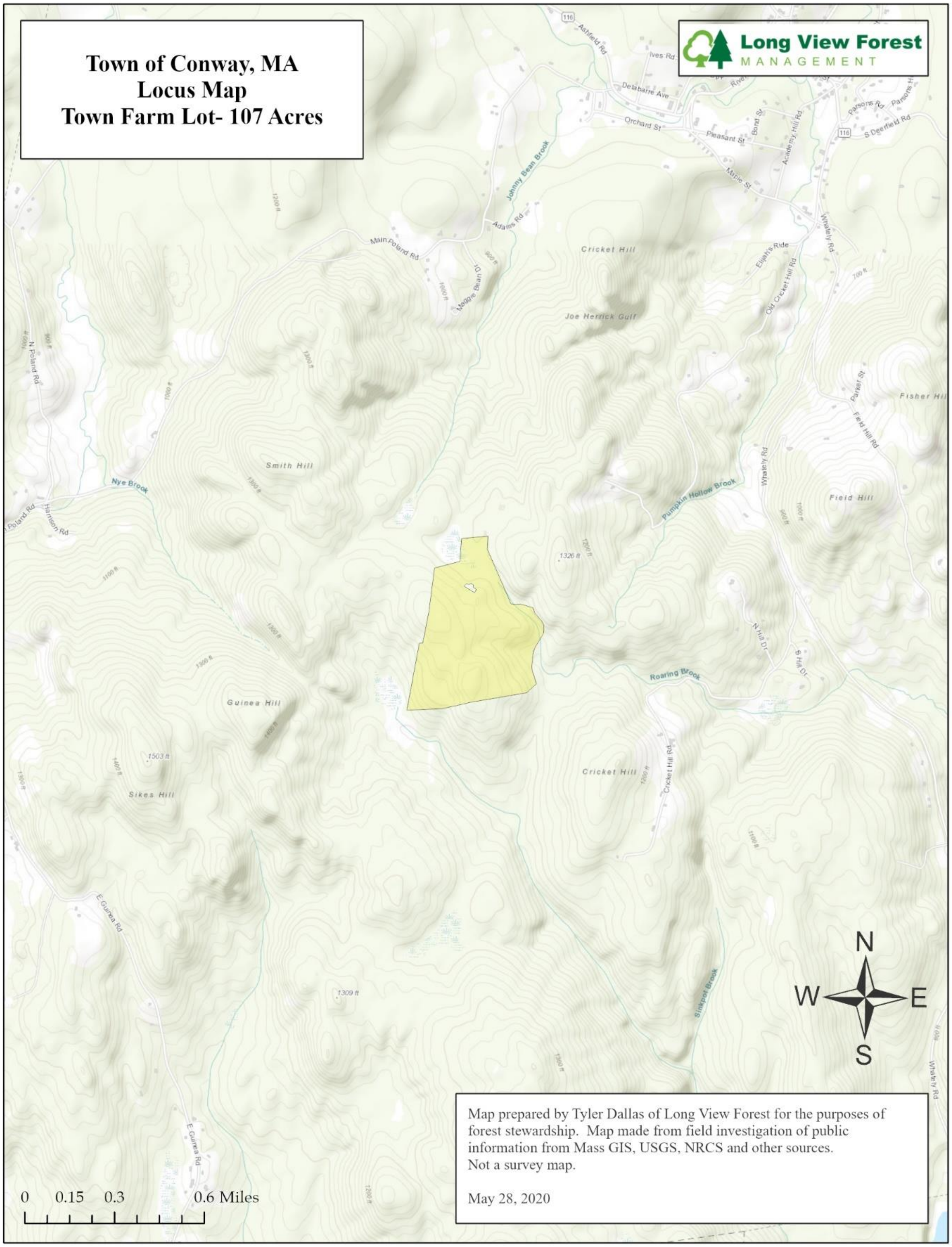


Figure 3: Locus Map showing property location

Figure 4: Woodcock actively use the early successional forest around the homestead. Here, a baby holds still to avoid detection during our inventory work.

The large wetland and ponds in the northern section split the property along Johnny Bean Road. Two large spring seepages drain their flow across the rocky soils. A small depression along the trail system in the southwestern section of the property holds water and supports a small marshy, hummocky site.

2.6 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 on the woodlot with much of it having a Red Oak and White Pine Site Index of 70. 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.

The soils on this property belong to the Millsite-Westminster Series, the Shelburne loams, the Wonsqueak mucks, and the Pillsbury loams. All these soils originated from glacial till, except for the muck. The upland soils drain water quickly. The Millsite-Westminster soils are variably productive, with some rich veins of Millsite loams. They tend to be droughty and found on upper slopes or hilltops. The Pillsbury and Shelburne soils are deep, well-drained loams that grow forests well. The Wonsqueak muck soils lie in the depression zones with a high-water table and beneath the wetland area.

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.

Stable soils with thriving mycorrhiza, microbes, and roots support tree and forest ecosystem health and growth rates or carbon uptake rates. These soils are healthy and protected with thick duff and litter layers, which protects the stored carbon within them. Most roads and trails have been built on high, dry, solid ground so maintenance and erosion prevention is less costly and soil health is protected.

Without recent disturbance the thick sponge like covering beneath the herbaceous plants and ferns traps moisture in the soils contributing to good seedling and tree growth. Draughtiness could be problematic in the future, but now the soils have a loam base and grow trees well. The young forest areas and the white pine and hardwood grove close to the cemetery grow on the richest soils in Franklin County. Sequestration rates are high and climbing.

When the temperature rises and the air and soil are warmer, the hydrologic cycle changes too. Seep effusion, powerful in early spring storms, slows later in the summer. This reduction in recharge impacts the health and function of the wetlands and streams downstream of the seep fonts, although they dry out with moss diebacks.

The moist depression around the spring seeps play an important role in climate change by holding water in the system, beneath the ferns, mosses, and plants keeping it cool and available for root growth. The riparian areas have a moderate to high adaptive capacity to cope with predicted climate change yet could be vulnerable to dry late summers.

Growth and survival rates of seedlings are moderate to high in the Shelburne soils, but low in the Westminster-Hollis complex because drought stress is a threat in these soils. Certain species find these soils good habitat now (sugar maple, yellow birch, white pine, red oak, and white ash). The risk for some of these tree species to shrink in abundance exists on these sites. One challenge these soils pose to the implementation of your proposed stewardship actions is their need for protection without disturbance during trail building, recreational use, or climate adaptation and mitigation actions or silvicultural treatments. The retention of the natural leaf and duff layer with its spongelike capacity that holds water in the soils will support regeneration and tree growth.

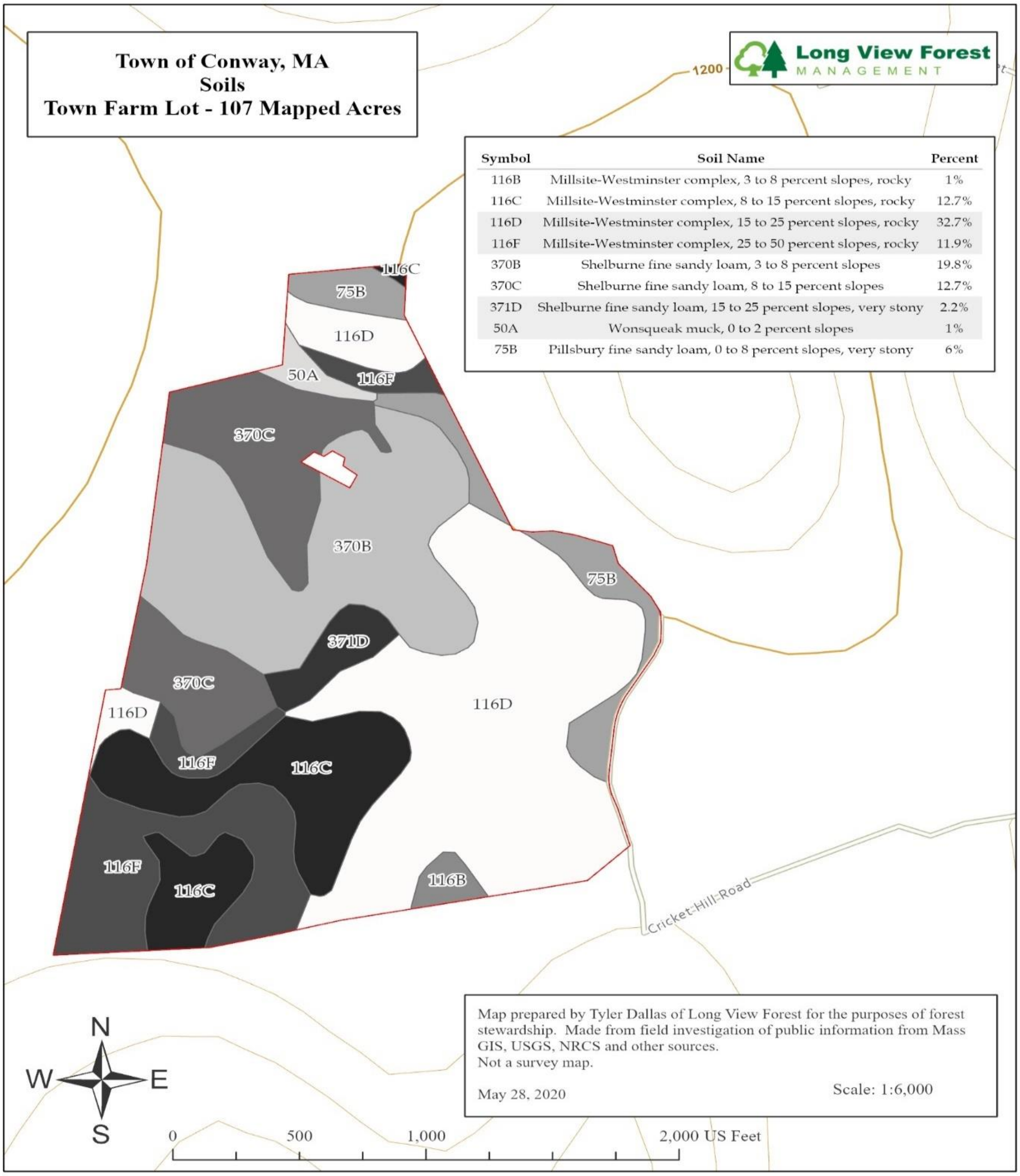


Figure 5: Soils Map

2.7 The Forest Ecosystem: Dominant Forest Types and Ages and Tree Habits

The 107-acre forest ecosystem on this property is composed of six forest stands. They originated from the abandoned farmland, and each have elements of a transitioning pine and hardwood groves typical in western Massachusetts. Each stand developed unique species composition and qualities because of its reaction to disturbance over time and the date of its reversion to forest. Viewed holistically, the forest ecosystem supports a rudimentary all-aged or un-even aged forest with three cohorts (age groups).

The average age range of the overstory trees (tallest and oldest trees in the canopy) is 80 to 120 years with some mature relics (large sized trees, which are remnants of an older forest closer to 200 years in age). Two younger age classes grow beneath this main canopy, a scattered stocking of large saplings, pole-sized trees, and small sawtimber, which range in age from 35 to 50 years, and the immature 13-year-old seedlings and small saplings that originated from the most recent harvesting activity here.

The species composition across the property is distributed by basal area (a term that denotes stocking density in a forest) as follows: white pine (43% of the stocking), red maple (13%), hemlock (11%), red oak (7%), black birch (7%), beech (4%), black cherry (4%), white ash (3%), and small contributions by yellow birch, sugar maple, aspen, black oak, paper birch, and hickory.

57% of the stocking on the site is contributed by tree species that may lose habitat range and consequently their abundance within fifty years. White pine growing in warm and humid air is susceptible to fungal infections that reduce productivity. White ash is suffering ash yellows and imminently under attack by the emerald ash borer. 43% (red oak, hickory, red maple, yellow birch, aspen, elm, and paper birch) of site stocking is contributed by species predicted to thrive with warmer soil, which presents an opportunity to shift the species composition towards more future adaptive ones. Herein lies one opportunity from the climate change crisis with respect to forest species composition. This forest will continue to renew and grow vigorously just populated with different species as habitat changes happen in the new millennium.

The forest ecosystem is lacking in the stocking of large sized trees and older trees due to its agricultural history. Harvest projects removed trees that were as old as the main canopy now, the only maturing wood exists in the relic trees (remnants of the farm days forest) scattered across the property. Sugar maple, black birch, red oak, and white pine are some of the oldest trees on the site (over 150- 200 years old). The forest supports thousands of immature saplings (with the highest concentration in the old red pine plantation zone from the 2007-2010 harvest projects and tornado disturbance). All the overstory species are represented with dominance by black birch, beech, and red maple.

Remember the simple maxim more biodiversity equals more resiliency. The different sizes and ages of trees, the landscape richness with deep forest, wetlands, beaver meadow, a pond, and the old homestead provide landscape diversity on the Town Farm property. As it displayed in 2017 (hurricane impacts) and 2008 (massive ice storm damage), this forest ecosystem has a strong ability to cope with drastic change and disruption and recover to its optimal ecological function swiftly.

The forest floor vegetation varies with the overstory shade. In general, a healthy, diverse mix of native shrubs and herbaceous plants are present. Some species include Christmas fern, hay scented fern, New York fern, lady fern, partridgeberry, aster, golden thread, maple-leaved viburnum, dogwood, black berry, blueberry, spicebush, ilex, and serviceberry. This layer is stocked and species rich.

While growing timber is not a primary objective for this forest, it is interesting to note the large volume of wood growing here. The high volume of fast-growing, healthy timber crops indicates the productive capacity of this site, and it correlates to a high volume of carbon stock stored within the trees in the forest.

Another notable metric is the growth that has occurred on the site since the 2006 to 2009 harvest operation. Although the harvest reduced the timber volumes and tree stocking, the release of the crowns of the residual trees increased sunlight, increased the site's productivity, and augmented the total carbon stored in the older trees and increased the accumulation rates of the younger seedlings, small sapling, and pole-sized trees. These measurements resolve an often-debated argument of how to rationalize the inevitable reduction in carbon stock in a forest when silvicultural harvests are conducted. Forest stewards could learn to accept these short-term reductions with the recorded evidence that the subsequent improved vigor and growth results in documented increases in the future carbon stock.

The forest ecosystem supports a diversity of hardwood and softwood species with almost equal proportions of those capable of coping and persisting under the predicted climate impacts and suitable habitat change (defined as moderate or high adaptive capability species) and those likely to face challenges and decline in abundance and distribution (low adaptive capability). These potential disruptions to tree species abundance and distribution across the forest landscape, pose a risk to the future ecosystem's ability to deliver a full suite of goods and services. Your community has an opportunity to act through the next few decades to establish a wider variety of tree species on the property.

Since the recent harvests, seedling and sapling development has been vigorous. There are new cohorts of small trees that contain ~8,000 stems <1" diameter at breast height (DBH) per acre. These are mostly black birch, red maple, and beech. If one follows the science on black birch, the youngest age class composition presents another threat to the sustainability of this functioning ecosystem. Black or sweet birch has a poor capability rating (its coping mechanisms under the impacts of climate change) and a predicted reduction in habitat due to its drought intolerance.

Red maple of stump sprout origin never tends to grow into vigorous, productive older trees, always suffering from the problem of shared resources. Many of the red maple trees are of seed origin with poor quality and low vigor. Despite their undesirable phenotype, these trees have the genetic composition to thrive under any future conditions. They are a gift to the landscape due to this endurance. In addition to the severe beech bark disease present in this forest, overall beech health will be directly impacted by climate change, if one specifically considers the expected fluctuations in precipitation leading to both drought periods and flooding. Beech is particularly sensitive to both extremes and is less resilient than other broad leaf tree species.

Other species face threats to their productivity and sustainability. White ash lives in peril and an uncertain future due to the incidence of emerald ash borer in Conway. As mentioned earlier, white pine growing in the current and predicted future warm and humid summers will suffer from severe fungal attacks. The changing climate conditions and corollary tree habitat changes will bring some benefits for other species. The opportunity exists for a gradual transitioning of the species mix to more future adapted trees such as red oak, black oak, white oak, shagbark hickory, bitternut hickory, basswood, black cherry, yellow birch, and sugar maple, as they are growing in this unique zone in which two major forest types of blend in southern New England. They will naturally seed into this forest over time as regeneration failures continue with the lower adaptive capability tree species.

2.8 Forest Ecosystem Vulnerability

Vulnerability is the susceptibility of a system to the adverse effects of climate change. It is a function of potential climate changes in your forests and the adaptive capacity of the forest ecosystem to these changes. A forest ecosystem is considered vulnerable if it is at risk of a shift in composition that leads to a different forest condition, structure, and function. Furthermore, if the forest is predicted to suffer substantial declines in size, health, or productivity it is also considered vulnerable. To assess the vulnerability of the Town Farm forest discussions about the stressors at work in the forest ecosystem and the adaptive capacity of this unique ecosystem are necessary.

Stress on trees and forests is defined as environmental (biotic and abiotic) pressure and strain that provoke a physiological change in the tree to either prevent or repair the damage. Trees will change their condition and reach a new state of balance or equilibrium. This mechanism helps trees endure environmental stressors, since they can’t escape, but must change their biology to survive it or succumb to it fully with mortality.

The stressor pressure within the Town Farm forest is low to moderate now with escalations if emissions levels do not decline. Several agents work against forest health and productivity here, but none do so aggressively. The risk to the ecological function now is minimal, but always conditional. It could rise if the climate change impacts increased in the future. The stressors forcing changes in tree biology and forest condition within the Town Farm forest ecosystem are:

- Pests and pathogens drain a tree’s resources and lower vigor, health, and productivity. Reduced productivity lowers the carbon sequestration capacity of a forest and can change its species composition and structure. Aggressive infestations can result in widespread mortality and ecosystem collapse. The following agents are at work in these woods.
  - Eastern hemlock represents 11% percent of the stocking in this forest. During the inventory, it was observed that both hemlock wooly adelgid and elongate hemlock scale on fallen hemlock branches. The crowns of most trees show needle discoloration of some degree, but needle loss remains under 25% of the crowns. This is a low stocking contribution, but most of these trees grow in the sensitive riparian areas along the spring seep fonts depressions and the filter strip corridors of the streams. Forest cover in these blue carbon strips protects the carbon that is stored soils. The big risk is loss of ecological filtration, buffering, and purification capacity of filter strips and upland seep wetlands if dense forest cover is reduced through loss of hemlock trees in the future due to increase stressors of habitat reductions.
  - Emerald ash borer has been documented in Conway. Several scattered large trees showed signs of “blonding” in their upper branches in May 2022. This may indicate its presence in the white ash trees.
  - Beech Bark Disease (BBD) is widespread and severe through the beech trees on the property. All the trees (all ages, all sizes) showed some sign of infection on their bark. BBD is the outcome of an insect-fungus complex, which results when a non-native beech scale insect feeds on beech bark, creating cracks through which native canker fungi can enter the tree. 50-85% of infected beech trees die within 10 years of infestation.
  - During a field review in May 2022 of this site, an estimated 20% of the needles on the older white pine trees appeared straw-colored to brown with a high volume of shed brown needles on the forest floor. White pine needle damage (WPND) is a complex of foliar fungal pathogens that causes significant defoliations of eastern white pine during the summer months. The fungi become more active with hot and humid conditions.
  - Leaf-out had occurred at the point of the field review in May 2022, and the red oak leaves on the ground showed spongy moth feeding on most

leaves with less than 20% eaten. The tree crowns had minor branch dieback from last growing season.

- 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.
  - In terms of invasive plants, this property has a population of oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), honeysuckle (*Lonicera spp.*), and Multiflora rose (*Rosa multiflora*). They mostly emanate out from the old homestead and are present in Stand 3, 4 and 5.
  - Having robust wildlife habitat often goes together with invasive plant seed pressure as birds move seeds into an area. To maintain the wonderful balance of native plants here that provide, among other values, preferred food for wildlife, we recommend a focused control effort to reduce the stocking levels of these plants.
  - They exploited the disturbed area beneath the removed red pine plantation that was damaged by ice in 2008 and 2010. They are a consistent but minor forest floor component of the other stands with concentrations highest along the trail and roadside edges and along the mainstream courses. These plants cause regeneration failure, reduce available water and nutrients for trees, and reduce the vigor and ecological capacity of a forest ecosystem.
- Advanced regeneration (trees that range in size from 2 to 4.5 inches in diameter) is dense across the 2010 harvested stands. These young trees are under high herbivore browsing pressure with two distinct browse heights. One occurs at an average height of 3 to 4 feet from moose, and the other occurs closer to the forest floor from deer. Their preference for palatable hardwoods leave an abundance of hemlock, beech, and black birch seedlings and saplings on site. This taste issue compounds the regeneration failure with the loss of seedling's growth of those eaten species that are more climate future adapted. In some places the deer were even eating the hemlock and beech stems.
- As mentioned earlier in the document the coarse textured soils lose water quickly when it is hot in the growing season. This places trees under moisture stress and can be fatal to seedlings.

A second concept that will help you understand the vulnerability assessment on your Town Farm forest is adaptive capacity. Adaptive capacity is the ability of a species or ecosystem to accommodate or cope with potential climate change impacts with minimal disruption. It is strongly related to the concept of ecological resilience (discussed later in the management plan). Higher adaptive capacity tends to reduce vulnerability to climate change, and lower adaptive capacity tends to increase vulnerability.

Studies have consistently shown that high-diversity systems are more resilient to disturbance. Low-diversity systems are expected to be more vulnerable to climate change. Species rich forest communities demonstrate greater resilience to extreme environmental conditions and greater potential to recover from disturbance. Only three species contribute over fifty-nine percent of the forest cover (white pine, hemlock, and white ash) here, but over 16 species grow in this forest and provide diversity to composition.

Tree species in isolated or fragmented landscapes will have reduced ability to migrate to new areas in response to climate change. The earlier discussion on "walking trees" mentioned tree's migratory tendency as climate change impacts disturb their habitat. High fragmentation on the landscape limits a tree species ability to migrate to a more suitable habitat. The Town Farm forest is nestled within thousands of acres of deep, prime forest land owned by the State of Massachusetts, The Massachusetts Division of Fisheries and Wildlife, Cowls Lumber Company, and many private forest owners. Fragmentation and non-forest use is limited to small home sites, agricultural blocks, and solar arrays. Conway is a community with zoning laws supportive of future growth. The extensive road frontage and site conditions within this forest block support the potential further development. Consideration of all these factors suggests that your community might consider some long-term protection strategies to protect the extensive forest landscape for future climate adaptivity and forest resilience.

Forest ecosystems that have greater tolerance for disturbance will cope with climate change impacts with greater ecological function than others. Climate change brings an increase in natural disturbances such as tornados, ice storms, and pest outbreaks. The statuesque hemlock and white pine trees might not tolerate severe wind damage. Some of the northern hardwood species growing here might not tolerate large patch openings creation that result from extreme storms or soil moisture drought in the long hot summer. Yet the transition hardwood species (red oak, hickory, and red maple) will tolerate warmer, drier conditions.

The vulnerability for the Conway Town Farm forest ecosystem is low to moderate because of the wide range in adaptive capacity but noticeable because of the level of existing stressors. Even though this forest is a highly resilient ecosystem when confronted with long-term climate change impacts, it could be vulnerable to sudden changes. Your knowledge of the current forest conditions can be used as a baseline comparison during your future monitoring of the forest for change or accelerated ecological function degradation due to climate change or stressors.

2.9 Risks to the Forest Ecosystem due to Stressors, Vulnerability, and Potential Climate Change Impacts

Forest vulnerability is low to moderate in this forest, yet the changing climate and its potential impacts to the forest ecosystem carry a fair amount of risk. Early discussions in this document highlighted how this forest might change as our climate changes and the existing forest stressors maintain their pressure. These predicted climate change impacts will have important implications to the stability and function of this forest ecosystem. The "big" risks of course are forest mortality and the loss of ecological function. The risks summarized below could all lead to the catastrophe of your forests losing their ability to nourish and support life.

Your community shares the universal hope that the probability of these risks materializing are extremely low, as your community counts on good habitat, carbon sequestration and storage for the mitigation of GHG emissions, water filtration, the simple beauty of the extensive wetland complex and its unique songbird habitat, the future wood products conservatively taken from these woods, and the emotional recharge found in a quiet hike along the main trail. The risks are clarified here to provide a better understanding to your community of the possible outcomes of our changing climate and its impacts in your forests. Humans will change their behavior and these risks factors will shrink over the next few decades.

Your community's awareness of the risks to your forest ecosystem due to climate change impacts over the next 25 to 50 years is important to your ability to plan and act for the protection and preservation of the Town Farm forest ecosystem. Policies that the Conway Forest and Trails Committee craft today will leave a conservation legacy to future generations that archives the actions that Conway took early on to perpetuate the life-giving ecosystem goods and services from your community forests.

Table 3: Summary of the Risks to the Forest Ecosystem Ecological Function

Projected New Normal Forest Conditions with Climate Change	**Immediate Risks**	**Consequent risks**
Drought and moisture stress	Reduced tree vigor and forest productivity. Tree mortality. Water regime in filter strip riparian zones lowered.	High fuel for fires. Reduced carbon sequestration. Seedling loss and regeneration failure. Riparian filtration and water quality protection function lost.
Biotic agents Pests and pathogens	Reduced tree vigor and forest productivity. Loss of keystone species such as hemlock and white ash.	Reduced species diversity and forest complexity. Reduced forest resiliency. Reduced carbon sequestration and storage.
Increased herbivore browsing	Regeneration failure.	Inability to start the future forest.

		Loss of future forest's ecological function. Decreased carbon sequestration in young trees.
Increased invasive plant forest growing space exploitation	Regeneration failure. Loss of tree productivity. Species diversity reduction.	Inability to start the future forest. Loss of biodiversity and resiliency. Loss of future forests ecological function. Decreased carbon sequestration in young trees.
Extreme weather events occurrence and intensity	Remote hilltop location with susceptibility to high winds and ice. Loss of tree vigor and forest productivity. Tree mortality.	Loss of carbon sequestration and carbon release. Changes to species composition. Ecosystem collapse and need for forest ecosystem replacement.
Combination of pest and pathogens and extreme weather events	Loss of riparian zone function and filtering capacity if loss of hemlock component.	Loss of carbon sequestration and carbon release. Degradation of the wetlands quality.

2.10 Quality and Variety of Habitat

Forest habitat connotes the idea that the Town Farm forest ecosystem 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 mostly upland, middle-aged forest habitat that balances maturing trees (although super-large specimens are rare due to the forest age), sufficient stocking of younger trees in the middle canopy, and a well-stocked seedling and sapling class across the forest floor.

Tall, maturing 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 Chickadee 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, as well as the rectangular-shaped excavations of foraging pileated woodpeckers searching for carpenter ants. Although resistant to breakage due to their wood characteristics, these statuesque trees have a high risk of ice or high wind breakage which would remove one of the oldest age groups on the forest and degrade valuable habitat and a viable seed source. Vertical complexity adds biodiversity and resilience to a forest ecosystem.

In addition to Stand 1, which features most the property's hemlock, the pockets of dense hemlock stocking in other stands significantly increase the shelter and foraging value of the resulting overstory canopy and as well as horizontal cover value for wintering white-tailed deer. Northern goshawk, great horned owl, and common raven all use larger white pine and hemlock trees among others to nest. 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. The risk of the loss of hemlock as an abundant species due to the stressors of hemlock wooly adelgid and elongate hemlock scale or the reduction of its habitat due to drying soils (hemlock seed and growing trees thrive with a cool, moist environment), would negatively impact the quality of the native habitat.

The past harvest retained an adequate amount downed woody material on the forest floor. This material recycles nutrients trapped in the wood and provides food and habitat. The list of organisms dependent on this coarse woody material (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.

Figure 6: A monster white ash tree was retained near a regeneration zone in 2007. Note the Coarse Woody Material (CWM) that was intentionally retained as well. Helmet for scale.

The stratified and regenerating forest on this site currently supports particularly strong bird habitat values. During our early spring inventory, we observed 13 bird species and noted ample habitat for them. These included Common Raven, Ovenbird, Blue Jay, Ruffed Grouse, Woodcock, Black-capped Chickadee, Winter Wren, Hermit Thrush, Red-winged Blackbird, Tree Swallow, Turkey Vulture, Black-and-white Warbler, and Black-throated Green Warbler. 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).

The richness and diversity of habitats indicate strong forest ecosystem functionality. 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.

Figure 7: Large healthy red pines that were retained provide preferred sign-trees for black bear who use them to communicate with other bears. Here, note the scratch marks and tooth scrapes.

The Massachusetts Department of Fisheries and Wildlife and The Nature Conservancy developed the BioMap2 project, which is 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. Figure 8: The BioMap2 delineates these valuable, resilient landscapes across the Town farm forest as Critical Natural Landscapes. These areas 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).

2.11 Unique Physical and Cultural Features

One can imagine not only the Bates family traveling down Cricket Hill to Pumpkin Hallow to church meeting or herding their cows along the central farm lane, but one can also see those fortunate residents who found respite in working this hilltop farm for sustenance in the later 1800's. The stone wall structure is extensive and well-preserved inclusive of a livestock corral, several larger pasture enclosures, the Bates homestead cellar hole, and the 2nd Cricket Hill Cemetery. The robust, highly resilient forest ecosystem itself is a unique feature growing amongst lands heavily managed for timber production. The wetland complex in the north of the property north of Cricket Hill Road and the cemetery is locally revered as a songbird-watching mecca. It's a serene view and a complex wetland system.

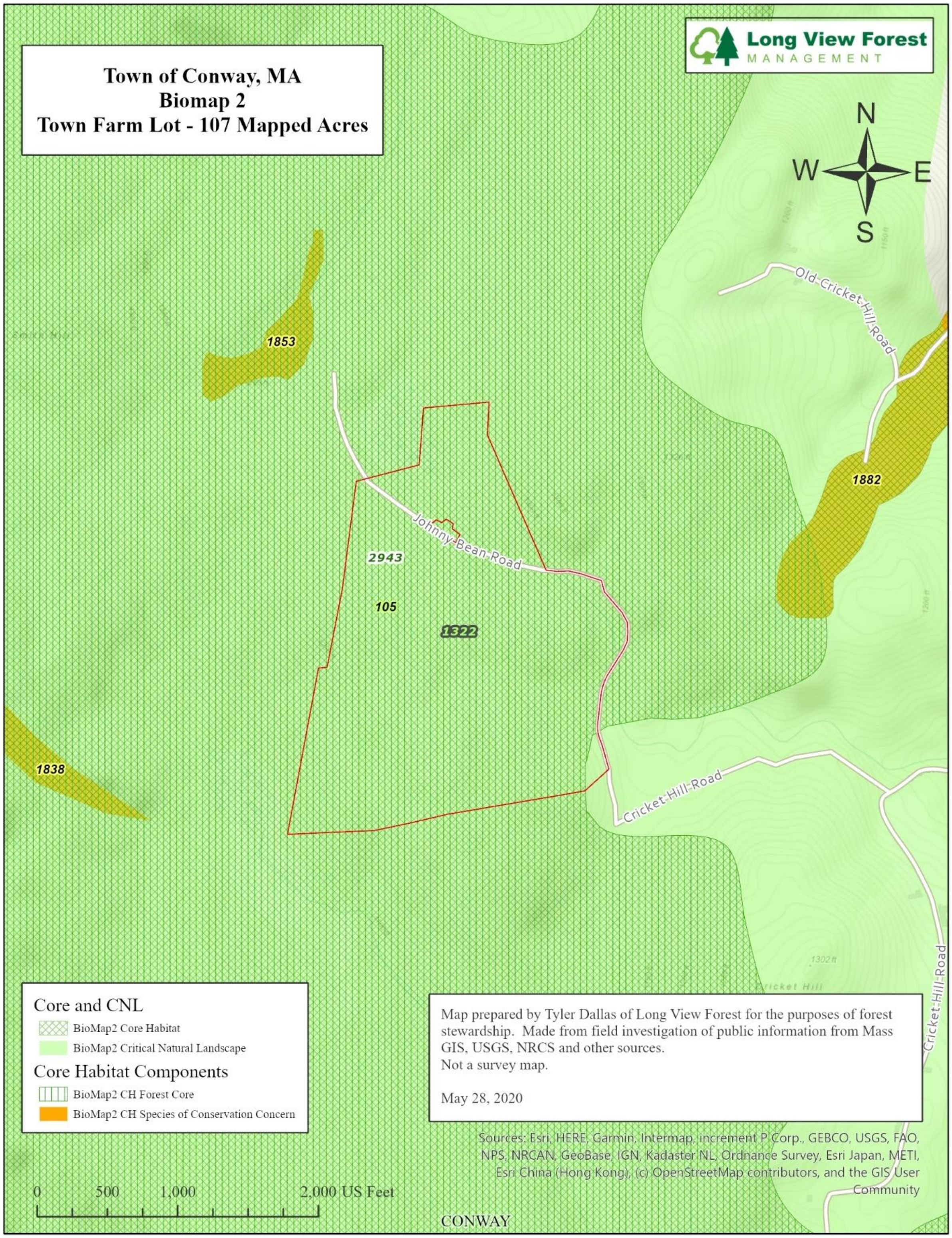


Figure 8: BioMap2 displaying the landscape-wide habitat conditions for protection

Figure 9: The headstone of Malachi Maynard- an underappreciated, important Revolutionary Period figure.

2.12 Recreational Uses

An extensive through-trail system connects the interior paths to Conway State Forest and subsequently the Ashfield Trail System, paths through the Northampton Water Supply lands, and numerous other local trails. The old town roads are wide and pleasant to walk, bike, or horse ride. Without much effort or time, one is removed to deep woods with its quiet and beauty on the Town Farm. The interior trails seeded heavy to hardwood saplings, which now, at 10-13 years, obstruct passage. As part of this Plan, we recommend mulching some of these trails to make them passable again. We also recommend leaving some alone because the property is quietly used by discrete individuals who appreciate the solitude of unmarked and covert trails as well.

Extreme storms with their winds, ice, and heavy snow bring down high volumes of woody material, which requires maintenance costs along the trail system. The predicted precipitation volume and intensity changes will require the design and implementation of erosion control measures along sloping sections of the trails and the main dirt access road to the property. Appropriate wetland or isolated wet patches crossing structures (short wooden bridges, rip-rap stones, or log poles) should be considered for use during the wettest times of the year. Resources are needed to maintain passage and safety on the trail system.

2.13 Property Boundaries

Conway State Forest and the lands of Cowls Lumber Company surround the Town Farm forest. These properties have blazed and signed perimeters. Physical evidence marks the Town Farm property. Signage around the boundaries would be directional and welcoming to the through-trail user.

2.14 What value or role does the Town Farm Forest play in relation to other protected lands and the broader forested landscape?

Roaring Brook fonts within the broad wetland in the north of this property. Its waters run clean directly into the Roaring Brook Reservoir. The pristine nature of these lands ensures high quality water and aquatic habitat along the way.

The Nature Conservancy designated the 41,622 acres (about twice the area of Manhattan) south of the Route#116 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. Town Farm forest rests within this matrix.

Matrix community types are often influenced by regional-scale disturbances such as hurricanes, insect outbreaks, or other extreme weather events. 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 meet 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. If in fact habitat becomes unsuitable for some common local tree species across the next century, large forest blocks without fragmentation provide the space required as trees begin to shift their homes.

The Surrounding Land Use Map (Figure 10 below) highlights the greenspace connectivity of the area as well and the importance that this small 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. Within a few miles of the property are several large parcels of land managed for conservation purposes inclusive of the Conway State Forest, the Lee Family Tree Farm, Northampton Water Supply watershed lands, South Deerfield Water District watershed lands, and numerous private conservation restriction, APR, and Chapter 61 Forest land program protected parcels. Efforts by the Town to track the management practices on these lands would inform future Conway decisions for the development of forest conditions that either support this work or complement it.

2.15 Property Impact of Proposed Forest Stewardship and Climate Adaptation/Forest Resiliency practices

Throughout our Stakeholder Outreach and Listening Session Process that drove the creation of this plan, Conway residents articulated their vision of the future forests on the Town Farm woods. Beyond the boundaries of the property, 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 help mitigate anticipated climate changes. Forest condition and health improvement measures also enhance the quality of native habitat attributes.

The community's decision is to retain their maturing trees throughout the property with conservative silviculture (climate adaptation and forest resiliency building practices) projects and tree harvest removals throughout future decades only if they support the ecological benefits and values that the community cherishes will change the structure and composition of this forest. The Town will own an older forest with many focus trees approaching biological maturity with time, and small patch openings dotting the landscape in which the new forest thrives. Although functioning well today and probably for 25 to 50 years, this system will continue to age and without the introduction of younger trees could be at great risk of ecosystem collapse and function loss. However, the Select Boards decision to use the forests as nature-based climate and carbon sanctuaries would benefit from the lack of disturbance and retention of high stocking.

2.16 How Management will 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 Conway enjoying these woods would be contributing to the local economy as they stop for lunch or spend an evening in a bed and breakfast. With its proximity to the State Forest and the beaver pond feature, this forest could easily be a wonderful additional stop on a birder's tour of the area. 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. The protection and enhancement of the Town Forest ecological function ensures the delivery of recreational opportunities that draws folks to this hill town destination.

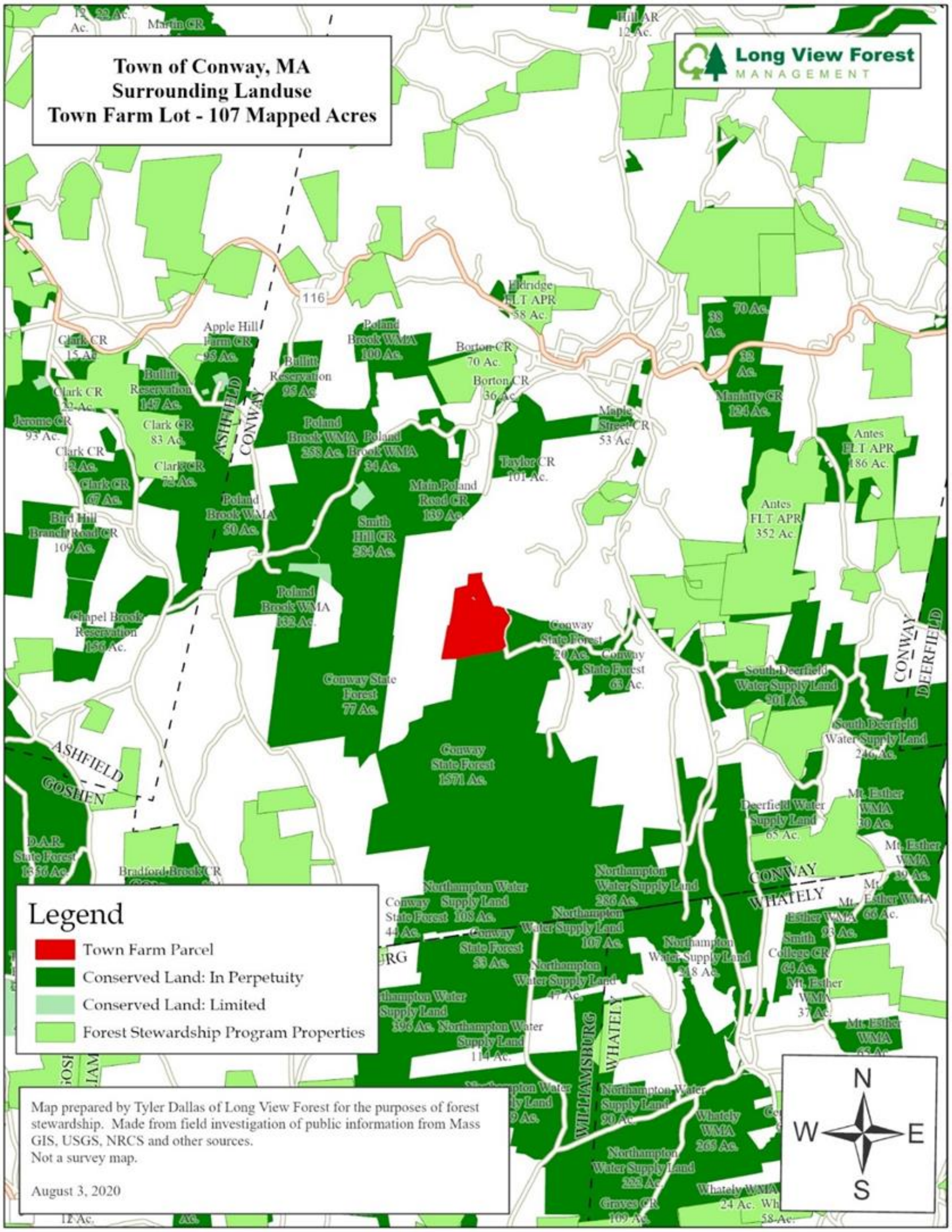


Figure 10: Surrounding Land Use Map

2.17 Forest Resilience (FR)

As humans understand more about the importance of our forests to our health and our ability to mitigate the coming climate crisis, forest resilience (FR) becomes critical for forest ecosystems. Resilience is the capacity of a forest to withstand (absorb) external pressures and return, over time, to its pre-disturbance state. When viewed over an appropriate time span, a resilient forest ecosystem can maintain its 'special identity' in terms of species composition, structure, ecological functions, and biological process rates.

The available scientific evidence strongly supports the conclusion that the capacity of forests to resist change, or recover following disturbance, is dependent on biodiversity at multiple scales. Maintaining and restoring biodiversity in forests promotes their resilience to human-induced pressures and is therefore an essential 'insurance policy' and safeguard against expected climate change impacts. Increasing or maintaining the biodiversity in natural forests will have a positive effect on their resilience capacity and often on their productivity (including carbon storage).

The resilience of a forest ecosystem to changing environmental conditions is determined by its biological and ecological resources, in particular the diversity of species, including micro-organisms and the genetic variability within species (i.e., the diversity of genetic traits within populations of species). Resilience is also influenced by the size of forest ecosystems (the larger and less fragmented, the better), and by the condition and character of the surrounding landscape.

FR has historically been high on the Town Farm property, as indicated by its ability to withstand the 2008 ice storm with the only major loss in a planted non-native tree species (red pine). These woods have minimal insect and pest infestations, and even mitigatable invasive plant issues. We have determined FR is high on this forest because of a set of conditions that are summarized in the following chart. Conway residents rank the protection/enhancement of forest resiliency as one of their top stewardship goals.

Table 4: Forest Resilience Indicators on the Town Farm Lot

Forest Condition	Why and how this supports High FR
Long term legal protection	Town owned and preserved from change of use- will always support a forest.
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
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.

2007-2010 silviculture based harvest project	Increased individual tree and stand vigor and growth, established adequate tree regeneration, added coarse woody material on forest floor, and increased structural complexity
Connectivity	Town Farm Forest is a part of a large forest block where animal and plant species can move freely
High water quality	Trail system respectfully avoids vernal pools, spring seeps, water courses and wetlands, dense forest cover in all riparian filter strips
Genetic variability	Resistant beech trees were observed, red maple trees showed variability in bark characteristics with the "curly" and smooth ridges bark traits present.
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 regional impacts of climate change, especially interacting with ecosystem stressors, might be sufficient to overcome the resilience of even some large block of forest, pushing them into a permanently changed state. If forest ecosystems are pushed past an ecological 'tipping point,' they could be transformed into a different forest types, and, in extreme cases, a new non-forest ecosystem state (e.g., from maturing forest to seedlings only growth through a tornado). In most cases, the new ecosystem state would be poorer in terms of both biological diversity and delivering ecosystem goods and services.

Forest biological diversity results from evolutionary processes over hundreds of years or even thousands which are driven by ecological forces such as climate, fire, competition, and disturbance. Furthermore, the diversity of forest ecosystems (in both physical and biological features) results in high levels of adaptation, a feature of forest ecosystems which is an integral component of their biological diversity. Within specific forest ecosystems, the maintenance of optimal ecological function is dependent upon the maintenance of their biological diversity.

Not to say that high FR sustains ecological function indefinitely. Even high diversity is no guarantee for ecosystem resilience once climate conditions move beyond those experienced by most of the tree species on site. However, there is a negative relationship between species diversity, ecosystem diversity, and the capacity of a forest system to be degraded by climate change impacts and stressors. Those risks to the stability, longevity, and adaptiveness of this forest ecosystem still exits and given current stressors and potential climate change impacts, forward thinking planning and an understanding of adaptive management techniques will prepare you for right action when needed.

It may be appropriate to quote Paul Catanzaro and Anthony D'Amato (Increasing Forest Resiliency for an Uncertain Future, 2016) for your community: "Promoting forests that have a high diversity of trees species, ample tree regeneration of future-adapted species, vigorous trees of various sizes and ages, a variety of tree arrangements, and an appropriate amount of deadwood gives a forest a complex structure and helps them to withstand and recover from stressors."

2.18 The Town Farm Forest and Carbon

During the 2020 Forest Stewardship Management Planning process, your community committed to the use of the Town Farm property for nature-based climate solutions (NBCS's). NBCS's support climate mitigation, which is the reduction of climate change impacts by increasing the amount of carbon dioxide pulled out of the air. Trees offer the most cost-effective and reliable way to slow down the rising carbon dioxide levels that drive climate change.

Most folks find comfort in the thought that their actions in the forest contribute solutions the global climate crisis. In 2020, your community raised this thinking to the next level with the decision to explore participation in the voluntary carbon market. Since timber harvest income wasn't a priority, the sale of carbon offset credits tied to the stored carbon in the forest might provide some income for re-investment into trail building or maintenance, invasive plant control, or any of the other important stewardship goals for the Town.

The following discussion presents the basic science of forest carbon integrated with an assessment of the Town Farm forest carbon sink. After the basics, comments on the relationship of climate change to carbon sequestration and storage are explored before closure of this section with comments on barriers to sequestration inherent to the Town Farm forest ecosystem.

Understanding these ideas and concepts will empower your community to choose stewardship actions that support a healthy, functioning carbon sink. Your actions and choices will also influence your eligibility to participate in the voluntary carbon market and the income opportunities therein. As the management plan document evolves, you will find that many of the possible actions for the increase of carbon sequestration and storage capacity of your forest ecosystem match those explored for the support of forest resiliency and the forest's ability to adapt to the changing climate impacts. A clear cooperation resides amongst these concepts as they each depend upon an ecological sound and functional forest ecosystem.

a. Basic Carbon Tree/Forest Science:
    i. Through photosynthesis, trees and other plants in our forests take in carbon dioxide from the air and use it for growth of boles, branches, leaves, and roots. Trees store carbon in their wood.

ii. When a tree dies and is decomposed by microbes or burned in a fire – whether in the forest or a home furnace, stored carbon is released into the air and taken back in by other live trees.

b. Storage versus Sequestration in a Forest Ecosystem:
   i. Carbon storage is the total amount of carbon contained in a forest both aboveground (trees) and below ground (soil) at a given time.
   ii. Carbon sequestration is the process of removing carbon from the atmosphere through photosynthesis and storing it in wood. It is the rate of carbon uptake from the atmosphere.
   iii. In forests, young, quick growing living trees sequester the most carbon, while older trees store it.
   iv. The Town Farm forest supports a healthy mix of younger and maturing trees, which indicates a good balance between sequestration and storage. Hundreds of tall, large-diameter white pine, hemlock, red oak, black birch, red and sugar maple populate your forest stands, and the patch openings from the 2007 to 2010 harvest filled with immature fast-growing stock.

c. Forest Carbon Sink versus Source:
   i. Carbon emissions from a forest are the opposite of carbon sequestration. Forest carbon can be re-emitted to the atmosphere through decomposition, respiration, or combustion.
   ii. If forests sequester and store more carbon than they emit, this is called a carbon sink and the total carbon storage of the forest will increase by the amount sequestered.
   iii. When the forest emits more $CO2$ than its uptakes, this is called a carbon source and the total carbon storage of the forest decreases. This occurs through natural, or human caused disturbance, including forest fires, timber harvesting, forest loss, or insects and disease.
   iv. The Town Farm and the Fournier town forests function as healthy carbon sinks with annual additions to the stored carbon stock. The carbon releases from the 2007 to 2010 timber harvest have been compensated for with additional uptake through the last fifteen years.

d. Forest Carbon Pools: Carbon in forest is changing its energy state constantly (flux) and moving between different carbon pools.

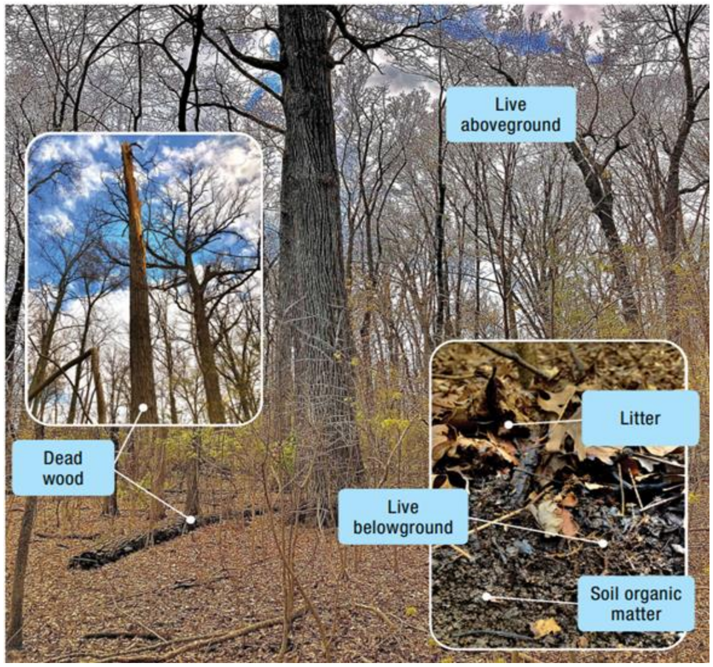


Figure 11: The Forest Carbon Pools

i. This forest currently stores over 4005 metric tons of carbon in the live above ground pool. This metric is equivalent to the CO2 emissions from **3,164** gasoline powered cars driven for one year. Not bad for a hilltop in West County. This stock is in the moderate percentile for other forests in Massachusetts (65 percentile based on a property wide basal area estimate) due to past timber harvesting, tornado damage, and dying hemlock trees. Dead woody material was abundant in both standing dead and fallen wood across the property.

ii. The soil pool has been protected through past best management practices during past timber harvests and the existing stable soil conditions. The wetland soils (filter zones around the vernal pool complex, stream banks, and wetlands) are loaded with carbon, while the drier upland sites have less carbon.

iii. The previously discussed tree species richness, vertical canopy structure (layering of leaves), diverse tree sizes and heights (optimal photosynthesis in all light regimes) on the Fournier property support the sequestration and storage of more carbon.

iv. Stocking of hemlock and white pine adds some additional carbon since softwoods tend to be taller for an equivalent basal area, which increases their carbon storage. Softwoods also tend to have higher trees per acre and stocking densities. Hardwood species contribute over 50% of the forest stocking hardwood stocking which boosts the carbon stock in this pool.

e. Climate change and Carbon:
If climate change impacts your forest ecosystem, it impacts its ability to uptake and store carbon. All that carbon dioxide in the air helps trees to grow a little better, but they do so in the same system replete with all the stressors and risks to the forest ecological functions identified earlier in the document. It's an interesting relationship in which carbon sequestration and storage mitigate the climate change impacts, yet the same impacts jeopardize the forest ability to take in and store carbon. Therefore, actions that your community take to address climate change (adaptation) correspondingly support carbon sequestration and storage (mitigation).
   i. Negative effects of climate change on forest carbon: Everything that you learned about your forests from the DCR Forest Climate Program in this management plan thus far- its stressors, the potential impacts of climate change and the risks to its ecological function- applies to the forest carbon stock. Reduced forest productivity from stressors will reduce sequestration rates. Regeneration failure due to drought, herbivory, or invasive plant exploitation will jeopardize the perpetuation of the forest sink. Tree mortality (wind or ice crown breakage and snapping, tree removal, or pest and pathogens attacks) turns your wonderful sink into a source.
   ii. Positive effects of climate change on forest carbon: Photosynthesis accelerates when more carbon dioxide is in the air. Longer growing seasons increase sequestration rates and storage stocks. In over 50 to 100 years from now when white pine and hemlock populations might decline, your forest could fill with carbon rich hardwoods growing fast and pulling in more carbon.

f. Significant Barriers to Carbon Sequestration in the Town Farm Carbon Sink:
   i. The overstory trees, the tallest trees in the high canopy, range in age from 75 to 90 years. Your carbon stocks are high because of the trees. The proportion of young forest (10 to 40 years of age) is 30% or less. These young trees are the powerhouse of carbon accumulators. They grow beneath an expanding high canopy and sequestration rates may decline through the next few decades as these trees continue to expand their crowns with age.
   ii. Your community values and proposes the development of an older, carbon rich forest. Your willingness to use active silviculture that is tied to ecological function is contingent on conservative work with less than 15% removals of total trees and stocking at any entry point. Overcrowding could bring decreased growth rates and reduced sequestration. Storage will soar in the older forest, and of course older trees still photosynthesize

and have thousands of leaves to do so. Yet the lower stocking of the younger fast growing (the uptake pool) trees will reduce sequestration.

iii. The hemlock wooly adelgid and elongated hemlock scale infestations in the hemlock (11% of your total carbon stock) reduces the vigor and growth rates of these trees due to needle loss. Sequestration is slowing among the hemlock trees of all ages. If your system loses white ash to the emerald ash borer, you will lose one of the fast-growing hardwoods that pulls in a lot of carbon dioxide.

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 not one prescription that works perfectly everywhere and there is room for variation in approaches to the use of adaptation and mitigation and forest resilience building management practices (silviculture with or without timber harvest removals) to promote optimal carbon sinks within your forests. 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 of 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 different species and sizes remains a very solid strategy

The Town Farm property is acting as a good carbon sink right now but could be enhanced. Close monitoring and a thoughtful diversification of age classes over time will enhance sequestration and long-term storage. With the vulnerable red pine removed, a new cohort of young vigorous hardwood trees helps to balance the current portfolio of accumulators/storers of carbon. The Town's commitment to long 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.

The Town is considering a feasibility study for the inclusion of these Town forests in a Climate Mitigation/Carbon Credit Program. Participation in an Improved Forest Management Carbon Program that use the forests for carbon sequestration and the offset of carbon dioxide emissions elsewhere, requires that forest owners demonstrate "additionality" within their forest stewardship programs and any proposed silvicultural treatments of climate adaptation or mitigation actions.

A carbon project is considered additional if one can show that the proposed silvicultural/adaptation and mitigation actions within the forest carbon sink removes more greenhouse gas emissions than other alternative forestry activities commonly undertaken locally. Your community would be required to show that any community-approved sustainable forestry practice (silvicultural/adaptation and mitigation actions) sequesters more carbon than a "business as usual" approach. All the actions that we present in this document, which are very conservative in nature and may or may not involve the removal from the land of wood products, would easily demonstrate additionality.

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, this Forest Stewardship Plan and the community outreach, education, and listening processes that drove its creation are together creating a new paradigm for community-based forest stewardship in Massachusetts. This Plan, along with the Fournier Property Plan, is part of the pilot project here and has yielded many promising results for future work. Here, we summarize what is new and special about this work.

3.1.1 Community-based Forestry

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 this 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 Conway. 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 the Town Farm Woods. They live here and depend on these forests for social, spiritual, recreational, and cultural sustenance. Who is better qualified to manage their futures?

Your Select Board created a Conway Forest and Trails Committee. This Committee has the responsibility to study forest stewardship matters, educate themselves about new ideas and directions for the protection of their forest ecosystems, monitor the condition of the two Town forests, and bring ideas and strategies to the Select Board. They seek grants and creative funding sources to support your community efforts to implement appropriate and community approved climate adaptation and mitigation actions/climate resiliency actions that will achieve the goals stated in Section 1 of this document.

They hold your elected officials accountable for the care and protection of these forests. They also hold your community accountable to an adherence to the collective decision process. They understand that any disturbance to the forest (invasive plant control, trail building, active silviculture, and tree removals) must be substantiated by a peer-reviewed science literature and academic discussions. They might approve land stewardship projects that support the enhancement, protection, or restoration of the resilient, evolving climate adaptive, carbon sink forest and its optimal ecological function. Experience in collaboration with this Committee indicates a thoughtful, serious team who cherish your forest treasure and act solely within their mandate for its stewardship and protection.

3.1.2 An Ecosystems Services Framework

Based upon the results of a community survey, this plan, and the community connectivity inherent to its creation, introduce and pilot a new paradigm for the decision-making process about forest stewardship. 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 as more communities 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 (Conway, 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 from the combined climate change impacts and active stressors 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 climate adaptation and mitigation actions/ forest climate resiliency enhancing practices in this Forest Stewardship Climate Management Plan only when they will support optimal ecological function, adaptative capacity within the forest, and the continual delivery of its essential services to your community. The Millennium Ecological Assessment (MEA 2005- www.milleniumassessment.org) defined these benefits and services with the following four categories:

- Provisioning – the "goods" such as timber products and fuelwood that humans rely on
- Regulating – the cycles that maintain our livable world with water purification, oxygen production, climate stabilization (CO2 uptake), and pollination
- Cultural – these make our world a place we want to live in -aesthetic and spiritual enjoyment of nature, recreational opportunities, solace, and educational opportunities
- 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 (Conway, May 2020, LV and WFRM) and the Conway Forest Stewardship Planning Workshops (Zoom Platform, May 26, 2020, and August 26, 2020) provided a clear, condensed set of goals and objectives for the stewardship of your Town forests. This plan proposes a set of sustainable forestry practices (SFPs), which can also be termed adaptation and mitigation actions useful for the enhancement of your forest ecosystem's ability to cope in an uncertain climate future, which are realistic given the Town's finite human resources, time, and financial resources. These SFP's were determined in terms of ecological outcomes such as improving forest ecosystem function, increasing forest resilience, and maintaining or enhancing goods and services provided to the community. Marketable timber goods consistently ranked as the lowest priority.

3.2 Climate Adaptation and Mitigation Forest Stewardship Philosophy

Your participation on the DCR Forest Climate Program enables your community to take a new direction with the care of your Town forests in this era of a rapidly changing climate. The ideas and concepts in this plan could guide the focus of your stewardship planning over fifty years or more because your awareness of your forest's vulnerability to and risk from climate change will support actions that slowly build forest resilience and climate change adaptive capacity in your forests. Each thoughtful action through the decades enhances your forest chances of beating the odds and risks and coming through with sustained ecological function.

This document took your community on a review of potential climate change impacts, the forest ecosystems' vulnerability, active and accelerating stressors, and the risks to sustainability of your forest's ecological function. The next discussion offers hope for your forest's future ability to deliver ecological benefits and services essential to your community's well-being and for your community to be able to achieve their stated stewardship goals.

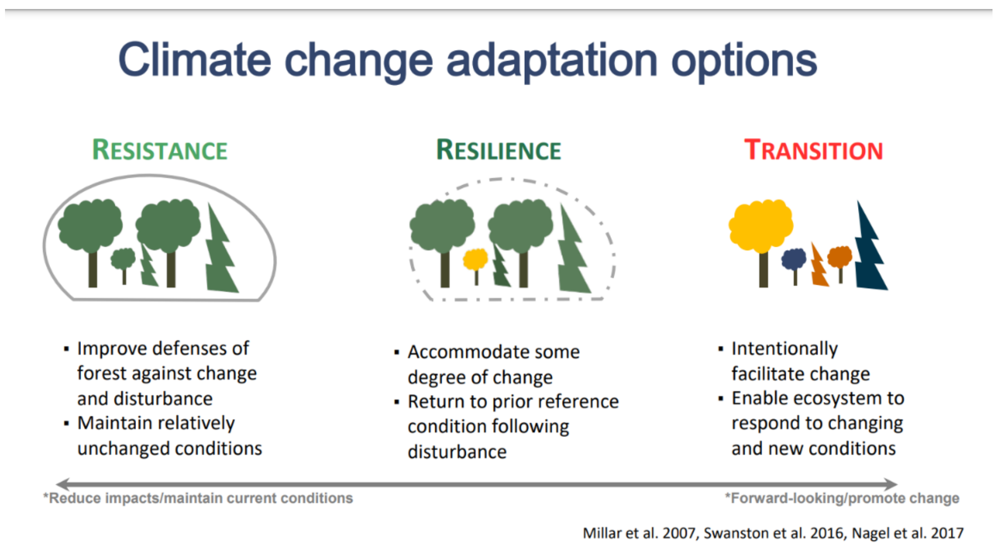
Your community insists that this ecological adaptation approach replace the old school silviculture and stewardship systems that prioritize forest productivity for income. One objective of the DCR Forest Climate Program is to enable your community to convert your 2020 stewardship forestry practices into forest climate resiliency practices or climate adaptation and mitigation actions to address the challenges and opportunities of the changing climate and to continue your stewardship role with the confidence that your work will be successful.

Adaptation actions align with mitigation actions as both support your forest ecosystem's ability to continue its ecological function despite the inherent risks to that capacity. Called Sustainable Forestry Practices in the 2020 management plan, here we will change the nomenclature and put on those off-rose colored climate lens glasses and identify them as forest resiliency enhancing or climate adaptation and mitigation actions. Your community wisely chose excellent adaptation and mitigation actions in the stewardship visioning and planning process in 2020 (referred to as SFP's and considered interchangeable terms for the remaining discussions).

Bound to honor your past hard work, your community is on a path to integrate all three of the science-based climate change adaptation options in the stewardship of the Town forests. Figure 12 demonstrates the basic ideas behind each of the broad options. These options can best be understood along a continuum that vary by such tiny differences that they do not seem to differ much.

Considering your stewardship goals (2020 plan and visioning process) your adaptation options range across the continuum from holding onto those majestic hemlocks for as long as you can to trying some underplanting with the Grammar school students of future adapted tree species which is moving your forest ecosystem into the changed climate world. The management actions summary will identify actions that fall into all three option categories. Our discussions from this point on will integrate adaptation with mitigation actions as your community voiced a strong opinion to use the Town Farm forest as carbon sinks and the Select Board is interested in monetizing that function.

Figure 12: Climate Change Adaptation Options



Let's discuss briefly the three options along this spectrum of the adaptation approach to maintain your forest ecosystem ecological function. Resistance can be a passive approach, but not always. In mature forest systems like this it can look passive, however, actions like treating invasives and protecting the vulnerable regeneration stocking from deer browse can still fit within a 'resistance' approach. This choice might not be driven by wishful thinking, but certainly it is driven by one's faith in the science of forest ecology and conservation biology. It may lead to more damage from active stressors, but with a low to moderate vulnerability rating for the risk to ecological function loss on the Town Farm property, stressor damage and function loss might be lowered or contained. Monitoring will be important for this approach to work well.

With this strategy your intention is to retain the forest ecosystem in its current condition and do all that you can to protect ecosystem function. It's business as usual but the stakes are higher, and you are hedging your bets. It's not a bad idea here since the site does have a moderately high degree of resilience built into it and your stewardship goals support retention of dense forest cover and the further development of all aged resilient forest.

The resilience option is peeking outside the climate management box with some elements of business as usual but the addition of proposed actions that will enhance the resilience of your forest ecosystem. This option is most useful in situations or sites where the risks are a little higher but still the forest is fighting back with low to moderate vulnerability and high resilience like the mixed species groves across the Town Farm property.

The recommended actions with this choice are enhancement of the forests' ability to cope with stress and to recover to optimal ecological function quickly as conditions keep changing. Your combination of both adaptation and mitigation options brings in the direct approach of just pulling carbon dioxide out of the air and reducing the main driver of the climate change forest impacts. Yes, it's an attempt to marginalize the risk to ecological function.

Certain resistance or resilience enabling strategies may not be enough or may be unsustainable given the acceleration over the last two decades of climate change impacts. Transformative adaptive changes anticipate the possible changing conditions and better align forest ecosystems to these predicted future conditions rather than letting the ecosystem and trees be caught off guard by rapid and catastrophic changes. Transition strategies involve human assisted movement of species in response to climate change.

One form of transformative adaptation suitable for the Conway forests is the movement of tree seed or seedlings to a location outside their natural dispersal or growth locations in your Town. If this path is explored, the community would have to decide which species would be most appropriate to favor here. The United States Climate Change Tree Atlas (US Forest Service publication) provides guidance on tree species habitat requirements. Transformational actions incur costs, and the Town would need a budget and a financing strategy (grants). Assisted migration may help maintain healthy and productive forests on your lands as our climate continues to change.

Another form of transitioning is the restoration of heavily impacted areas (such as Stand 4, young hardwood) in which the invasive plant community dominates at least 50% of the of growing space. Their stocking reduction would allow the future climate adaptive tree species to regenerate and with time fully occupy this forested area. Many seedlings and saplings of red oak, yellow birch, sugar maple, red maple, and some hickory would thrive after such an action. This action would slowly move the forest stand structure and condition to a more desirable one capable of coping with an uncertain climate future.

3.3 Adaptation and Mitigation Actions Summary

Here we connect your stated stewardship goals to climate adaptation and mitigation actions that will support this forest ecosystem's ability to thrive and keep providing its essential ecological services to your community. This document has tried to bring you along a linear, logical path of reasoning from your statement of forest stewardship goals, through assessment of the forest ecosystem's vulnerability, risks, and resiliency to climate change impacts, to the hope for your forest's ability to thrive found optional climate adaptation and mitigation actions that you chose during the 2020 planning work. Section 5 of this plan will detail the tasks necessary to implement the broad actions presented here.

Table 5: Adaptation and Mitigation Action Summary/Management Practices Summary

Stewardship Goal	Broad Adaptation Option or Mitigation	Mitigation Involved	Action/Strategy to Achieve Goals =2020 Stewardship Practices= 2022 Resilience enhancing practices and Adaptation and Mitigation Actions
Sustain biological richness	Resistance and resilience and transition	Yes	Keep forest in forest land. Protect rare species on site. Regenerate the forest when needed. Promote diverse tree species, ages, and sizes. Control Invasives. Native shrub planting with future adaptive species. Establish a Proforestation zone.
Sustain ecological function	Resistance and resilience	Yes	Create Community Best Management Practice guide for any activity on the land. Participation in a Voluntary Carbon Market program. Trail mapping, assessment, construction, and mapping. Educational outreach through signage and school curriculum.

Promote forest health and productivity	Resistance and resilience	Yes	Focus tree release with pre-commercial thinning in young forest groves.

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. Your community clearly stated the acceptance of the use of climate adaptation and mitigation actions 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 any actions exclusively for the goal of economic gain.

3.4 Climate Change Challenges and Opportunities For Future Action

As your community begins to consider and understand the implications of climate change and its impacts to your ability to derive the same benefits from your forest ecosystems and reach some of the ecological driven goals, it might be useful to consider the challenges and opportunities climate adaptation and mitigation management will bring. The discussion reviews these ideas from the near term (1 to 25 years) and the long term (over 50 years) perspective.

a) Challenges: Your community worked hard on the derivation of your stewardship goals. You brought passion, intelligence, and your hopes for the future to the project. Your concentration of the climate adaptation and mitigation management approach with use of the resistance and resilience enhancement end of the continuum will bring some challenges to the successful achievement of your goals.
   i. As mentioned earlier 53% of your stocking is contributed by white pine, hemlock, and white ash. Within the next decade it may be hard to retain your dense cover maturing forest with the rate of adelgid, scale, and emerald ash borer advancement amongst these trees. White pine decline in habitat and abundancy might take longer (half century or more), but if temperatures keep rising and the hot summer humidity needles wet, white pine will decline also.
   ii. The goal of growing this forest ecosystem for the biological lifespan of the dominant tree species presents a challenge because forest renewal depends on successful seed germination. The future adaptive species that could save ecological function over the long term (cherry, red maple, red oak, the hickories, yellow birch, and whatever new species move into our region over 100 years) will require more sunlight than usually filters through a maturing canopy to the seedbed. Dense cover could also interfere with the goals of planting native shrubs on the xeric upper slope sand through the riparian zone to increase plant diversity. Planting to expand biodiversity and increase feed meets the biodiversity objectives.

iii. Your community-based decision-making process for the implementation of climate adaptation and mitigation or forest climate resiliency actions in the Town forests merits admiration and respect. It may be challenging to gather the consensus for an immediate response after a major disturbance from climate change impacts. Rapid response for restoration or mitigation of tree mortality or system degradation will require fast action.
iv. The vision of the Proforestation zone (hemlock and hardwood refugia, spring seep font conservation, and maturing white pine co-niche) covering 40 acres of the property might be tough to secure if hemlock trees keep dying from adelgid and scale. But the springs and streams keep the air cool and moist, and these tree species might keep growing strong.
v. Putting on the climate lens as you revisit the planning process started in 2020, the uncertainty of tomorrow climate itself presents a big challenge. Will storm intensity and frequency start to blowdown the tall pine and hemlock; will it just keep getting hotter; can ash survive as the wonderfully fast-growing carbon dioxide vacuum in the forest? Hopefully, the Forest and Trails Committee understands the challenge and will prepare.
vi. Warmer weather and longer drier summer and fall seasons will increase mountain bike and hiker use. It will be a challenge to maintain the remote and stable nature of the trail system to and within the Town Farm forest. Extreme weather events may cause flooding of the low-lying areas of trails, erosion, and hazard tree issues.

b) Opportunities: Remember that forest stewards need to think outside the usual management toolbox as climate change impacts alter the structure, composition, and function of your Town forests. Today's goals and plans might not be useful in 30 years if change is rapid and irreversible. As the forest shifts into its future condition, numerous opportunities to implement new ideas that might support optimal ecological function will arise. Be mindful that these are opportunities, ideas that would require a review and collective decision by the community for any implementation, but they are a way to try to make some lemonade out of climate lemons.
i. 38% of the forest stocking in this forest is contributed by hardwood species. These recent arrivals (60 million years ago versus conifers 150 million) to the plant kingdom have greater photosynthetic capacity than the conifers so they capture more carbon through the growing season. These trees are of seed setting age and will begin the conversion of this forest to future adapted species (red oak, cherry, red maple, sugar maple, hickory, and lack birch), which can secure the ecological function here. Loss of white pine or hemlock abundance could be compensated for with the growth of these future climate adaptive species.
ii. Small town leadership changes and with it changes policies and stewardship goals. Progress usually forces change that is sometimes

unwanted on small towns. The opportunity exists now for your community to explore permanent forest protection with irreversible covenants through the placement of a conservation restriction on the Town forests. Research could determine if sale of a restriction is possible to a non-profit or a government agency that would provide some income to invest in the stewardship of your forests. The most important action you can take to assist your forest to cope with climate change impacts is to keep it as a growing forest.

iii. Predictions state that temperatures will keep climbing and if we humans don't stop our emissions more carbon dioxide will fill our air. The voluntary carbon market now offers viable paths to income from carbon storage, but indirectly it offers a means to secure sever reductions in the intensity of any possible future timber harvesting (even if it is approved by the community) or even the retention of your maturing forests.

iv. By now it is apparent that the science and the language of climate adaptation and mitigation stewardship are complex and difficult to figure out initially. Given your goals of trail development, maintenance and signage, an opportunity arises for the establishment of an "adaptation, mitigation, and resiliency" nature trail that educates your community about how these forests are a part of the climate crisis solution. People are hungry for answers to their fears around what is coming for our natural sites.

3.5 Sustainable Forestry Practices Known within the DCR Forest Climate Program as Climate adaptation and Mitigation Actions

A full set of useful objectives and sustainable forestry practices useful for their achievement can be reviewed in **Appendix A**. **Appendix A** is the distillation of our Forest Stewardship Planning Workshop, the Community Forest Stewardship Survey, 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. The next sections of this document introduce a sub-set of **Appendix A** for the convenience of publishing. This full set could be revisited at any future date by the community.

3.6 Forest Carbon Management

Your community accepts the use of the Town Farm forest for nature-based climate solutions. There are many options for stewarding the health of your forest while enhancing carbon sequestration and storage. Options that align with your stated 2020 stewardship goals include continuing to let the forest grow. However, this option might at some future date cause carbon losses since your dominant species have some sustainability issues from climate change impacts and stressors. If your community supports the future implementation the conservative thinning around designated focus trees for release of their crowns (Stand 2), or even the weeding of the immature sapling class to increase their vigor by removing competition (Stand 4) it would be necessary to plan well to avoid soil disturbance or other risky carbon losses.

Again, we notice that mitigation actions converge with climate adaptation actions as carbon management strategies that will help your community achieve their stewardship goals and increase carbon uptake include invasive plant control, seedling protection from browse, and the enhancement of species and structural forest diversity. The simplest approach is to retain older, larger trees if/when you implement any of the prescribed adaptation or mitigation actions for the enhancement of forest resiliency. Your community's desire for the removal remove of less than 15% of stocking makes this approach feasible. The weeding and low canopy thinnings discussed later in Section 5 of this document would help increase carbon sequestration rates by improving vigor of young trees. Qualification must be made again that any work of this mature would need to be supported and approved by the community with strict guidelines on its implementation.

3.7 Adaptive Management

Forests are living, dynamic systems trying to thrive in a complex environment subject to the stress of a changing climate. Adaptive management strategies can support your community as it acts to overcome the inherent uncertainty surrounding climate change and its effects and support appropriate actions as the forest changes. 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 should be adaptive to what happens in the forest when planned or unplanned. The diverse elements of this management plan document should be re-evaluated when new scientific information and community values change in time. 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 Conway in 1900 would have a quite different take on the woods than we do today, and as future generations will have in another 100 years.

Regularly walking the woods and noting changes or responses to both your actions and a passive approach informs your next best action or decision. Keep an eye on the climate change impacts and phenomena. Maybe record phenological changes such as leaf out date, when the skunk cabbage pokes out of the wetlands, or the timing of the wildflower blooms. Check for new pest and pathogen occurrences or the expansion of current activity. Record whether tree seedlings are still developing on the forest floor (and what species they are) as they are your future hope for ecological function. The Town Forestry and Trails Committee could oversee this work with the ideas and strategies within this document as a guide for the development of a climate-adaptive, carbon-friendly, resilient forest ecosystem development approach. Monitoring templates and forms could easily be created for this work and archived by the committee or concerned citizen scientists within your community for future reference and decision making.

Section 4: Methodology

4.1 Forest Inventory

Field method for tree data and volume per acre: In all stands, a nested point-sampling cruise was conducted using a 10-gauge factor basal area prism for “count trees” that determined basal area and determined trees for volume measurement. Product volumes were calculated using Forest Metrix, a forestry software package. Results are reported in the Stand Overview table.

We installed 18 plots across the forest to collect our data. In addition to the tree data, we measured:

1. Regeneration via mil-acre plots,
2. Snags, coarse woody material, and forest structure,
3. Invasive plant densities, and
4. Birds via visual and aural identification

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 Orthoimage (2013/2014)
USGS Topographic Quadrangle Images
Protected and Recreational Open Space
BioMap2
Mass DOT 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.

4.5 Carbon stock metrics

The Estimating Carbon for Forest Stewardship Climate Plans published by Massachusetts Audubon in 2022 was used for the computation of metric tons of carbon in the forest ecosystem and the percentile of this stocking ranked against other Massachusetts forests.

Section 5: Stand Descriptions

Table 6: Forest Stands Summary

Stand	Acres	Forest/ Habitat Type	Important Observations regarding Climate Change, Carbon, or Or Unique Features and Attributes	Climate Risk	Carbon/ Acre
1	16.47	HH	Hemlock trees growing with the birches, maples, beech, cherry, and white pine. A rudimentary all-age grove with some maturing statuesque hemlock and white pine growing above immature saplings and pole-sized trees. Adelgid sparse. Proforestation refugia. Photosynthesis high, sequestration rates high. Protect healthy water inspiring seep fonts. Let mature trees grow. Super-dominant white pine risk with high wind. Black cherry, yellow birch, and red oak seedling development all future adapted species. Dense pockets of sapling layer mostly black birch-10% of stand in this age class.	Moderate. Hemlock might lose of abundance and habitat over different time spans. Regeneration failure or bias to black birch and beech. Low seedling count and advanced regeneration is mostly black birch which may decline in abundance. Stressors moderate but may increase. Filtration capacity must be sustained.	45 tons per acre 50th percentile
2	38.22	OH/RO	Stretches over a hilltop. Vigorous young red oak, red maple, sugar maple, yellow birch, black birch, cherry, and hickory trees with high CO_2 uptake rates.	Moderate. Upland droughty soils so drought stress threatens long term forest renewal. Species composition bias to Black birch which	30 tons per acre 15th percentile

			Resisted ice storm damage 2008 and 2010. Carbon rich hardwoods. Opportunity for new species composition development with future adaptive species seed source.	may be drought intolerant long term.	
3	WH	29.1	Maturing white pines grow with scattered large sized red oak, black birch, red maple, sugar maple, ash, and cherry. The upper layer towers above seedlings and sapling hardwood and thickets of white pine. Carbon storage high with large sized trees. Balance between uptake and storage with fast-growing young trees.	Moderate. White pine long term risk of suitable habitat loss and abundance reductions. Extreme winds ice, or heavy snow events threaten high canopy composition and structure.	55 tons per acre 65th percentil e
4	YF	13.56	Thousands of saplings and small-pole sized hardwoods seeded into an old red pine plantation site. 10 to 13 years old. Excellent habitat zone for songbirds, grouse, woodcock, moose, deer, and rabbits. The occasional legacy red or white pine towers over the new forest. Beginning of the growth curve for rapid CO_2 uptake. Enhances forest landscape biodiversity.	Moderate. New forest growing has dominance of black birch and beech both susceptible to stressors (beech bark disease) and possible long term moisture stress. Composition may not be sustainable.	15 tons per acre. 2nd percentil e

			Survive ecosystem collapse after the ice storms and a tornado because <10 years old seedlings and saplings on site. Unique moose and deer browsing areas.		
5	WP	4.99	A naturally seeded pure white pine stand that is slowly adding hardwood species in natural openings across the canopy. Refugia for maturing white pine. Retain all carbon through reserve status. Good location to promote old growth characteristics and structural complexity.	Moderate. WPND threat to species composition long term.	64 tons per acre 85^{th} percentil e.
6	RZ	4.67	Wetlands mucks carbon rich soils. An open water marsh site with recent beaver activity, thriving hydric shrubs and plants, and high use by mammals and songbirds.	Low: Ecological function high through wetlands. Phragmites threat to native plant community.	

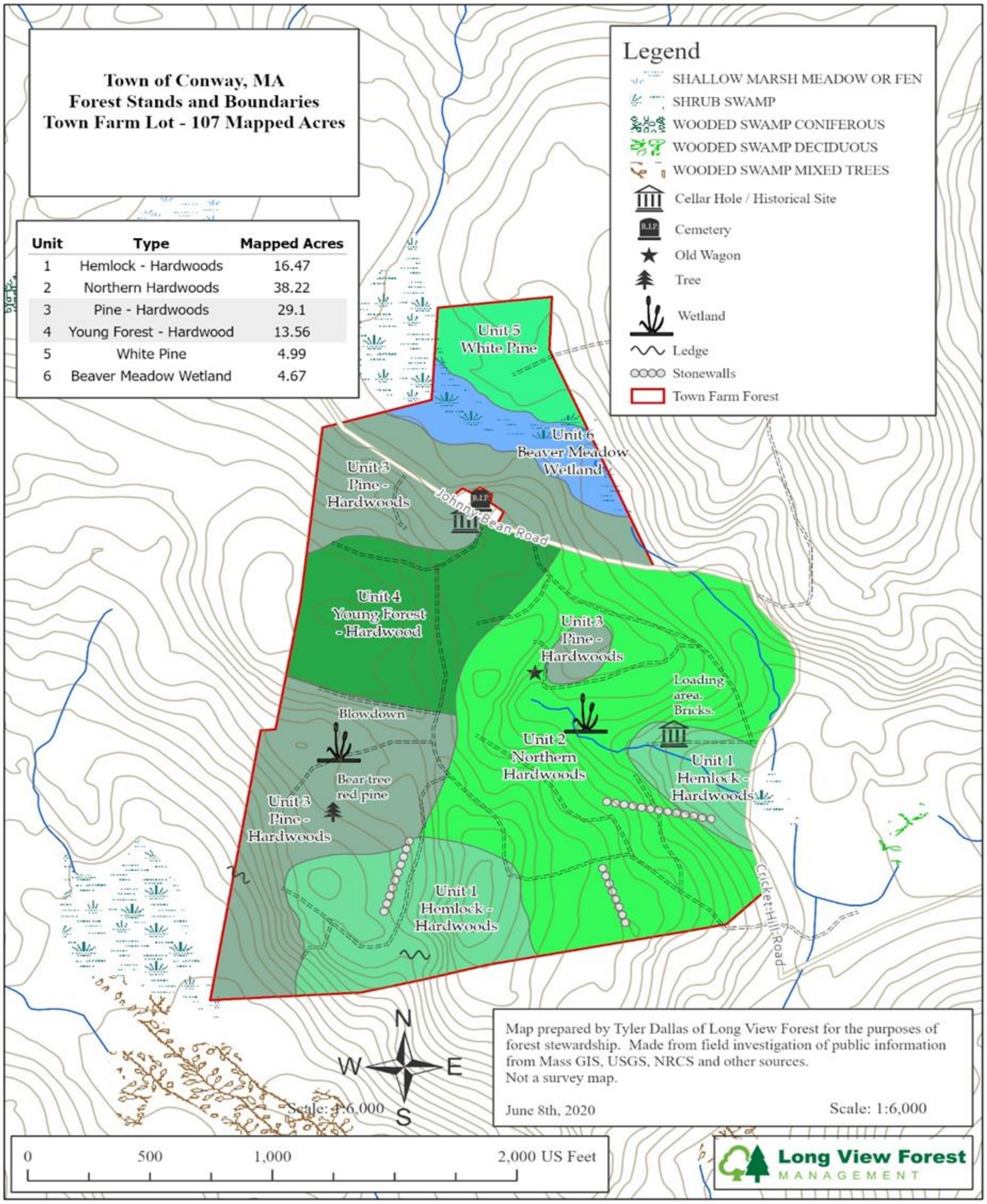


Figure 13: Forest Stand and Boundary Map

5.1 Stand 1: Hemlock and Mixed Hardwoods (HH)

Figure 14: The rocky knoll forms the western part of Stand 1 and could host a nice view.

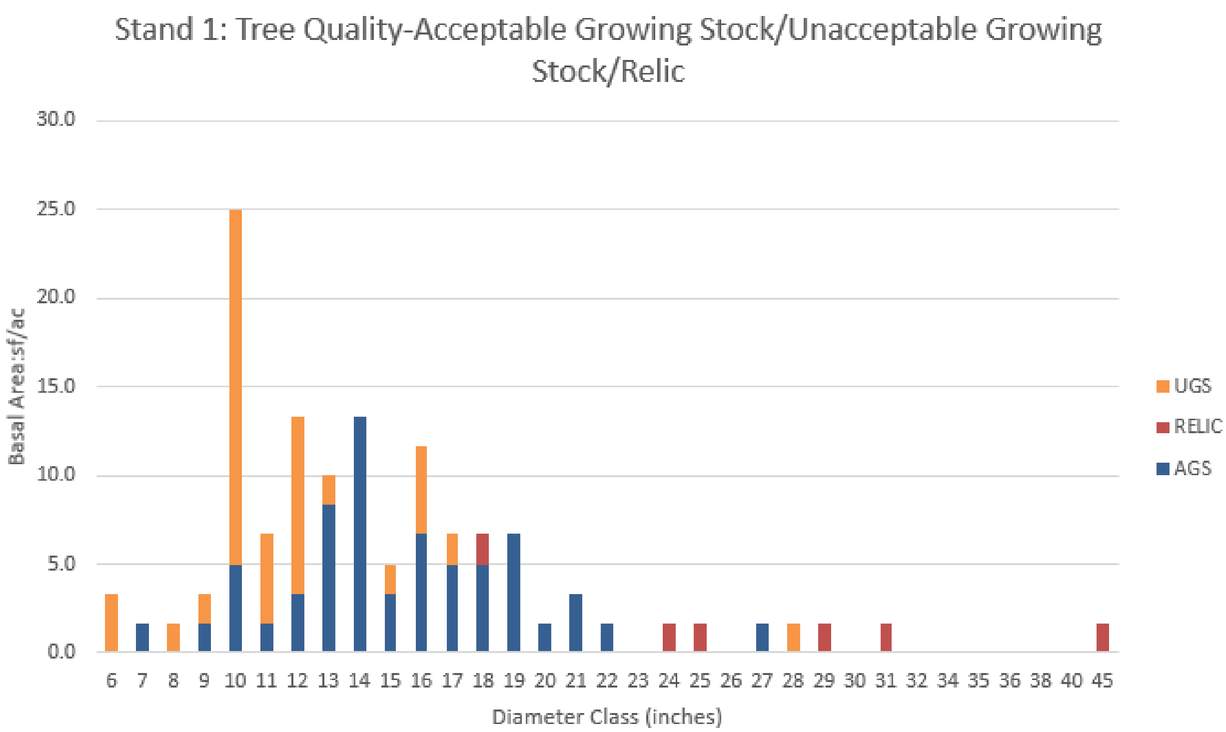
5.1.1 Overview

In two sections, this Stand presents a beautiful mixture of hemlock and hardwood across a range of topography. The eastern section features historic remnants from the Town Farm days and the western section feels like some of the most remote terrain on the property. Keeping an eye on the hemlock for signs of significant hemlock wooly adelgid stress will be key to make sure this Stand thrives and continues to supply maximum carbon storage benefits.

Stand 1 Summary Data

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index
Stewardship	1	HH	16.47	12.5 inches	135 Sq. Ft.	6.423 MBF 8 cords 13 tons	55: WA

Stand 1 Tree Quality Graph



5.1.2 Terrain and Topography

The terrain sweeps across two small hills (separated by a low saddle) with slopes that range in steepness from 8% to 25%. Exposed ledges and bedrock dot the ground. The two small knolls that define the saddle formation along the southern boundary present a challenge to hemlock seed germination and seedling development with their droughty and shallow soils.

5.1.3 Soils and Productivity

The physical diversity of this stand places it above two distinct soil regimes. The largest section, which lies along the southern bound, grows above Millsite-Westminster rock complex soils. The smaller section lies along Cricket Hill Road within a narrow drainage channel above the moist Pillsbury Soils. The matrix of droughty and moist soils retains a little more moisture through the growing season and might provide a suitable seed bed for some of the moisture loving seedlings (hemlock, yellow birch, and black birch). This stand surrounds the spring seep and isolated small wetland areas, which are hemlock's preferred habitat.

5.1.4 Forest Stewardship History

The 2008 ice storm did some minor damage to the crowns throughout this stand. Earlier hemlock wooly adelgid infestations forced many hemlock trees into decline. The application of a joint Salvage Harvest (2009) and Individual Tree and Group Selection Harvest in (2007) resulted in the introduction of a seedling and small sapling age class thereby increasing vertical stratification and size diversity within this stand. These young trees are thriving, as are the larger trees whose canopies continue to expand into available growing space. High biodiversity (diverse tee ages, sizes, and species) supports forest resiliency and this forest's ability to cope and adapt to a changing climate.

5.1.5 Overstory Species and Condition

A well-stocked, two-aged stand supports larger hemlock (33% of the stocking), red maple (25%), red oak (9%), black cherry, and aspen, and yellow birch larger trees in the high canopy (diameter over 14 inches) and smaller sapling and pole-sized (diameter range of 9 to 12 inches) black birch, sugar maple, red maple, beech, and hemlock tree below. The quality of these trees is fair to good, with limited disease or pests, except for severe pocking by beech bark disease. Even the hemlock does not suffer from intensive adelgid attacks.

If one assessed them as timber crops, the hardwood has high value potential. Working with the ecosystem function paradigm, as these narratives shall do from here on, these trees are productive and vigorous, efficiently photosynthesizing, pulling in carbon, and filtering water across the stand. Recent storm activity, with its wind, ice-loading, and snow loading, causes limb breakage. Scattered super dominant white pine trees tower above the forest (average of 1 tree per are). Relic stems (over mature stems with >24 inches dimeters-remnants of the original post-agriculture forest) of hemlock, white pine, yellow birch, and sugar maple dot the landscape.

5.1.6 Regeneration Species and Condition and Forest Floor Cover

These less fertile soils took a while to begin the regenerative process, yet now the site supports thousands of seedlings per acre. Species include all the overstory tree with dominance in beech, red maple (greatest number of seedings), black birch, and white pine. Herbivore pressure here is common and pronounced (moose and deer). Scattered patches of mountain laurel are present.

5.1.7 Invasive Plants

Invasive plant communities are absent.

5.1.8 Unique Stewardship Considerations and Inclusions and Habitat Thoughts

1. Pockets of dense hemlock trees were intentionally left undisturbed during the harvest project. These areas provide "deer yarding" niches in which the microclimate and wind shelter offer comfort from the winter temperature extremes. "Deer runs" traversed the stand. This basic habitat service is at risk from the pest stressors on the hemlock crop. The resistance strategy lets these valuable niches live on in the forest landscape.
2. The eastern knoll in the southern section offers a vista potential. If some trees were simply felled and a narrow trial laid out through the hemlock and over the rocks to the top, a view to the north would offer a peek at some un-named hills and the pleasant sensation of looking down on the treetops.
3. The sighting of a raven over this stand confirms their return to the forests of western Massachusetts. The super dominant pine and hemlock trees (some reaching over 80 feet in height) supply nesting or roosting sites. High wind, heavy ice and early snow threaten the breakage of these perching treasures.
4. The over-mature sugar maple and yellow birch relic trees support cavities and crevices that supply nesting and denning opportunities.
5. The section nestled in the wetland area along Cricket Hill Road Extension supports a habitat niche with grasses, wetland ferns, and moss-covered rocks. The slow-moving spring seepage attracts songbird, who find the maple-leaved viburnum fruit appealing. One could listen for the Canada Warbler or Red-eyed Vireo in such a moist niche. This is a nutrient rich spring font. Hemlock protects the water and soil health. Its loss would be difficult for this forest niche to recover from. Monitoring of the hemlock and your community's consideration of under planting some future climate adaptive hardwood tree seedlings are recommended.
6. A second spring seep fonts water that flows westerly into the adjoining lands of Cowls Lumber. These small eco-niches support a microclimate due to their dense cover of shrubs, trees, and herbaceous plants. They usually never freeze and return to open ground first in the spring. They supply ideal habitat for feeding and water. As mentioned above, the value of the dense hemlock cover for water quality and habitat is threatened due to the possible accelerated stressor impacts and seedbed unsuitability if the mineral soils dries out in the future. The replacement of the hemlock component for these ecological services would be difficult.

7. A trail guides the interested hiker to the spring seep font in the eastern section of this stand along Cricket Hill Road Extension and through the heart of the larger stand. In this area, the trail follows an impressive stone wall.
8. Black-capped Chickadee, Brown Thrasher, and Wood Thrush might be seen foraging on the ground beneath dense mixed hemlock and hardwood grove. The volume of coarse woody material from the past harvest and fallen limbs increases the invertebrate population for their feed.

5.1.9 Climate Vulnerability

This stand records a moderate present time vulnerability rating to climate change impacts on its ecological function. Short term risks to tree productivity and the forest's function originate from the current stressors (hemlock wooly adelgid, elongate hemlock scale, beech bark disease, and deer browsing on seedlings under 6 inches in height). The combination of the predicted long term climate change impacts (drier soils, late growing season drought and extreme, lack of winter die back with pests, and herbivore populations increasing) could escalate this rating to high with the possibility of ecosystem collapse 50 to 100 years from now.

Your community's decision to designate this stand as a Proforestation Zone might protect its ecological function for several decades with the existing dense cover holding moisture in the soils and viable seed hardwood seed sources on site for stand renewal if hemlock regeneration and tree health fails, but the threats and risk described above could accelerate if CO_2 emissions keep climbing. As your monitoring continues, attention could be given to the seedling stocking levels and the advance of hemlock decline, new considerations for transitioning species composition to a mix of more future climate adaptive species might be considered.

Hemlock, white pine, and white ash face the threat of abundance and suitable habitat loss, but over 40% of the stocking density is other hardwood species (red oak, black cherry, aspen, yellow birch, and red maple) that may thrive with more CO_2 available for their growth. Red maple contributes 25% of the stocking, and it is an "endurance species" capable of thriving under any climate conditions and regenerating by stump sprouts or beneath the dense hemlock cover while its persists in the stand.

Beech (greatest number of seedlings counted in field inventory), hemlock, and red maple dominate the youngest age class beneath the main canopy. This stocking density is sparse now but may expand as more hemlock succumb to stress and decline and light penetrates the forest canopy. Even if seed germination occurs in the canopy openings, seedling development may be difficult with the current and predicted herbivore pressure. The establishment of the new forest is essential for the sustainability of a climate adaptive ecosystem; this uncertainty poses the greatest threat to ecological function in the long term.

5.1.11 Forest Carbon

Future decline and decay of the hemlock and beech crops in this stand will reduce both the carbon uptake and storage functions of this stand. This threat does provide the opportunity over the next 50 to 100 years the opportunity for the replacement of these species by fast-growing, future climate adaptive hardwoods. Proforestation actions retain the carbon storage volumes in trees and forests. An estimated total of 1046.5 metric tons of carbon are stored within the trees in this forest stand. This storage volume equals the sequestration of the CO_2 emissions from 875 gasoline-powered passenger vehicles driven for one year. This is a moderately high volume of carbon stored in these maturing mixed hemlock and hardwood trees.

5.1.12 Desired Future Condition

The establishment of a hemlock refugia area within this stand would protect the water quality and function of the spring seep font areas. Proforestation is a sustainable forestry goal, which increases structural complexity as conditions and tree ages slide out towards the old growth curve. It's a gamble here with hemlock risk factors, but the cooler hilltop site and the moisture might keep this hemlock grove healthy for decades yet.

With time, the birch, maple, hemlock, and pine seedlings will rise to take their place in the main canopy. Some hemlock might succumb to adelgid damage and offer large snag trees for insect feeding by songbirds. The maturing overstory will continue to grow, adding more carbon with each season. One could climb to the knoll vista along the new path and enjoy the more remote sections of the stand.

5.1.13 Recommended Adaptation and Mitigation Action

1. Reserve Forest/Proforestation Area of this unique hemlock and mixed hardwood stand that one can visit via dense forest cover with minimal disturbance along a narrow trail. Increase forest resilient. Resist loss of hemlock keystone species status.
2. Development of an interior forest vista and a trail accessing it. Highlight biodiversity of landscape and forest niches.
3. Trail maintenance with mulching or brushing of the sapling growth along the trail network and installation of erosion control measures on the existing trail system through the stand. Promote full ecological function inclusive of the solace of a walker.

5.2 Stand 2: Red oak and mixed hardwoods (OH)

Figure 15: Red oaks and a regenerating cohort of mostly birches and maples characterize Stand 2

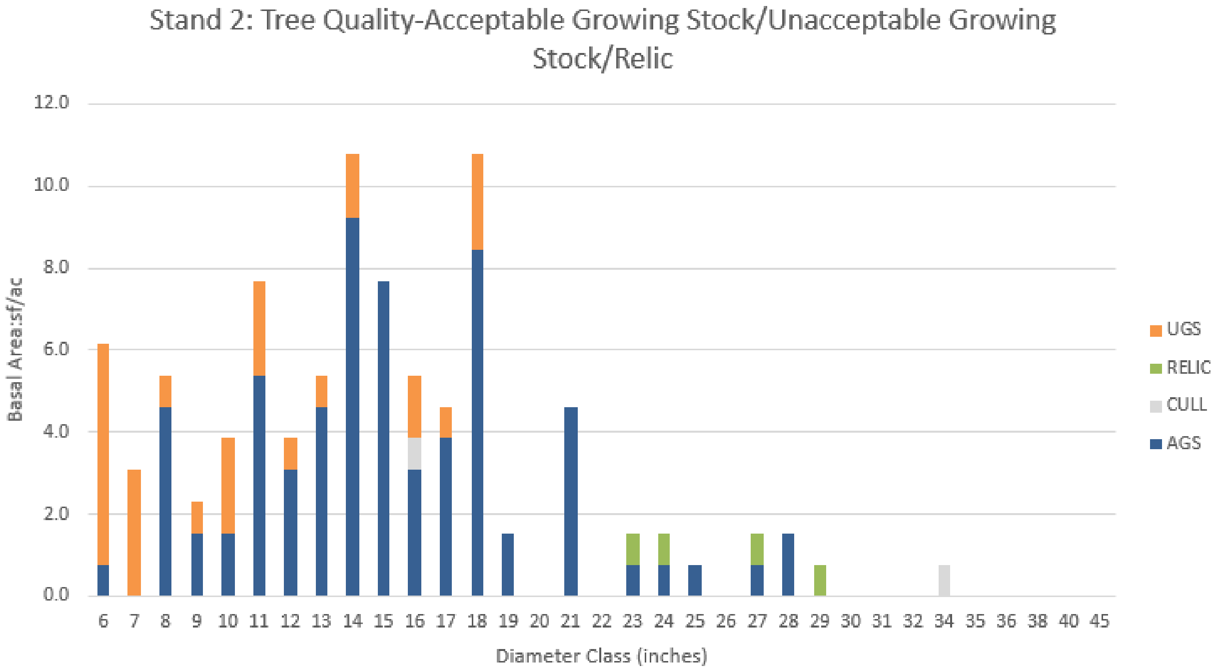
5.2.1 Overview

This is the largest and most representative Stand on the property. It features a vigorous oak component, well-designed logging roads that could be used as trails, a wetland feature, and a vigorous cohort of saplings.

Stand 2 Summary Data

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index
Stewardship	2	OH	38.20	16 inches Overstory 7 inches lower	92 Sq. Ft.	5.472 MBF 8 cords 1.25 tons	65:RO

Stand 2 Tree Quality Graph



5.2.2 Terrain and Topography

Entering the stand from the southern boundary, the relief sweeps around the eastern flank of the un-named hilltop in Stand 1, dropping into the drainage valley of a spring seep before rising upwards and crossing the broad eastern flank of another hill. The terrain is mostly gentle to moderate slopes. The pitch is divided between a north easterly aspect and a south westerly aspect. This orientation both protects the dry soils from full solar exposure (northeast) and opens the other portion of the stand to dissecting solar energy through the growing season. Seedbed conditions are variable with the opportunity for a wide diversity of tree seed to germinate across the stand.

5.2.3 Soils and Productivity

The variably productive Millsite-Westminster soils lie beneath this stand. The more productive Millsite sites grow the more site demanding red oak trees here. The oak quality is quite high, and crowns continue their expansion post- release and post-ice storm. The dry, shallow Westminster soils tend to hug the convex upper slopes with the deeper, moister Millsite soils on the lower slopes and small depressions. Seed germination and regeneration efforts may prove more successful in the regions that lie above the Millsite soils, which hold some water for tree growth.

5.2.4 Forest Stewardship History

The 2008 ice storm in Franklin County damaged the crowns in this stand. Black cherry, white ash, and birch stems were most severely impacted, the red oak resisted breakage. The application of a joint Salvage Harvest (2009) and the Individual Tree and Group Selection Harvest in (2007) resulted in the current sapling age class, thereby increasing vertical stratification and size diversity within this stand. Crown damage from ice decreases a tree's productivity and vigor. It also makes the tree susceptible to other pest and pathogen stressors that might enter the wounds.

5.2.5 Overstory Species and Condition

This is another two-aged main canopy stand with red oak (27% of the total stocking), yellow birch, black cherry, sugar maple, and white ash trees in the high canopy and black birch (22%), red maple (22%), beech, cherry, yellow birch, red oak, sugar maple and hemlock sapling and small pole-sized trees (range from 4 to 7 inches) beneath it. These younger trees contribute the greatest number of stems per acre (80) giving the appearance of a "crowded" middle canopy. Productive, healthy trees with open crowns fill both upper layers. Each acre supports at least one over mature (>25 inches in size) sugar maple, red oak, or black birch relic. The increase in sunlight from the 2007+harvest sprouted side branches (epicormic) on the lower boles of the occasional suppressed red oak trees.

5.2.6 Regeneration Species, Lower canopy, and Condition and Forest Floor Cover

Openings from the Group Selection part of the past harvest filled with vigorous red maple, black birch, beech, black cherry, sugar maple, and striped maple seedlings. Red maple (stump sprout behavior) and beech (root system cloning behavior) supply a large starch store for vigorous growth and abundant numbers. The immature trees record diameters of 1-2 inches now. The sapling trees reach maximum heights of 35 feet.

Tree seedlings (young trees with heights less than 3 feet and diameters <=1 inch) are deficient across the stand due to the overstory shade. It is notable that given its success on this site, red oak seedlings and saplings are uncommon. Herbivore browsing was noted. The shrub layer is sparse and includes maple-leaved viburnum, witch hazel, and pockets of mountain laurel.

5.2.7 Invasive Plants

Invasive plant communities are present throughout this stand, with the greatest concentration (pockets of up to 25% ground cover) along the western stand edge adjoining Stand 4 which is the early successional habitat zone. Species include Japanese barberry, Asian bittersweet, multiflora rose, and honeysuckle. Invasive plants consume valuable seed bed forest floor area preventing hardwood seedling development.

5.2.8 Unique Stewardship Considerations and Inclusions and Habitat Thoughts

1. The red oak stocking provides nice habitat attributes- from the episodic acorn production but also as high forest nesting sites for birds like orioles. The leaves, twigs, and young shoots supply browse for deer and rabbits during times of food shortages. The large surface area of oak leaves also provide food to a diversity of invertebrates. Many species of insects feed on oak leaves, with several species of moth larvae feeding on nothing else. Many songbirds search the surface of branches and leaf clusters for insects.
2. Undoubtedly the most valuable resource oaks support vertebrate wildlife with is acorns. More than 100 species of vertebrate animals are known to consume acorns in the US, including white-tailed deer, gray squirrels, flying squirrels, mice, raccoons, opossums, bear, and red foxes. Birds that feed on acorns include wild turkey, wood ducks, woodpeckers, crows, and jays. Acorns are on the ground in autumn and winter, when availability and nutritional quality of food resources are lowest, and animals need to consume extra food in preparation for the harsh weather conditions of winter.
3. A small native tree, hophornbeam, grows well in this upland stand and we record 3 hophornbeam trees per acre across the stand. The trees here have an average size of 6-7 inches, and they set ample seed each year. Their seed is a small, tight cluster of nutlets that are eaten by songbirds, Wild Turkey, and other small mammals. Witches' broom that commonly occurs on this tree supplies a home to many invertebrates eaten by songbirds, especially during the winter.
4. Birds seen during the field inventory include Ruffed Grouse, Blue Jay, Black-capped Chickadee, Black-throated Green Warbler, Ovenbird, and Woodcock. The soft mast source in black cherry trees, maple-leaved viburnum shrubs, and wild grapes provide high value nutrition prior to the fall migration.
5. The over-mature sugar maple and yellow birch relic trees support cavities and crevices that supply nesting and denning opportunities and store a large volume of carbon in their aging trunks.
6. Wild grapes present some problems with tree productivity in this stand. They climb into high crowns and arc over immature tees to exploit photosynthetic area. Sometimes they strangle the trees. But their palatable fruit is enjoyed by most wildlife.

5.2.9 Climate Vulnerability

This stand records a low vulnerability rating to climate change impacts and its ecological function now and in the next few decades. Short term risks to the forest's productive capacity are much greater than climate change impact threats. 25%of the forest floor supporting invasive plants might be a marginal proportion, but without control measures initiated here, these plants might continue their spread through the stand and prevent regeneration success in the future. Apart from beech, white ash, and the scattered super dominant white pine (reaching over 75 feet in height) the species that grow here are future climate adaptive and can regenerate and grow vigorously if our climate keeps warming.

If one considers the long-term perspective (50 to 100 years of forest dynamics), the species mix (red oak, white oak, sugar maple, red maple, cherry, hickory, and yellow) is well suited to warmer soils and provide an ideal seed source as regeneration efforts continue naturally. The dominance of the younger age classes by black birch and red maple guarantee a well-stocked upper canopy for a long time. These trees shade the forest floor and set ample annual seed crops. If major disturbance due to climate change impacts occur, the stand is well positioned to renew itself without a loss of ecological function. The above circumstances provide hope for stand continuity if the abundance and distribution of white ash and black birch by species loss due to seed germination restrictions or emerald ash borer infestations. A vulnerability to the future species composition and function of the ecosystem does exist from the stand's susceptibility of the red oak crop (27% of the stocking) to spongy moth defoliation, as this pest is emerging as a threat in western Franklin County. is important

65.2.9 Forest Carbon

Broadleaved species, such as oak, beech and maple, are optimal carbon dense species because they have a larger surface area of leaves which generates more photosynthesis, whereas conifers absorb more heat. The stand contains an estimated 1,510 metric tons of stored carbon in its trees. This is a moderate to high volume of storage for a stand in which 50% of its stocking is contributed by immature seedlings, saplings, and small pole-sized trees. These immature hardwood trees accumulate CO_2 at high rates. This storage volume equates to the emissions that would be released if 72 tanker trucks of gasoline were combusted in gasoline powered vehicle engines.

5.2.10 Desired Future Condition

Carbon friendly forests supports several canopy layers of healthy, productive trees of diverse species. The crowns of the oldest and largest trees are expanding across the skyline, collecting CO_2 efficiently, and seeding each year onto the forest floor for perpetuation of this valuable ecological service. The healthiest of these maturing trees are kept, if possible, for their lifespan, gaining girth and photosynthetic leaf surface each year. Younger trees struggle mid-canopy to capture more sunlight in this current forest condition. Seed germinates on the forest floor in sunlit small canopy gaps to sustain this species-rich valuable forest ecosystem. As this stand matures into an all-aged stand structure, it will present a good balance between the immature tree sequestration and the older stem storage of carbon discussed earlier in this report. Eventually consideration must be given to the establishment of a new seedling class and the herbivore browsing levels must be mitigated.

5.2.11 Recommended Sustainable Management Practices

1. An application of a conservative Focus Tree Release silviculture project with the creation of small gaps between the crop trees.
2. Regeneration studies and if necessary, for the preservation of a red oak component in the stand, plant and protect red oak seedlings for biodiversity.
3. Trail maintenance with mulching or brushing of the sapling growth along the trail network and installation of erosion control measures on the existing trail system through the stand.

5.3 Stand 3: White pine and mixed hardwoods (WH)

Figure 16: White pine regeneration takes hold in an opening made by past harvesting. Note the high volume of woody material on the forest floor.

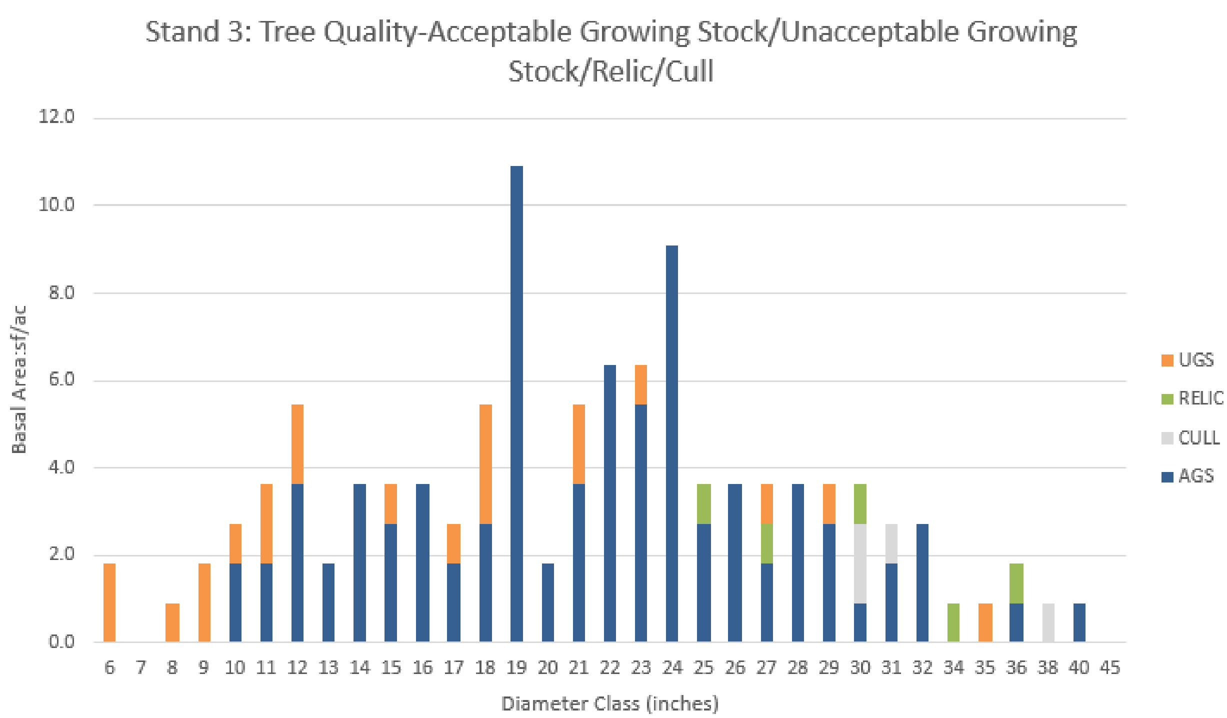
5.3.1 Overview

The pines in this Stand are soaring, remarkable, and quite large. Pockets of pine are regenerating here and will hopefully play a role in the future forest. Bears have regular routes through the Stand and the regenerating hardwoods are vigorous too. Logging roads provide nice access here and could be better kept allowing visitors to experience the pines here.

Stand 3 Summary Data

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index
Stewardship	3	WH	29.1	17 inches WP 23 inches Lower canopy: 7-11 inches	92 Sq. Ft.	12.656 MBF 3 cords 9 tons	68: WP

Table 1: Stand 3 Tree Quality Graph



5.3.2 Terrain and Topography

The southern section of this stand lies on the steeply pitched (slopes ranging from 25% to 50%) western flank of an un-named hilltop in the southwestern corner of the property. The northern section descends from the crest of a hill (highest point on the land) onto the broad, gently sloped to level lower flank along Johnny Bean Road and on down to the shores of the beaver meadow.

5.3.3 Soils and Productivity

The variably productive Millsite-Westminster soils lie beneath the southern section of this stand. The trees are more productive above the Millsite loams. Exposed bedrock, some cliff-like formations and ledges are also common here. The northern section grows above the deep, well-drained, fertile Shelburne loams. Not surprisingly, this is where the cellar hole still denotes where people focused their farming efforts. The hilltop areas and upper slopes lie above the droughty Westminster soils, which pose a challenge for successful seedling development. White pine seedlings are maturing on the deeper, sandy soil zones.

5.3.4 Forest Stewardship History

The 2008 ice storm minimally damaged the hardwood crowns throughout this stand. The applications of a combined Salvage Harvest (2009) and Individual Tree and Group Selection Harvest (2007) resulted in the current sapling age class thereby increasing vertical stratification and size diversity within this stand. Recent strong wind and high-volume precipitation events blew down several large white pine trees inclusive of a small pocket in the southern section of the stand. An earlier conservative harvest in the 1990's succeeded in the start of a new forest that now fills the middle canopy with 30- to 35-year-old hardwood and white pine trees.

5.3.5 Overstory Species and Condition

This stand supports a classic example of the transitioning successional forest from abandoned pastures, which usually evolve with high species diversity. The abundant white pine trees (54% of the stand stocking) are an artifact of human land use, seed ecology on bare soils, and shade tolerance of trees. Two distinct upper canopy layers developed from past disturbances. Larger red oak, white ash, aspen, red maple, black birch, sugar maple, and black cherry trees share the high canopy with the pine. A well-stocked layer of large sapling and pole-sized trees (size range from 6 to 12 inches) grows beneath this layer. The 2007+ harvest released the crowns of these trees for expansion and increased productivity. Traditional timber crop standards might suggest that the maturing white pine trees have trunk defects from excessive branching, but these trees hold tremendous amounts of carbon and provide useful habitat. Their vulnerability to windthrow, however, makes them a slightly riskier carbon portfolio asset.

5.3.6 Regeneration Species, Lower canopy, and Condition and Forest Floor Cover

This discussion focuses on trees less than 2-3 inches in diameter. The past harvest germinated seed and encouraged sapling development of all the overstory species. A simple seedling count recoded numbers well above a sufficient stand continuity count of 2,000 seedlings per acre. Black birch, black cherry, red maple, and white pine were successful. Dense thickets of white pine seedlings surround pockets of pine seed bearers. Once the canopy began to close over the last 15 years, beech seedlings dominated the forest floor given its cloning, prolific seed, and shade tolerance habits. The shrub layer is sparse, and the needle layer on the ground is thick.

5.3.7 Invasive Plants

Invasive plant communities cover a small percentage of the ground throughout the northern section of this stand. The greatest concentration occurs along this northern edge of the stand adjoining Stand 4 (the early successional habitat zone) and along the north and south frontage to Johnny Bean Road. Species include Japanese barberry, Asiatic bittersweet, multiflora rose, and honeysuckle. Along the shoreline, the honeysuckle is particularly obvious.

5.3.8 Unique Stewardship Considerations and Inclusions and Habitat Thoughts

1. A small copse (some >20 inches) of aspen grows in the northern section close to Johnny Bean Road. This unique tree has two characteristics useful to high carbon accumulation. Its bark is photosynthetic, meaning that growth is still possible after the leaves have been dropped. The bark also has lenticels that serve as pores for gas exchange (like the stomata on leaves). Its bark is also base-rich, meaning aspens are important hosts for bryophytes and function as food plants for the larvae of butterfly species.
2. Remnants of the red pine plantation cling to the western edge of this stand. Multiple trees have evidence of repeated bear use. These trees have successfully germinated seed and established some scattered saplings across the forest floor, thereby increasing species diversity and stand resilience.
3. Maturing white pine trees reach high into the air (some trees record heights of >90 feet). Given this tendency, forest structure is influenced by single large tree falls and occasional pockets of blowdown. Uprooting opens bare patches of mineral soil that can function as seed sinks and create higher biodiversity. Toppled trees have the potential of becoming nurse logs, nurturing habitats for other forest organisms. Predicted extreme storm events could continue to break, snap, or topple this maturing white pine component in the stand, thereby decreasing carbon store and reducing stand diversity and resilience.
4. Standing dead and declining large sized white pine trees across the stand provide potential and useful snag and cavity trees. Owls will roost in these tall trees. Black-capped Chickadees sleep in the small cavities rotted from branches, as they excavate small roosting holes. Upturned root balls are preferred nesting sites for Winter Wren – many of whom heckled us repeatedly during the inventory process.

5. The northern section supports a thin strip of maturing mixed pine woods along the beaver wetland. The denser shrub covers here (inclusive of winterberry, dogwood, spice bush, and service berry) attract songbirds. Sightings were made of the Canada Warbler, Black-and-white Warbler, and the Red-winged Blackbird.
6. The soft mast species (black cherry, wild grape, and extensive rubus thickets) supply late fall feed for migrating songbirds and high nutrition feed for small mammals and overwintering birds such as chickadee, turkey, and grouse.
7. The inventory counted <=9 large diameter relic trees and cull (>25 inches in diameter) per acre across the stand with stems of cherry, red oak, and sugar maple. These remnants of the older forest hold high habitat value. In addition to the large mast and seed crops of the hardwood trees, they provide cavities and crevices for denning and nesting. The large pines attract cavity-using birds and mammals as well as larger birds for perching and roosting. These older hardwood trees linger in the high canopy for decades holding onto high volumes of carbon in each tree.
8. Other songbirds noted during the field inventory include Winter Wren, Hermit Thrush, Ovenbird, Tree Swallow, and Turkey Vulture.

5.3.9 Climate Vulnerability

This stand records a moderate present time vulnerability to adverse climate change impacts on its ecological functioning capacity. If climate conditions worsen with higher emissions or the worst-case scenarios of predicted changes through the next 50 years occur, this vulnerability rating might increase to a high level. The invasive plant community's current abundance and its potential spread deeper into the stand pose a threat to regenerative capacity and future resilience without some stocking control or reduction.

The impressive high canopy white pine trees will be vulnerable to the predicted extreme wind events that could cause their loss from breakage or blow-down. The hilltop locations with good air movement and drier site conditions may prevent them from succumbing to the destructive fungal agents. Over 35% of the stocking is contributed by future climate adaptive species, which can take over ecological function (habitat, seed source, and carbon sequestration) in the event of white pine decline.

The new forest cohort (seedlings and saplings) is dominated by black birch, cherry, red maple, and white pine. Both black birch and white pine might face threats in the future if climate conditions evolve as predicted. Dry soils challenge black birch seedling survival and moister, hotter, longer summers could escalate fungal activity on the pine needles. The subtle encouragement of the cherry and red maple might protect this stand in the future from loss of resilience and ecological function. The underlayer of only beech new seedlings (under 6 inches in height) could signal less biodiversity in several decades without some intervention. Herbivore pressure is a concern as your forests' ability to thrive in a warmer climate depends on successful reproduction of the future climate adaptive species.

5.3.10 Forest Carbon

As mentioned earlier, broad leaved trees have greater leaf surface area and greater photosynthetic capacity than softwoods. Over 40% of the stand overstory is contributed by hardwood trees, and over 70% of the immature trees on site are hardwoods. In combination with the massive white pine trees in the high canopy, this stand has a moderately high current carbon stock and the potential for high sequestration rates as the young hardwood component matures. An estimated total of 1,015 metric tons of carbon is stored in the trees in this stand. This stored volume is equivalent to the greenhouse gas emitted by one average gasoline powered car driving over 9,237,942 miles.

5.3.11 Desired Future Condition

The extreme weather predicted with the future changing climate could continue to force large white pine trees topple downs and uprooting. Retention of the pine trees in pockets and clusters supports their wind firmness. Dominance by beech in the lower canopy might limit the future species richness of these woods. Opening the canopy to more sunlight encourages seed germination and seedling development of cherry, ash, red oak, white pine, the birches, and maples, especially in the rich soils of the northern zone. The all-aged, resilient condition of this stand continues to evolve though the next few decades with a balance between carbon storage in the older trees and accumulation in the young. Your community has time over the next two decades to determine the appropriate adaptation and mitigation actions for this stand that align with your goals and objectives.

5.3.12 Recommended Climate Adaptation and Mitigation/Forest Resiliency Practices

1. An application of an optional, conservative Focus Tree Release silviculture project.
2. Trail maintenance with mulching or brushing of the sapling growth along the trail network and installation of erosion control measures on the existing trail system through the stand.
3. Underplanting of red oak seedling with proper browse protection to increase the chances of its presence in the future forest ecosystem.
4. Corresponding cleaning out or weeding of the extensive beech sapling and seeding stocking to encourage biodiversity.

5.4 Stand 4: Early successional habitat dominance with northern hardwood species (ESH-BB)

Figure 17: The young forest of Stand 4 provides excellent early successional habitat

6.4.1 Overview

This stand is slowly aging out of its ability to provide this high value young forest songbird, game bird, and mammal habitat. In the meantime, it will continue to be excellent early successional habitat- a feature lacking across much of our forested land. The next decade here could focus on trail development, invasive plant control, and the tending of a wide array of desirable trees for wildlife, aesthetic, and carbon purposes.

Stand 4 Summary Data

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index
Stewardship	4	ESH-BB	13.56	6.5 inches Overstory: 14-24 inches	Lower: >300 Sq.Ft. Overstory: 35 Sq. Ft.	1.935 MBF 2.4 cords	75: WP

Stand 4 Tree Quality Graph

6.4.2 Terrain/Topography

The Civilian Conservation Corps planted softwood groves across the gently sloped, stone-free plains in western Massachusetts in the late 1920s. This land contributed the most productive agriculture sections of the Town Farm. The relief tips gently to the north across a broad plain exposing the young trees to less direct solar radiation and late afternoon cooling shade.

6.4.3 Soils and Productivity

The Shelburne soils are very deep, well-drained loams that are well suited to productive tree growth. These deep, rich soils retain moisture for long periods through the growing creating an ideal seedbed for germination.

6.4.4 Disturbance History on and Current Species Composition and Condition

The red pine plantation once growing here was infected with pathogens in the early 2000's and severely damaged by the 2008 ice storm. Red pine trees snapped, broke in half, and uprooted. Hardwood tree crowns (hardwood sprouted and grew up alongside the red pine through time) were battered, and many stems today still have diminished crowns. The first salvage harvest in this stand removed the pathogen-infested, dying red pine trees and kept a healthy, well stocked mix of red pine and hardwood. After the ice storm in 2008, a second salvage operation removed all the damaged red pine stems salvaging any commercial value and reducing potential fuel loads and hence forest fire danger.

Any hardwood trees with a live crown intact were retained, even if severely damaged. They form the upper canopy layer of the stand today. Black cherry, black birch, red maple, and beech trees share this high space with the super-dominant white pine relics and remnants of the original old field forest. They continue to set seed each year and productively grow. Thousands of young trees less than 1 to 2 inches in diameter (<=11 to 13 years of age) grow beneath them. They seeded from any available seed-bearing trees in the vicinity. Species here include black birch (dominant), cherry, white ash, red maple, sugar maple, beech (dominant), paper birch, pin cherry, aspen, and white pine. These young trees accumulate carbon with their vigorous growth habits each season.

6.4.5 Native Shrub and Herbaceous Cover

Native shrub thickets grew into the open ground after the red pine removal. Witch hazel, striped maple (dominant in stocking), maple-leaved viburnum, elderberry, and rubus canes are present. One unique site in the southern edge of this stand supports dense herbaceous plants and grasses, which gives it giving it an open savannah-like appearance. Here, many saplings show signs of moose browse.

6.4.6 Herbivore Browsing

Moose and deer browse impact in this stand is high.

6.4.7 Invasive Plants

The full exposure to sunlight and high bird traffic after the last harvest introduced a moderate invasive plant community. A simple metric for its stocking density is B+ (on a A=high, C=low scale). Asiatic bittersweet, honeysuckle, Japanese barberry, and multiflora rose, grow here. The diffuse light through the immature trees could not prevent their spread. We recommend a concerted control effort to favor the growth of the native plants.

6.4.8 Unique Stewardship Considerations/Inclusions

1. Extensive volumes of coarse woody material were kept on site post-harvest. Sections of red pine logs and upper branch material and hardwood branches cover the ground in various stages of decay. This material decays and builds a healthy soil layer. American Woodcock prefers stands less than 20 years of age with a lot of coarse woody material that supports their main food of invertebrates.
2. Rubus canes create thickets where birds, rabbits, and other animals hide. Game birds, songbirds, raccoons, chipmunks, and squirrels eat the fruits. The nectar and pollen of the flowers attract many kinds of insects, especially butterflies and bees. This plant is moderately resistant to damage from deer. During the winter, birds and small mammals eat the seeds left from rotten fruit.
3. Chestnut-sided Warblers forage by flitting between the branches of saplings, where they find insects among leaves and small twigs and dart out to catch flying insects in the midair.
4. The hopping, chirpy Veery might use the red pine stumps and residual log sections for nest building sites. The thick duff layer and coarse woody material volume supports high insect populations. Veery flips through this layer for its preferred foods of beetles, caterpillars, ants, and crickets.
5. The "peely" exfoliating bark of a couple of maturing red maple trees provide ideal bat habitat and small openings supply insect hunting areas.
6. Insects excavate the standing dead red pine snags, which provides more feed for insectivore songbirds and excavators.
7. Although damaged by ice, the maturing white ash trees are surviving the intense weather without any evidence yet of the emerald ash borer.
8. Songbird species sighted here include Ovenbird, Black-and-white Warbler, Black-throated Blue Warbler, Raven, Woodcock, and Ruffed Grouse. Witness was made of the mother grouse "injured act" for protection of her brood.
9. The grassy-brush site mentioned earlier is surrounded by an often-visited moose browse zone where ash, cherry, and red maple saplings show annual browse marks, and many larger saplings and pole trees have been rubbed by the moose.
10. Stone walls, corrals (livestock pens), and scattered field stone piles remind one of the diligent families that needed respite from the community in the early 1800s.

6.4.9 Climate Vulnerability

This stand records a moderate vulnerability rating to climate change impacts on its ecological function with the potential for decreasing this vulnerability to low though the next fifty years as the forest matures. Older forests tend to host much greater biodiversity than younger forests, and forest reliance decreases when forest biodiversity is low. Species diversity in the youngest age class is high, but it is limited in the residual overstory hardwood trees. Only two distinct ages are present on site with a high degree of vertical diversity between the two canopy layers. The lack of overstory stems could limit seed production; if these trees are lost to climate change impacts, there is no stocking remaining to conduct the ecosystem functions of older trees (seed production, cavity denning and nesting, and protection of forest soil health).

As the young trees mature, the older trees perched above them are susceptible to extreme wind, ice, and snow damage with the predicted precipitation changes. The advanced regeneration contains future climate adaptive species (black cherry, oak, sugar maple, and red maple) as well as some species that might be threatened by hotter growing seasons and active stressors (black birch and white ash). The wide diversity might compensate for any risks to species abundance or habitat loss.

The necessary stand renewal functions in this stand are threatened by the herbivore pressure and the expanding invasive plant community. The southern section of the stand supports an active deer wintering site amongst the dense native shrubs. Serial browsing of all the immature hardwood trees (inclusive of black birch and beech) were noted for an estimated 200-foot radius of this epicenter. Beech seedlings of clonal origin were the only plants beneath the dense sapling growth. Without some protection of future seedlings, the essential cycle of replacement of a functioning forest ecosystem will be disturbed.

Invasive plants infiltrated the northern most sections of the stands from seed droppings from songbirds within the wetland complex. These plants have begun to expand southward into the interior of the stand. Their stocking levels are manageable now, but with further spread, seedbed area will be lost.

6.4.10 Forest Carbon

Young forests that begin to grow on disturbed open ground like this stand grow rapidly for the first several decades. The less successful trees are crowded out and die, but there's much more growth than death overall, so there is a net removal of CO_2 from the atmosphere, locked away in new wood. These trees are growing fast in the carbon dioxide rich air, but these young trees haven't captured the loss of carbon from the removal of the diseased red pine plantation. The estimated volume of carbon stored in this stand is 205 metric tons. Amazingly this volume is equivalent to the CO_2 emissions from the burning of 823,537 pounds of coal. These immature trees contribute to the forest ecosystem's mitigations of GHG emissions.

6.4.11 Desired Future Condition

While slowly walking the improved trail network in the spring, one hears the songs of many songbirds or hear male grouse drumming on some of the larger down logs. Although the stand nears the end of its most useful period as migratory songbird habitat, the preservation of the dense, immature cover prevents full site exploitation by invasive plants. This young forest contributes to the Town Farm carbon pool with its rapid accumulation (high site productivity for hardwood trees, they are growing fast here). Some forest tending begins to favor the best formed and most vigorous stems across a range of species. If the proposed lower canopy weedings are conducted in this stand, the reduction of competition for water and nutrients amongst these young trees would boost the forest productivity and assist in its transition to a more resilient forest.

6.4.12 Recommended Management Practices

1. Trail maintenance with mulching or brushing of the sapling growth along the trail network and installation of erosion control measures on the existing trail system. Community decisions on the trail network extent and resource are necessary as an extensive network is possible.
2. Cleaning and weeding amongst the saplings to release the crowns of the climate adaptive species and increase their vigor.

Stand 5: Pure natural stand of white pine (WP)

Figure 18: Thickly stocked with white pine, stand 5 is a classic example of old fields that turned to pine after agricultural abandonment

5.5.1 Overview

After agricultural abandonment, much of New England looked like this Stand in the early 1900s when the boxwood industry thrived in an era before cardboard. Big, mostly poorer-formed white pines with multiple trunks dominate this area which supports the highest stocking of anywhere on the forest. This area provides an unmanaged contrast to Stand 3, just across the water.

Stand 5 Summary Data

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index
Stewardship	5	WP	4.99	17 inches	193 Sq. Ft.	16.898 MBF 2 cords 12 tons	75: WP

Stand 5 Tree Quality Graph

5.5.2 Terrain and Topography

This stand grows at the northern tip of the Town Farm property upon a wide, low slope plain next to Roaring Brook and its beaver wetland. It was plowed in the past.

5.5.3 Soils and Productivity

The stand grows above the deep, fertile Shelburne loams that support productive white pine growth. These fertile soils retain moisture long into the growing season and support the germination of a wide diversity of tree species.

5.5.4 Ecosystem Narrative

Maturing white pine trees of variable condition (some heavily weevilled and some exceptional, branch-free boles) form the main stand. These trees reach over 90 feet in height. Past weevil damage presents as asymmetrical and declining crowns. A stage of decadence is setting into the oldest trees. The trees are vulnerable to extreme weather due to their height and rooting systems. Scattered robust large sapling, pole-sized, and small sawtimber black cherry, red maple, white ash, and black birch trees dot the canopy. Red maple sprouts and beech seeds into the shady lower strata. As the water level in the beaver pond fluctuates, mortality follows within the white pine at the edge of the wetland.

5.5.5 Regeneration Species and Condition

Regeneration is sparse (C level) due to shade. Beech seedlings contribute most of this stocking.

5.5.6 Native Shrub and Herbaceous Cover

A sparse carpet of shrubs and herbaceous plants cover the forest floor, with higher densities along the wetland edge (spicebush, elderberry, ilex, maple-leaved viburnum, and dogwood). Striped maple dominates this age class due to its shade tolerance and prolific seeding habits.

5.5.7 Herbivore Browsing

Moose and deer browsing affects the shrub layer. Past beaver impacts are also clear.

5.5.8 Invasive Plants

Given the stands remote position north of the wetland and its lack of disturbance, invasive plant activity is low. Scattered individual stems of Japanese barberry sprouted from bird droppings.

5.5.9 Unique Stewardship Considerations and Inclusions

1. This stand presents an example of the natural condition of a transitioning old farm pine forest before the disturbance common in the stands south of the beaver wetland. The white pine trees range in age from 85 to 115 years, and they are in decline. They offer a unique opportunity to see how this transition forest evolves with the changing climate.
2. Access gained from the Conway State Forest lands to the east provides the chance to walk the northern edge of the wetland. This trail could be improved in collaboration with the Commonwealth. Beaver dams supply connectivity from the south for the sure-footed.
3. Soft mast from black cherry and striped maple and hard mast from beech occur. They help a variety of species such as songbirds, Wild Turkey, Blue Jay, and white-tailed deer.
4. As a food source, white pine supplies seeds, needles and buds, bark, and the insects that can be gleaned from white pine substrates. White pine seed provides a food source for bird species such as Red-breasted Nuthatch, Pine Warbler, Chipping Sparrow, and Common Grackle.
5. Larger white pine stems, both live and dead, in and next to the wetland offer nesting sites to Great Horned Owl and Great Blue Heron. These tall trees (range in height from 80 to over 100 feet) attract birds that feed in the high canopy.

5.5.10 Climate Vulnerability

This stand records a high present time (and for a few decades given the use of Proforestation actions for resistance adaptation strategy) vulnerability to climate change impacts to its ecological function. Biodiversity is low with dominance by the maturing white pine and sparse stocking and low species richness in the seedling, sapling, and pole-sized age classes.

Some of the white pine trees reach over 90 feet in height. These tall poles invite lightening, ice, heavy snow, and intense wind damage form the predicted sever storm vents as our climate changes. The loss of the overstory here would disrupt the sites delivery of ecosystem goods and services. These trees are also threatened by potential rising water levels in the pond and wetland to their south as precipitation volumes increase in the future. The sparse younger component contains future climate adaptive tree species (black cherry, sugar maple, red maple, and red oak), which offers hope for the long term adaptive a capacity of the stand.

As some white pine succumb to stressors and climate impacts, openings in the canopy may continue to fill with hardwood seedlings. The survival of these tree isn't secure due to both moose and deer browsing. Your monitoring efforts must be diligent in the future for the determination of shifts in the stand species composition, condition, and health.

5.5.11 Forest Carbon

This small remote stand stores the greatest amount of carbon per acre amongst all the stand on the property. Large sized, tall white pine trees support massive carbon storage in their boles. The estimated carbon stored within these aging white pine trees is 315 metric tons. This volume is equivalent to the CO_2 emissions from 249 gasoline-powered passenger vehicles driven for one year. Proforestation actions retain all the carbon stored in this unique pine grove.

5.5.12 Desired Future Condition

The stand's inaccessibility for active management without use of the Commonwealth lands prevented its inclusion in the past harvest projects. The stand continues its development into a climax farm transition forest ecosystem. As the white pine trees mature, many will succumb to pests, disease, windthrow, and internal rot from overcrowding. The surviving overstory white pine might remain in clusters for wind firmness. Hardwoods will continue to seed into the slowly expanding gaps from attrition, and with many decades the site will convert to species rich, all-aged resilient forest. Although losing carbon storage ability as the older white pine dies, the stand finds its balance with the vigorous younger hardwood trees.

5.5.13 Recommended Climate Adaptation and Mitigation/Forest Resiliency Building Practices:

The establishment of a Reserve Forest and Proforestation Zone amongst the densely stocked, maturing white pine forest cover with minimal disturbances upon a narrow trail system will protect the stored carbon in this stand and its valuable habitat benefits. The minimally intrusive construction of a narrow shoreline trail along stonewalls and the beaver meadow that connects to the State Lands trails nearby would provide a pleasing vista and some solace to your community walkers.

5.6 Stand 6: Riparian Zone (RZ)

Figure 19: The beaver meadow complex and riparian zone is a highlight on the property.

Stand 6 Summary Data

Objective	**Stand#**	**Forest Type**	**Stand Area acres**	**MSD or Size Class (inches)**	**Basal Area (sq.ft./ac)**	**Volume Per Acre**	**Site Index**
Stewardship	6	RZ-Beaver Pond and Wetlands	4.67	NA	NA	NA	NA

5.6.1 Narrative

A large upland wetland rests at the height of the land to the west of the Town Farm property. This system drains both northerly (into the Johnny Bean Brook watershed) and easterly serving as the headwaters of Roaring Brook. The eastern edge of this riparian area juts onto the Town Farm lands with a large pond and an extended tip of two smaller ponds connected by Roaring Brook. This ecosystem is a deep marsh complex, which is flooded with over three feet of water, though the depth fluctuates seasonally and with beaver activity. It stretches out in patches of integrated complexes of open water, dense marsh plants, and shrubs. The Pillsbury soils have a layer of well-decomposed organic muck on their surface.

Vegetation includes tall graminoids like cattail and phragmites in extensive dense stands. Other plants include goldenrod, arrow-leaf, and bulrush. Tall shrubs noted are speckled alder, spicebush, ilex, and dogwood. Invasive plants common here are purple loosestrife and phragmites. Many animals, vertebrates, and invertebrates use this wetland for feeding, nesting, roosting, cover, and movement corridors. Serial beaver habitation marks the landscape with dams, abandoned lodges, and chewing sign.

5.6.2 Water Quality Concerns

This wetland forms the headwaters of Roaring Brook. Local responsibility to the protection of wellheads downstream and the South Deerfield Water Supply District's public drinking water in the Roaring Brook Reservoir mandates prudent stewardship of this resource. No stewardship practices would be done within the riparian resource sites, except for non-intrusive trail use. These resources form the heart of the Roaring Brook riparian corridor and its unique habitat.

5.6.3 Desired Future Condition

Riparian resource areas and wetlands function as filtration and purification systems for the water that moves through them. These areas will be preserved in their pristine condition.

5.6.4 Climate Vulnerability and Forest Carbon

Wetlands are ecosystems that are inherently vulnerable to climate change impacts depending on their location in the watershed, soils, and past land uses. The active stressor of the invasive plant phragmites forces the native aquatic vegetation to struggle for nutrients, which could affect the quality of habitat benefits. The spread of this and other invasive plants downstream through increased stream flow due to changes in precipitation patterns could further degrade the quality of lowland wetlands. The mountain top location of this wetland (it's a headwaters wetland) might prevent any adverse impacts of erosion or sedimentation to water quality as water levels and stream flow velocity rise. The prevention of disturbance to the wetland, the inflow and outflow stream channels, and any spring seep effusion sites close to the wetland might prevent any loss to the hydraulic processes.

Wetlands have a remarkable capacity to sequester carbon despite covering less land area than other ecosystems, like forests. One reason these ecosystems accumulate carbon so effectively is that they are water-logged, dark, and very productive, which creates conditions for highly stable carbon content. Wetlands sequester carbon from the atmosphere through plant photosynthesis and by acting as sediment traps for runoff. Carbon is held in the living vegetation as well as in litter, peats, organic soils, and sediments that have built up, in some instances, over thousands of years.

Section 6: Climate Adaptation and Mitigation and Forest Resiliency Management Practices Recommended for 2022-2032

6.1 Climate Adaptation and Mitigation Actions for the purposes of the revised Forest Stewardship Climate Management Plan

A full set of useful objectives and sustainable forestry practices useful for their achievement can be reviewed in Appendix A. Appendix A is the distillation of our Forest Stewardship Planning Workshop, the Community Forest Stewardship Survey, 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. The next sections of this document introduce a sub-set of Appendix A for the convenience of publishing. This full set could be revisited at any future date by the community.

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 Fournier Woods are presented in the chart below. Your community clearly stated the acceptance of the use of sustainable forestry practices inclusive of silvicultural harvesting, if an 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.

Section 6.2 Climate Vulnerability and Opportunity

Forest are changing as our climate changes. The DCR Forest Climate Program introduced you to the potential impacts in your forest from the predicted climate shifts. The stressors exacerbate the forest's vulnerability to change. Forest stewardship and the use of climate adaptation and mitigation actions count on its inherent strengths and resiliencies. Thoughtful planning considers climate change affect's on your forest now and in the future as these impacts manifest over long periods.

Choosing to keep the forest structure and condition stable and use a combination of the Resistance and Build Resilience strategies for climate adaptation forest management will hold these hemlock and white pine heavy forest for as long as they are ecologically functional. Over 60% of the trees here are tall (over 75 feet) and susceptible to extreme weather events and breakage or blowdown, battling active pest outbreaks, and losing habitat. Might as well try it. The vernal pool complex and sharp dry nobs make this site a special habitat.

Establishing over one half of the property as a Proforestation reserve protects special habitat, water and soils health, and the ecological function of this area. The reserve zone keeps adding carbon.

Resolved to work with the present, actions are suggested that reduce the stressors active in degradation of the resource now such as control the invasive plants and thin dense thickets to increase nutrients and water to trees and increase vigor. Climate Forestry demands that your keep your eye on the distant future. Thinking out 50 years what actions could you do now to secure a diversity of species, tree ages, tree sizes, in short, a resilient forest continually adapting to change. The 2020 planning process had the foresight to recommend numerous resistance and resilience adaptation strategies.

The creation of micro-gaps in the main canopy will encourage seed germination and assist in a transition to the all-tree species, age, and size forest. Structural and species diversity is boosted with under planting of wetland and riparian shade trees and shrubs and those that survive stony, open dry sites. Mindful of your choice to use this forest as a nature-based climate mitigation solution, low thinnings to release the young crowns of saplings and small pole trees increases their productive capacity and uptake rates. The blended approach of the adaptation and mitigation strategies moves the system towards a balance of carbon uptake and storage and ecological equilibrium. Having stated the big risk being the loss of ecological function and chaos in a forest system, any stressor that threatens that function should be considered for action.

Therefore, if the forests stay vigorous and care and resilient traits stay ahead of the stressors, this property acts as an ideal carbon sink and should hold on to its original ecological attributes. Active stressors reduce tree and stand vigor, and actions the community might consider include conservative, minor treatments or thinnings in the hardwood groves, which could boost growth and uptake rates.

Holding onto the nature of this forest ecosystem, the large white pine and hemlock trees continue to defy wind speeds and statuesquely share the high canopy with fast-growing hardwood climbing right up to pine heights with accelerated growth over the last 25 years. Legacy pine, hemlock, maple, and oak with diameters over 26 inches provide a peek at the original forest on site. Serial applications of low thinnings and non-commercial weeding of the youngest age class shaped the species composition to one favoring tree species suited to changes, dry soils, and warmer air.

Monitoring, careful planning, and conservative implementation of the resilience building practices could keep this amazing ecosystem functioning optimally for the next 100 years. All the goals stated so clearly in the first section of this management plan are possible and will be achievable for decades yet. Retention of the best, most productive trees (free of pest or pathogens) will support high forest resiliency and optimize carbon storage and sequestration.

The following chart summarized each proposed stewardship or climate adaptation and mitigation action that might support your forest's ability to cope and grow under the future climate conditions. Those designated as *STEW* are voluntary and are provided as suggestions of activities that can help you achieve your woodland objectives. If you think of just one thing in the coming weeks as you reconsider how your Town forests are doing their bit for climate, remember that forest resiliency is high through your Town forests, and vulnerability to the essential ecological function of these woods is low.

Stand	Obj Code	Desired Condition	Management Action	Benefits			Value/Cost/Cost Sharing Opportunity
					Climate Change Adaptation	Forest Carbon	
1 2 3	Ste w	Reduce stocking of invasive plants and their impact on regeneration .	Invasive plant control 15-20 acres. Annual monitoring and repeat treatments if needed.		Successful regeneration of forest tree species, Begin shifting seedling class to future adaptive species and o more species diversity.	Increase sequestration with reduced competition in youngest trees on forest floor.	Costs. DCR Community Forest Outreach Grant. NRCS RCPP. The Forest Resiliency Practices Program.
Al l	Ste w	A narrow, non-intrusive trail that take one from the northwest corner of the forest to the ice pond.	Trail Mapping, Assessment, Construction, and Maintenance- Develop a narrow trail across rock ledges to a vista site in Stand 1 (HH) and create a panoramic vista to the north at the hilltop if Town wide consensus. GIS mapping of Town trails. Publish new trail map. Develop a maintenance plan. Install directional and permitted use signage. Clear logging roads to be useable paths.		Raise awareness through educational signage about the use of Town forests for climate adaptation and mitigation. Assist monitoring of future climate change impacts and advance of stressors.	Maintains sequestration and storage rates with minimal removals of small saplings if on trial.	Costs. Grant opportunities for trail work are numerous in Massachusetts.

1 2 5	Stew	Over 27 acres are set aside as forever wild with no disturbance.	Reserve Forest and Pro-forestation area- Designate, map, and set aside ~43-acres of representative natural ecosystem across three forest types to serve as a reserve area. Complement active forest stewardship with reserve pro-forestation.		Attempt at resistance strategy in hemlock grove. Protects biodiversity and sites adaptive capacity.	No carbon stock loss for hundred years. Increase storage and sequestration.	No Cost.
1 2 3 4 5	Stew	Educational signage along trail system. School curriculum set up around forest resiliency and climate change.	Educational Outreach- Install educational, historical, and demonstration signage for interpretive purposes along the trail system inclusive of detail about the natural and cultural history of the property in school curriculum. Schedule Community learning walks.		Community education about climate science and adaptiveness of forests or its risks to loss of function will gather support for the implementation of adaptation actions.	No carbon loss.	No cost.

2 3	Ste w	Vigorous, fast-growing hardwoods, uniquely superior pine trees, and heathy hemlocks crowns are opened for increased growth.	Silvicultural Practice- Focus Tree Release and Weeding in immature trees in appropriate areas <15 acres.		Shift future species composition to future climate adaptive species through enhancement of seed production in hardwoods.	Increase sequestration with enhanced vigor and productivity of focal trees. Increased storage with retention of the older, mature tree. Minor carbon loss with trees removals.	No costs and possibility of minimal income for re-investment. Grants available from DCR Community Outreach Grant, NRCS RCPP, and the Forest Resiliency Practices Program.
4		Carbon uptake young hardwood grove replete with climate future adaptive species.	Cleaning or weeding amongst the youngest age class. Thousands of saplings are growing in the salvaged red pine plantation site upon the most fertile soils on the property. Much like your garden, taking a few out helps the growth of the remaining. Leave cut material on site to rot.				

1 2 3 4 5	Ste w	Conway's unique community controls the impacts on their Town forests if climate adaptive forestry is done.	Develop and Archive Town Best Management Practices for use with trail work and silviculture.		Assure professional and high-quality implementation of any adaptation silviculture.		Cost with the Forest and Trails Committee resources. Grants would be available for climate smart BMP creation.
2 3	Ste w	Tree species composition is diverse and includes future adaptive species	Red oak underplanting in the hardwood mix. Red oak is not regenerating well. Its success in the stand will increase resiliency and sustain ecological function. Scattered pockets of planting through 30 acres.		Enhance forest resiliency. Transitioning to species better suited for a changing habitat.	Increase sequestration in the future with fast-growing young oak trees.	
1 2 3 4 5	Ste w	Conway Town forest lead the community in nature-based climate solutions.	Participation in a Carbon Program -either through marketing scheme with a carbon credit vendor or the possible Massachusetts EEA sponsored programs.		Could motivate climate adaptive practices to protect carbon sink in the future.	Carbon management strategies employed. Sequestration and storage supported.	Start-up cots but income following. Seek grant money for startup and maintenance.

1 2 3 4 5	Stew	Hikers understand that they must respect these forests as it's a climate smart sanctuary.	Boundary delineation with discrete signage				
1 2 3 4 5	Stew	Increased awareness of forest conditions and climate impact.	Adaptive management bi-annual or annual monitoring of the site.		Opportunity to note changes and respond with climate-adaptive practices.	Opportunity to increase carbon stock over the long term.	Significant effort. Could be grant funded for startup and protocol establishment.

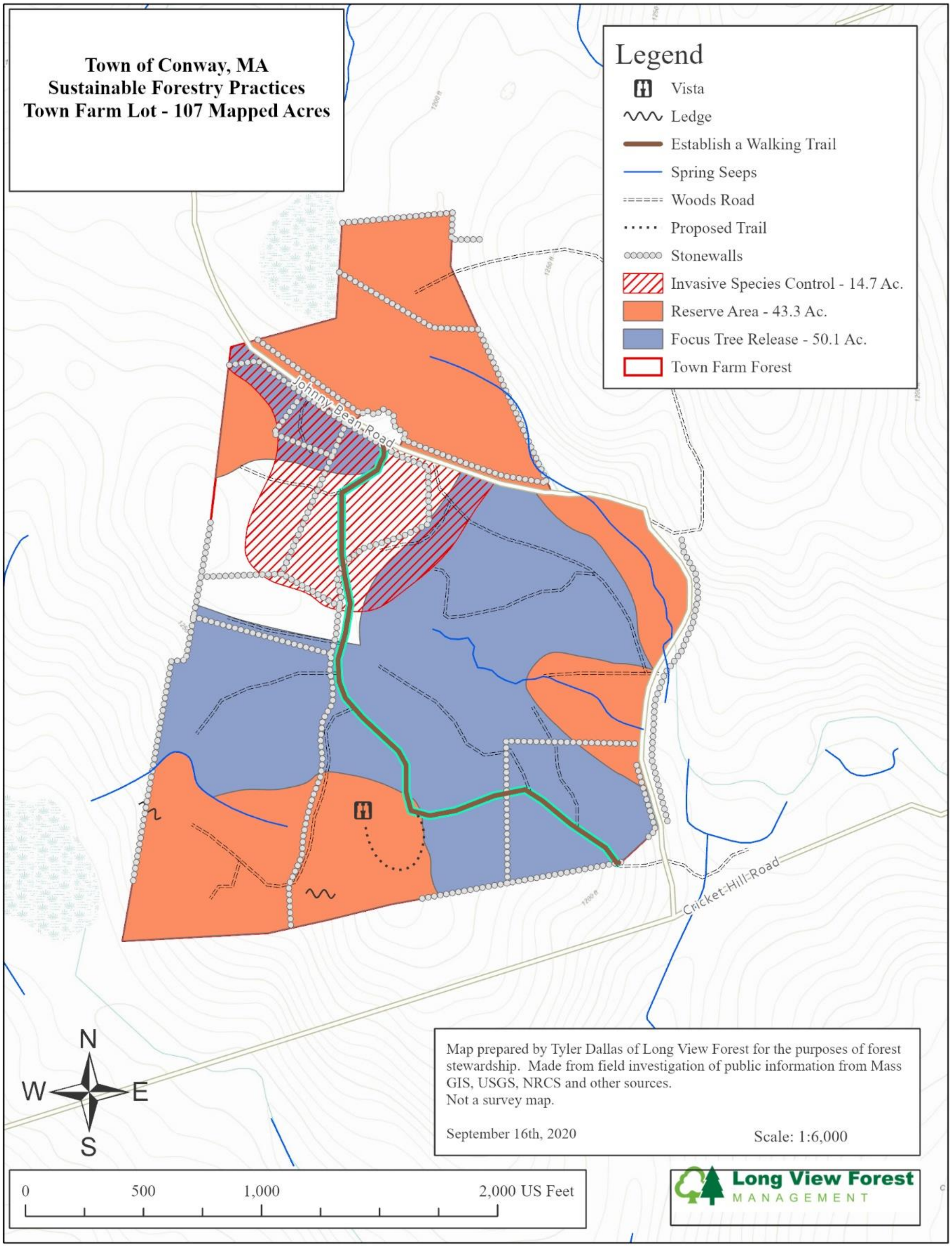


Figure 20: Proposed Forest Stewardship Activities

6.3 Climate Adaptation and Mitigation Actions/Forest Resiliency Building Forestry Practices

Practice 1: Invasive Plant Control

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience. Forest Productive Capacity with Regeneration.	2 3 4	OH WH BB	Invasive Plant Control Measures	Density depends on stand location- highest stocking in Stands 3 and 4. Total of 15-18 acres lightly affected	2020-2025

Project Specifications: Integrative Vegetation Management (**IVM**) will be employed with review of each site will be reviewed and decisions made about the application of safe, cost-effective, and environmentally sound methods of control. The invasive plant communities are more extensive in Stand 4 (ESH-BB) due to the first red pine mortality and then salvage harvesting practices in 2009. Their stocking is less dense in Stand 3 with high stocking along Johnny Bean Road, and marginal in Stand 2.

Mechanics of Practice: Manual removal is expensive and time consuming but offers an environmentally safe 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**.** This method will prove most effective in Stand 2 and the low stocking sites of Stand 3.

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 scheduled. 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 needed when mechanically controlling climbing vines or small multi-stemmed woody species. Always follow the vine or stem to the point where it appears 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 a proper 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.

Although chemical methods may be the most effective control method for the high-density zones, biological and mechanical methods applied serially should be explored. A local farmer could intensively graze animals to work with the Town to remove the plants. Or, the Town may decide to have these dense sites with shade retention on their margins and repeated manual and mechanical control the margin plants preventing their further spread.

For the invasive plant communities in Stand 4, due to their higher stocking and the overall thick density of the stand, we recommend exploring both manual control and chemical control via a judicious cut-stump application. Any chemical control work should be discussed fully in Town and should be buffered around hydrologic features as Roaring Brook springs from the nearby wetland. Licensed and insured professionals would execute this practice to effectively accelerate the ecological restoration work needed here to assure a mix of native plants moving forward.

Target Species and Stocking Densities: Densities are low, but growing, and include honeysuckle, Asiatic bittersweet, Japanese barberry, and multiflora rose.

Stewardship Discussions: Small Towns run on a tight budgets and shortfalls to revenues are expected for western Massachusetts in the coming years. Conway might commit financial resources to the provision of ecosystem services. Further public outreach initiatives can discuss the invasive species problem. Residents will motivate and take part in a volunteer program for simple manual removals of some of the plants. Grant funding from both Federal and State programs will be looked for help with this effort. Either way, the focus of ecological restoration should be paramount here where the Town weighs the environmental and community impacts of different control measures and choses the one base suited to the task.

Community Outreach: An educational outreach process would inform the community about the invasive species projects. A brochure could be published and available through the Town offices, educational bulletins could be posted on the Town website, and field tours could show the plant species, removal techniques, and native plant communities. Education might inspire community members to volunteer at an ecological restoration day or contributions to any fund-raising campaigns for this work.

Community education also prevents misunderstandings about the plant removal activities.

Climate Vulnerability: Forest renewal is essential to the sustainability of ecological Function within your forest ecosystems. When invasive plants exploit growing space. Less seed bed area is available. Increasing species diversity and stem count increases forest resiliency. The youngest age class is over twelve years, and the benefits of the young forest zone diminish with the time from reset. Educating the site users and community to climate adaptation and mitigations forestry actions will increase efficacy of any project. Allies always help.

Thinking 50 years into the future, promotion of the regeneration of hardwood trees that are future adapted species might begin the species composition transition necessary for sustained forest ecosystem function. GHG emissions might drop, and the current species mix might experience improved growth and the current conditions might prove sufficient to maintain ecological function. These stand grow in the unique blended tree communities where each species has a wider latitude for habitat than if they were found in only one ecotype.

Carbon: Less invasive plants equates to more nutrients, water, and sunlight available for native trees. Increased CO_2 uptake in the forest means more carbon sequestration. Disturbed zones invaded by these exotic plants do not have as much stored carbon as other forested sites. Increasing the number of young trees and tree species diversity increases a site's growth rate. Vertical diversity allows different angles and orientation of leaves to capture all available sun for enhanced photosynthesis.

Practice 2: Trail Development and Enhancement

Ecological Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Ecological goods and benefits- solace, education, enjoyment, recreation. Ecological function-Soil quality and function. Cultural values.	1 2 3 4 5	HH OH WH ESH-BB WP	Trail development and maintenance and general access development	<1,000 linear feet of new trail Mulching/opening of 2,000-3,000 feet	2020-2022+ Annual Monitoring and Maintenance Scheduling

Trail Development and Maintenance Discussion:

1. Mapping of the existing trial system. Publication of a revised Town Farm Forest trails map with its connections to broader Conway State Forest and Herron Gulch trail networks.
2. The layout and development of a narrow trail to the crest of a small hilltop within Stand 1 in its southern section and the creation of a small vista here with a northward outlook over the interior forest and some distant hilltops is suggested. The trail should be kept narrow for minimal intrusion to this forest ecosystem. It would cross over some of the rock outcrops and ledges.
3. The trail system wanders along the exquisite stone wall work indicative of the historic field edges, stock pens, and the cellar hole on Cricket Hill Road Extension and the interior old farm lanes (bordered by stone wall). Thousands of young trees seeded onto the trail ways. Mulching and brushing the trail network (removal of the dense sapling and seedlings trees along the trail surface) will delineate the trail locations and draw the walker's attention to the beauty of these stone structures. Mulching and brush cutting will open these trails.
4. The trails follow many of the roads used for the past harvest. The surface of these trails held up over the last 11 years due to the installation of adequate erosion control measures post-harvest. An assessment and documentation of the current trail condition with the follow-up of the development of a maintenance plan and protocol is recommended. The Conway Trails Committee and community members could foster the energy for the care of these woods for seasonal community trail work on volunteer days.
5. With the guidance of the community or the Conway Trails Committee, construct trailhead kiosks or simple box-slot for maps and install color-coded, directional signs on the trail network. Some noticeable educational signs near the stock pens, corrals, cemetery, and unique habitat and ecosystem features would increase the community's awareness and appreciation of this resource.
6. Parking along Cricket Hill Road Extension at the corner of the Cricket Hill Road and the State Forest access point invites the hiker into this forest. Signage here would help visitors understand the location and access to the Town Farm trail system as well as the differences between the different ownerships and management styles here

Climate Vulnerability: All models predict the increase in the intensity and frequency of severe storm events with high, strong winds, and high volumes of rain or ice. This precipitation pattern will increase volumes and velocity of water moving over the forest and through the drainage channels within the forest. Erosion protection and sensitive site engineering would be included within a good set of adaptation and mitigation actions. Teach everyone who uses the site about climate forestry and stewardship and how their actions matter. Some words could be added to the trail maps about the protection of soil integrity and erosion prevention. Educating the site users and community to climate adaptation and mitigations forestry actions will increase efficacy of any project. Allies always help.

Carbon Considerations: Trail engineering and construction or maintenance should consider erosion control and surface stabilization to protect healthy soil structure and function.

Practice 3: Reserve and Proforestation Area

Ecological Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Climate Mitigation. Carbon Storage. Ecological goods and services- solace, nature study. Forest Resilience.	1 2 3 5 6	HH OH WH WP RZ	Designate and Map a Refugia/Reference Forest/Pro-forestation Zone within this property	~43 acres	2020-2021

Definition: Proforestation is the practice of purposefully growing an existing forest intact toward its full ecological potential. It is a nature-based solution whereby existing forests are protected as intact ecosystems to foster continuous growth for maximal carbon storage and ecological and structural complexity. In suitable forested areas it has the potential to be a powerful forest-based strategy that can address the global crises in climate and biodiversity.

Discussion:

1. A part of the community would like to see both Town forests undisturbed by future timber harvesting and management activities. This voice is important and presents a valid position given the forest's ability to mitigate climate change by accumulating and storing carbon.
2. The hemlock-hardwood groves (Stand 2) support the spring seep fonts and their drainage systems and adelgid-free hemlock trees. The remote white pine stand (Stand 5) offers an ideal reference forest for the natural evolution of the transitioning old farm white pine forest. One of the larger stone wall enclosures near the southern bound eclipses area in Stand 1 (OH: Oak and mixed hardwood trees) and Stand 3 (WH: white pine and mixed hardwood trees) and creates a clear bound for the preservation zone. All lands north of Cricket Hill Road extension which surround the Maynard cemetery support the beaver meadow

complex and the aesthetic appeal of the cemetery structures. A riparian zone paralleling Cricket Hill Road extension (south of road) contributes the last section of reserve sites for the protection of water quality.

3. If the Town takes part in any climate mitigation or carbon storage programs in the future, these protected areas will provide carbon reserves with high carbon stocks.
4. Long term protection as a reference forest in undisturbed conditions would provide a useful comparison to other managed areas while at the same time recognizing and celebrating the values that some community members hold. Afterall, this is everyone's forest.
5. However, the Town would also need to set up guidelines for what types of emergency interventions would be permitted in this zone.
6. This proposed reference forest would be a place where natural processes such as carbon sequestration and storage, would develop without human intervention from the moment of designation forward- fully recognizing that the complex anthropogenic land-use history from native peoples up to the present time obviously changes this trajectory.
7. Given the uncertainties and unknowns around above-and below ground forest carbon dynamics, having a reference forest paired next to a more managed forest would allow both layperson observation of differences as well as scientific study of change over time.

Optional Passive Approach for the Property: Two letters were received through the community outreach component of this document preparation phase that requested that the Town consider the designation of all the Conway forest lands as reserve zones without any harvest related disturbance. Support for trial building and maintenance and invasive plant control shows a reluctance by these parties to promote true non-disturbance zones.

It is beyond the mandate of this document to resolve active versus passive forest management philosophical debate within Conway. A total passive approach to this entire property is certainly an option for review and debate in the future. This discussion should include the concepts of the increase in forest structure vulnerability and the decrease in forest resilience within a forest ecosystem that supports an overstocking of maturing trees as they face disease, insects, climate changes, and severe storm damage. One should also consider the trade-offs in optimal carbon dioxide uptake rates in young trees that is sacrificed with an abundance of older trees that store carbon.

Climate Vulnerability: Preservation of this site might increase the hemlock tree's resilience to the adelgid and scale. It is a moister site with the vernal pools and spring seep water resources. Our hemlock will rally. Hardwood seed will have begun to set in the small gaps from individual tree mortality and initiate a subtle transition to more climate future adaptive tree species. One small intrusion might be a narrow perimeter trail for future ecosystem monitoring, and some cut over paths within the forest interior.

Carbon: No harvesting would prevent any major carbon loss over the next 50 to hundred years except for dying and decaying trees. The young hardwood trees in this stand are growing optimally for their size and carbon sequestration rates are high. If natural disasters stay at bay and the active stressors do not degrade site productivity too much, this stand will increase its carbon stocks growing for the next couple of decades.

Practice 4: Develop Conway-Specific BMPs

Ecological Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Ecological function- Hydrologic cycle and Soil Quality and Function.	1 2 3 4 5	HH OH WH ESH-BB WP HH	Develop either Town-specific Best Management Practices (BMPs) or codify as policy for the Town a set of BMPs	Property-wide	2020-2023

Discussion:

1. Survey results and public comments show 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 Town forests.
2. The Massachusetts Department of Conservation and Recreation has a set of BMPs for use when a silviculture 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 started on the Fournier Lot, both the minimal and the added precautionary suggested practices will be followed.
3. Written guidelines or at least a discussion of appropriate BMPs for the protection of water quality, soil integrity, rare, endangered, and protected species zones, the aesthetic appeal of the land, or unique cultural sites (ice pond) are advisable for use during any future sustainable forestry practice inclusive of trail development or maintenance projects, invasive plant control projects, storm damage clean-up projects, and silviculture harvesting projects.
4. 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.

5. 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. Weather it is conducted 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.
6. A Town Forestry Committee or Advisory Board could undertake this process. It would require some research into existing BMP's and education of the Select Board, and Forest Advisory Board or Committee about standards, equipment familiarity, and general forest engineering ideas.
7. Discussions included the possibility of a forestry by-law for Conway. No clear resolution was made about the process for the establishment of a set of BMP's for the community. Our recommendations include the completion of this work by some community-wide mechanism. Its priority in discussions, survey, and the workshops merits the consideration of the application for grant funding for the support of this work.
8. 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 5: Optional- Focus Tree Release

*Presented as an Optional Active Forest Management Project for the support of forest health, individual tree vigor, and the establishment of additionality for any participation in a carbon sequestration program by Conway.

Objective	Stand No.	Forest Type	Sustainable Forestry Practice: Silvicultural Practice	Stand Area (acres)	Basal Area Removal (sq.ft.)	Volume Removal (MBF)	Fire-wood Removal (Cords)	Pulp-wood Removal (Tons)	Timing
Biodiversity Forest Resilience. Carbon pooling. Climate Mitigation. Forest and Tree Productivity Regenera-tion.	2 3	OH WH	Legacy or Focus Tree Release	~50 acres	<30 Sq. Ft. 15% - 20% of stocking.	100 MBF	115 cords	125 tons	2025-2030

Climate Adaptation and Mitigation and Forest Resiliency Building Forestry Practice Objectives:

1. Increase structural complexity amongst age classes, species composition, and tree heights.
2. Improve the general health and vigor of the crop trees.
3. Enhance and protect songbird habitat attributes in the small openings while keeping functional stand dynamics and natural resilient structure in over 80% of the stand.
4. Preserve dense forest cover for maximum carbon storage in maturing trees.

Mechanics of the Harvest for Focus Tree Release:

1. Legacy or Focus tree release mechanics aim to open the crowns on two to three sides of the broadly defined legacy or focus trees on the stand. A minimum of 25-30 trees will be selected per acre. Many trees with no influence on focus tree crowns or growth would still grow. It would be a conservative harvest.
2. Scheduling of this proposed project should reflect commitment to carbon friendly and ecological forestry in which disturbances are spaced out over a 20-year window for sufficient recovery of the forest ecosystem between these disturbances. The conservative removals (remember the total stocking and volume records for this site are extremely high due to the tree size and heights) adhere to the maximization of carbon storage premises of retention of high stocking post-harvest.
3. The proposed silviculture project would follow the Ecological Forestry precepts as summarized in Appendix B of this document.
4. The trail network would be protected with the strategic retention of aesthetic pleasing trees, a buffer strip along the trails, the removal of any brush from this trail surface at the end of operations.

Trees to Be Removed: Sawtimber-sized oak, maple, birch, white pine and hemlock stems and large sapling and pole-sized red maple, beech, hemlock, and paper birch stems, trees with poor form, low vigor, and a juxtaposition that interferes with crown expansion of the chosen focus trees. Some of the high value red oak trees could be harvested. An estimated 10-15% of the site stocking will be harvested. Hardwood trees with crown damage, obvious decline due to insects and disease, or toppling over-uprooting storm damage. White pine trees for removal include those with root heaving, asymmetrical crowns, and extensive needle dropping caused by fungi. Hemlock trees that shed over ~75 % of their needles over the next five years would be included.

Legacy or Focus Trees: Expansion of the definition of crop/focus trees from the traditional use of the term crop trees reflects the Town's concern that no emphasis on economic gain or timber crop management be pursued. Focus trees include soft mast producing trees, aspen, the relic trees (large trees over 25 inches in diameter that have been a part of the forest for a long time) and black cherry (soft mast), any species with well-formed cavities, trees with large, expansive, healthy crowns for perching, large-diameter snag trees, uncommon species such as white oak, black oak, or hickory, or aesthetically appealing trees. And it can include vigorous trees that diversify or enhance the carbon portfolio in the forest here.

Invasive Plant Control: The invasive plant communities within these two stands should be treated for stocking reductions prior to the implementation of any sustainable forestry practices to protect the seedbed conditions. Appropriate control measures as outlined above can be scheduled prior to any silviculture disturbance.

Landscape Considerations: Forest management approaches on neighboring private, industrial, and State-owned forest lands differ from this proposed silviculture project. This is a conservative technique which removes a minimal number of trees per acre, keeps maturing, large sized trees for their life cycle, minimizes disturbance to ecosystem function, and supports a quick return to pre-disturbance condition and structure.

In contrast, other forestry projects, which are driven by a different set of goals and objectives than your communities, remove higher levels of stocking, harvest more and keep less mature trees, and create large openings in the forest landscape for habitat values. If the community support this proposed practice, it will not detract from the use of the Town forests as a carbon sink and the Town's participation in any carbon credit offset project.

Climate Vulnerability and Opportunity: At the time of this project 2023 to 2025+, the advanced regeneration will be over 15 years of age, at which time it would be wise to consider the introduction of a new young forest component. The creation of conservative openings within the forest canopy would start new seed germination in the rich soils. The release of the healthy crowns of the oak, maple, black and yellow birch, cherry, and white pine seed trees will increase species diversity in the new forest. Species composition and seedling development projects increase biodiversity and forest resilience.

If species composition shifts occurs in the distant future, this stand's composition would have been transitioning to a hardwood oak forest capable of drought tolerance for decades. Keeping the hemlock and the majestic white pine trees is crucial, but mindfulness of the risks this choice brings will keep your community prepared to respond quickly if conditions change quickly. Seed bearing trees for crown release and vigor improvement include red oak, black cherry, yellow birch, sugar maple, white pine (for now), and red maple, all future climate adaptive species.

Forest Carbon: Forest improvement projects increase growth rates and sequestration rates, which sequesters more carbon in the forest. The hardwood trees range in age from 16 years to 45 years, this is the prime stage of height and diameter growth for immature trees thereby geometrically increasing carbon dioxide uptake rates. It's a good mitigation project, which is based in carbon science.

Practice 6: Red oak, white oak, and hickory underplanting

Ecological Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience. Social and economic goods. Forest Productivity. Carbon Accumulation. Climate Mitigation.	2 3	OH WH	Plant red oak, white oak, or hickory seedlings (large size) within the stand to increase the stocking levels of this species for habitat, biodiversity, and economics (carbon or timber).	Dispersed planting out over the 50 treated acres.	2025+ Post disturbance

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 Conway 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 ability of this forest.

Climate Vulnerability: Forest renewal is essential to the sustainability of ecological function. Increasing tree species diversity in the seedling class and stem count increases forest resiliency. The youngest age class is over twelve years of age, and the benefits of the young forest habitat diminish with the time from reset. Educating the site users and community to climate adaptation and mitigations forestry actions will increase efficacy of any project. Allies always help. This practice would initiate the transition of the forest composition to future climate adaptive tree species.

Carbon: Planting any plants or trees in a forested ecosystem increases the density of stems which increases the above ground live carbon stock as plants and trees mature. Shrub plantings such as nut, seed, or fruit producers, increases food and habitat. Since this forest has ample carbon stock and the capacity to self-renew, resources invested into planting should be analyzed and natural seed tried first.

Practice 7: Cleaning and Weeding in Sapling Area

Ecological Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience. Forest Productivity. Carbon Accumulation. Climate Mitigation.	4	ESH-BB	Cleanings and Weeding amongst the sapling and seedling class. Wild grape control	9 acres	2025+ Post disturbance

Discussion:

1. Release operations such as cleanings and weeding free young trees not past the sapling stage, from the competition of surrounding trees that threaten to suppress them.
2. The basic goal is to give young trees enough light and growing space to grow vigorously and develop into mature trees in the main canopy at a more accelerated rate than might otherwise occur. Another purpose of this practice is regulation of species composition so that trees adapted to a changing climate will form the future forest ecosystem.
3. Immature trees for removal include the short-lived species such as striped maple, gray birch, and pin cherry in favor of the long-lived trees best suited for warmer soils and air such as black birch, red maple, red oak, white ash, cherry, and white pine.
4. The scattered older trees provide carbon storage trees and although they are over topping some of the vigorous young trees. They should be kept for a simple balance in ecosystem function and seed-bearing ability.
5. The cutting of some of the wild grapes that climb into some of the most productive overstory trees and smother the younger trees would increase site productivity.

Climate Vulnerability: This stand is regenerating with a diversity of hardwood tree species and white pine. The removal of some of the competition amongst the superior young stems increases the water and nutrients available for their growth. Many of these hardwood species (red maple, red oak, yellow birch, black cherry, and aspen) are predicted to thrive in a drier, warmer future climate.

Carbon Considerations: Any improvement to photosynthesis or seedling/sapling growth supports higher carbon sequestrations rates. Hardwoods are genetically evolved to hold denser carbon stocks over time as these trees climb into the high canopy.

Practice 8: Forest Carbon

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Climate Mitigation. Carbon storage and accumulation. Forest Resilience. Ecological goods-economic goods.	1 2 3 4 5	HH OH WH ESH-BB WP	Participation in Carbon Offset Project-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

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 program 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.
3. The United States Forest Service offers technical help 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.

4. The Town has applied for grant funding from the FRCOG-Mohawk Trail Woodlands Partnership for the completion of a feasibility study for the initiation of a carbon sequestration and credit generation project for the Town forests in aggregation with surrounding municipal and private forest lands. The ideas, goals and objectives sustainable forestry practices presented in this document integrate well with participation in such a program.

Practice 9: Adaptive Management

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
1 2 3 4 5	HH OH WH ESH-BB WP	Practice Adaptive Management Development of a Monitoring Program and Documentation or Archive System	Property -wide	2020-2030

Discussion:

1. As discussed throughout this Plan, change is an inevitable part of natural processes. The forest will evolve through the next ten years no matter what and climate change will undoubtedly scramble this process too. 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 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 a community-derived Town Forest Committee (keeping in mind the experience and wisdom of the Conway participants in the Forest Stewardship Planning process) or some derivative of these methods.
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 first resources to complete this Forest Stewardship Management Plan, and you can easily use 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 thin crowns, dying trees, and regionwide reporting on winter Hemlock Wooly Adelgid mortality rates will help inform this effort.

Climate Considerations: Resistance and building resilience are appropriate strategies for the low to moderate vulnerability and impact risks with this forest ecosystem. Stressors will be the most powerful driver for change over the next two decades with concerns for the long game here and tree species habitat change and abundancy reductions. Keeping a watchful eye on minor changes will archive the trending patterns for the forest stewards in the future and support their response for recovery or triage. Immediate detection and solution planning if an unintended reversal in the carbon stocks occurs if the Town does sell their offset credits will facilitate resolution.

6.5 Boundary Maintenance and Delineation

The placement of small identification signs along the perimeter of the property would help visitors understand the bounds of the Town Farm Forest. Community feedback shows that many recreators are unsure when they enter the Town farm given the vastness of the State Forest and Cowls Lumber Company holdings. And tasteful signage could help differentiate the management approach and style of the Town.

6.6 Access Negotiation, Road Improvements, and Maintenance

Cricket Hill Road Extension is technically the access for the Maynard cemetery and the Town holds some responsibility for access to the graves by the families. The road has been kept through the years for this purpose. Recent harvesting activity upon the State Forest and Cowls Lumber Company lands have changed the condition of this road. The predicted weather pattern changes in the future and its accompanying high-volume storm events will bring higher flow rates than the existing culverts might mange well (under-sizing in the past).

Some pre-planning about the care and upgrade of this access could assure continual use of the road for cemetery access and forest management purposes. Collaboration with the Massachusetts DCR Management Program and Cowls Lumber could share the costs of these projects. The documentation of Best Management Practices and a road use policy (as it is still a continued Town road) would provide the Town with the means to secures its upkeep as the Town and your neighbors use of it for forestry practices in the future.

Climate Vulnerability: One culvert has already failed along the access road system. Its replacement with a larger diameter culvert would guarantee the culvert's ability to service higher volumes of storm waters in the future. Annual monitoring of the road conditions, an annual maintenance program) even as minimal as the hand removal of debris within the culverts) will prevent the erosion of the road surfaces.

6.7 Community-based Forest Stewardship and Budgeting Planning

The Town of Conway 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. The Townspeople would like is to be fully informed in a prompt fashion whenever forest management work is proposed or planned. As mentioned earlier in this document, one way to assure full disclosure or any discussions relating to the Town forests would be the creation of a formal political body within the auspices of Town government and committees to conduct due diligence when necessary.

Such a body could meet when the implementation of any of the recommendations in this document are proposed. The Committee's responsibility would include the protection of the collective voice heard during this project. Small Towns face financial dilemmas in their annual budget season. Our current pandemic might enforce austerity measures for years. This body could 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 Town forests or keep a third-party for such supervision and implementation. A Town Forestry Committee could also liaison with your neighbors as future harvesting projects are planned and educate them about Town mandates or future by-laws so that respectful treatment of your road surfaces and wetlands occurs.

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 part 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 part 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 lying under oath:

Owner(s)____Date____________

Owner(s)____Date____________

I attest that I have prepared this plan in good faith to reflect the landowner's interest.
Plan Preparer: Mary K. Wigmore MFL #250 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- Forest Stewardship Goals
The full set of forest stewardship goals, objectives and strategies using sustainable forestry practices for the Conway town forests, which were derived from the Online Community Forest Stewardship Planning Survey and the Forest Stewardship Planning Workshop.

These are all the things that we heard the community say they wanted to do. It embarks from position of community engagement- knowing full well that the voices in the decision-making process may change at different times and in response to different values.

There were two general approaches that coalesced- one which tends towards a passive, hands-off approach to stewardship, and the other which tends toward a more active, direct approach. Here, we strive to present two tracks, which will undoubtedly often overlap, of stewardship practices.

The more passive approach is highlighted with grey in the central column where applicable.

COMMUNITY-BASED FOREST STEWARDSHIP GOALS	OBJECTIVES	SUSTAINABLE FORESTRY PRACTICES	Fiscal Year accomplished	Example of Ecosystem Service or Ecological/Social Function Outcome
1. Sustain biological richness defined as all forms of life within the forest and their ecological roles and the different ecosystems, landscapes, species, and genetic codes present here now.	**1.Preserve Habitat for rare and endangered species and species of conservation priority in natural condition.** **2.Support a full range of habitat conditions for the support of wildlife diversity.**	**A: Passive with Minimal Disturbance** **1.Find priority habitat through GIS mapping** **2.Set policy for these areas of non-disturbance-BMP guidelines set up for visiting and trail use in Conway Community Forests.**	**2021-2030**	**Sustain wildlife habitat in its natural condition** **Mapped and reserved refugia sites or long-term minimal**

	3.Protect native plant communities.	**3. Interpretative signs constructed and installed on the properties with a simple message of treading lightly and sharing the forest.** **4. Identify unique habitat refugia and legacy sites for protection, use GIS mapping for their designation, and establish a Town policy about the establishment of these micro-refuges upon the two Town forests with non-disturbance/forever wild zones understanding.** **5. Develop a long-term protection plan for the Town forests such as the sale of a conservation restriction or a Town initiative for no future development.** **6. Educate the neighborhood and Town about strategies to protect and enhance habitat.** **7. Protect Rare, Threatened and Endangered (RTEs) Species by strategically focusing recreational and educational access away from special areas.**		**management zones**

		B. <u>Active and Conservative Stewardship</u> **1.Identify full scope of the invasive plant threats on both Town forests. Use GPS and GIS mapping technologies to figure out and map their extent on both forests.** **2.Develop an Integrated Vegetation Management Plan for the control of these invasive plants. The current stocking allows for manual and mechanical control measures with hand pulling, brush cutting, or mowing on the Fournier Woods, but Town Farm Forest may need other control measures.** **3. Promote Old Growth Stand Characteristics through the felling of large trees to create large sized downed woody material to support invertebrates and girdle large sized trees for snags and cavity nesting sites.** **4. Create added wildlife habitat by installing a 1-2-acre openings in the remote uplands of the properties without the extraction of forest products.** **5. Plant native shrubs within forest areas that are deficient in this valuable plan layer for cover and feed.**	**1.2020-2021** **2. 2020-2021** **3.2020-2030** **4. 2020- through 2030** **5. Ongoing**	**Protect native habitat and plant communities and their ecological function**

		6. (a) Explore full government grants, private foundation grants, forest goods based, and community resource for human power (volunteer programs) funding for the completion of these sustainable forestry practices. (b) Secure funding sources. (c)Implement these Sustainable Forestry Practices on the two Town forests. 7. Protect RTEs by planning and timing SFP's around the requirements of known RTEs on the property.	6. Continual 7. Ongoing	
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	**1.Maintain and enhance the recreational experience of both forests.** **2. Develop and expand the educational use of the Fournier Woods by the Conway Grammar School**	**Cannot be too passive here- if you do not do anything, trails deteriorate, and erosion occurs-community spoke and wants to use the land.** **1.Trail inventory of current trail locations and condition on the Town Forests.** **2.Identify needs for trail restoration and maintenance such as brushing out, erosion prevention measure installations, closing trails if deteriorating beyond sustainable condition, and signage needs**	**2020 through 2030**	**-Protect and enhance emotional and spiritual well-being of community** **-Sustain and protect water quality with erosion prevention**

		inclusive of best locations, minimal effective number, educational/interpretive, directional, and designation of trail use as some should be just for walking. **3. Develop a 10-year working plan for trail maintenance and upgrade when necessary.** **-Secure funding sources.** **4. Implement the recreational plan for the trail system** **-erosion control measures installed** **-proper signage installed** **-map of the system made and presented at a kiosk with rules of use** **-kiosk built with local wood and installed** **- designate locations of good viewsheds.** **5. Install educational signage to enhance peoples' experience of the place with a special focus on children's engagement with the woods here.** **(a) Assist local teachers in attendance to a Project Learning Tree seminar** **(b) Apply for special grants if an interest teacher appears for the inclusion of forest ecosystem material in the curriculum.**		**-Sustain and Protect soil integrity** **-Promote Recreational Opportunities**

		(c) Revision of the Ruth Parnell Forest Treasure map for display at the forest and availability in a kiosk for family use. **6. (a) Explore full government grants, private foundation grants, forest goods based, and community resource for human power (volunteer programs) funding for the recreational trail development and maintenance.** **(b) Secure funding.**		
b. Hydrologic cycle through which forests absorb water from soil and atmosphere and return it and filter it for its improved quality	**1. Protect and maintain the water quality in vernal pools, streams, spring seeps, riparian zones, and wetlands**	**If passive- then no forestry and no use in riparian zones but that only stops the respectful, civil folks from damaging these sensitive sites.** **Active Management:** **1.Draft and document a set of best management practices that use an acceptable set of standard practices for water quality protection during trail work, forest stewardship projects, or silvicultural activity.**		**-Protects and supports high water quality within the wetland resources on these lands and downstream** **-Sustains ecological function of the forests**

		2.Map and find riparian resources on both properties and display map on interpretive signage with directions to tread lightly. **3.Follow all CMP's from Mass NHES Program for Vernal pools during any Sustainable Forestry Practices.**		**-Sustains biological richness with preservation of water sources**
c. Soil quality and function as forest filter toxins before they enter the soils, anchor soils in place, support microbial and microorganism activity to build soils, which support all life	**1.Protect and restore soil integrity and structure**	**Passive- then no forestry and other disturbance in the riparian zones or on highly erodible sites, but that only stops the respectful folks from damaging these sites and protecting soil integrity** **Active Stewardship-one can argue recreational use of the trails on site falls within Active Stewardship parameters:** **1.Identify areas with soil degradation due to past harvesting or current welcome and unwelcome recreational use, map field locations of current and possible sensitive zones where site degradation could occur from use and establish a GIS database on both properties inclusive of minor issues (ruts in woods, overuse trails, or sheet erosion on trails and major issues (failed or undersized culverts or massive sedimentation and erosion zones).**		**-Protects and sustains long term soil integrity, fertility, and function on both forests** **-Sustains ecological function of the forests** **-Sustains biological richness with preservation of water sources**

		2.Draft or accept an already proven set of best management practices with community input that decides how to us the trail system or implement SFP's and protect soils integrity. **3. (a) Explore full government grants, private foundation grants, forest goods based, and community resource for human power (volunteer programs) funding for the completion of the above tasks when necessary.** **(b) Secure funding sources.** **4. During any future silvicultural SFP's for forest health, productivity, or resilience, make use of the Massachusetts 2014 BMP Manual and the added Town policy and minimize road surfaces for work and restore disturbed soils surfaces.**		
d. Climate Regulation - protect and promote the forests' use as a Carbon sink that pulls CO2 out of the air in photosynthesis, accumulates and sequesters carbon and stores it in boles, leaves, branches, and roots	**1. Promote forest conditions that support their use as a mitigation strategy for climate change through Carbon sinking/pooling and promoting forest conditions that allow for climate adaptation by the forest**	**1.Social/cultural- Before any active management starts- hold a community forum to accept the proper sustainable forestry practices necessary for the accomplishment of this goal. At the forum present science to date and decide what the Town can accept.**		**-Maintain forest condition for its use as mitigation strategy for climate change** **-Protects and sustains biological richness**

thereby mitigating the threats of climate change		**2. Active management- science has some guidelines on how to grow a forest for the best accumulation and storage of carbon and the adaptation of forest conditions for climate mitigation.** **(a) Identify the current forest conditions and characteristics useful to carbon pooling and supportive of future adaptation to a changing climate.** **(b) Set up a long-term SFP in a long rotation (time you grow trees on a property) and grow site and climate changing suitable trees older-closer to their lifespans.** **(c) Require long recovery periods between disturbance from forest stewardship/harvest with a required 20-year window. Both forests are in the recovery phase for another 5 to 8 years+/-** **(d) Establish a monitoring system on both forests so that you can see how the forest is doing as change occurs annually/biannually?** **(f) At end of recovery period use silvicultural practices to introduce a new young age class, improve forest stand and individual tree vigor, increase forest ecosystems productive ability, and remove any threatened trees**		**-protects and sustains the delivery of ecological services** **-Increase forest productivity and its ability to sequester carbon**

e. Economic goods- timber products and fuelwood are important to some community members, but overall, these are the lowest priority objectives	**1. Maintain and improve timber stocking where appropriate and where co-benefits of forest health and productivity gain.** **2.Regenerate the forest when necessary**	**Pro-forestation – is a passive management approach whereby the Town lets the forests develop naturally from this point forward through time.** **1. Implementation of a low intensity harvest that meets all the ecosystem services and benefits goals- Crop Tree Release with small gaps creation between crop trees or Combination of Single Tree and Small Group Selection.** **2. Draft an aesthetic values protection land for use during implementation of SFPs** **3. Ask for community input and involvement in all the decisions about best use of silviculture on the Town forests.** **4.Hold educational field tours about the project goals and mechanics.**	**2028+**	**-Maintain and enhance forest health and vigor** **-Maintain forest condition for its use as mitigation strategy for climate change** **-Protects and sustains biological richness** **-protects and sustains the delivery of ecological services** **-Increase forest productivity and its ability to sequester carbon**
f. Cultural values-some of the history of Conway is held on these lands.	**1.Protect all historic and cultural resources across both forests**	**Combination of Active and Passive <u>required</u>** **1.Map the cultural resources.** **2. Create and follow a community policy for their protection.**		**-Protects and supports the historic and cultural values inherent on the Town forests**

		3. Seek any funding for special protection measures- such as restoration of gravestones. 4. Secure funding 5. Implement any practical measures.		-Protects and sustains the delivery of ecological services and benefits to humans
Sustain Forest Resiliency	**1.Conserve and Protect the Forest Ecosystem itself against conversion of use** **2.Use SFP to increase and maintain forest resiliency**	**1.Set up a monitoring program that can assess future vulnerabilities to disturbance across both forests, change sin resilient characteristics, and threats to the forest ecosystem.** **2. Implement SFP's that promote long term forest resiliency** **(a) Passive-Let the forest grow and naturally develop resiliency. Depends on the premise that forests have the genetic history and adaptiveness to survive.** **(b) Implement many of the above stated SFP's which are scientifically accepted, and community accepted and will increase forest resilience:** **b.1. Similar SFP's for climate mitigation.** **b.2. Create balance in age classes across the forest.** **b.3.improve the health and vigor of the trees in both forests.**		**-Sustain Forest Resilience** **-Maintain and enhance forest health and vigor** **-Maintain forest condition for its use as mitigation strategy for climate change** **-Protects and sustains biological richness** **-protects and sustains the delivery of ecological services** **-Increase forest productivity and its ability to sequester C**

		b.4. Use an adaptive management program for frequent review of resilient conditions and adaptation of necessary measures to protect FR. **6.Educate the community about forest resilience.**		

Appendix B: 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 a suitable silvicultural tool to meet the integrated goals of management on the Conway Town Forests. 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, it is planned and executed to mimic natural disturbances. 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 keeps 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 Fournier Forest, there is already a complex mosaic of species, size classes, and natural features. However, it is a young, to middle aged forest and management here can look to guide portions of the woods toward and older forest condition replete with the structural complexity and messiness that this entails. The proposed reserve 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, regeneration harvests, variable density thinnings, and crown thinnings for the improvement of individual tree and stand vigor, habitat, carbon reserves, and biodiversity.

Longer rotation ages (more than 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 found 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 Town forests.

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

Forest Management Standards for the Silvicultural Application of Ecological Forestry on Conway Town forests

Goal: Use of silvicultural-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 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 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 proper stream crossings for logging machinery and work 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. Find 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 area 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 across the Town Forests.

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