Forest Stewardship Climate Plan 2022-2032
Fournier Lot – The Grammar School
Town of Conway

Total Forested Acres: 47.3

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

Prepared by Wigmore Forest Resource Management

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Revised for the Massachusetts Department of Conservation and Recreation Forest Climate Program- October 26, 2022

Forest Management Plan

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

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

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Conway

Mailing Address 32 Main Street Conway, MA 01341 Phone 413.369.4235.ext.3

Email Address townadmin@townofconway.com

Property Location Town(s) Conway Road(s) South Deerfield Road (Rt.#116)

Plan Preparer Mary K. Wigmore dba WFRM Mass Forester License # 250

Mailing Address 1601 West Road-Ashfield, MA 01330 Phone413.628.4594

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
411	068	2464	320	55.6			12.7	42.9
			TOTALS	55.6			12.7	42.9

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

The immediate school grounds as well as the newly developed Highway Department garages and equipment yard.

HISTORY Year acquired 1990 Year Management began 2007

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.)? NA

stand no. ______ treatment ______ reason ______

(If additional space is needed, continue on separate page)

Previous Management Practices (last 10 years) NA

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date

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

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.**

<u>In your own words please describe your goals for the property:</u>

____

____

____

Stewardship Purpose

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

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

Signature(s): ______________________________ **Date** ______________

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

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 subsequent escalations in 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 potential 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 is designed to educate your community on the potential impacts of our changing climate in the Fournier forest. The Fournier woods 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 this natural resiliency. If you understand these dynamics and the true character of the Fournier woods, your community would be prepared to make right choices for the care of this land despite whatever chaos our changing climate might unleashes in Conway.

The Forest Stewardship Climate Management Plan 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. Your plan weaves multiple scientific disciplines, recent ideas on appropriate management actions for an uncertain future, with your values and dreams for the Fournier forest. Looking ahead 10, 20 or 50 years, the actions a certified Climate Forestry forester recommends for your forest now and if change accelerates, will nudge a slowly evolving forest ecosystem into a more resilient condition for sustainable ecological function.

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

All 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 on the forest ecosystem structure and condition are then reviewed within each original subject heading. To aid in understanding these complex topics, climate forestry specific sections have been added to the management plan.

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 Fournier Town Forest 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 future ecological function of your forests.

The basic objective of the FSCMP plan is to introduce a new direction for forest management that hopefully sustains their ecological function and vigor while they endure and adapt to climate changes. With an introduction of your broad forest stewardship goals in the first section of the management plan, the FSCMP aspires to support actions now, which will determine the health, structure, and ability of your Town forests to thrive in a warmer climate in 50 years. You will understand 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.

Section 1: Conway Town Forest Fournier 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 new direction for 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 the 2020 collective efforts 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 consistently ranked as the lowest priority to your community during the outreach process.**

The Conway community stated the following goals for the stewardship of the Fournier Forest 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, anchor the soils on the landscape, and through tree root systems support microbial and microorganism activity that build up soils and support all life.
    d. Climate change impacts mitigation as forests function as a carbon sink that pulls carbon dioxide 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, trees remove a lot of carbon dioxide through the growing season.
    e. 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.

f. 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.

3. Sustain or enhance, when necessary, forest resiliency. A resilient forest is one that will continue to be an ecologically functioning forest 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: Overview of the Conway Town Forest- Fournier Lot

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, 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 for New England.

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

Climate Changes Observed Now	Climate Changes Predicted
• 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 and more 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

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NIACS Northern Institute of Applied Climate Science

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

The Fournier lot 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 Fournier family ran a working dairy farm here, worked the agricultural parcels, and tended the woods for fuelwood and timber income until the late 1980's. These woods were harvested in the 1950's for building lumber with periodic annual firewood and sporadic farm lumber harvests. The 2007 Shelterwood Harvest opened the forest for mixed white pine, hemlock, and hardwood seedling development.

Climate change became real for the residents of Conway on February 27, 2017. They learned firsthand the power of a raging windstorm with the loss of homes, forest stands, special trees, and the local power grid. Extreme weather events like a tornado are more common now. It drastically disturbed the forest ecosystem on both Conway Town forests. Luckily, your past management practices had enabled the system on the Fournier property to recover quickly without disturbance to the delivery of ecosystem benefits.

Figure 1: Tornado damage in an area that began regenerating after the 2007 harvest. Note the vigorous hardwood poles that have responded to the newly available light.

2.5 General Property Overview

Location and Property Size: The Fournier Lot, also known as the Grammar School Woods, contains 61.4 acres of land as computed from the MassGIS database system Tax Records maps. It adjoins Massachusetts Highway #116, known locally as South Deerfield Road. One enters the land along an improved access road shared by the Town of Conway and Gregory Rose. The Town Highway Department garages and storage sheds, the Conway Grammar School, and its playing fields occupy the southern portion of the property.

Topography, Land Formation, and Hydrology: One enters the Fournier property along an improved access road that crosses a broad plateau perched on the steep north bank of the Mill River. The terrain of the property features gentle slopes with some steep crags straddling interior depressions that fill with seep flow. One small rocky chasm provides landscape and terrain biodiversity. In terms of operability, all acres are accessible for stewardship activities. The undulations of slope, knolls, and depressions provides a wide variety of suitable tree habitats, which can promote some genetic variations within the tree species. The general relief pitches to the south across the property, which increases solar radiation on the soils further drying and warming them (causing seed germination issues).

When the temperature rises and the air and soil are warmer, the hydrologic cycle changes too. Streamflow during the intense spring and early summer rains disperses water quickly across, over, and through the soils making it unavailable for growing trees. This reduction in recharge impacts the health and function of the wetland that courses ribbonlike through the center of the property draining an interconnected wetland, vernal pool, seep, and stream system. Water levels may go down in the remnants of the old ice pond. Jefferson salamanders, a rare and endangered species in Massachusetts, have designated habitat along this central core and depend on a stable hydrology.

The lowland forested wetland (central strip through the Fournier property) plays an important role in climate change, due to its capacity to modulate atmospheric concentrations of greenhouse gases. The soils here are saturated through most of the year with seasonal flooding, and they hold less nutrients. Trees struggle to grow here. This wetland zone (spring seeps, streams, and vernal pools) has a moderate adaptive capacity to the predicted climate change yet could be vulnerable to a dry late summers.

Figure 2: Small streams, vernal pools, and wetlands dot the property

Several vernal pools dot the landscape (their location is defined on **Figure 9: Forest Stand Map**). These are seasonal, depressional wetlands that occur in previously glaciated areas. They are covered by shallow water for variable periods from winter to spring, and some are completely dry for most of the summer and fall. These pools rest upon a mixture of deep clay and bedrock.

The vernal pools serve as essential breeding habitat for certain species of wildlife, including salamanders and frogs (amphibians). Juvenile and adult amphibians associated with vernal pools provide an important food source for small carnivores as well as larger game species. Rich native plant species line the edges of the pool inclusive of blueberries, ilex, and witch hazel.

The vernal pools connect to a lowland wetland system, which fills with spring seep flow and run-off. The system drains southerly into the Mill River watershed basin. This intricate matrix of water and unique herbaceous plants (lycopodium, Christmas fern, starflower, hepaticas, and others) spills out of the crags between knolls and presents a unique visual appeal along the main trail. Water draining off the northern tip of the property circles back though an unnamed tributary into the Mill River basin.

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 Red Oak Site Index of 70, and portions of Stand 2 record a Site Index of 65 for Sugar Maple. Site index numbers are presented in Section 5: Stand Descriptions. 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 Chatfield-Hollis complex and their productivity varies as one climbs the gentle grade up away from Route 116. Not surprisingly, Route 116 winds its way through the more fertile soils that in many cases remain(ed) in agriculture due to their productivity and workability. A swath of Swansea muck constitutes a flat, wet area along the central, western edge of the property.

The Chatfield Hollis complex consists of a matrix of the moderately deep and well-drained Chatfield loams found in the flatter areas of uplands between rocks, and the shallow, excessively drained Hollis soils found on upper slopes and rock outcrops. Their coarse texture moves water downward quickly. Available water for tree growth is moderate to exceptionally low (Hollis). Tree rooting depth is limited by shallowness to bedrock (<= 40 inches).

Soils functions beneath the forest floor to regulate temperature, cycle nutrients and water, store carbon, feed trees and mycorrhizae, and decompose natural wastes. Health of the soils guarantees the health of the forest. The nature of the Chatfield-Hollis matrix indicates that on the lower, more gentle slopes the deep, well-drained Chatfield loams hold more water, while on the upper, steeper slopes the excessively drained Hollis soils lose their water quickly. The shallow depth to bedrock and the high permeability rates of the soil matrix increases the risk of moisture stress and subsequent mortality or decreased productivity.

Growth and survival rates of seedlings are low in these soils now. Given the temperature increase predictions, these soils might present a “hotter and drier” seedbed in the future. Certain species common here find these soils good habitat (sugar maple, white pine, red oak, and white ash). The risk for some tree species to do well and a few to shrink their abundance exists on these sites. One challenge these soils pose to the implementation of management actions is the need to protect and not disturb them during trail building, use, 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.

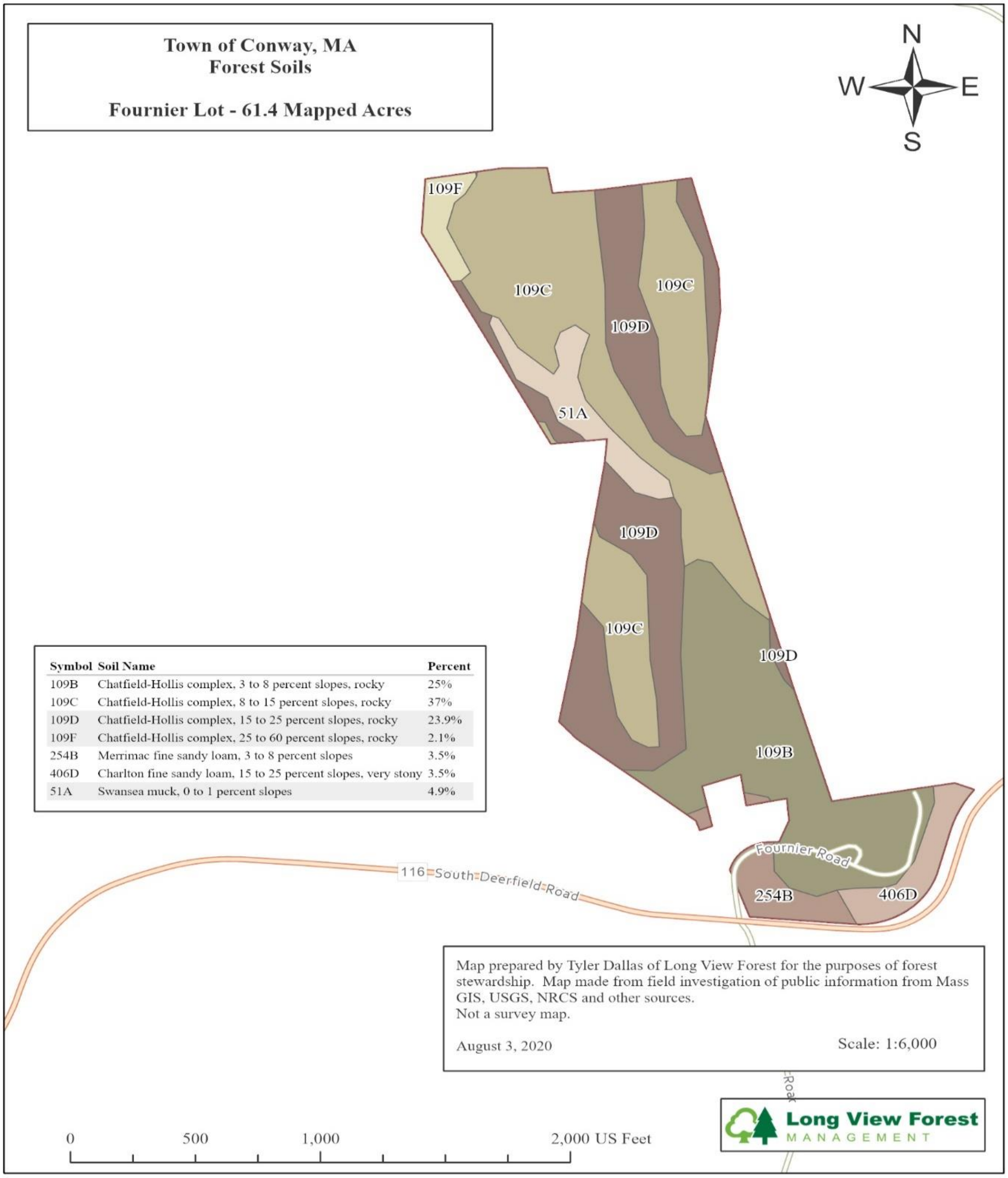


Figure 3: Soils Map

2.7 The Forest Ecosystem: Dominant Forest Types and Ages

The 47.3-acre forest ecosystem on this property is composed of two forest stands. Both feature a predominant hemlock component as well as a promising cohort of young trees, mostly in pockets, which established 15 years ago and are thriving. Collectively the site 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 75 to 100 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 15-year-old seedlings and small saplings.

The species composition across the property is distributed by basal area (a term that denotes stocking density in a forest) as follows: hemlock (39%), white pine (23.3%), sugar maple (9%), and black birch (9%). Red oak, yellow birch, and red maple are the other important species. Black oak, white oak, shagbark hickory, beech, and big tooth aspen are minor species associates. The white pine, hemlock, red oak, and white ash trees have grown here the longest, while the vigorous black and yellow birch, red maple, beech, and some aspen seeded into the forest due to past disturbances.

Over 62% of the property wide stocking is contributed by two species (hemlock and white pine) with low adaptive capability rating (a rating of how likely a tree species is to cope or persist with a changing climate based on suitable habitat characteristics). They could decrease in abundance as future suitable habitat decreased under predicted future conditions. Humid summers also increase white pine's susceptibility to fungal attacks. These potential developments pose a risk to the future ecosystem's ability to deliver a full suite of goods and services. Understanding these vulnerabilities and risks, the Town has an opportunity to act through the next few decades to establish a wider variety of tree species on the property with underplanting of future climate adaptive species or attempts at natural regeneration through forest resiliency building or climate adaptation forestry practices.

The structure of the forest is varied. Stand 1 features majestic pines on rocky ridges with large oaks, plenty of standing dead trees, and good quantities of retained coarse woody material. The new cohort of small trees contains ~8,000 stems <1" diameter at breast height (DBH) per acre. These are mostly black birch and white ash. If one follows the science on the black birch, the youngest age class composition presents another challenge to the sustainability of this functioning ecosystem. Black or sweet birch has a poor capability rating (its coping mechanisms in the light of climate change) and a predicted reduction in habitat due to its drought intolerance. White ash lives in peril and an uncertain future due to the incidence of emerald ash borer in Conway.

Stand 2 is smaller, but more varied stand with an array of larger northern hardwoods including sugar maple, white ash, beech, and yellow birch. It is a remarkable shift from the drier pine areas of Stand 1 into the more mesic hardwoods of Stand 2. The regeneration is less rich here with ~6,000 stems <1" DBH per acre held mostly in beech and black birch. The shrub layer is lacking in both stands and represents an area for improvement. There are some patches with brambles or mountain laurel scattered and some thickets around the ice pond.

While growing timber is not a primary objective for this forest, it is interesting to note the large volume of wood growing here. High timber crop volumes indicate the productive capacity of this site, and they equate to a high volume of stored metric tons of carbon within these trees. There are 500,000 board feet of timber crops in trees larger than 12 inches in diameter, 640 tons of smaller sized and poorly formed more mature softwood products, and 160 cords of mostly younger and poorer quality hardwood trees. High volumes equate to a high carbon stocking across these forests.

Another notable metric is the growth that has occurred on the site since 2007. Although the harvest reduced the timber volumes and tree stocking, the release of the crowns of the residual trees to increased sunlight, increased the site's productivity, and augmented total carbon stored in the older trees and accumulated in the seedlings and small saplings. 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 for the improved future vigor and growth and a corresponding increase in carbon stocks.

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 Fournier forest a discussion of the stressors at work in the forest ecosystem and the adaptive capacity of this unique ecosystem is 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 to reach a new state of balance or equilibrium. This mechanism helps trees endure environmental stressors, since they can't escape stressors, but must change their biology to survive it or succumb to it fully with mortality.

The stressors' pressure within the Fournier forest is low to moderate. Agents are working against forest health and productivity but not aggressively. The risk to the ecological function might manifest if the climate change impacts increase in the future. The stressors forcing changes in tree biology and forest condition within the Fournier property are:

a) 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 fifty 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, but needle loss remains under 25% of the crowns.
    - 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, but not severe 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 15% 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 and harmful under hot and humid conditions.
    - "Leaf-out" had occurred prior to the field review in May 2022, and red oak leaves on the ground showed spongy moth feeding on the leaves with less than 10% eaten. The tree crowns had minor branch dieback from last growing season.

b) 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 small, widely scattered populations of oriental bittersweet (Celastrus orbiculatus), Japanese barberry (Berberis thunbergii), honeysuckle (Lonicera spp.), Multiflora rose (Rosa multiflora), and Phragmites (Phragmites australis). Luckily, the 2007 harvest did not result in these plants spreading, although subsequent disturbance might.

c) Advanced regeneration is dense across the stand but seedlings under two feet in height were browsed heavily by deer. Their preference for palatable hardwoods leaves hemlock, beech, and black birch on site. In some places the deer were even eating the hemlock and beech stems.
d) 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 forests 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 sixty three percent of the forest cover here, but over 16 species grow in this forest.

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 capacity as climate change impacts change their habitat. High fragmentation on the landscape limits a tree species ability to migrate to a more suitable habitat. The Fournier forest lies at the southern tip of a 1,600-acre undeveloped block of forest that is surrounded by a fragmented landscape of agriculture plots, hay fields, and home sites. Conway is a community with zoning laws supportive of future growth. Road frontage and site conditions within this block support further development. The community is committed to the long-term preservation of their Town forests as forest, which decreases the vulnerability and increases forest resiliency.

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 are not tolerant to severe wind damage. Some of the northern hardwood species growing here might not tolerate large patch 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 Fournier forest ecosystem is low to moderate because of the wide range in adaptive capacity and the level of existing stressors. Even though the Fournier forest is a highly resilient ecosystem when confronted with long-term or severe climate change impacts, it could prove vulnerable to sudden change. Your knowledge of the current conditions can be used as a baseline condition for comparisons as future monitoring of the forest for change or accelerated 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 present a fair amount of risk. Early discussions in this document highlighted how this forest might change as our climate changes and the inherent 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 because you count on good habitat, carbon sequestration and storage for the mitigation of GHG emissions, water filtration, the simple beauty of the vernal pool complex, 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 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 risk 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 these forest ecosystem. Policies that the Conway Forest and Trails Committee craft today will leave a conservation legacy to future generations archiving the actions that Conway took early on to perpetuate the life-giving ecosystem goods and services of the Town forests.

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

Projected New Normal Forest Conditions with Climate Change	**Immediate Risks**	**Future risks**
Drought and moisture stress	Reduced tree vigor and forest productivity. Tree mortality.	High fuel for fires. Reduced carbon sequestration. Seedling loss and regeneration failure.
Biotic agents Pests and pathogens infestations more frequent and widespread	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.	Inability to start the future forest. Loss of future forests ecological function. Decreased carbon sequestration in young trees.
Extreme weather events occurrence with higher frequency and intensity	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 connotates the idea that the Fournier Woods 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 skews toward a maturing hemlock and white pine forest with dense patches of newly regeneration hardwoods. This structural diversity resulted from a timber harvest in 2007.

Tall, maturing hemlock and white pine trees provide terrestrial habitat elements in unique ways. As a food source, they provide seeds, needles and buds, bark, and the insects that can be gleaned from their substrates. Seed provides a food source for bird species such as Red-breasted Nuthatch, Common Grackle, and Evening Grosbeak. Black-capped 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.

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

After the 2007 harvest, a tornado in 2017 knocked down many trees here. Where they crossed the path, these trees were removed from the trail. Otherwise, the Town chose to leave them in the woods where they currently add important wildlife habitat and forest structure. 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. Dotting the forest is a rich array of vernal pools. These pools have been mapped, certified with Massachusetts NHESP, and are monitored by locals and used occasionally by the School. Several mole salamanders, particularly marbled and Jefferson salamanders, use these temporary pools in this upland stand. Fairy shrimp, larvae, and salamander and wood frog egg masses were noted during the inventory.

The stratified and regenerating forest on this site currently supports strong bird habitat values. During our early spring inventory, we observed 9 bird species and noted ample habitat for them. These included Black-and-white Warbler, American Robin, Red-eyed Vireo, American Crow, Turkey Vulture, Black-throated Green Warbler, and others. Black-and-White Warblers were particularly common as they utilize coarse woody material. 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.

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 5: The BioMap2 delineates these valuable, resilient landscapes across the Fournier property as primarily Core Forest Habitat with a subcomponent of lands important for Species of Conservation Concern. 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

This common farm abandonment land use pattern played out across the Fournier property, which was once a part of a larger working dairy farm. Stonewalls, wire fencing, and modified soil profiles attest to the agricultural past. These old fields grew into dense, complex, and highly resilient forests. The remnants of an old ice pond and the dam suggest the past busy farming community. A series of vernal pools have been identified on the lot by the NHESP.

The property is used by the Grammar School community for educational programs, which connects it to the children of Conway's sense of place. Wandering out of your school and into the enchantment of the vernal pools and quiet beauty of spring wildflowers stays in a child's mind. We recommend enhancing and increasing the frequency of this experience for the children.

Figure 4: The old dam still holds back water- creating a rich wetland area ringed by majestic pines.

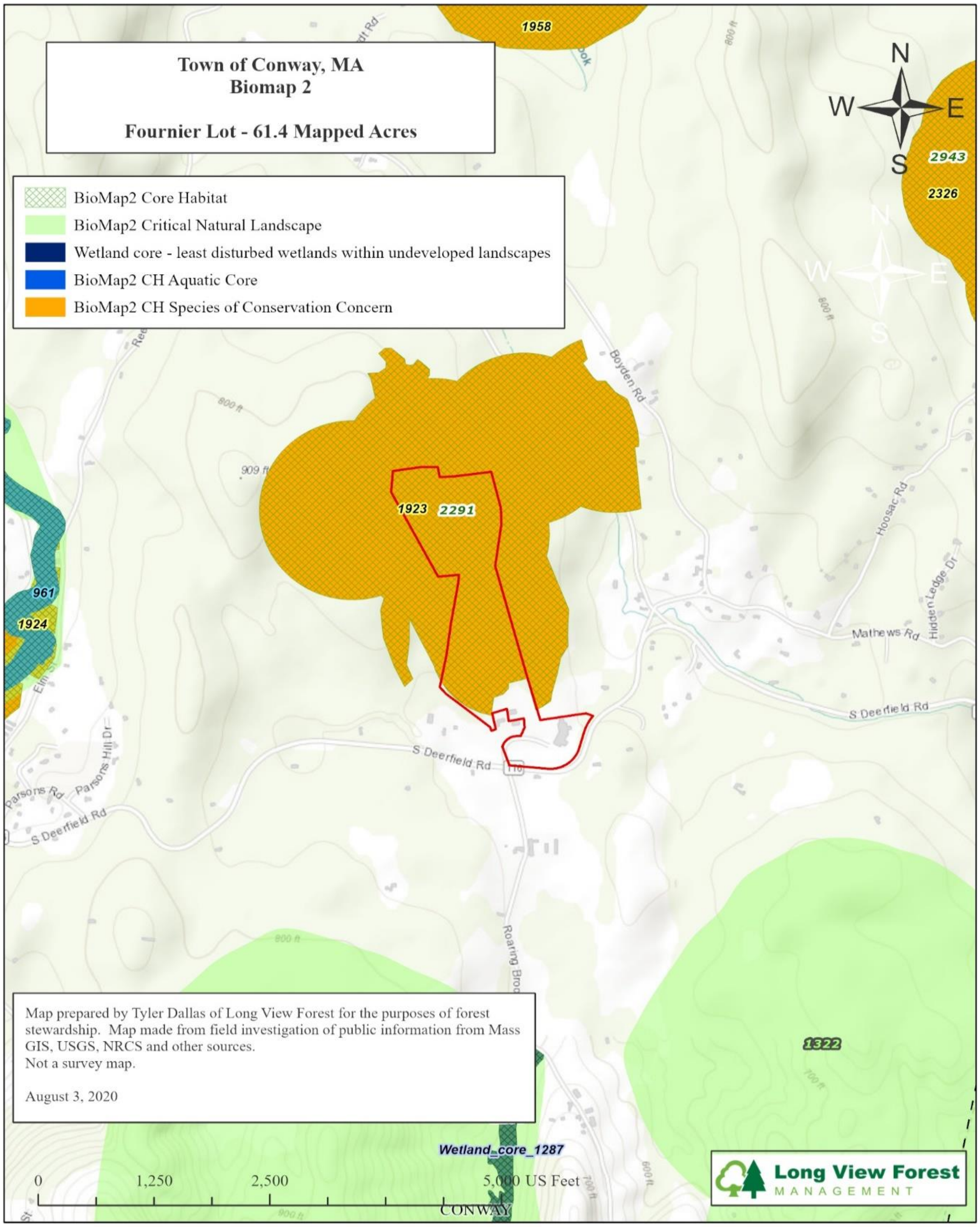


Figure 5: BioMap2 displaying the landscape-wide habitat conditions for protection

2.12 Recreational Uses

A well-maintained hiking and snowmobile trail traverses the center line of the property from the point of access to the northern boundary, at which it connects to a network of community trails. It provides a pleasing view of the vernal pools, changing forests, ice pond, and some unique native plants. Residents often walk the trail through the center of this property in search of relaxation, botanical study, and natural surroundings. We recommend adding a loop trail to enhance the recreational experience here. The trail system across the Fournier lot lies upon gentle sloping and level terrain so the disturbance to the carbon stored in these soils is minimal.

2.13 Property Boundaries

Although the Fournier lot was carved out of a larger dairy farm, the boundaries are delineated by the physical evidence of stone walls and barbed wire fencing as shown on Stand Map. Hanging property identification signs would let the recreational users know that they have entered the Fournier Lot.

2.14 What value or role does the Fournier Lot play in relation to other protected lands and the broader forested landscape?

The Surrounding Land Use Map (Figure 6 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 Warner Family lot on Hoosac Road, Dani and Jack Lochhead's Tree Farm, Mass Audubon's Conway Hills Wildlife Sanctuary, the Antes and Boyden Farms, and the South River State Forest.

The Fournier Lot provides a stark forest contrast to the highly traveled corridor of Route 116 and Town facilities as one enters along a wide hiking trail and escapes into the quiet wonder of this property. This lot rests at the southern tip of a long forest block that stretches to the Deerfield River gorge beneath Reeds Bridge Road to the Northampton Watershed lands in Whately. The Totman hayfields, some smaller pastures and mowing, and scattered residential lots marginally break this forest block.

The Nature Conservancy designated the 41,622 acres south of the Fournier property and 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. If in fact habitat becomes unsuitable for some common local tree species over the next century, large forest blocks without fragmentation provide the space required as trees begin to shift their homes.

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.

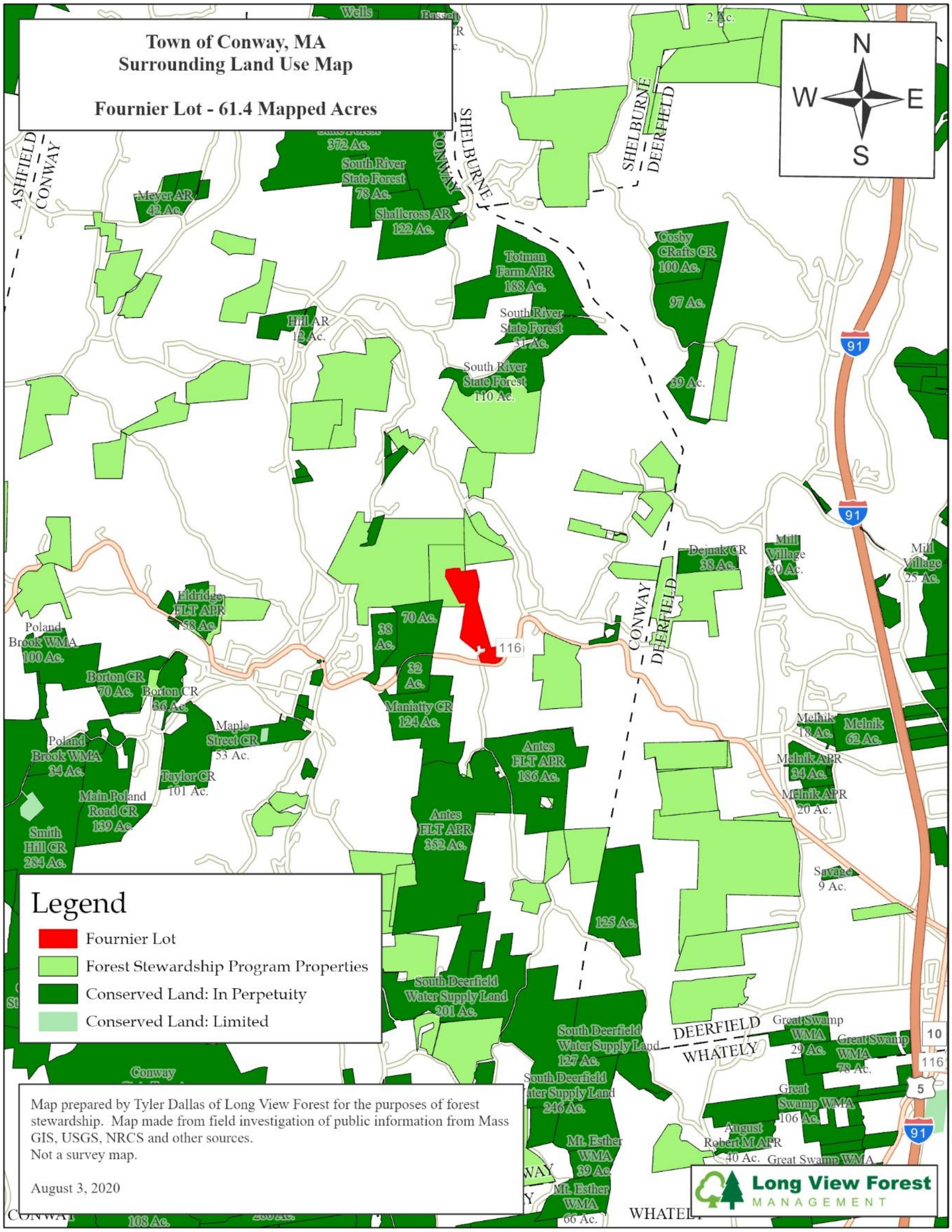


Figure 6: Surrounding Land Use Map

2.15 Property Impact of Proposed Forest Stewardship and Sustainable Forestry 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 Fournier Lot. 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 climate adaptation and mitigation actions/forest climate resiliency actions detailed in this plan increase the vigor and health of the forest ecosystem and 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 projects (implementation of climate adaptation/forest resiliency building practices) 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 Board's 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 Massachusetts Audubon Conway Hills Wildlife Sanctuary, 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.

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 Fournier property, as indicated by its ability to withstand the 2017 tornado with some tree loss and almost no perceptible loss of ecosystem function. These woods have marginal insect and pest infestations, and even mitigable invasive plant issues. We have determined FR is high in this forest because of a set of conditions that are summarized in the following chart. Conway residents rank the protection/enhancement of FR as one of their top stewardship goals.

Table 4: Forest Resilience Indicators on the Fournier 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.
Genetic variability	Resistant beech trees were observed, red maple trees showed variability in bark characteristics with the "curly" and smooth ridges bark traits present.
2007 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	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
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 type, 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 Fournier Forest and Carbon

During the 2020 Forest Stewardship Management Planning process, your community committed to the use of your Town forest as nature-based climate solutions (NBCS's). NBCS 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 would find comfort in the thought that their actions in the forest contribute solutions to 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 goals for the Town.

The following discussion presents the basic science of forest carbon integrated with an assessment of the Fournier 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 Fournier property.

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 the forest ecosystem match those explored for the support of a 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 a 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 a live tree.
b. Storage versus Sequestration in a Forest Ecosystem:
    i. Carbon storage is the total amount of carbon contained in a forest both above ground (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, fast-growing, living trees sequester the most carbon, while older trees store it.
iv. The Fournier 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 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 (Fournier Town forest) 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 Fournier forest acts as a healthy carbon sink with annual additions to the stored carbon stock. The carbon releases from the 2007 timber harvest have been compensated for with additional uptake through the last twelve years.

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

Figure 7: The Forest Carbon Pools

i. This forest currently stores over 1721 tons of carbon in the live trees. The carbon estimation tables include carbon stored in both the above- and below-ground portions of trees. This stock is in the lower percentile for other forests in Massachusetts (15th to 35th percentiles) 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 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. Dominance by 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. The 40% hardwood stocking across the property 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- 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 future forest sink establishment. 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. If over fifty to one hundred years 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 Fournier 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 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 uptake trees will reduce sequestration.
   iii. The hemlock wooly adelgid and elongated hemlock scale infestations in the hemlock (39% 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 2020 financial and logistical support from the Massachusetts Executive Office of Energy and Environmental Affairs, the original 2020 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. Massachusetts EOEEA also directly funded this revised Forest Stewardship Climate Management Plan. The revision process honored the original work of your community, and all changes were done to align your earlier work with the new direction of climate change adaptive and mitigation forest management

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 Fournier 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

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.

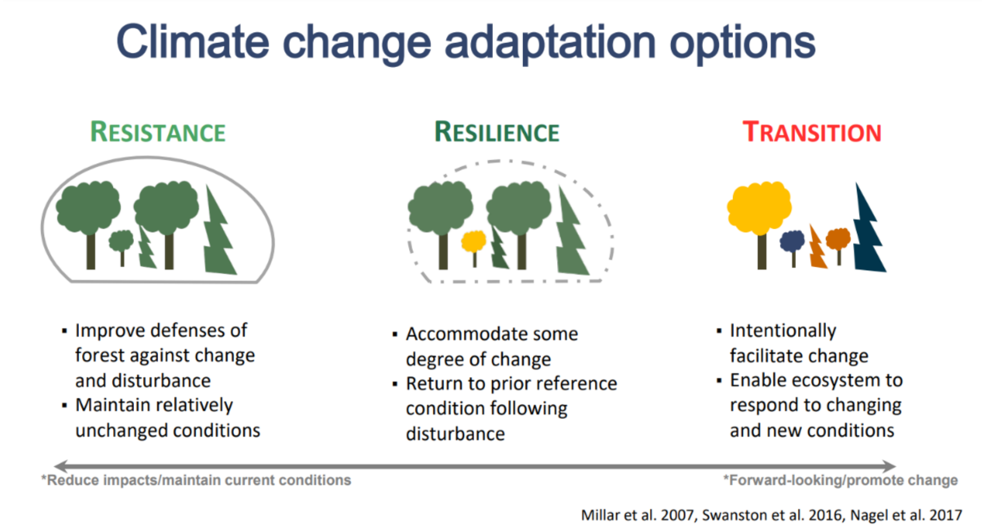
Your community insists that this ecological adaptation approach replace the old school silviculture and stewardship systems that prioritize forest productivity for income. One objective of the DCR Forest Climate Program is to enable your community to convert your 2020 stewardship forestry practices into 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 8: Climate Change Adaptation Options



Let's discuss briefly the three options along this spectrum of the adaptation approach to keep your forest ecosystem functioning. Resistance can be a passive approach, but not always. It can also be highly active in the case of maintaining open fields or other early successional ecosystems. In mature forest systems like this it can look passive, however. Actions like treating invasives and protecting regen from deer browse can still fit within a 'resistance' approach.

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 proposed actions that will enhance the resilience of this ecosystem. This option is most useful in situations or on 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 dense hemlock and white pine groves. The recommended actions under this option will enhance the forests' the ability to cope with stress and support its recovery 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 across the last two decades of climate change impacts. Transformative adaptive changes anticipate the possible changing conditions and better align forest ecosystems to the 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 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.

3.3 Adaptation and Mitigation Actions Summary

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 hopes for the future to the project. Your concentration of the climate adaptation and mitigation management approaches on the resistance and resilience enhancement end of the continuum will bring some challenges to the successful achievement of your goals.

i. As mentioned earlier 62% of your stocking is contributed by hemlock and white pine. Within the next decade it may be hard to retain your dense cover maturing forest with the rate of adelgid and scale advancement through the hemlock trees. White pine decline in habitat and abundancy might take longer (half century or more), but if temperatures keep rising the hot summer humidity keeps dumping moisture across the forest, 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, 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.

iii. Your community-based decision-making process for the implementation of climate adaptation and mitigation or forest climate resiliency actions in the Town forests demands admiration and respect. However, 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) covering 25 acres of the property might be tough to secure if hemlock trees keep dying from adelgid and scale.

v. Putting on the climate lens as you revisit the planning process started in 2020, the uncertainty of tomorrow's 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 through the Fournier 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 the 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 explore with new ideas that might support optimal ecological function will arise. Be mindful that these are opportunities or 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 synthetic 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.
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 severe 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 this 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 a "adaptation, mitigation, and resiliency" nature trail that educates your community about how these forest 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 this Town 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 of the small patch opening project for the establishment of new forest in a small 1-to-2-acre patch or the conservative thinning around designated focus trees for release of their crowns, or even the weeding of the immature sapling class to increase their vigor by removing competition it would be necessary to plan well to avoid soil disturbance or other 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 a lot of trees if you do any silviculture. The community's desire to only remove 10 to 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 nature 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: Field 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 collected data from 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: Forest 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	31.16	WHK	Tall, large sized white pine and scattered hemlock store lots of carbon. Dense pockets of sapling layer mostly black birch- 10% of stand in this age class. Rare and endangered species and lots of vernal pools. Diversity supports climate adaptiveness of stand. Ice pond remnants.	Moderate: Both pine and hemlock might lose abundance and habitat over different time spans. Upland droughty soils. Low seedling count and advanced regeneration is mostly black birch which may decline. Stressors moderate but may increase.	38.8 tons per acre
2	16.18	HH	Interesting mix of knolls and uplands with the low riparian strip and vernal pool complex. Maturing hardwoods with scattered hemlock above a dense middle strata of hemlock. Resistant beech genetic material. Tornado damage worst here. Shady species seedlings hemlock, beech, and birch. Unique large vernal pool with blueberries.	Moderate: Species composition, upland droughty soils, regeneration low.	32.4 tons per acre

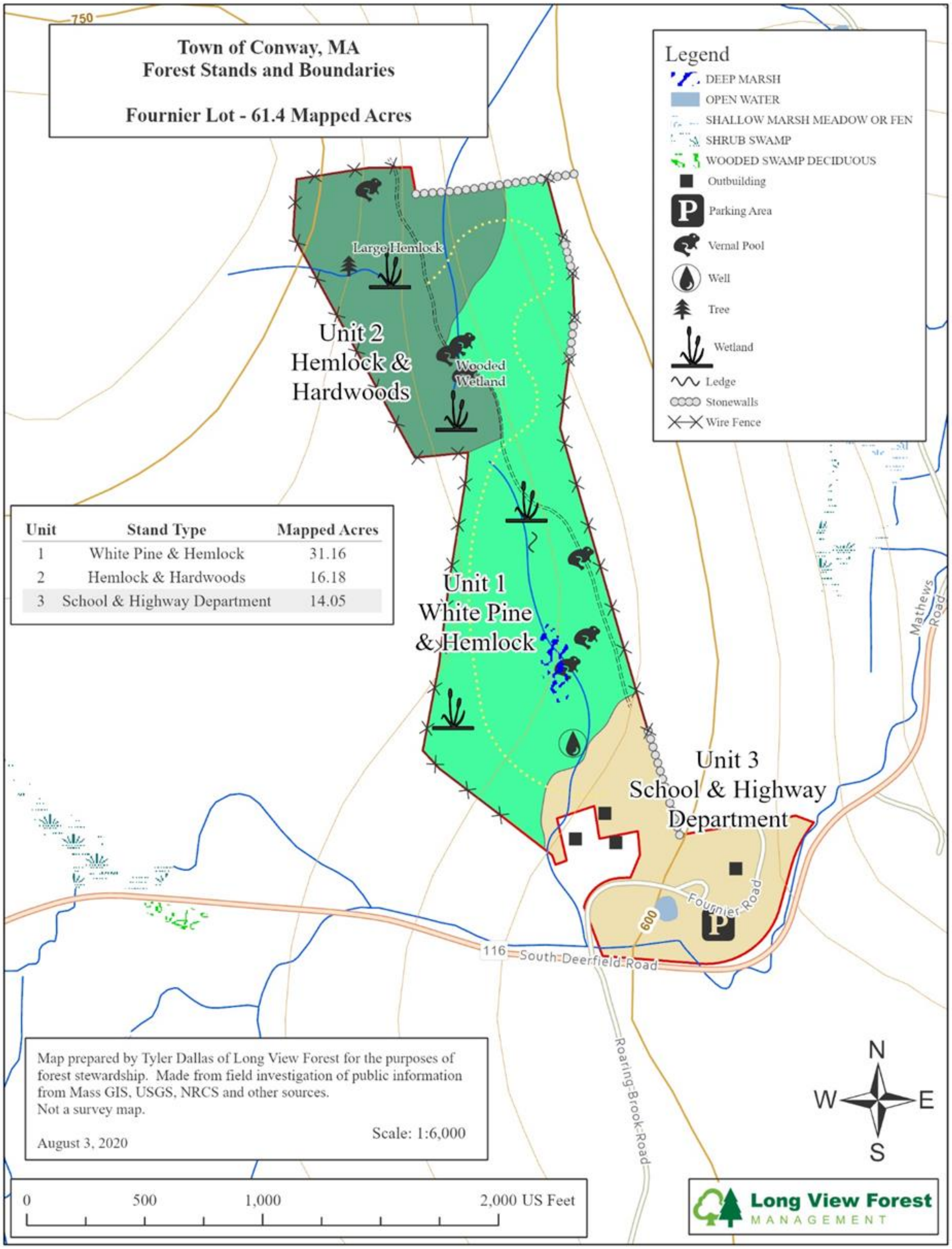


Figure 9: Forest Stand and Boundary Map

5.1 Stand 1: White Pine Hemlock

Figure 10: This white pine-hemlock stand is the representative stand for this property.

5.1.1 Overview

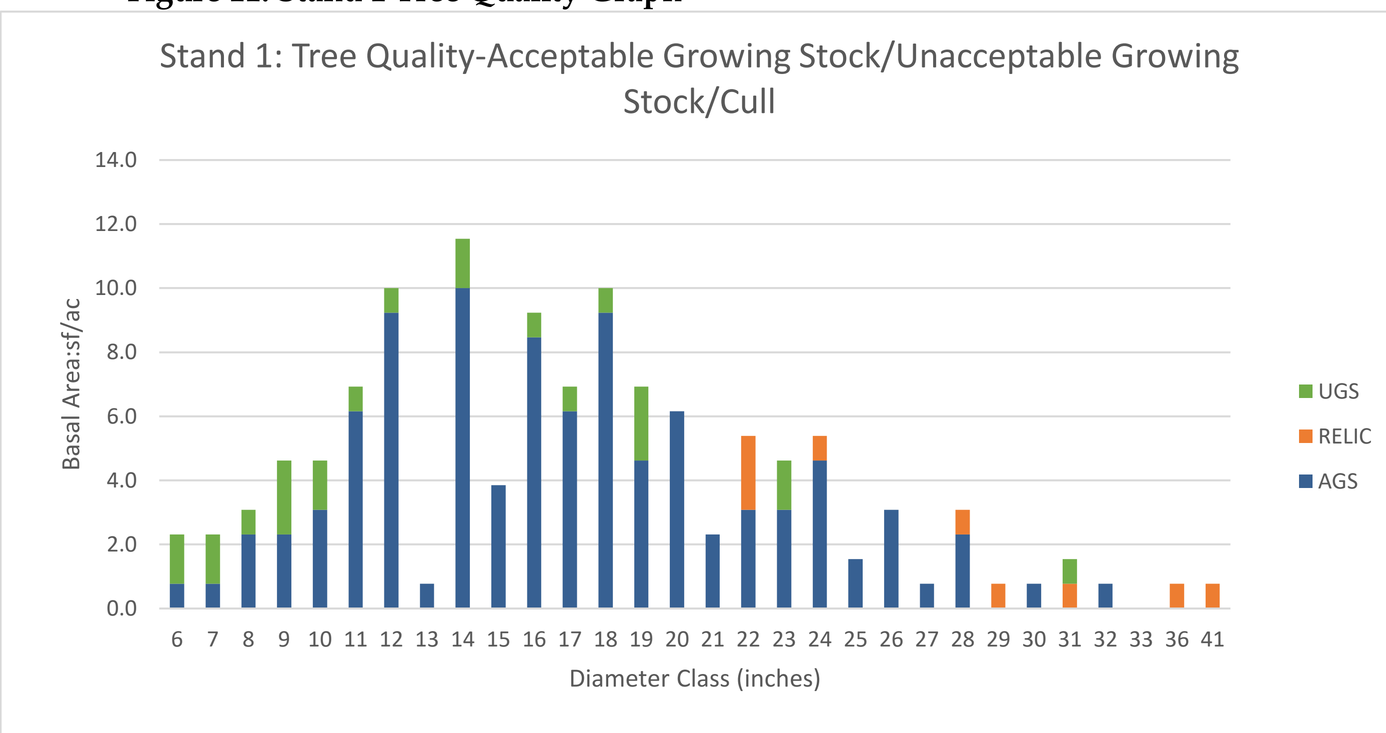
This is a stand of majestic pines, vibrant regeneration, and dynamic processes of individual tree disturbance by wind, ice, and tornadoes both before and after the most recent management work that was done here in 2007. Filling the southern half of the property and then stretching along the eastern boundary of the property, this stand is representative of the property- it is what most people who visit the property experience, and it is the place with the most immediate need for stewardship activities and monitoring as the Town looks to mitigate the invasive plant infestation, develop trails and new forest habitats, and protect the rare, threatened, and endangered species (RTE’s) documented on site.

Dotted with vernal pools and filled with vibrant migratory and resident bird communities, Stand 1 is poised to continue evolving its diverse framework - adding new trees, maturing the ones that are there, sequestering and storing carbon, and providing the rich forest experience people expect when visiting.

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Growing Stock Analysis	Volume Per Acre*	Site Index
Stewardship	1	WK	31.16 acres	14" WP:19" RO: 23"	121 ft^2	AGS: 96 ft^2 UGS: 18 ft^2 RELIC: 7 ft^2	12.3 MBF 3.2 Cords 16.5 Tons	70: RO

*Sampled volume, does not include top wood

Figure 11: Stand 1 Tree Quality Graph



5.1.2 Terrain and Soils

This is a diverse stand in terms of ground and form- it features exposed bedrock, mostly shallow soils, some steep slopes, and some nice plateaus where past management has focused its regeneration efforts. The soils all belong to the Chatfield-Hollis complex except for a small intrusion of Swansea muck.

5.1.3 Canopy Layers

This is a multi-aged Stand that features 3 distinct canopy layers, but a depauperate understory. Emergent, and towering over the stand, we have the white pine component. These are large, mostly wind-firm, mature pines that are growing significantly and appear quite healthy. Under them, we have a thick hemlock component that holds most of the canopy in this Stand except where it was perforated by the 2007 harvest. In these areas, and in areas adjacent to these openings where sunlight reaches the forest floor, we have a robust new cohort of saplings- mostly black birch. Some patches of young pines exist as well. Birch is a dependable seed producer that is less prone to deer browse than the oak, hemlock, or maple components here.

5.1.4 Regeneration/Ground Cover

This Stand has a good duff layer with adequate leaf litter in places to support foraging by birds and mammals.

The understory in this stand is, however, lacking. This is due to a lack of light, but also due to herbivory pressure from deer. During the inventory we noted deer scat and buck rub trees in abundance. There is little regeneration establishing itself here and what we did observe were mostly first year maple seedlings that tend to get mowed by the deer each year and don't move from seedling to sapling as they would otherwise.

To improve this situation, more light on the forest floor is needed. This will come with natural disturbance, or with a purposeful establishment effort. Also, the Town could consider planting shade tolerant, understory plants with high wildlife value such as maple leaved viburnum.

5.1.5 Interfering/Invasive Plants

There are scattered barberry plants in this stand, as well as some honeysuckle and bittersweet out towards the open land, but overall, this stand is in good shape in terms of invasive plants. Individual stems and scattered clusters were found across the forest floor. There is one small concentration of phragmites along the trail. These should all be manually removed as soon as possible by completely pulling out the plant and disposing of it by letting it desiccate somewhere secure- either on-site in the forest, or off-site.

Native beech, ferns, and grapes can often be significant impediments to the development of a balanced, resilient forest. In this stand, these species are not an issue at this point. The 2007 harvest managed to do its work well and didn't exacerbate any existing pre-conditions.

This is a Stand in transition from a habitat perspective. A mostly single-aged, middle-aged forest of hemlock and pine is transitioning to a multi-aged stand with an array of habitat features provided by the trees and other vegetation. The patches of young forest from 2007 are giving way to poles and hence losing some aspects of their habitat value-particularly for birds and their fledging young.

However, the mature component of pine and hemlock remains important as it provides high nesting sites for mammals and birds, good winter cover for all creatures, and food sources for mostly squirrels.

Our inventory also revealed a high density of snags and large relic trees- See Table 5. These relic trees can be thought of as a third age class in the forest- they are often old pasture trees that pre-date the current forest assemblage. Many are dying, or dead, and provide immense habitat value as well a legacy seed source. Cavity nesting species, like barred owls, often utilize big relic trees like some of the sugar maple and oaks found in this stand.

5.1.6 Forest Health

Aside from the hemlock wooly adelgid and elongate hemlock scale, this is a healthy Stand. As noted, the pine has escaped damage, or recovered quickly from the host of stressors resulting in needle dropping in the pines in our region in the last 10 years.

5.1.7 Unique Features

The vernal pools, ice pond, and chasm above it are all unique features in this stand. The Natural Heritage Program also highlights the occurrence of RTE's in this stand and stewardship shall take them into consideration when any activities are planned as the Town has successfully done in the past.

5.1.8 Climate Vulnerability

This stand records a low to moderate present time vulnerability rating to climate change impacts on its ecological function. Short term risks to the forest originate from the active stressors (pest and pathogens, invasive plants, and deer browsing of seedlings under six inches in height). The continual acceleration of climate change could shift this threat in the future. Your community's choice of the resistance and resilience path for climate adaptation and mitigation management mandate the retention of this ecosystem in its current condition for as long as possible. Minimal action might work well now, but as your monitoring progresses, consider some of the risks in the stand and witness some changes, you might consider different ideas especially if conditions shift to a higher level of vulnerability.

Three of the dominant species (hemlock, white pine, and white ash) that support the ecological integrity of this stand are considered at risk species currently and in the future, due to these stressors and possibility of abundancy and habitat loss as the climate warms. The extreme intensity and frequency of precipitation events and windstorms could result in a massive loss of the majestic overstory trees (and the carbon stored within them). Black birch contributes an estimated 75% to 80% of the youngest age class. Debate within the scientific community about its future ability to cope with a drier, warmer forest environment is still open. If the new forest that must take on the mantel of climate adaptation consists of a high-risk species ecological function is in jeopardy.

Field observations of the level of deer browsing in this stand were a concern. This stressor alone may be why black birch was so successful in its exploitation of the growing site after the 2010 harvest. Without intervention over many decades the opportunity to shift the species compositions to future adaptive species could be lost. Cherry, red oak, yellow birch, sugar maple, and red maple grow well here, and it would be important to promote their seed germination and seedling development.

5.1.9 Carbon

Warmer winters, early springs when they emerge first, and less snow will increase the footprint on the landscape. Less invasive plants equate to more native tree and plant stems growth, so in the future there are increases in carbon uptake and storage. Disturbed forest areas that revegetate with invasive plants store less carbon.
Over 1,396 metric tons of carbon have been stored in the trees within this stand. This storage volume falls within the 20th percentile (moderate) of similar forest stands throughout New England. This volume represents the carbon dioxide emitted if an average gasoline powered vehicle was drive for 16,180,009 miles.

5.1.10 Desired Future Condition

Given the Town's current goals for the next 10 years, this stand is just where it needs to be. Long term, the desired future condition is a multi-aged forest with pine, hemlock, and hardwood components that is managed on a longer rotation. If one were to walk through these woods in 25 years, you would see large-sized hemlock and white pine trees (over 24 inches in diameter) and some scattered relic or legacy stems towering above healthy, species- rich middle and lower canopy layers of red oak, yellow birch, black birch, red maple, sugar maple, ash, cherry, and aspen. Birdsong would greet you from scattered thickets of seedlings and saplings. Some large, downed woody material would be host to small pole yellow birch or red maple stems. Hemlock has held on in these woods due to the site productivity. This overall condition was maintained using conservative silvicultural practices such as Legacy/Focus Tree Release.

Figure 12: The rocky chasm above the ice pond- surely this is a highlight for any local child visiting.

5.2 Stand 2- Hemlock Hardwood

Figure 13: A disease-resistant beech tree stands tall. Note the diversity of trees in the canopy here

5.2.1 Overview

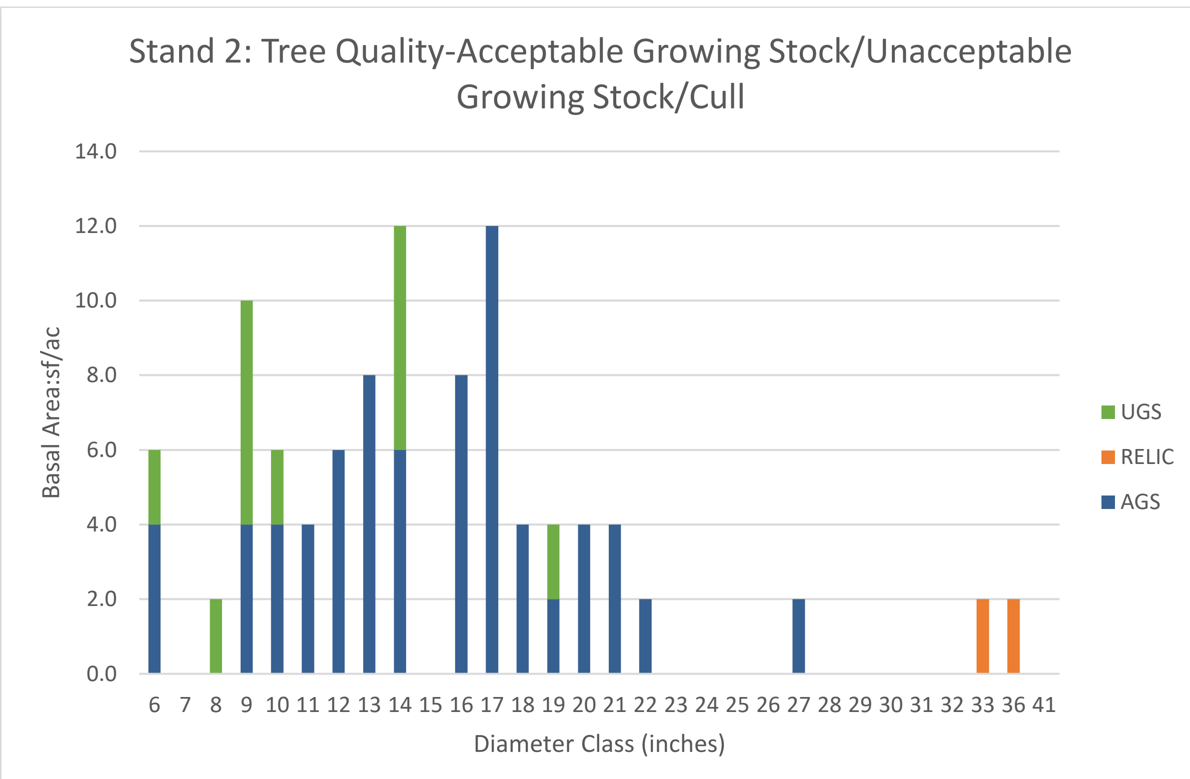
Stand 2 occupies the more remote northwestern section of the property. Here, the pine drops out and gives way to a more northern hardwood- hemlock forest that wraps around exemplary vernal pools and a forest wetland on Swansea Muck soils. Smatterings of mountain laurel let you know you are still in the Oak-Northern Hardwood Transition forest, but otherwise you feel like you're in a higher altitude forest.

American Beech is present across this Stand and in some cases is crowding out other species. Some of the beech is diseased, but there are also a few examples of resistant trees that remain healthy. These should be protected under any forest management scenario. The 2007 harvest pushed into this Stand with similarly good results as occurred in Stand 1. There is a diverse cohort of new young trees including black birch, pin cherry, beech, and red maple. Tornado damage in these regenerating areas was mitigated by the young trees which quickly occupied the newly available growing space as they did in Stand 1 as well.

Objective	Stand	Forest Type	Area	MSD or Size Class	Basal Area Per Acre	Growing Stock Analysis	Volume Per Acre*	Site Index
Stewardship	2	HH-Hemlock-Hardwood	16.18 acres	12'' WP: 21" RO: 21" WA:19"	98 ft^2	AGS: 74 ft^2 UGS: 20 ft^2 RELIC: 4 ft^2	7.2 MBF 5.3 Cords 10.1 Tons	70: RO 65: SM

*Sampled volume, does not include top wood

Figure 14: Stand 2 Tree Quality Graph



5.2.2 Terrain and Soils

Compared with Stand 1, this is a flatter, more homogenous area. It also features soils from the Chatfield-Hollis complex with one steeper section in the back corner as the land begins to rise. Much of the stand is a flat area of Swansea Muck- these wetland soils grow trees, but tip-ups abound and small braided channels of running water move amongst fallen and rotting trees. Vernal pools dot the depressions here.

5.2.3 Canopy Layers

The canopy here has multiple layers thanks to the diversity of species, the resilience of the forest to ongoing single tree disturbance, and to the management work from 2007. Sugar maple, red maple, birches, beech, and the occasional pine or oak share the overstory with some larger hemlocks. Hemlock and beech occupy the mid-story while beech, birches, hemlock, and mountain laurel make up the understory.

5.2.4 Regeneration/Ground Cover

Like Stand 1, this Stand has a good duff layer with adequate leaf litter in places to support foraging by birds and mammals. Our inventory plots all noted good or excellent leaf litter. Also, there is an abundance of natural and manufactured coarse woody material here. These slowly decomposing material is valuable as habitat and foraging terrain.

The understory in this stand is composed of shade tolerant hemlock and beech. Where the wetland picks up, ferns abound along with other mosses and wetland-obligate plants. Diverse regeneration is lacking. There is little to no advance regeneration seedling stocking. Some beech and hemlock seedlings are present, but notably maple, oak, and birch seedlings are lacking.

To improve this situation, more light on the forest floor is needed. This will come with natural disturbance, or with a purposeful establishment effort. Also, the Town could consider planting shade tolerant, understory plants with high wildlife value- here, hobblebush would be an appropriate choice.

5.2.5 Interfering/Invasive Plants

This Stand is currently free of invasive plants and outside of the wetland, ferns are not an interfering issue here. However, our inventory work was not an exhaustive plant survey and so we recommend a careful walk-through to manually remove any invasive plants. This can be done in conjunction with similar work in the more infested Stand 1.

5.2.6 Habitat

The habitat assessment and analysis from Stand 1 holds for this stand. This is a stand in transition as vigorous clumps of new trees thrive in the gaps made by logging and the tornado. However, more of this Stand was not managed during 2007 and so it retains a more interior forest feel to it. The wetland and vernal pools are obvious central features from a habitat perspective- both for the water they provide year-round, and for the unique habitats they provide to vernal-pool obligate creatures.

The beech component, with its nut production, adds important habitat value for bear, deer, turkey, and rodents while the yellow birch provides valuable gleaning terrain for insectivorous birds. The thicker, shrubbier mountain laurel and beech areas provide good cover component not found in Stand 1. It is easy to imagine resident wildlife moving back and forth between these two areas or venturing out from the thicket into nearby agricultural lands.

5.2.7 Forest Health

The main forest health concerns here remain the threats to hemlock and the beech bark disease. Careful and regular monitoring will be the best antidote here. If hemlock mortality rises, corrective actions might be warranted which could include cutting small patches of diseased trees or other approaches. The 2007 harvest has already helped prepare this Stand for a smooth transition during this eventuality, and more recruitment of young trees could help further.

5.2.8 Unique Features

The unique features of this Stand are the vernal pools. The most northerly one is particularly large and special and features spits of land protruding into it covered with highbush blueberries. These pools undoubtedly support the RTEs identified on the property.

5.2.9 Climate Vulnerability

Although the Fournier forest ecosystem vulnerability is moderate, the hemlock component of this stand faces serious threat from pests. Loss of this core species would be problematic. The opportunity presents itself with the management for transition of this crucial ecosystem by promotion of future adapted tree species such as sugar maple, cherry, red oak, hickory, and beech. Drier soils conditions and warmer water and air temperatures poses a risk to the stability of the vernal pool and wetland matrix n this stand.

5.2.10 Carbon

Proforestation is the practice of leaving existing older and middle-aged forests to grow as intact ecosystem. This new, and revolutionary concept proves that forests show their full potential for carbon uptake when we let the trees grow. Letting trees grow is the sure-fire way to manage for more carbon. If the hemlock trees succumb to increased pest pressure, mortality will cause drops in the carbon stock. Over 523 metric tons of carbon have been stored in the trees within this stand. This storage volume falls within the 20th percentile (low) of similar forest stands throughout New England. This volume represents the carbon dioxide emitted if 2,117,667 pounds of coal were burned for fuel.

5.2.11 Desired Future Condition

This area was minimally disturbed during the 2007 harvest operation. The dense grove of mixed hemlock and hardwood will continue to develop in its two-aged condition. Designation of this stand as a habitat niche for preservation offers long-term protection to the vernal pool complex in this remote area. The main hiking trail bisects this area and provides access to the northern community snowmobile and hiking trails. Like Stand 1, a gradual, thoughtful, long-term approach here paired with careful monitoring will yield the best results.

Figure 15: Pin cherry and black birch compete in a space opened by the 2007 logging and made more open by the tornado. Note the abundance of coarse woody material on the forest floor.

Section 6: Sustainable Forestry Practices Recommended for 2022-2032

6.1 Sustainable Forestry Practices

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 on your forest from the predicted climate shifts. Active environmental stressors exacerbate the forest's vulnerability to these climate change. Forest stewardship and the use of climate adaptation and mitigation actions or forest resiliency building practices count on its inherent strengths and resiliencies of your forests. Thoughtful planning and stewardship by your community will consider climate change affect's on your forest now and in the future and your actions might lessen the potential long-term impacts

Choosing to keep the forest structure and condition stable and your use a combination of the Resistance and Build Resilience strategies for climate adaptation forest management will retain these hemlock and white pine dominant forests for as long as they are ecologically functional. Over 40% of the trees here are tall (over 75 feet) and susceptible to extreme weather events and breakage or blowdown. Many of your trees are also battling active pest and pathogen outbreaks and they could lose suitable habitat as the earth warms. This forest also supports a species rich population of future climate adaptive hardwood species which offer hope for sustained ecological function here. Establishing over one half of the property as a Proforestation Reserve Zone could protect a special habitat, water and soils health, and the overall ecological function of this area and still sequester and store carbon.

Your community's resolve to work with the present forest conditions with minimal disturbances, motivates actions that might reduce the active stressors and prevent resource degradation such as control the invasive plants and thinning of dense immature thickets to increase nutrients and water to trees and increase their vigor. Climate Forestry demands that your keep your eye on the distant future. Thinking about what actions now would support your forest in 50 years with an increase in tree species, tree ages, and tree sizes provides your community with some insurance against climate change impacts. 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 upon 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 threaten 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 will function as an ideal carbon sink and should hold on to its original ecological values and benefits. Active stressors reduce tree and stand vigor, and actions the community might consider include conservative thinnings in the hardwood groves, which could boost individual tree growth and carbon uptake rates.

Your retention of the current condition of this forest ecosystem depends on the large white pine and hemlock trees continued defiance of wind forces and fast-growing hardwoods filling the high canopy due to their accelerated growth. 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 weedings of the youngest age class could begin the species composition transition to one that favors tree species suited a warmer, c drier earth.

Monitoring, careful planning, and conservative implementation of the resilience building practices could keep this amazing ecosystem functioning optimally for the next 100 years. Your actions could guarantee that the goals stated so clearly in the first section of this management plan will be 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.

6.3 Climate Adaptation and Mitigation and Forest Resiliency Building Management Practices Recommendations Summary for 2022 to 2032

For the purposes of this report management practices with an object code of *CH61* are required to be accomplished as a commitment to the Massachusetts Current Use Program. Practices with object codes of *STEW* are voluntary and are provided as suggestions of activities that can help you achieve your woodland objectives.

Table 9: Summary of the Management Recommendations for your property

Stand	Obj Code	Desired Condition	Management Action	Benefits			Value/Cost/Cost Sharing Opportunity
					Climate Change Adaptation	**Forest Carbon**	
1 and 2	Ste w/ Climate	Reduce stocking of invasive plants and their impact on regeneration.	Invasive plant control <5 acres. Annual monitoring and repeat treatments if needed.		Successful regeneration of forest tree species, Begin shifting seedling class to future adaptive species and greater species diversity.	Increase sequestration with reduced competition in youngest trees on forest floor.	Costs. DCR Community Forest Outreach Grant. NRCS RCPP. The Forest Climate Resilience Program.
1	Ste w/ Climate	Small patch of young forest placed near hardwood seed bearers and along edges of existing gaps in overstory.	Create a 1 to 2 acres of open growing space around an existing patch to widen it. Place near hardwood seed source. Leave trees on site or remove them depending on community feelings.		Introduce a <15-year-old age class. Begin to shift to future adaptive hardwood young trees and species diversity.	Increase storage with retention of the rest of the overstory stocking outside 1-2 acres. Increase balance between uptake and storage with introduction of more young trees.	Costs but some income if the material is sold. DCR Community Forest Outreach Grant. NRCS RCPP. The Forest Climate Resilience Program.

1,2	Ste w/ Cli mat e	Species rich lower strata in the sensitive riparian zone and xeric slopes.	Native Shrub Planting in riparian zones and poorly stocked xeric uplands- Plant a wide array of native understory plants to increase wildlife food sources and increase property-wide biodiversity		Increase resiliency to changes in sensitive riparian and dry slope sites.	Prevent tree mortality to blowdown on sensitive sites so maintain sequestration and storage.	Costs. DCR Community Forest Outreach Grant. NRCS RCPP. Municipal Vulnerability.
1 an d 2	Ste w/ Cli mat e	A narrow, non-intrusive trail that takes one from the northwest corner of the forest to the ice pond.	Trail Mapping, Assessment, Construction, and Maintenance- GIS mapping of Town trails. Publish new trail map. Develop maintenance plan. Build new trail if consensus. Install directional and permitted use signage.		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 trail.	Costs. Grant opportunities for trail work are numerous in Massachusetts.
1 an d 2	Ste w/ Cli mat e	Over 25 acres are set aside as forever wild with no disturbance.	Reserve Forest and Pro-forestation area-Designate, map, and set aside and map ~25-acres of representative acres across both forest types to serve as a reserve area. Complement active forest stewardship with limited pro-forestation.		Attempt at resistance strategy in hemlock grove. Protects biodiversity and the site's adaptive capacity.	Natural carbon dynamics. Could increase or decrease depending on hemlock health.	Some cost associated with mapping, signage

1 and 2	Stew/Climate	Educational signage along trail system. School curriculum set up around forest resiliency and climate change.	Educate community about the climate adaptation and mitigation role of their forest with signs and tours. Incorporate forest resiliency and climate change science in schools.		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.	Cost of developing and manufacturing signage.
1	Stew/Climate	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.
1 and 2	Stew/Climate	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.	Protects from unnecessary carbon losses.	Cost with the Forest and Trails Committee resources. Grants would be available for climate smart BMP creation.

1 and 2	Stew/Climate	Conway Town forest lead the community in nature-based climate solutions and protection of forest vitality	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 costs but income following. Seek grant money for startup and maintenance.
1 and 2	Stew/Climate	Hikers understand that they must respect these forests as it's a climate smart sanctuary.	Boundary delineation with discrete signage				
1 and 2	Stew/Climate	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.

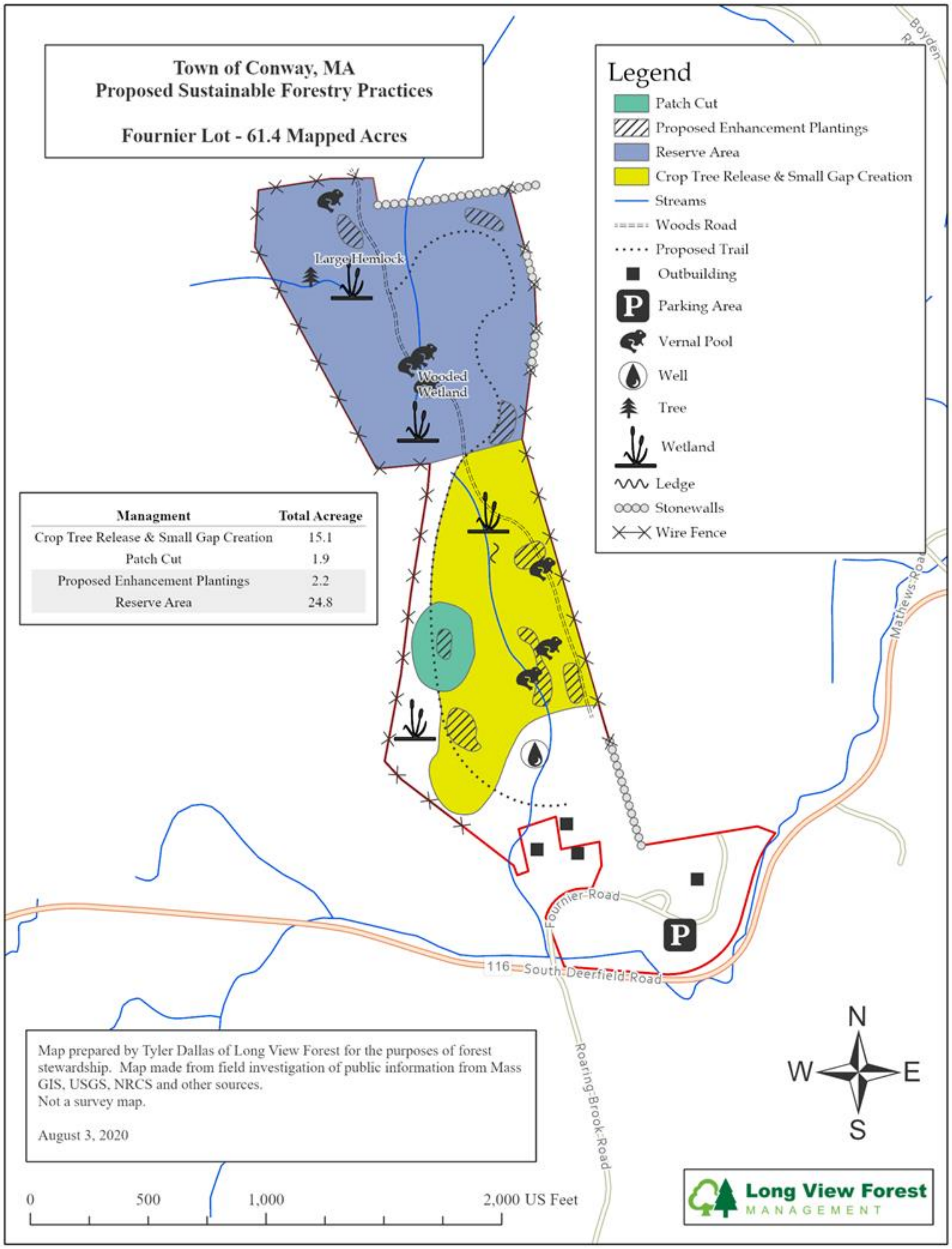


Figure 16: Proposed Forest Stewardship Activities

6.4 Sustainable Forestry Practices

Practice 1: Invasive Plant Control

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience.	1 2	WK HH	Invasive Plant Control Measures	~0.25 acres of thicker infestation and ~10 acres of noticeably light infestations	2020-2025

Project Specifications: Integrative Vegetation Management (IVM) will be employed, through which each site will be reviewed, and decisions made for the application of safe, cost-effective, and environmentally sound methods of control. The invasive plant communities are not extensive yet; manual methods will be effective with sufficient community assistance, willing hands, and committed resources.

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**.**

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

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

Target Species and Stocking Densities: There is a small pocket of Phragmites along the trail and widely distributed, very sparse populations of barberry and honeysuckle throughout the property. In the western part of Stand 1, some bittersweet vines are establishing. Luckily, these are all small and controllable populations. However, they are difficult to find due to their scattered presence. Control workers will need to carefully grid most of the property.

Stewardship Discussions: Small Towns operate 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 participate in a volunteer program for simple manual removals of some of the plants. Grant funding from both Federal and State programs will be sought for assistance with this effort.

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 demonstrate 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. When invasive plants exploit growing space, less seed bed area is available. Increasing species diversity and seedling/sapling stem count increases forest resiliency. Controlling invasive plant populations will benefit native plant populations and tree maturing tree health. 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 transformation. Emissions could lower and the current species mix with improved growth and condition might prove sufficient to maintain optimal ecological function. As this stand grows in a transition zone between two major forest communities as mentioned earlier in this report, this stand could support a wider variety of tree species (inclusive of the current species that thrive and some of the more southern future adapted species).

Carbon: Less invasive plants equates to more nutrients, water, and sunlight up taken by trees. Increased CO_2 uptake means more sequestration. Disturbed zones invaded by these exotic plants does not have much stored carbon. Increasing the number of young trees and tree species diversity increases site's growth rate. Vertical variance allows different angles and orientation of leaves to capture all available sun.

Practice 2: Young Forest Enhancement

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience. Climate Mitigation. Carbon Accumulation. Forest Vigor and Regeneration.	1	WK	Enhance Young Forest Habitat with the creation of a small patch opening or expansion of an existing gap in a xeric upland region	1-2 acres	2025+

Discussion:

1. Designate a site with low forest stocking and diseased or high-risk trees of all sizes. These tees would be girdled in place or dropped to the ground and retained on site. Opening the forest floor in this manner encourages seed germination and seedling development of the native species present in the overstory.
2. Placement of the opening near large crowned, healthy seed-bearers like oaks, birches, beech, maples, and pine increases the chances of a good seed catch.
3. Retention of the coarse and fine woody material in the trees supports substrate development and snail feed. Wood Thrushes enjoy high-calcium snail shells, and more feed will increase their numbers. Eastern Towhee also requires high invertebrate populations that thrive in and around rotting logs.
4. Designation of the patch in an area with low native shrub stocking allows for the possibility of planting some native fruiting shrubs for increased late fall feed pre-migration for songbirds. This project could involve the community or school children.

Trees for Removal: Diseased beech stems, hemlock with wooly adelgid, trees with broken trunks or damaged crowns. This is not a commercial project; the material would remain in the woods, and some would be piled for habitat use.

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 diminishes with the time from seed germination and forest regrowth. Thinking 50 years into the future, a subtle nudge for the regeneration of hardwood and future adapted species might begin the species composition transition necessary for future sustainability of the ecosystem.

Small patches in the canopy mimic natural disturbances. Retention of at least the four largest trees nearby the patch guarantees a good seed source. This site regularly suffers heavy browse pressure, so consideration of the protection for seedlings is important. Larger gaps create the correct light conditions for a wider variety of species to germinate such as cherry, sugar maple, and red oak. Larger gaps also produce an overwhelming amount of seedlings, which can't all be eaten by herbivores.

Carbon Considerations: If your forests do not continue to regenerate and produce the new, future forest, you have no additional carbon storage or sequestration into the distant future. The loss of carbon from trees removed or left on site would be compensated over the twenty years or more of deferred major harvesting and the accrued years of additional growth on the immature hardwood trees. Forests with diversity in species, age, size, and genetics have more pathways to recover and restore after a major disturbance related to climate change impacts. The immature trees found within this stand accumulate carbon at high rates, which boosts the sequestration rates in the stand.

Practice 3: Understory Planting

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Biodiversity. Forest Resilience. Ecological function- Hydrologic cycle.	1 2	WK HH	Plant a wide array of native understory plants to increase wildlife food sources and increase property-wide biodiversity-focus in riparian zones and poorly stocked xeric uplands.	Opportunistically- property wide	2025+

Discussion:

1. Consider a wide array of native shrubs here such as holly, high bush blueberry, maple-leaved viburnum, hobblebush, spicebush, pepperbush, shad, and witch hazel.
2. Birds will key in on these plants and their presence enhances biodiversity.
3. As stated above, this project could involve the community or school children- led either by a professional services company or a knowledgeable and motivated community member.
4. 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 sought from Franklin County nurseries or businesses.

Climate Vulnerability: Thinking 50 years into the future, a subtle nudge for the regeneration of hardwood and future climate adapted species might begin the species composition transition necessary to guarantee forest ecosystem sustained function. Planting is an assisted migration or transformational adaptation strategy. Planting tree species that thrive here now or introducing more southern species indicated as future adaptive (hickory, white oak, or tulip poplar) would diversify the native tree and shrub community and increase resilience. Higher biodiversity is associated with greater resilience of the forest ecosystem.

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 4: Trail Development and Maintenance

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Ecological goods and benefits-solace, education, enjoyment, recreation. Ecological function-Soil quality and function.	1 2	WK HH	Trail Development and Maintenance and general Access Development and signage	2,000 linear feet	2020-2025+

Discussion:

1. Mapping of the existing trail system and new or proposed routes. Publication of a revised Town trail maps and their connections to broader trail networks.
2. If Town consensus advocates for this practice, the development of a new trail connector loop (that winds through the eastern portion of the property from the northern tip, crosses the main access trial, and winds through the southwestern portion of the property terminating near the ice pond), lay-out the proposed trail route for approval by site users, construct a narrow, hiking path along the route with necessary erosion control measures built into the trail course. It is important

that the location avoid Priority Habitat Zones for Species of Conservation Concern and sensitive wet soils during the trail lay-out and construction.

3. With the guidance of the community or the Conway Forest and Trails Committee, construct trailhead kiosks or simple box-slot for maps and install color-coded, directional signs on the trail network. Given community feedback, keep the signage discrete.
4. Conduct and document current trail condition assessment and develop a maintenance plan and protocol. Relying on the community interest in the care of these woods for seasonal community trail work volunteer days.
5. Seasonally monitor the trail conditions and when appropriate, do maintenance for sustainability of trail surfaces and network.
6. Parking can be gained from the school parking areas. A permanent entrance route could be determined in cooperation with the Town Highway Department so that no further development at the Town facility would disturb this access point.
7. Work with the School to potentially develop educational signage and/or curriculum based around the amazing features in these woods. A simple, interpretive trail with a guide could be laid out and integrated into the school's program.
8. This work would adhere to a community wide set of standards for the use of equipment, hand tools, and human resources within sensitive reserve zones (RTE's habitats).

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 floor and trough the drainage systems on the property. Erosion protection and sensitive site engineering would be included with adaptation 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 erosion prevention and soil carbon storage. 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 5: Reserve and Proforestation Area

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	WK HH	Designate and Map a Refugia/Reference Forest/Pro-forestation Zone within this property	~25 -35 acres	2020-2025

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 is a powerful and immediate forest-based strategy that can help address the global crises in climate and biodiversity.

Discussion:

1. A portion of the community would like to see both Town forests un-disturbed 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 across the landscape.
2. To maintain the current character of the forest or develop old-growth forest characteristics over time, reserves are best sited in locations with mature forest, minimal vulnerabilities, and landscape attributes that promote these areas as refugia over time. While hemlock is a climate vulnerable species, the wet soils in this area may support the species for a longer period than the surrounding drier soils and is therefore an appropriate site to designate as a reserve.
3. Furthermore, the hemlock-hardwood grove in the northern tip of the property supports a unique wetland system and offers a potentially good site for study of the natural development of a hemlock and mixed hardwood grove through our changing climate. The sections of Stand 1 (WK) that surround the vernal pools, their interconnecting water courses, the Priority Habitat Zones for Protected, Rare, and Endangered Species, which were defined during the last harvest disturbance by the Natural heritage and Endangered Species Program, and the ice pond area will also be set aside as reserve zones with long-term protection from anthropogenic disturbance.

4. If the Town participates in any climate mitigation or carbon storage programs in the future, these protected areas will provide carbon reserves with high carbon stocks.
5. Long term protection as a reference forest in undisturbed conditions from now moving forward 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.
6. However, the Town would also need to establish guidelines for what types of emergency interventions would be permitted in this zone.
7. 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 impacts this trajectory.
8. Given the uncertainties and unknowns around above-and belowground 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 Fournier 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 trail building and maintenance and invasive plant control indicates a reluctance by these parties to promote true non-disturbance zones.

It is beyond the mandate of this document to resolve a passive versus active 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 good older storage trees.

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. Your hemlock trees will rally. Hardwood seed will have begun to set in the small gaps from individual tree mortality. A subtle transition is underway. One small intrusion might be a narrow perimeter trail for future ecosystem monitoring, and some cut over paths in the interior.

Carbon: No harvesting ensures natural carbon dynamics and may prevent any carbon loss over the next 50 to hundred years. 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 6: Conway-Specific BMPs

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Ecological function-Hydrologic cycle and Soil Quality and Function.	1 2	WK HH	Develop a set of Town-specific Best Management Practices	Property-wide	2020-2023

Discussion:

1. Survey results and public comments indicate that the community shares a concern for the protection of water resources and soil integrity during the implementation of any sustainable forestry practices on the Town forests.
2. The Massachusetts Department of Conservation and Recreation has a set of BMPs for use when silviculture project occurs. The Massachusetts 2014 BMP Manual lists minimal requirements for statutory compliance and more protective suggested practices for the protection of water and soil. If silviculture is initiated on the Fournier Lot, both the minimal and the additional 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. Whether it is accomplished via a detailed contract with any contractors that are

privileged to work these lands or through a private consultant or Town official, language that conveys the needs of the community and the rigor of the Town-wide BMP's must be used.

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 BMPs 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.

Climate Vulnerability: Climate change is causing more extreme precipitation and shorter windows of frozen ground conditions, both of which cause challenges for access for stewardship activities. Since the existing literature for Massachusetts BMPs were developed to protect soils and wetland resources, and present options for implementation under historic temperature and precipitation regimes, it may be advisable to create a more updated set of silviculture, recreational, or trail building activities BMP's, which incorporate the current science on hydrologic patterns. For example, in 1990 one water bar on a 20% pitched trail for 100-feet or more may have been adequate but in the predicted climate conditions more may be necessary for trail stability. Clearly defined BMPs for stewardship activities on town forest land will help protect carbon in soils and wetlands while creating the conditions for a more resilient forest

Practice 7: 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 (Cords)	Timing
Biodiversity Forest Resilience. Carbon pooling. Climate Mitigation. Forest and Tree Productivity Regenera-tion.	1	WK	Focus Tree Release	25 acres	<30 Sq. Ft. 10-15% of stocking.	80 MBF	25 cords	90 tons	2025-2030

Climate Adaptation and Mitigation Actions/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 legacy/focus trees. Legacy or focus trees here are defined as trees important to the Town for achieving its long-term stewardship goals. These goals include:
    a. Preserving and favoring a diversity of tree species and hence seed sources. For example, identifying an underrepresented species like white oak or aspen and partially freeing these trees from nearby competition.
    b. Enhancing specific trees' access to resources so they can grow better to provide wildlife values such as acorns, fruits, and dwelling sites. For example, a disease-free beech tree (nut production) or a black oak tree (fruit) could be given more light.
    c. Enhancing and managing growth for carbon accumulation and storage. For example, favoring the growth of vigorous black birch poles to make a better balanced and less-risky carbon portfolio- black birch is expected to do well under climate change scenarios and regenerates well under forest-wide deer-browse pressure.
3. Enhance and protect songbird habitat attributes for maturing interior forests with dense canopy cover (>80% crown cover post-harvest). The proposed harvest removal levels are minimal, which retains stand dynamics, ecosystem function, and natural resiliency inherent to a densely stocked, maturing forest.
4. Preserve mostly dense forest cover for maximum carbon storage in maturing trees.

5. Legacy or focus trees may be retained in the stand for their lifetime or removed in the future due to designation of a high-risk tree with insects, disease, or its proximity to a higher priority legacy/focus tree.

Mechanics of the Harvest for Focus Tree Release:

1. Retain dense thickets of native shrubs and tree saplings during operations. Black-throated Blue Warblers and Black-throated Green Warblers love caterpillars, which can be gleaned from these dense young patches. Many songbirds use the dense lower cover for breeding and nesting.
2. Legacy or focus tree release mechanics aim to open the crowns on two to three sides of the chosen trees in the stand. A minimum of 25-30 legacy or focus trees will be selected per acre. Trees would be removed from 1-3 sides of these legacy/focus trees, and trees with no influence on legacy/focus tree crown or growth would still grow. It would be a conservative harvest.
3. 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.
4. The proposed silviculture project would follow the Ecological Forestry precepts as summarized in Appendix B of this document.
5. The trail network would be protected with the strategic retention of aesthetically pleasing trees, a buffer strip along the trails, and the removal of any brush from this trail surface at the end of operations. Brush piles could be made to be nesting sites, or to provide cover to small mammals.

Trees to Be Removed: Sawtimber-sized 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 crop trees in the stand. An estimated 10-20% of the site stocking will be harvested. White pine trees for removal would 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: See Objective 2 above. Here, we expand the more traditional definition of crop trees to include yellow birch, beech, black oak, white oak, white ash, shad, and black cherry (soft mast), as well as any species with well-formed cavities or large, expansive, healthy crowns for perching, and large-diameter snag trees. Crop trees for either enhanced carbon storage or timber production include stems that adhere to the conventional wisdom of a superior phenotype and genotype timber bole, clean of branching defects, straight, non-tapering, windfirm, low upper crown decline with dead branches, and full, healthy crown.

Stewardship Concerns of the Select Board Conway August 2020: It was suggested that a reason be identified for the harvest of any tree, let alone hundreds, on Town forest lands. If the proposed silviculture project is approved within the community in the future, a site review could accompany any project documents that specifies the detailed criteria for choice of trees for removal. Any tree proposed for harvest would be taken in support of the stated goals outlined in this Forest Stewardship Management Plan.

Landscape Considerations: Forest management approaches on neighboring private, industrial, and state-owned Forest lands differ from this proposed silviculture project. This Legacy or Focus Tree Release is a conservative technique which removes a minimal number of trees per acre, retains 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 retain fewer mature trees, and create large openings in the forest landscape for habitat values. If the community supports 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.

Invasive Plant Control: Invasive plants are inching into this stand along the main road and from adjacent agricultural areas along the southwestern section of the property line. Appropriate manual control measures as outlined above can be scheduled prior to any silviculture disturbance.

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 prudent to consider the introduction of a new young forest component. Conservative openings could start new seed germination in the rich soils. Release of oak, maple, black and yellow birch, cherry, and white pine seed trees will increase species diversity in the new forest. Species composition and abundancy forest resiliency building projects, when done well, 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 on site for as long as biologically is crucial, but mindfulness of the risks will keep your community prepared to respond quickly if conditions change down the road. 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; more carbon comes into the system. 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, just as pure science.

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	WK HH	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 assistance with the establishment of carbon friendly forestry practices (much like the ideas presented in this document) on municipal and community forest land. It may be helpful if the Town considered participating in a study or project with the United States Forest Service Northern Institute of Applied Climate Sciences case study on the

Town forests. In many ways, this climate plan starts this process, as the requirements are a distillation of the NIACS adaptation workbook. You may consider working with NIAC as a "case-study" property as you explore the implementation of these ideas in your forests.
4. The Town used 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 for sustainable forestry practices presented in this document integrate well with participation in such a program.

Practice 9: Boundaries and Signage

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Ecosystem goods and services- cultural and social values.	1 2	WK HH	Boundary Delineation and Signage	Property - wide	2020-2030

Discussion: The placement of small discrete signs that welcome hikers onto the Town Forest from the interconnecting trail system and protect Town lands from unwanted use or activities. It's a good neighbor policy to establish and mark your boundaries.

Practice 10: Grade School Educational Programs

Objective	Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
Support social, cultural, and educational values of the forest ecosystem	1 2	WK HH	Development and Promotion of an educational program for use of the forest ecosystem in the Conway Grammar School	Property-wide	2020-2030

Discussion: The proximity of this valuable resource to the school facilitates the inclusion of natural history, forest ecosystem function, habitat attributes, protection of sensitive species, biodiversity, and climate mitigation by trees, and general environmental science lessons into the curriculum. The school has used the site in the past, and the Principal expressed an interest in future use. Project Learning Tree distributes curriculum templates, online educational materials, and classroom posters and material for use in teaching students about the forest ecosystem. PLT offers free teacher training for school staff to learn how to use this curriculum and inspire student interest.

The Town and school could decide the direction of the education process for their children and the concepts and ideas that should be promoted. It is recommended that the concepts of sustainable forest management be included in the educational efforts. Conway is a farming community, and students might benefit from an appreciation of forestry techniques and their benefits to the forest ecosystem. Several ideas were proposed about nature classroom ideas inclusive of the set-up of a camera for observation of the vernal pool habitat development in early spring, general camera images of wildlife using these woods, or the establishment of some sampling plots for the students to conduct tree measurements for ether volume of carbon tonnage.

Climate Science and Tomorrow's leaders: Any way that these ideas and concepts might motivate a community to action for natural-based climate solutions could be integrated through an earth science curriculum will provide your youth with the skills and thinking necessary to begin their salvation of this climate mess.

Practice 11: Practice Adaptive Management

Stand Number	Forest Type	Sustainable Forestry Practice	Extent	Timing
1 2	WK HH	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, and our climate changes. One can wisely guess, but not completely understand today what threats or challenges this forest ecosystem will face though this period. The establishment of a record keeping system to archive the forests' current condition (this document could serve as your baseline description of the forest and its functionality in 2020) and the changes that occur with each growing season and weather cycles provides the Town with the flexibility necessary to work on solutions if problems arise.
2. This responsibility could be hired out to a forester, a botanist, an environmental consultant or taken on by 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 this concept. The FCRP has developed guidelines and protocols for climate resilience monitoring. Participating in the FCRP includes support for monitoring activities.

3. Good record keeping and documentation will also position the Town to take advantage of any carbon sequestration, climate mitigation, or carbon credit marketing programs that arise during the coming years. Your Town invested the initial resources to complete this Forest Stewardship Management Plan, and you can easily leverage the data, ideas, and stewardship issues presented here for future program development.
4. Monitoring hemlock will be an important task over the course of this Plan. Keeping an eye out for 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 Community-based Forest Stewardship and Budget 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 most important thing the Townspeople would like is to be fully informed in a timely fashion whenever forest management work is proposed or planned. The Town has promulgated a Conway Forest and Trails Committee with the responsibility of conducting due diligence on the behalf of the Select Board for all matters relative to the stewardship of the community forests.

Such a body could convene 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 retain a third-party for such supervision and implementation.

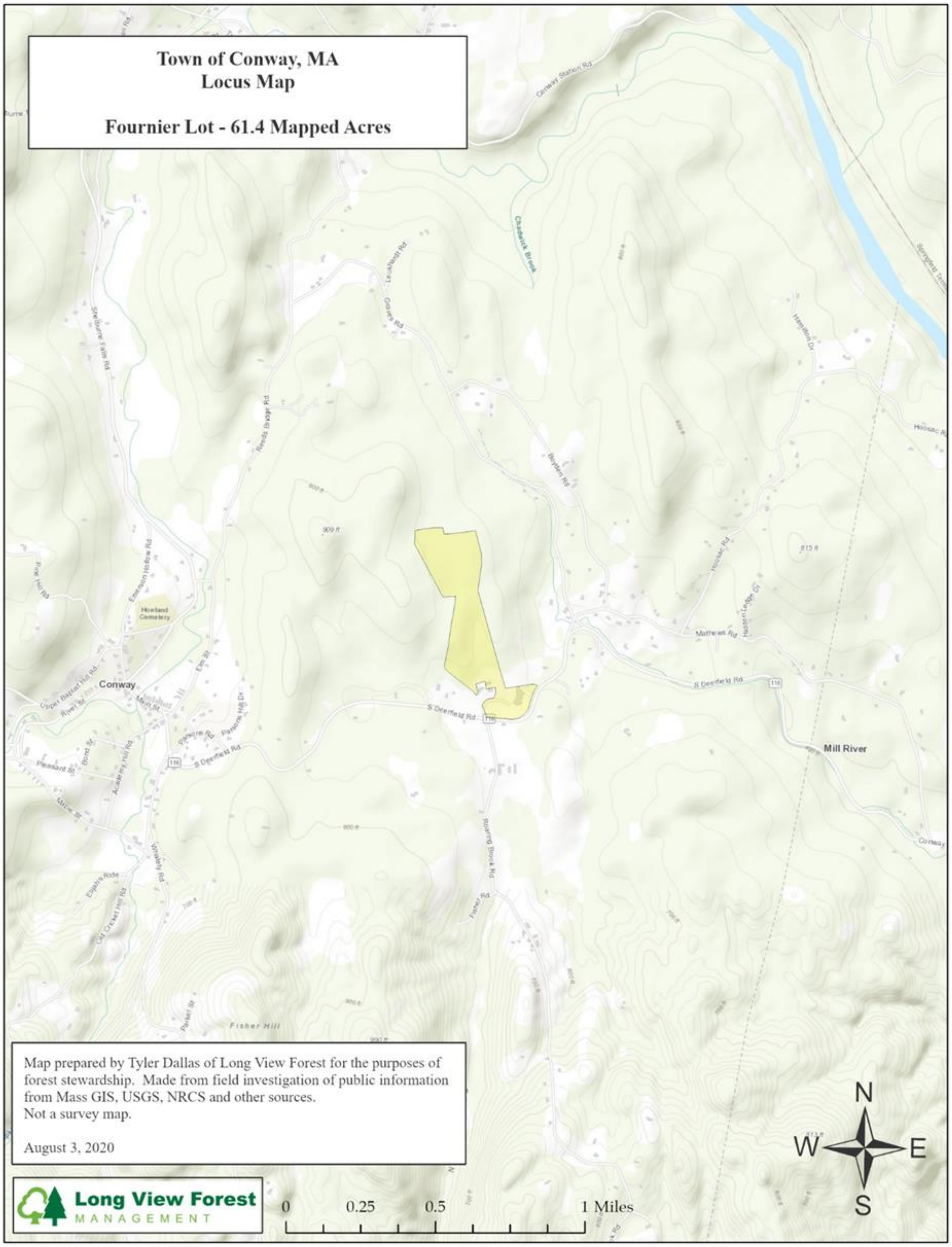


Figure 17: Locus Map for the Fournier Property

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 On-line 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, firsthand 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.Maintain a full range of habitat conditions for the support of wildlife diversity.**	**A: Passive with Minimal Disturbance** **1.Identify priority habitat through GIS mapping** **2.Set policy for these areas of non-disturbance-BMP guidelines established 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 determine 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 additional wildlife habitat by installing a 1-2-acre openings in the remote uplands of the properties without the extraction of forest products.**	**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**

		5. Plant native shrubs within forest areas that are deficient in this valuable plan layer for cover and feed. 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	Can't be too passive here- if you don't 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,	2020 through 2030	-Protect and enhance emotional and spiritual well-being of community -Sustain and protect water quality with

		erosion prevention measure installations, closing trails if deteriorating beyond sustainable condition, and signage needs 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** **-appropriate 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**		**erosion prevention** **-Sustain and Protect soil integrity** **-Promote Recreational Opportunities**

		(b) Apply for special grants if an interest teacher appears for the inclusion of forest ecosystem material in the curriculum. **(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**		**-Protects and maintains high water quality within the wetland resources on these lands and downstream** **-Sustains ecological**

		work, forest stewardship projects, or silvicultural activity. 2.Map and identify 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.		function of the forests -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		-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

		issues (failed or undersized culverts or massive sedimentation and erosion zones). **2.Draft or accept an already established set of best management practices with community input that determines 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 additional 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	**1. Promote forest conditions that support their use as a mitigation strategy for climate change through Carbon sinking/pooling and**	**1.Social/cultural- Before any active management starts- hold a community forum to accept the appropriate sustainable forestry practices necessary for the accomplishment of this goal. At**		**-Maintain forest condition for its use as mitigation strategy for climate change**

sequesters carbon and stores it in boles, leaves, branches, and roots thereby mitigating the threats of climate change	**promoting forest conditions that allow for climate adaptation by the forest**	**the forum present science to date and decide what the Town can accept.** **2. Active management- science has some guidelines on how to grow a forest for the optimal 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**		**-Protects and sustains biological richness** **-protects and sustains the delivery of ecological services** **-Increase forest productivity and its ability to sequester carbon**

		ecosystems productive capacity, and remove any threatened trees		
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 accrue.** **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 an 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. Solicit 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.**		**-Protects and maintains the historic and cultural values**

		2. Create and follow a community policy for their protection. **3. Seek any funding for special protection measures- such as restoration of gravestones.** **4. Secure funding** **5. Implement any practical measures.**		**inherent on the Town forests** **-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.Establish 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 grows 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.**		**-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**

		b.3.improve the health and vigor of the trees in both forests. **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.**		**its ability to sequester C**

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 an appropriate 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 retains many of the elements of the original forest such as standing dead cull trees and legacy mature stems. Structural and compositional complexity is preserved or created during any disturbance. On the 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 seek 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 thinning, and crown thinning 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 located and protected. Longer rotations also accommodate species specific adaptations amongst the forest to climate change.

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

1) forests have intrinsic value,

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

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

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

Forest Management Standards for the Silvicultural Application of Ecological Forestry on 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 years) rotations (time necessary to produce the desirable management crop on the watershed) and establish 15-to-20-year intervals between harvest disturbances within any give management unit on the watershed forest unless more frequent entries are necessary for salvage due to pathogen damage or regeneration purposes.

4. Prevent the movement of sediments into the riparian zones and its riparian corridor of seeps, streams, wetlands, and swamps during any silvicultural harvest work. Conduct all silviculture harvests under an approved Massachusetts Chapter 132 Harvest Cutting plan and in full compliance with Massachusetts Chapter 131 The Wetlands Protection Act.

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

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

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

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

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

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

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

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

13. Comply with all Conservation Management Practices, if necessary, from the Massachusetts Natural Heritage and Endangered Species Program for the protection of any state listed and priority natural communities identified within the managed sections of the watershed forest.

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

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

16. Leave the 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.