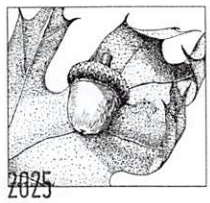
dcr

Forest Management Plan

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



RECEIVED JUN 23 2025

CHECK-OFFS

CH61	CH61A	CH61B	STEWARDSHIP	Cost Share
cert ☐	cert ☐	cert ☐	new ☐	EEA ☒
recert ☐	recert ☐	recert ☐	renew ☒	Other ☐
amend ☐	amend ☐	amend ☐	Climate ☒	Birds ☒
			Conservation Rest. ☒	
Plan Change Stew → Stew/Bird/Climate			CR Holder DCR	

Administrative Box

Case No.	(G) 106-10018 (B) 029-10019
Owner ID	503734
Date Rec'd	6/23/25
Plan Period	2026-35
Rare Spp. Hab.	NO
Orig. Case No.	
Add. Case No.	

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) The Town of Gill – c/o Town Administrator – Ray Purington
Mailing Address 325 Main Road, Gill, MA 01354 Phone (413) 863-9347
Email Address administrator@gillmass.org

Property Location Town(s) Gill & Bernardston Road(s) Hoe Shop Road

Plan Preparer Tobias Carter – Bay State Forestry Service Mass Forester License # 456
Mailing Address P.O. Box 416, Montague, MA 01351 Phone 413-853-4832

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
Gill 208	7	5750	129	98.219	-	-	0	98.219
Gill 208	1	5750	129	61.0	-	-	0	61.0
Bern. 3	1	5750	129	3.3	-	-	0	3.3
			TOTALS	162.519	-	-	0	162.519

Excluded Area Description(s) **(if additional space is needed, continue on separate paper)**
No Exclusions

HISTORY

Year acquired 2009 Year Management began 2009

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

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

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date
n/a					

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)

Aggregated responses of the Gill Town Forest Committee

Goal	Importance to Me			
	HIGH	MED	LOW	N/A, Don't Know
Improve access for walking/skiing/recreation	3	3	1	0
Improve hunting or fishing	0	2	4	0
Maintain or enhance privacy	1	1	4	0
Preserve or improve scenic beauty	5	1	1	0
Protect special features, including those of historical or person significance	5	2	0	0
Enhance the quality and/or quantity of forest products*	2	1	4	0
Practice agroforestry	1	0	4	1
Produce income from timber products, or other products and services	0	0	7	0
Produce firewood for personal use	1	1	4	0
Enhance habitat for birds	6	1	0	0
Enhance aquatic habitat in streams, ponds, and other wetlands	6	1	0	0
Enhance habitat for wildlife	7	0	0	0
Promote diversity of plant species and habitat types	7	0	0	0
Increase forest resiliency	5	2	0	0
Minimize damage from forest pests	5	2	0	0
Protect water quality	6	1	0	0
Sequester and/or store carbon to mitigate climate change	2	4	1	0
Suppress or eradicate invasive plants	4	3	0	0
Lower property taxes	1	0	4	1
Protect land from development	2	1	3	1

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

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

Responses from members of the Gill Town Forest Committee:

- "To maintain a healthy forest."
- "I would like to see all the wonderful qualities of the Forest – its trees, fields, pond, streams, and trails enhanced and protected from erosions and invasives – it seems as if the property could also become more of an educational resource for the local schools as well as for the many people who walk here."
- "Maintain the existing trail network and perhaps add a new trail to the southeast of Otter Pond. Manage the property in ways that provide outdoor recreation & education opportunities for Gill residents and other locals. Do our best to keep invasive plants under control."
- "As town forest, the main purpose is recreational use, and maintaining good habitat and water quality. Targeted treatment of hemlock woolly adelgid should be considered-especially near watercourses. Knowing which species of particular concern are there should be an important management driver. In general, passive management seems fine to me. However, some light management such as the thinning recommended in the forest stewardship plan might be appropriate, especially in the southern portion of the west side of Hoe Shop Road-especially if that can be down by low-impact logging methods and supply local needs, such as housing or a firewood bank."

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:** 6/9/25

Chair Gill Forest Committee

Owner(s) (print) Town of Gill

(This page will be included with the completed plan.)

1. Introduction

The purpose of this document is to present the Town of Gill with a strategy for meeting its stewardship goals for the 162.5-acre, Blake Town Forest property located in the towns of Gill and Bernardston, Massachusetts. This plan includes a presentation of current conditions identified on the property in the Winter of 2025, which includes an analysis of the property's ecological qualities and their vulnerabilities under predicted climate change, as well as a proposed vision for the management of the property's natural resources for the coming decade for the purpose of addressing both current and future conditions and to enhance the overall resilience of the property to continue to provide myriad environmental and social benefits. This plan complies with the terms of the Conservation Restriction (CR) placed on the property which requires an updated Forest Stewardship Plan every 10 years. The natural resources on the property have been well studied in the 15 years of the town's ownership. This report draws on and expands on these analyses, especially the 2015 Forest Stewardship Plan (Wigmore), particularly through the lenses of bird habitat management and climate-informed forestry. It complies with the standards of the Forest Stewardship Program, as well as the Foresters for the Birds, and the Climate Forestry programs, and was prepared by Licensed Professional Forester in the State of Massachusetts. Any amendments or renewals to the plan should comply with the same terms.

2. Property Overview

2.1 Property description

The Blake Town Forest is located in the northwestern eastern portion of the town of Gill and includes a 3.3 acre parcel in the southeast of the Town of Bernardston. It is situated approximately 1.5 miles west of the Gill town offices and 2.5 miles north of Turners Falls, Montague. The property is divided through the center by Hoe Shop Road with the east side containing 101.519 acres (including the 3.3 acres in Bernardston), with the western portion containing 61 acres. The entire property is within the Connecticut River Watershed and the majority of the property drains to the east through multiple extensive wetland complexes and unnamed tributary streams into Otter Brook. Otter Brook winds through town until it merges with Dry Brook just west of Gill Elementary School, where it flows through the center of town until reaching the Connecticut River along Grist Mill Road. The western third of the property drains directly into Fall River along the western edge of the property, where it flows due south into the Connecticut River just north of Peskeomskut Island.

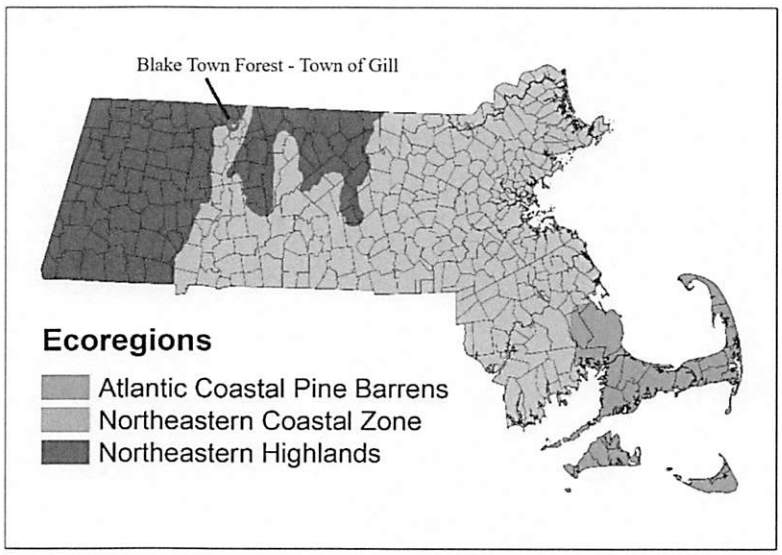


Figure 1. The three ecoregions of Massachusetts - MA Audubon

The property is considered within the Northeastern Coastal ecoregion of Massachusetts, though its position along the border with the

Northeastern Highland ecoregion means that it has some transitional qualities found in both regions which has implications for biodiversity, tree growth, and carbon pools, each of which will be discussed in greater depth.

2.2 History

Paraphrasing from the 2014 Forest Stewardship Plan (Wigmore) – "Gill Town Forest property was acquired in 2009 through a cooperative effort by the Franklin Land Trust, the MA Department of Conservation and Recreation, and the Town of Gill. The property had been owned by the Sandri family who actively managed their forestland, consistent with land use in the area and part of the local heritage of land ownership and working forests. The Town, Land Trust, and DCR worked together to conserve the 163-acre Town Forest, which was funded partially by selling off 4 house lots totaling 10 acres located on the eastern edge of the property. In addition, DCR purchased a Conservation Restriction to legally and permanently protect the land for conservation and public outdoor recreational use. Other funding sources were the Ruth Cook Trust and the Clesson Blake Trust with a large contribution. The resulting Gill Town Forest is a legally protected piece of the local natural heritage."

Like most of Massachusetts, much of the accessible acreage with favorable slopes across the property was historically used for pasture and was all but completely cleared of trees. Documentation of an exact timeline and the extent of the property's use as pasture or for other agricultural purposes was not identified for this report, though given the extent of stone walls and barbed wire across the property, and variable ages and composition of forest stands, it is likely that there was a long history of near continuous use in agriculture since European settlement up through the early 1900s. Small fields in the center and west of the property have seen residential and agricultural use until much more recently and have been maintained open for their wildlife and recreational benefits. Evidence of periodic timber harvesting is found across parts of the property, both in the form of stumps and large, multi-stemmed oak "stump-sprouts". Most of the property has since been allowed to be follow the course of natural disturbance and succession for at least the last few decades.

3. Ecological Conditions

3.1 Geophysical conditions

Blake Town Forest is situated within the Connecticut River Vally, a clearly discernible subregion of the Northeast Coastal Ecoregion in Massachusetts. The land here is much lower and relatively level compared with the hilly country on either side of the valley. The elevation of the property ranges from approximately 265 ft. in the southwest along the Fall River, to 413ft. in the eastern uplands. The landforms and soils are glaciofluvial in origin, meaning they formed by the processes of erosion, transport, and sedimentation related to the movement, deposition and melting of glaciers over multiple periods of glacial expansion and recession. The dominant landscape feature on the property is the significant glacial eskers created by deposition of unsorted gravel and sediment. Following glacial recession, accumulation of rich alluvial sediment and organic material have created high variability in the fertility and drainage of the soils across the property and have influenced the plant communities present as well as their growth, as illustrated in the following table of the soil types, their characteristics and site indices (a measure of tree growth potential). See also the Soil Type map in later section.

Table 1. Soil types present on the Blake Forest Property and their characteristics.

Soil Series	Description	% area	Site Indices

Amostown	Very deep fine sandy loam, moderately well drained soils formed in loamy glacial outwash overlying lacustrine sediments. They are nearly level to gently sloping soils on terraces, outwash plains, and deltas.	3.05	75-WP 70-RO 65-SM
Canton	Very deep, well drained fine sandy loams formed in a loamy mantle underlain by sandy till. They are on nearly level to very steep moraines, hills, and ridges.	8.34	58-WP 52-RO
Cardigan-Kearsarge complex	Very stony, somewhat excessively drained, shallow to moderately deep, poor to moderately productive soils. Rock outcrops are frequent in these soils, and the potential for erosion is high on slopes where vegetation is removed.	31.34	60-RO 64-WP 57 SM
Dutchess-Cardigan complex	Mix of very deep, well drained Dutchess soils on glaciated uplands that formed in loamy glacial till, and Cardigan soils that are bedrock controlled landforms on hills and are moderately deep, well drained soils formed in till or colluvium.	3.42	63-RO 70-WP 63-SM 60WO
Freetown muck	Very deep, and very poorly drained, organic soil located in depressions and along streams and rivers. The soil is subject to ponding and there is a seasonal high water table that is at or near the surface during most of the year. This high water table restricts root growth leaving trees subject to blowdown.	7.29	50-RM 55-HK
Merrimac	Well drained fine sandy loam. It is slightly droughty, has moderate to rapid permeability and only a fair moisture holding capacity. Water runoff, if allowed to concentrate, can easily cause erosion of this soil.	3.61	51-RO 64-WP 58-SM
Ninigret	Moderately well drained fine sandy loam that formed in deep deposits of water sorted sand and located on terraces bordering major streams. Water passes through this soil rapidly except when it is saturated. A high water table makes this soil wet in the spring	3.86	75-WP 65-RO 60-RM 55-SM
Quonset	Very deep, excessively drained Fine sandy loam formed in glaciofluvial deposits. They are nearly level through very steep soils on outwash plains, terraces, deltas, kames, and eskers.	12.46	61-WP 70-RO 52-SM
Ridgebury	Poorly drained fine sandy loams. These soils have a hard layer that prohibits the downward movement of water. They also receive surface water and seepage from surrounding slopes. Consequently, these areas have a high water table, and are often wet for most of the year.	0.12	63-WP 57-RO 52-SM 47-RS
Scarboro	Very poorly drained mucky sandy loam that is found in depressions or low lying areas. Although it is rapidly permeable it is kept wet for most of the year due to a high water table and lack of suitable drainage outlets.	0.81	55-WP 55-RM
Scio	Very deep, moderately well drained silt loam formed in eolian, lacustrine, or alluvial sediments dominated by silt and very fine sand. They are on terraces, old alluvial fans, lake plains, outwash plains and lakebeds	1.25	70-HK 85-WP 75-RO 70-SM
Walpole	Very deep, poorly drained sandy loams formed in outwash and stratified drift. They are nearly level to gently sloping soils in low-lying positions on terraces and plains	0.87	54-HK 68-WP 75-RM
Warwick	Very deep somewhat excessively drained channery fine sandy loam formed in glaciofluvial deposits.	16.88	70-WP 55-RO 59-SM

Whitman	Poorly drained extremely stony fine sandy loam contains a shallow hardpan at a depth of 14 inches that restricts water percolation as well as root growth. Consequently, trees in this area are slow-growing and prone to blowdown.	3.68	55-RM 56-WP 52-RO
Water		3.02	

3.2 Forest Conditions

The natural ecology of the forest on the property is a continuum of white pine, hemlock and oak-hickory communities. At present, these forest types are well suited to the environmental conditions on the property including soils and climate. The range of geophysical conditions on the Blake Town Forest has produced a diversity of natural conditions, largely determined by the variability of the terrain to accommodate historical use of the land as pasture or for timber harvesting.

The majority of the property has reverted to forest from agriculture from different points over the last 50 to 120 years. Underlying soil conditions, natural disturbance and succession, and periodic timber harvesting have shaped the different stands species composition and age structures. The historic disturbance regime in the forest appears to have consisted of relatively small-scale pest infestations and storms. No evidence of large-scale disturbance events was decipherable. The resulting forest structure in both younger and older stands is largely closed-canopy with small gaps, and mostly of uniform age. Some parts of the relatively older stands have seen more small-scale disturbance over time and have developed more un-even aged characteristics. In general, however, like most of the forest in Massachusetts, the forest is ageing and there is a lack of abundance in the younger age-classes of trees.

Closed-canopy conditions and small-gaps mean that the younger aged trees also lack in species diversity and skew towards more shade-tolerant, late-successional species such as hemlock and beech. Where there is slightly more light reaching the forest floor, places with more well-drained soils have seen pine and oak able to regenerate, whereas more mesic sites are have primarily regenerated with black birch and red maple. Good age diversity and species diversity among all ages of trees are important features for wildlife habitat and is the best-known way to ensure the resistance and resilience of the forest in the face of changing conditions and novel disturbances.

3.3 Forest Health

Like individual organisms, vegetative communities vary in their overall health. The health of a community is affected by many factors including weather, soil, insects, diseases, air quality, water quality, other plants, wildlife, and human activity. In some cases, it is easier to prevent vegetative health problems than to cure them. This preventative approach usually involves two steps. First, it is desirable to maintain or encourage a wide diversity of plants species and age classes within the habitat. This diversity reduces the susceptibility to a single devastating health threat. Second, by managing competing or less desirable vegetation, well-spaced, healthy plants are assured enough water and light to thrive. These two steps will result in a plant community more resistant to environmental stress including impacts from climate change.

At present, the Blake Forest does not appear to be atypical of the broader forested landscape in terms of forest health. The foremost forest health issues on the property are all common in our region and none of them represent a dire situation under current conditions, though they are expected to be exacerbated by the interacting effects of climate change (more on that later). The current health issues include the presence of non-native invasive plants and insect pests, and common forest pathogens. It is also likely that other pests and pathogens are present though their effects are either too limited or were undetectable at the time of field work (winter and early spring). Taken together, current forest health

problems can reduce the resilience of forests to the stress of climate change and limit how much carbon a forest can sequester and store. This concept will be discussed in greater detail in later sections of this report.

Invasive plants

Invasive plants are defined here as non-native species who cause harm to the native ecosystem. They are an immediate and long-term threat to the woodlands of Massachusetts. Our state is home to numerous invasive plant species capable of outcompeting desirable native species, including trees. These invasives have the potential to create monocultures devoid of biological diversity. They also support far fewer native insect species than native plants do. Low native insect populations can have a negative impact on the rest of the native ecosystem.

Japanese barberry, Multiflora rose, oriental bittersweet, glossy buckthorn, and phragmites are the invasive plants found most frequently on the property. Overall there is a low abundance and scattered distribution with some concentration in poorly drained areas where all of these species grow best. Each of them has the ability to outcompete native wetland plants, especially glossy buckthorn and phragmites which can dominate the shrub swamp/shallow marsh transition. Both have the ability to quickly spread and outcompete native plant species, significantly impacting the diversity and quality of this otherwise species and structurally rich ecosystem, which makes their control a priority. Multiflora rose and Japanese barberry are noxious plants especially in recreational woodlands due to their sharp thorns and the high number of ticks barberry bushes can support. They can also inhibit diverse tree and shrub regeneration in rich mesic sites.

Invasive insects

Invasive insects are non-native pests that lack native controls in the region/ecosystem. On the Blake Forest, the most concerning of these are the hemlock woolly adelgid (HWA), and hemlock elongate scale (HES). The concern is simply due to the abundance of hemlock, not because of the advanced infestation of either. Both were detected but the present damage from the pests is unremarkable. The impact of prolonged or repeated stress on hemlock is often an internal degradation of the integrity of the wood (stress induced defects known as ring shake) which can be difficult to detect until signs of overall decline become apparent externally. Both pests cause defoliation and death of hemlock trees and which threaten much of the hemlock in southern New England. With continued and increased presence of adelgid, hemlock stands can suffer extensive mortality.

Hemlock woolly adelgid adelgid is sensitive to cold winter conditions, especially a quick change to extremely cold weather early in the winter. In this region, the decline of hemlock trees due to adelgid is quite variable. The hemlock forests on the property show limited damage from adelgid at this time, but this could change unpredictably, depending on weather conditions or the adelgid's ability to adapt to colder temperatures, or from climate change making cold winter temperature less frequent. Outbreaks of hemlock elongate scale insect usually intensify after trees become weakened by other factors that have caused stress. Trees can die within ten years or linger in a weakened state with only a sparse amount of live crown toward the very top.

Other more minor invasive insect issues on the property include emerald ash borer (EAB). EAB is an invasive beetle that was introduced to the United States in the early twenty-first century. It has since spread through half of the country, causing mass mortality of ash species. It kills ash by excessively feeding on the trees' xylem and phloem. Though ash species are in very small numbers on the property and few of these ash trees show signs of possible EAB infestation, it is highly likely that EAB will have a severe impact on the ash population in the near future.

Beech bark disease (BBD) is complex of two fungal pathogens that infect the bark on the trunks of trees through feeding wounds caused by an invasive scale insect, called beech bark scale (*Cryptococcus*

fagisuga). Introduced to the U.S. in the 1920s, the disease complex is prevalent throughout the northeast. The injuries caused by the infection are enough to eliminate all timber value, and in severely infected trees, the main stem will become weakened and break, or the tree will become completely girdled and die. Once the main stem breaks or dies, the root system sends up vigorous suckers that form dense thickets and are functionally invasive in their ability to inhibit the regeneration of other, native vegetation. Beech of all ages, including root suckers are susceptible to the disease, and a prolonged cycle of death and resprouting can occur before the root system dies. Few large beech trees in a stand fail to be affected by this disease. However, it is not uncommon for individual trees in a stand (estimated at 1-5%) to show some resistance to infection. BBD also has significantly reduced the amount of beech nuts available to wildlife, which has likely had a widespread affect on a number of species and the food web at large. Fortunately, beech is not a significant component of the forest types on the property at this point, though it is overrepresented in the understory due to the general ageing forest structure and lack of diversity in younger ages, which is a concern for the long-term health of the forest.

While not an insect, another invasive pest likely to affect beech on the property (if not already present) is beech leaf disease (BLD). This disease is caused by a recently discovered species of nematode, which is a microscopic roundworm. The disease has mysterious origins and has been afflicting beech trees in New England for only the last several years. Much is unknown about the long-term effects of BLD, but it has caused mass mortality in some beech stands after a few years. Much of the beech in the surrounding greater landscape have seen multiple years of BLD infestation. If the majority of beech trees die from a combination of BBD and BLD, an ecologically valuable tree will be lost, but more light will be let into the understory for other, healthier tree species to grow.

Common white pine pests/pathogens

Due to the importance of white pine on the property, the most common current health concerns for the species on the property are relevant, though they are not of significant present concern. In general, mature pine on the property is of below average health, having noticeable damage, thin crowns, and a "limby" appearance. This poor health is likely caused by several factors, including white pine weevil damage and other common pests and/or pathogens. White Pine Weevil *(Pissodes strobi)* Larvae tunnel through the main terminal leader of pines often killing this section of the tree. One or more lateral branches will then replace this main leader, making the tree take on a forked or crooked shape potentially reducing the timber quality as well as increasing the vulnerability of the tree to other damage. Damage from this insect is greater among open-grown pines where the stem density and temperatures are optimal for its dispersal.

White Pine Needle Disease - Needle Cast (*Lophophacidium dooksii*), Brown Spot Needle Blight (*Lecanosticta acicola*), also (*Bifusella linearis*) and (*Septorioides strobi*) Large scale needle damage in white pine trees from these four fungal diseases became widespread throughout New England in 2010. Wet spring weather favors spore development, dispersal, and infection by these fungi. Favorable weather conditions for the spread of these diseases in consecutive years can lead to repeated damage, weakening trees and making them susceptible to other diseases or insect infestation. There is usually a one year delay between favorable conditions that lead to the spread of these needle diseases and when symptoms appear in the foliage. Trees growing in dense stands, near bodies of water, on steep slopes, or on dry shallow soils appear to be more susceptible to damage from these fungal agents.

4. Regional significance

4.1 Landscape Analysis

The context of the property within the larger landscape is important for understanding the benefits that it provides to the ecology of the area and to society, as well as the vulnerabilities that it faces. Similarly,

analysis of the relative ecological strengths and vulnerabilities of the property within the landscape is valuable for determining appropriate management to enhance the ecological integrity and the resilience of the property and the landscape at large to present and future stressors. For example, in areas where significant fragmentation is an issue, creating patches of young forest habitat may not be desirable, as this will create additional forest edge habitat which is already over abundant. In areas with extensive mature forest acreage, enhancing the age class distribution may be more appropriate.

Using a fixed radius from the center of the property to create a lens of the surrounding 2500-acre landscape, we can analyze the land cover of the immediate area. The Mass GIS 2016 Land Cover data layer for Massachusetts was utilized to analyze land uses within this landscape. These were then compiled into functionally related land uses (Table 2). These data show that the property is within a moderately forested landscape, compared with much of western Massachusetts (67.4%) that skews towards evergreen-dominated types. The wetland and open water cover types adds some natural area to the landscape as these areas tend to be located in remote low-lying areas. The open developed and agricultural lands tend to be concentrated in the flattest upland areas, along which roads were constructed historically. Of course, general land use categories do not take into account the differential benefits of land management practices in terms of the quality of habitat they provide, they merely provide a description of quantity and spatial arrangement in relation to the property.

Table 2. Land Cover of 2500-acre landscape

Cover Type	2500-acre landscape
Deciduous Forest	21.4%
Evergreen Forest	46.0%
Pasture/Hay/Cultivated	14.6%
Wetlands/Water	5.9%
Developed Land	8.5%
Grassland/bareland	3.6%

Land protection

Conservation land plays an important role in protecting the myriad benefits provided by unfragmented forest. In Massachusetts, the biggest threat to biodiversity is the loss of habitat to development. The landscape surrounding the Blake forest largely consists of rural residential properties that are heavily wooded with some maintained pasture, hay or other agricultural use on relatively small acreage. Most of the land protected from development in the upper Connecticut River valley in Massachusetts is a combination of Agricultural Preservation Restrictions (APR) which applies to mostly open space and active agricultural land, and Conservation Restrictions (CR), primarily protecting forested area. Immediately adjacent to the south of the property are three such properties – the Brechenser, Remillard and Bascom Hollow Farm APRs that collectively protect 250 acres. The town of Greenfield also owns 190 acres of protected land on the west side of Lampblack Road. Current use land tax programs (Chapter 61, 61A & 61B) protect an additional substantial amount of private land from development in the Fall River Watershed on a temporary and voluntary basis (some of this land overlaps with land in permanent protection).

4.2 Biodiversity and Wildlife Habitat

Biological diversity is, in part, a measure of the variety of plants and animals, the communities they form, and the ecological processes (such as water and nutrient cycling) that sustain them. With the recognition that each species has value, individually and as part of its natural community, maintaining biodiversity is an important resource management goal.

While the biggest threat to biodiversity in Massachusetts is the loss of habitat to development, other concerns include the proliferation of invasive non-native plants and the amount and distribution of forest growth stages. Wildlife biologists have recommended that, for optimal wildlife habitat on a landscape scale, 5-15% of the forest should be in the seedling stage (less than 1" in diameter). Yet we currently have no more than 2-3% early successional stage seedling forest across the state. There is also a shortage of forest with large diameter trees (greater than 20").

Many wildlife species need a variety of plant communities to meet their lifecycle requirements. In general, a property that contains a diversity of habitats will support a more varied wildlife population. The appropriate mix of habitat types, however will primarily depend on the composition of the surrounding landscape and landowner objectives. The overall conditions across the Blake Forest property provide a good diversity of habitat types ranging from open grassland to shrub swamp and closed canopy forest that are an appropriate mix for the goals for the property. However, the forested portion of the property reflects the larger trends of the landscape in this part of the state, in that they are predominantly maturing second-growth forest that are generally lacking in forest growth stage heterogeneity, and subsequently lacking some beneficial habitat qualities and species diversity.

Bird Habitat Characteristics & Habitat Strengths

Interior, mixed-wood structure - The predominant habitat characteristic across the property is that of largely closed canopy forest of mature or maturing timber punctuated by irregularly distributed small gaps. These characteristics are similar to what would be considered "Interior Forest" which describes extensively forested portions of the landscape where forest cover is relatively un-fragmented by human development. This habitat condition is vitally important for wildlife that requires large, unbroken expanses of forest and minimal human disturbance for their welfare. Many Neotropical migratory birds and animals such as great horned owl, black bear, bobcat, fisher, and many others, require, prefer, and/or utilize interior forest habitat at some point in their lifecycles.

Bird species vary in their sensitivity to fragmentation and forest patch size needed for quality habitat. This sensitivity is less pronounced in highly forested landscapes. Therefore, the habitat features of both the landscape level and the property level interact in determining the quality of bird habitat. Closed canopy conditions on the property may be suitable for a suite of interior-nesting bird species that include: the ovenbird, black-throated green warbler, blackburnian warbler and scarlet tanager all of which have been identified in recent years by birders (Northfield Bird Club). Furthermore, tree/shrub regeneration in irregular gaps provide ephemeral nesting habitat type that may be suitable for birds such as black-and-white warbler, black-throated blue warbler, wood thrush, and veery (veery has been identified).

The forest's composition ranges from large areas of majority softwoods to mixed-wood to pockets of majority hardwood stands. This gradient of species composition creates abundant mature forest bird habitat diversity. Softwood-nesting species such as black-throated green warbler and Blackburnian warbler utilize areas especially where hemlock is most abundant in the midstory under pine in the overstory. Hardwood-nesting species such as veery and wood thrush would tend to utilize the mixed wood and hardwood forest matrix more.

Riparian forest and wetland complex - The majority of the forest is also riparian, meaning that they are serving to protect the transition between aquatic and terrestrial habitats. These areas often contain a greater variety of vegetation at various height levels within the forest providing cover and diverse nesting and feeding opportunities for wildlife. They also serve as forested connectors between woodland habitats providing travel routes between these areas. The variety of aquatic habitats provide the most important qualities to the property. Forested wetland communities provide breeding habitat important to Canada Warbler. These forests tend to have a low canopy height and an abundance of ground cover — primarily ferns and shrubs. They also have structurally complex and uneven forest floors with hummocks, rootballs, and downed woody debris that provide concealment for nests and young. Shrub-dominated wetlands provide habitat for American Woodcock and Alder Flycatcher. Rock- or gravel-bottomed streams such as the Fall River support Louisiana Waterthrush, a warbler that nests in cavities under steep streamside banks or in upturned roots of a fallen tree over or near water, and has been identified regularly on the property. Additionally, the isolated nature of some of some wetland sites may serve as vernal pools and allow amphibians to carry out breeding and feeding in an area of reduced predation. Vernal pools and wooded wetlands host more rare species of plants and animals in Massachusetts than any other woodland habitat.

Structurally complex habitat features - Throughout the forest, there are good numbers of large diameter trees of different species. Structurally-sound, large diameter trees are important stick nest sites for woodland raptors, such as the northern goshawk. Large-diameter cavity trees are critical for larger cavity-nesting species including owls and pileated woodpeckers. Cavity trees of all types and sizes are utilized by a wide variety of species, and provide a long-term supply of coarse woody debris as the tree gradually declines. Standing dead trees – snags - are important as nesting, feeding, and perching sites for many bird species. Woodpeckers excavate cavities in these snags for roosting and nesting that are often subsequently used by other birds and small mammals. Brown creeper, winter wren, eastern screech-owls, and black-capped chickadees all use cavities for nesting. Fallen logs and tree branches of various sizes on the forest floor provide cover and harbor insects that are food for many birds, reptiles, amphibians and small mammals. These creatures in turn provide food for larger carnivores and birds of prey. This material also plays an important role in the life cycle of many amphibious creatures and provides nutrients for healthy soil and future growth in the forest.

Forest edge and early successional habitat - An additional beneficial characteristic is the forest edge habitat between the maintained fields and forest which can be extremely productive for wildlife as they often contain plants that are not commonly found in either forested or open field environments. They also tend to harbor a variety of insect life and therefore are important areas for many insect eating birds. Many wildlife species will also utilize these areas for sunning, dusting, nesting and den sites, travel lanes and protective cover.

An important bird habitat type that is lacking on the property is young or "early successional" forest. Young forests are dense and brushy with a mix of young tree species and shrubs. These habitats provide a high amount of cover and food for birds. Even small patches of young forest can be nesting and foraging habitat for a number of bird species. 2-acre canopy gaps can be nesting areas for chestnut-sided warblers and brown thrashers. Young forests are also often used as foraging grounds for species that breed in mature forests, such as eastern wood-pewee, wood thrush, ruffed grouse, and woodcock. The creation of a occasional larger canopy gaps than are currently present has the potential to notably increase the bird species diversity on the property. Additionally, the maintained open fields can be managed to enhance quality of early successional habitat.

Rare and Endangered Species

Rare species include those that are **threatened** (abundant in parts of its range but declining in total numbers, those of **special concern** (any species that has suffered a decline that could threaten the species if left unchecked), and **endangered** (at immediate risk of extinction and probably cannot survive without direct human intervention). Some species are threatened or endangered globally, while others are common globally but rare in Massachusetts.

Of the 2,040 plant and animal species (not including insects) in Massachusetts, 424 are considered rare. About 100 of these rare species are known to occur in woodlands. Most of these are found in wooded wetlands, especially vernal pools. These temporary shallow pools dry up by late summer, but provide crucial breeding habitat for rare salamanders and a host of other unusual forest dwelling invertebrates. Although many species in Massachusetts are adapted to and thrive in recently disturbed forests, rare species are often very sensitive to any changes in their habitat.

Indispensable to rare species protection is a set of maps maintained by the Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) that show current and historic locations of rare species and their habitats. Prior to any regulated timber harvest, if an occurrence does show on the map, the NHESP will recommend protective measures. Possible measures include restricting logging operations to frozen periods of the year, or keeping logging equipment out of sensitive areas. You might also use information from NHESP to consider implementing management activities to improve the habitat for these special species. Currently no identified priority habitat of rare species are found on the property but immediately upstream along the Fall River contains a small area of priority habitat of an aquatic species.

Furthermore, MassWildlife and the Nature Conservancy collaboratively maintain a mapping tool (Biomap) that identifies lands and waters that are most important for conserving biological diversity in Massachusetts. The Blake Forest contains both central elements of Biomap which are Core Habitat and Critical Natural Landscape that cover collectively cover around 90% of the property as well as portions of the surrounding landscape. The components of these designations are a buffer around the core wetland habitat (Otter Pond) and connectivity with a landscape block with high ecological integrity.

5. Climate Change

The climate of Massachusetts is changing, and this impacts our forests in a number of ways. At the same time, because the cause of climate change is increasing carbon dioxide concentrations in the atmosphere and trees represent the best mechanism available for removing carbon dioxide from the atmosphere, forests are a powerful nature-based climate solution. This section will provide an overview of how climate change is impacting the Town of Gill Blake forest, and the actions available to help the forest adapt to climate change. In combination, these actions are balanced to maintain the ability for the forest to continue to absorb carbon from the atmosphere, as well as store it in trees, soils, and all other parts of the forest for decades and centuries to come. For more general information on climate change effects on forests and actions to adapt forests to climate change, please review the resources provided by the MA-DCR Service Forestry Program and partners. The *Caring for Your Woods: Adapting to Changing Conditions* booklet, and the *Caring for Your Woods: Managing for Forest Carbon* booklet provide this background information on forest carbon and considerations for management.

Climate change will not affect all plant species, communities and parts of the landscape in the same way. Factors such as soil type, elevation, species composition, slope, and past land use history may or

may not buffer ecosystems from the impacts of climate change. While there is uncertainty as to how natural communities will react to changing climate and the indirect impacts of it, we can be confident that they will change. The potential issues are numerous and can work interactively to exacerbate existing and emergent issues. Many challenges are not new, but we can expect novel combinations of stressors, and changes in timing and intensity. Broadly speaking, based on available climate models, we know that:

- Temperatures will increase throughout all seasons in the Northeast region over the next century, annual temperature projected to increase by 3 to 10°F.
- Future precipitation rates are uncertain but are changing, and will continue to change. Total annual precipitation is generally expected to increase over the next 100 years.
- The greatest precipitation increases are expected to occur during the winter months, where warmer temperatures will result in more precipitation falling as rain instead of snow.
- Even with moderate increases in rainfall, there will likely be more frequent droughts in the summer and/ or fall because higher temperatures will lead to greater water loss from evaporation and transpiration.
- More extreme precipitation and other weather events will occur more frequently.

5.1 Climate Impacts & Vulnerabilities

While changes in climate generally occur over long-time scales, we are already seeing noticeable changes that impact our forests and how we manage them. Even minor, incremental changes in temperature and precipitation can have significant impacts on a forest. Climate change and interacting factors not only affect the health and vitality of the trees currently living in the forest, but also influence which young trees can get established to create the future forest, and our ability to respond to these changes through management. Table 1 summarizes climate vulnerabilities of the Gill Town forest.

Table 1: Blake Forest Vulnerabilities

Climate Change Impact	Vulnerability	Climate Related Challenges/Opportunities to Meeting Goals
The populations of a key herbivore will be affected	• Warmer winter temperatures and reduced snow depth are expected to reduce the energy requirements for white-tailed deer and increase access to forage during winter months, enabling them to expand the size and range of their populations. • Deer impact plant regeneration, structure, and species diversity. Expanded deer herbivory could disproportionately affect regeneration and recruitment of beneficial species like oak, especially where snowpack and winter severity are reduced. • A largely closed canopy and a shaded forest floor limits the potential amount and diversity of tree and shrub	• **Challenge:** Relatively insulated, isolated sites such as those dominated by eastern hemlock can support large numbers of overwintering deer. • **Challenge:** Increasingly warm temperatures may make higher, colder and more exposed sites more hospitable to deer in the future. • **Opportunity:** Leaving woody debris on the forest floor after creating canopy gaps through tree harvesting can create obstacles for deer, who prefer to feed on more easily navigable terrain. • **Opportunity:** Installing individual tree tubes or deer exclosure fencing in parts of the forest to protect natural or planted

	regeneration, increasing the likelihood that deer will browse what is present out of necessity.	seedlings of desirable species will help improve vegetative diversity. • **Opportunity:** Maintaining or increasing habitat diversity may yield sufficient fodder for deer in more open areas, reducing the browse pressure in the interior of the forest
Increased Risk of Summer Drought	• Drought poses the greatest risk in the excessively drained soils at the relatively higher elevations in the property. • Late summer drought stress increases the likelihood of mortality from insect pests that affect pine and hemlock.	• **Challenge:** Increased mortality risk associated with drought makes it more difficult to sustain carbon storage levels, especially in white pine and eastern hemlock on the property. • **Opportunity:** Dry periods during the summer months could help to reduce the severity of fungal pathogens. • **Opportunity:** Dry soils may provide opportunities to harvest that minimize impact on soil and water quality.
More frequent and severe ice and wind storms	• High elevation and/or exposed areas are subject to greater risks from wind and ice storms. • Limited established regeneration in much of the property make the system respond less resiliently to disturbance. • Insect-stressed and weakened white pine and hemlock are more susceptible to wind/ice storms. • High precipitation rates in spring and early summer are becoming more common in New England. These conditions are associated with white pine decline.	• **Challenge:** Increased barriers to tree regeneration threaten to reduce stocking levels, carbon sequestration rates, and diversity of low-vulnerability species following disturbances. • **Opportunity:** An increase in mild-moderate disturbances could increase the structural complexity of the forest, thus providing benefits to a diversity of wildlife and providing conditions for younger regeneration to establish.
Increase in forest insect pest and pathogen outbreaks	• Hemlock woolly adelgid and hemlock scale represent significant potential threat to the property. In particular, the range of hemlock woolly adelgid is expanding northward because warmer winters have reduced the occurrence of extremely low temperatures that cause insect mortality • Fungal-borne pathogens including white pine needle damage and oak wilt are likely to increase as climate change continues. Pine and oak may not face mass mortality, but increased stress caused by these pathogens contribute	• **Challenge:** Warmer winters will make it harder to address forest health threats. • **Challenge:** Increased success of deer and invasive species will make it more difficult to improve species diversity, and increased representation of less vulnerable species. • **Challenge:** Increased success of invasive pathogens will make it more difficult to improve species diversity, and increased representation of less vulnerable species such as maple and black birch. • **Opportunity:** Growing sites with good characteristics to support a vulnerable

	to their decline, especially in interaction with increased drought. • Beech bark- and beech leaf disease, may prove more lethal to all ages of beech with the interaction of increasing temperatures and drought • Emerald ash borer poses a long-term risk to white ash as EAB continues its spread.	species are good candidates for forest reserves where they stand a greater chance of resisting the pest impacts of climate change.
Increased success of invasive plants	• Phragmites, multiflora rose and Japanese barberry threaten to spread further within the property and limit the success of tree regeneration and biodiversity and reduce the forests' ability to respond to disturbance. • Exotic species not currently present on the property may become established.	• **Challenge:** Warmer temperatures will increase vigor of invasive species. • **Challenge:** Selective deer browsing eliminates competing native vegetation and improves the conditions for invasives to spread in the understory. • **Opportunity:** Longer growing seasons can also support the competitive success of native species. • **Opportunity:** Increased range of some pests and pathogens may adversely affect some invasive plants.
Conditions may become more, or less, favorable for certain tree species	• Some northern species may be less able to take advantage of longer growing seasons and rising temperatures (eg. white birch, poplar, white pine, and hemlock), then other, more southerly distributed species able to tolerate occasional drought (eg. oak, hickory, black cherry, and maple). • Some species (eg. white ash and beech), which would otherwise fare well in a warmer climate, are susceptible to climate-change exacerbated pests and pathogens. • Species that are more tolerant of disturbances (eg. red maple) may have an advantage.	• **Challenge:** Regeneration of less climate-suited species may be especially difficult. • **Opportunity:** Promoting more diverse systems in terms of species composition, structural characteristics, and genetics, can increase resilience to disturbance and adaptability. • **Opportunity:** Promoting underrepresented species that are predicted to fare well in future climates (eg. hickory spp., oak spp., black cherry) through silvicultural treatments and enrichment planting (with deer protection) will increase diversity and climate resilience on the property.

As described above in Table 1, climate change will favor some tree species over others over varying time scales depending on the given site and other factors. The Town of Gill Blake forest contains a mix of northerly and southerly trees, which are expected to decline or prosper, respectively, over timescales of several decades. Table 2 provides a summary of climate and forest health risks for the tree species growing on the property. This table summarizes how favorable habitat conditions are expected to be for these species at the end of the century (from climate models), how susceptible the species are to physical disturbances from storms or drought, whether pests or diseases are expected to impact forest

health in the near term, and whether regeneration of the species requires specific attention. Management actions can help shape the species composition of the forest, aim to make individual trees less vulnerable to physical disturbance, pests, and diseases, and encourage regeneration of future adapted species. See the 'Stand Descriptions' for a more detailed information on forest conditions and vulnerabilities of specific forest stands, and the 'Management Recommendations' for actions to improve the forest's resilience to climate impacts and to promote the goals for the forest.

Table 2. Forest health and climate risks for most abundant tree species present on Blake Forest.*

Tree Species	Code	Estimated Basal Area (ft^2) (134.4 forested acres)	*Long-Term Projection*	*Near Term Stressors*			
			Habitat conditions	Storms	Drought	Pests/disease	Regeneration
eastern white pine	WP	8,333	concern	concern	concern	concern	
eastern hemlock	HK	4,704	concern	concern	concern	concern	
red maple	RM	3,629					concern
oak, black	BO	2,419				concern	concern
oak, white	WO	2,016				concern	concern
oak, red	RO	1,747				concern	concern
black birch	BB	806		concern			
black cherry	BC	134		concern			concern

* Tree species vulnerability to long term climate risks (habitat conditions) and near-term stressors determined from the UDSA Forest Service Climate Change Tree Atlas data, modified by site conditions on the property. The Tree Atlas uses modeled climate at the end of the century to project whether tree species will gain or lose suitable habitat by then. Also included in the Tree Atlas are an assessment of "modifying factors" that may alter how tree species respond to climate change. This table uses these modifying factors to describe how vulnerable the tree species present on the property are to risks from drought, and pests or disease, and the level of concern about the regeneration of the species given observed levels of deer browse and site conditions

5.2 Management Options for Adaptation and Mitigation

A wide range of management actions can be used to support climate adaptation and mitigation. Climate adaptation options can be across a continuum that include **resisting** change, enhancing the **resilience** of ecosystems to change, and **transitioning** systems to better match expected future conditions. Options to support climate change mitigation in forested ecosystems can be described in terms of those that **avoid forest loss or degradation**, **reduce carbon emissions** in forests**,** or **enhance carbon sequestration**. Multiple options are possibly applied across the property and within a stand, which in the context of the larger landscape, serve to diversify habitat conditions and increase the adaptive capacity of the whole ecosystem.

Given the uncertainty of the precise impacts that novel combinations of stressors, and the changes in timing and intensity of stressors will have on the landscape, a key recommendation for buffering against the effects of climate change, and enabling natural communities to adapt, is to have a variety of conditions in place. That is, variety in terms of the age and species of trees, and age classes and species compositions of different habitats. Considering current conditions on the Town of Gill property in terms

of past management, present successional stages, diversity of site conditions, and ecosystem health issues, adaptive measures that fall at various points along the resistance-resilience-transition continuum are appropriate.

The rich structural diversity among the various areas on property can accommodate a range of site-specific, adaptive management approaches across the spectrum of passive to active management. Designating areas to be maintained as they are, will sustain natural ecological processes and functions, carbon stocks and other benefits. These areas will include unique or sensitive sites and ecosystems, such as the wetland complex around Otter Pond, soils that support isolated wetlands, and riparian forest, and remote sites that possess less-common qualities such as old-growth characteristics. These sites may also have a good diversity of site-suited species already, and a favorable micro-climate to resist the changes brought on by climate change, or serve as climate refugia for at-risk species. Where these qualities don't apply, and proactive management will have an overall benefit to ecosystem function and adaptation, increasing forest resilience to climate change will be the guiding principle.

The resilience approach will allow for the forest on the property to experience some changes with the goal of retaining existing species and habitat characteristics as much as possible, while understanding that some characteristics will change. The ability of the forest to rebound from intensified disturbance in a way that will be well-adapted to future conditions is essential to its long-term health. The key to building resilience on the property is improving age diversity in the forest, particularly by working to increase the abundance and diversity of trees and shrubs in the younger age-classes. Silvilcultural treatments to support young growth where it is present and to initiate and establish it where it is lacking will put the forest on the desired trajectory. Crucially, the success of these treatments must be monitored for understory degradation from excessive herbivory and invasive plants and organisms.

Where climate change is most likely to exceed the capacity of the existing forest community, taking anticipatory steps to transition the forest towards species assemblages that are expected to fare better in future climate conditions is warranted. Strategies to promote resistance, resilience, and transitions in specific stands will be described later in the stand description and management recommendation sections.

5.3 Carbon Storage and Sequestration

Forests help to both soak up atmosphere-warming greenhouse gases from the air (carbon *sequestration*) and lock them away for long periods of time (carbon *storage*). Young forests *sequester* carbon at the highest rates, since young trees rapidly convert carbon dioxide into the carbon they store in their wood. Older forests and trees continue to take up carbon dioxide, but at slower rates. These slower rates of sequestration in older forests are due to a number of factors, including increased tree mortality and slower average growth rates. The biggest climate benefit of older forests is *storing* the carbon that they have accumulated over time. In addition to the carbon stored in the trees and other forest plants ("above-ground carbon"), a significant proportion of forest carbon is stored in the soil ("soil carbon").

Forests with a high amount of organic material (including woody debris left on the forest floor) and high levels of structural and species diversity tend to store the most soil carbon. The ideal forest for carbon benefits has a mix of healthy and vigorous young and old trees that both sequester carbon dioxide at a high rate and store that carbon securely for a long time. The amount of carbon stored on the property is not static, as living vegetation continually absorbs carbon dioxide while decaying plants release it back into the atmosphere. Put simply, the challenge is to increase carbon storage over the long-term while

accounting for inevitable reductions resulting from different types of disturbances, both natural and anthropogenic.

The Blake forest has a low proportion of young forest. As a result, the property's overall sequestration rates are relatively low. Nevertheless, the forest is contributing to the reduction of carbon dioxide in the atmosphere. Based on a rough estimate according to the property's ecoregion and the basal area of the living and dead trees on the property, approximately 63.2 tons of carbon per acre are stored here, for a minimum of 8,494 tons of carbon over the 134.4 forested acres on the property. On average, this forest stores as much or more carbon than 85% of similar forests in western Massachusetts.

Management considerations for protecting carbon pools

Of critical importance to managing for carbon storage and sequestration is the soil carbon pool, which is one of the largest pools in the forest ecosystem. Soil carbon should be protected by limiting the potential for soil compaction and erosion by concentrating access for recreation and management activities to designated hardened routes. Bridges and trails should be further stabilized where they interact with unstable soils, such as saturated or sloping soils. Temporary soil stabilization techniques may be employed if necessary, during management activities to prevent unnecessary impacts to the soil and subsequently to water quality.

Also of importance to carbon storage and sequestration, is retaining carbon pools in deadwood and declining trees in the course of management activities. As discussed above, the following carbon retention practices also maintain or enhance vital wildlife habitat characteristics:

- Retain snags (standing dead trees). Standing dead/dying trees store carbon and provide feeding and nesting strata for insects, birds and mammals.
- Retain large legacy trees. These trees store a great deal of carbon and can continue to sequester and store for decades. They also provide a wide range of animals protective cover and nesting opportunities.
- Retain coarse and fine woody material. This material can store carbon for many years and will eventually add to the soil carbon pool through decomposition. Additionally, this material provides excellent refuge for hundreds of insects and small vertebrates and returns nutrients to the forest soil.
- Create brush piles. In the course of vegetation management large brush piles from cut material can be created to provide cover and feeding opportunities for small animals and bird species.
- Maintaining Early Successional Forest. Periodically expanding young forest will not only provide valuable light, nutrients and water for remaining trees to utilize and grow/store more carbon, but it will regrow quickly, sustaining a steadily high rate of carbon sequestration. Additionally, this habitat characteristic is extremely valuable for forest birds who utilize openings for forage, nesting, and refuge.

Carbon accounting

Should the Town of Gills elect to participate in a Carbon Offset Project, which requires a sustainable forest management strategy that assists with the stabilization/accumulation of greenhouse gas emissions, they must demonstrate their ability to enhance carbon sequestration and produce additionality. Additionality is achieved by demonstrating lower emissions/greater sequestration of greenhouse gases (GHG) than under typical practice. In general, a passive approach to forest management can demonstrate additionality, since most forests undergo some harvesting and there are GHG emissions associated with that. However, leakage, the increase in harvesting elsewhere to make up for the forgone harvest on passively managed land, is a potential net loss in carbon accumulation

associated with a passive approach. By continuing to harvest wood products in a way that retains higher levels of carbon (eg. retaining high stocking levels, growing older trees in extended rotations), while adding to the rate that carbon is sequestered (eg. increasing the frequency of the cutting cycle, and increasing levels of immature stocking), leakage is minimized while demonstrating additionality.

7. Management Summary

The Town of Gill, Blake Forest is a significant asset to the upper Connecticut Valley portion of the border area between the Northeastern Coastal and Highland Ecoregions of Massachusetts. It serves to protect important aquatic habitat around Otter Pond, the Fall River, and isolated forested wetlands, and provides residents of Gill and the wider region with great scenic and low-impact recreational opportunities. It provides valuable ecological contiguity within the surrounding landscape. The goals of the Town of Gill Forest Committee are to sustain these two main qualities of the property: wildlife habitat and scenic/recreational values, as well as protect water quality, and enhance forest health and resilience. To meet these goals, the guiding management principle for the next decade and more, should be to sustain and enrich the mosaic of habitat types and successional stages on the property.

The recommended course of action at this time consists of two priority management tenets:

1) Allow natural disturbance and succession processes to remain undisturbed- More than half of the property is well suited to a passive management approach for this ten-year period or longer. A variety of site conditions, including significant landscape features, ecologically sensitive sites, and uncommon habitat conditions are appropriate for protection as ecological reserves, as well as areas that are frequented for recreational uses. Additional area that is remote, poorly accessible or has favorable site conditions for long-term resistance or resilience to climate change-exacerbated stressors, may also better serve the goals for the property if spared active management and allowed to grow trees to their full biological potential. Together, these areas will protect vital wildlife habitat, water quality, long-term carbon pools and increase all the benefits associated with ageing, interior forest characteristics.

2) Improve forest resilience to impacts of climate change- In the context of this property, this means reducing the proportion of at-risk species from sites where they are most vulnerable to climate change-exacerbated stressors, for the goals of increasing climate-suited species abundance and diversity, carbon sequestration, and attendant benefits to wildlife habitat, particularly that of interior-forest migratory birds. This may be achieved differently between sites but should include creating the light conditions for species with a variety of shade tolerances to establish and thrive and protecting desired regeneration from the effects of excessive deer browsing and excessive competing vegetation, both native and non-native.

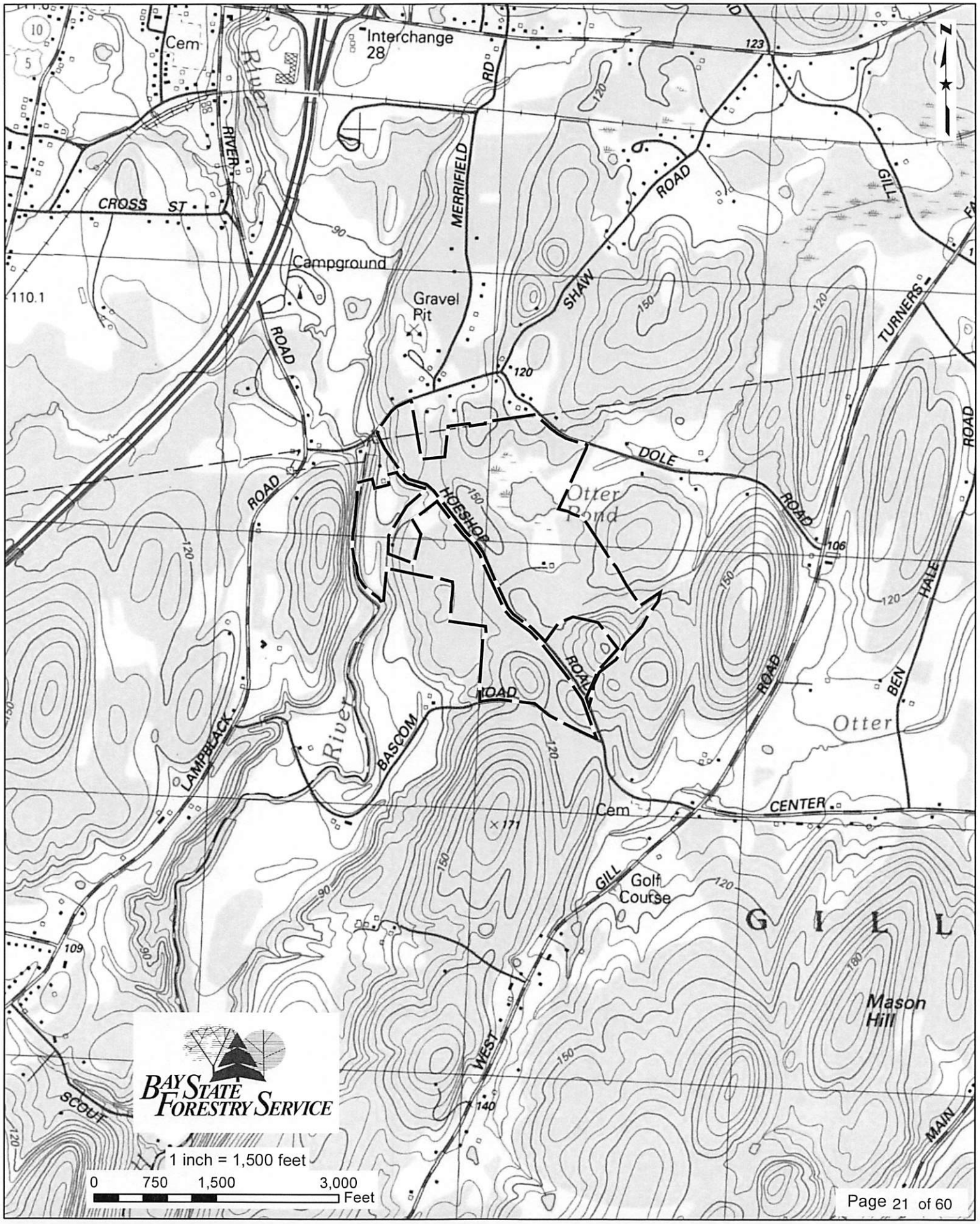
Adaptive Management

These recommendations are not intended to be a permanent solution to concerns the property faces considering climate change. Rather, as an adaptive management approach, it is intended to allow for changes in priorities as new information becomes available and conditions on the landscape change, and may include activities not addressed in this plan. This plan will be amended to reflect any appropriate management in response to changing conditions that are not currently recommended.

Property Locus Map

Town of Gill - Blake Town Forest

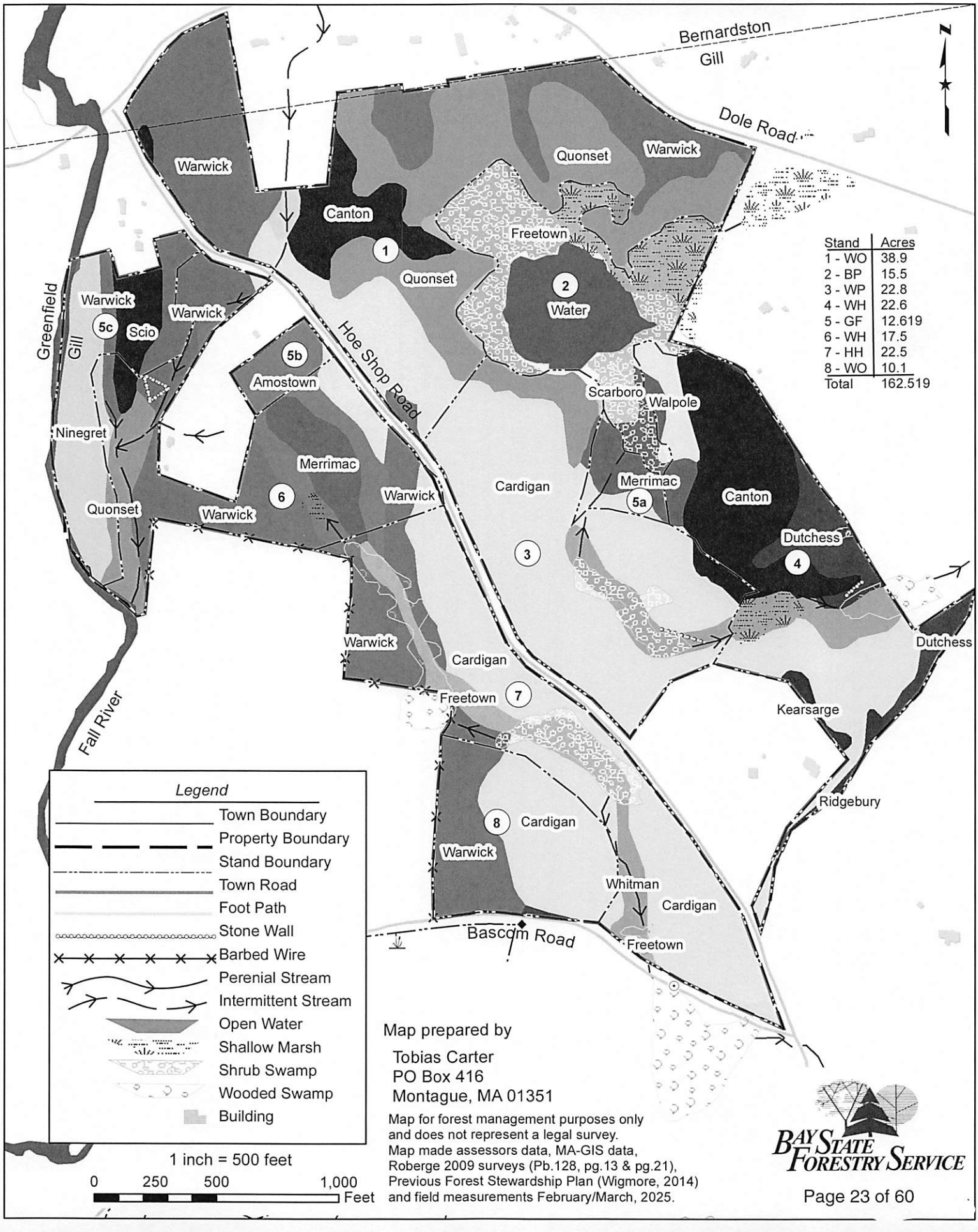
Located off of Hoeshop Road, Gill & Bernardston, Massachusetts



Soils Map

Town of Gill - Blake Town Forest

Located off of Hoeshop Road, Gill & Bernardston, Massachusetts



Map prepared by

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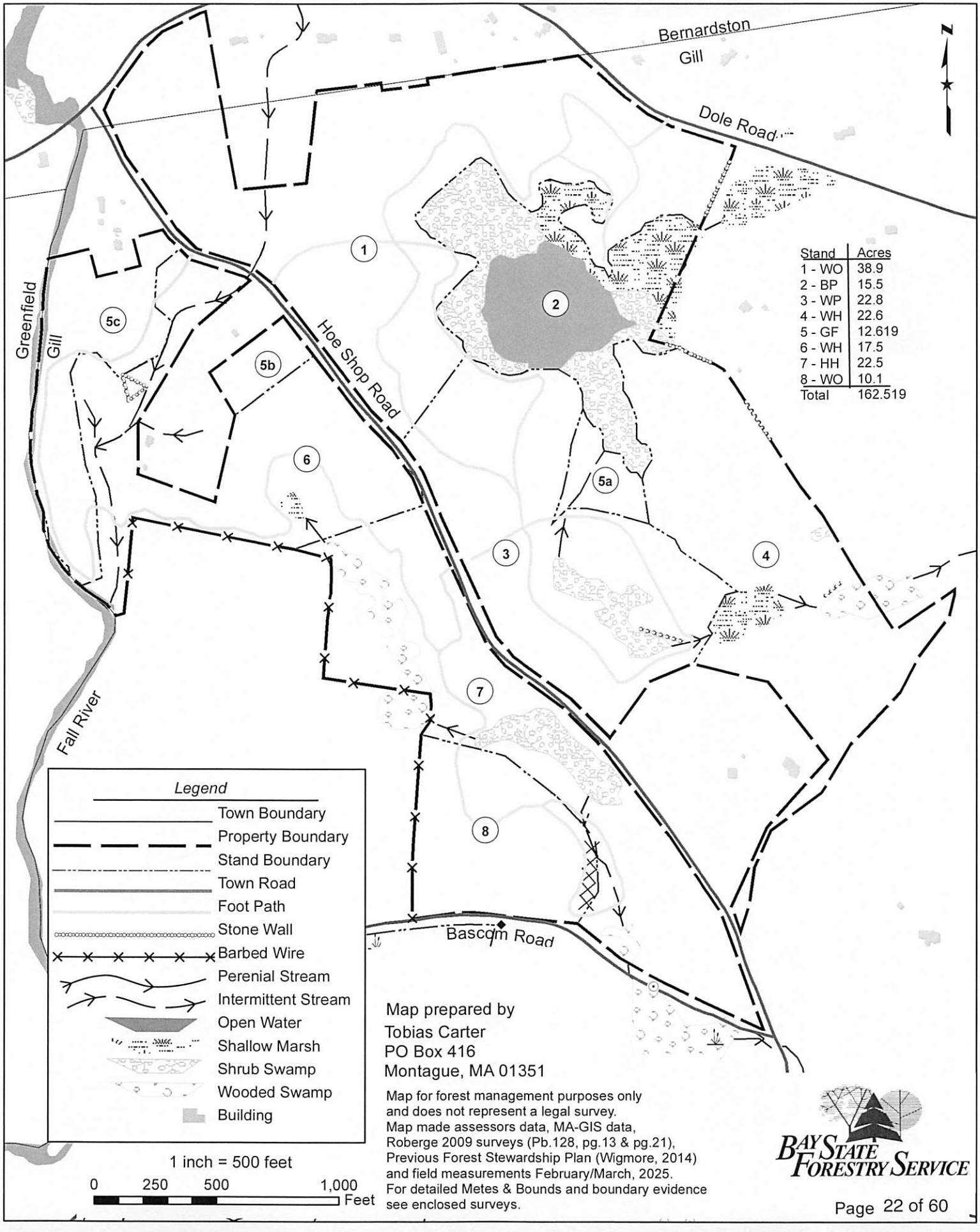
Map for forest management purposes only and does not represent a legal survey.
Map made assessors data, MA-GIS data, Roberge 2009 surveys (Pb.128, pg.13 & pg.21), Previous Forest Stewardship Plan (Wigmore, 2014) and field measurements February/March, 2025.

BAY STATE FORESTRY SERVICE

Forest Stand Map

Town of Gill - Blake Town Forest

Located off of Hoeshop Road, Gill & Bernardston, Massachusetts



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BAY STATE FORESTRY SERVICE

Stand Summary

For the purposes of this report a stand is a defined area that has relatively consistent vegetative communities, geomorphological traits, wildlife habitat types, or other similarities in composition and structure, as well as management considerations.

Stand Forest Type	Total Acres	Key Features and Attributes	Climate Vulnerability	Management Considerations	Live tree Carbon/Acre (tons)
1 – WO (white pine/oak)	38.9	Surrounding Otter Pond on the north side. Contains significant variation in soil moisture and site quality. Areas of mixed species, uneven-aged structure and mature pine/oak.	(Low) – Adequate diversity of site- and future-climate-suited species.	Mimicking small-scale disturbance regime would create/sustain mixed species, uneven-age characteristics. Limited access & operability due to steep slopes and shallow/wet soils. Set aside sensitive and recreational areas for passive management.	58.7
2 – BP (beaver pond/wetland complex)	15.5	Consists of Otter Pond and associated shallow marsh and shrub swamp wetland complex.	(Low) Highly resilient, structurally complex and diverse ecosystem.	Spread and dominance of non-native invasive plants should be controlled.	n/a
3 – WP (White pine)	22.8	Dense even-aged white pine in most places, with some past light thinning in most accessible places along Hoe Shop Road. Highest density of recreation.	(Low/medium) – Lacking diversity and abundance of climate adaptable species in sites where pine and hemlock are most vulnerable.	Expanding on past thinning, creating small gaps would promote mixed species, uneven-age characteristics. Limited access & operability due to steep slopes and shallow or wet soils	53.1
4 – WH (white pine/hardwood)	22.6	Varied mix of mature hardwoods, pine and hemlock in highly varied terrain and soils in the southeast of the property.	(Low) – Adequate diversity of site- and future-climate-suited species.	Same as Stand 1. – individual and group selection of declining white pine and hemlock.	72.7
5 - GF (grasses & forbs)	12.619	Three distinct maintained fields kept open for scenic/recreational interest and habitat diversity.	(Low/medium) – Increased deer pressure would reduce biodiversity and favor non-native invasive plants	Opportunity to enhance early successional habitat and other benefits. Control spread of invasive plants.	n/a

Owner(s) Town of Gill – Blake Town Forest Towns(s) Gill, Bernardston

6 - WH (white pine/hardwood)	17.5	Lightly thinned and declining mature pines above dense younger pine and hardwood cohorts. Important riparian, wetland, and vernal pool protection conditions.	(Low/medium) decline of pine may accelerate though good site suitability for healthier pine and hardwood components.	Same as Stand 1. – individual and group selection of declining white pine in northern upland, while buffering isolated wetland.	50.2
7 – HH (hemlock/ hardwood)	22.5	Overstocked hemlock on growing sites of varied quality. Serves important protective function for significant isolated wetland systems.	(Medium) – Potential high hemlock decline, lack of diversity and abundance at all levels. Good hemlock growing sites provide some resistance.	Same as Stand 1. – thinning from below, crown thinning hemlock and releasing hardwood seed trees in small gaps to promote greater species and age diversity.	76.1
8 – WO (white pine/oak)	10.1	Stony and droughty upland with high proportion of oak and young white pine.	(Low) – Adequate diversity of site- and future-climate-suited species.	Same as Stand 1. – individual and group selection of declining white pine and hemlock.	55.4

Stand 1. White Pine / Oak

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	1	WO	38.9	17.3"	169 sq ft.	21.41 MBF 5.1 CDS	60-RO

Overstory	*Canopy Height*	**>50'**
	% Canopy Cover	**>80%**
	Canopy Gaps	**Occasional small**
	Stocking Level	**Adequate**
	Distribution	**Somewhat variable**
	Type	**White pine / oak**
	Species Diversity	**Moderate**
	Species Present	**WP, BO,WO, RM, RO, HK, BB**
	Forest Health	**Relatively low concern: some age/species/structural diversity to overcome potential species decline**
	% at-risk trees	**24%**
Midstory	*% cover*	**30%**
	Distribution	**Variable**
	Type	**Oak-Hardwood**
Understory	*% cover (woody)*	**10%**
	Distribution	**Patchy**
	Type	**Mixed**
Regeneration	*Seedling/Sapling Diversity*	**low**
	Species Present	**HK, AB, RM, BB, WP, RO**
	% At-Risk Trees	**50%**
	Browse Impact	**High in places**
Invasive Species	*% Cover*	**1%**
	Species Present	**Japanese barberry, multiflora rose**
Other Habitat Characteristics	*Soft Mast*	**Lacking**
	Leaf Litter	**Adequate**
	Course Woody Material	**High**
	Fine Woody Material	**High**
	Standing Dead Trees	**Abundant**

Stand Narrative Stand 1 is located in the northern portion of the east parcel, surrounding the wetland complex around Otter Pond (Stand 2) on the northern side. The stand is defined by significant steep glacial eskers that formed with the deposition of deep till and sand deposits that form somewhat of ring around Otter Pond. Most of the terrain is rocky and rolling and soils are a variety of deep, well-drained fine sandy loams of the Canton, Cardigan-Kearsarge, Quonset, and Warwick Series. These soils are all well suited to oak and pine growth, with some variability in suitability between oak and pine. Warwick and Cardigan-Kearsarge are excellent pine sites,

whereas Quonset and Canton soils support more productive oak growth. These patterns are born out in the forest. The more upland sites (Cardigan and Warwick) have notably higher quality pine than oak, and vice versa.

The distribution of species varies somewhat across the stand. On average white pine is the dominant species, with a substantial proportion being of very large height and diameter. Black oak and white oak are the next most abundant species. Red oak is important in the stand, and although less dense than the others, it is typically much larger and of higher quality. Red maple, black birch and hemlock are associated species, largely occupying emergent midstory positions. Oaks and pine are also present in the midstory at a low density. The understory has a typically low density of moderate to high shade tolerant species, especially American beech and hemlock, and including areas with greater numbers of white pine, red oak, black birch, and red maple. American chestnut sprouts are also common, though severely blighted. Other understory species common in places in the stand include lowbush blueberry, witch hazel, mountain laurel, and serviceberry.

Habitat Natural dynamics and past disturbance are responsible for the multi-age, multi-size structure in this stand, which generally supports good forest health and wildlife habitat conditions. Evidence of past pine weevil infestation among large overstory pines leaves trees with multiple stems and asymmetrical crowns. These, and other large trees have seen a good amount of storm damage which has yielded abundant snags and large deadfall branches and trunks. These structural components support a rich food web of decomposers and insectivores and provide important denning and nesting cavities. Ovenbird and veery both nest on forest floors that have ample woody and leafy material available for cover. Many other warblers, thrushes, woodpeckers, and other songbirds forage for invertebrates that lives in rotting woody material in the understory. Ruffed grouse may also use large downed logs for drumming during the mating season.

Large diameter trees in the vicinity of the Otter Pond wetland complex also provide ideal nesting sites for stick-nesting birds, especially raptors. Large and limby pines also provide nesting and foraging sites for flycatchers, woodpeckers, and some songbirds. The high density of mature pines here is preferred by a number of songbirds, including pine warbler, Blackburnian warbler, black-throated green warbler, and hermit thrush. Weaknesses in bird habitat quality in this stand include a lack of gaps large enough to support birds that nest in young forest.

Climate Change & Adaptation This stand is considered to have relatively low vulnerability to climate change, compared with some of the other pine dominated stands on the property. White pine is not considered a climate-adapted species in our region. White pine decline is expected to increase as springs and early summers become consistently wetter and droughts become more common later in the summer. As white pines decline and die, the stand's short term carbon sequestration and storage capabilities will decrease. Though pine constitutes the majority of the canopy, there is a relatively good mix of climate suited hardwoods, especially oak species, red maple and black birch in the overstory and midstory that will benefit from pine's decline which is the why, in the long term, it can be considered fairly resilient in the face of climate change.

Selectively removing overstory pine would accelerate the succession of the stand to a more mixed composition, taking care to leave the healthiest pine to provide a long-term source of seed and to maintain the mature pine habitat benefits. Opening new small gaps would also provide the space for new growth of species with a greater range of shade tolerance than is presently in the understory, likely increasing net carbon sequestration rates in the long term. Harvesting should be limited to the most accessible, least favourable pine growing sites that don't disturb recreational or aquatic resources.

Stand 1. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Low	**Short-Term:** White pine decline may accelerate as the combined stresses of pest/pathogen damage and drought increasingly impact mature trees. **Long-Term:** Mixed pine and oak species should fare well overall here. The site is well-suited for the current mix of cover types, with the exception of occasional large, weevil-damaged white pine, which are already showing natural decline.
Forest Strata	**Climate Vulnerability and Adaptation Options**
* Canopy	**Vulnerabilities:** Good representation of site-suited species helps to minimize the vulnerability in this stand. **Carbon:** Carbon storage is at a level expected for this forest type, site condition, and stocking level (78th percentile of carbon stocking in northeastern coastal zone). **Adaptation:** Promoting species diversity will help with long-term resiliency.
* Midstory	**Vulnerabilities:** Some age diversity of site-suited species helps to minimize the vulnerability in this stand. **Carbon:** The growth of trees in this layer varies within the stand. More open canopy conditions allow for rapid sequestration and increased storage, whereas closed canopy maintain low levels of sequestration and storage. Decline/removal of overstory trees from natural disturbance will create light conditions for a dynamic picture of carbon sequestration and storage across the stand. **Adaptation:** Releasing diverse, healthy trees in this layer will sustain the suitable forest type for this site.
* Regeneration	**Vulnerabilities:** Tree regeneration is sporadic and patchy and consists of species with generally lower future suitability. **Carbon:** Sequestion and storage could be increased substantially by allowing additional area of tree growth to be established. **Adaptation:** Providing more sunlight to the forest floor and expanding gaps can help to increase the desired regeneration component.

Stand 1. Desired Future Condition

Increased biodiversity through the natural and assisted succession of native vegetation, unimpeded by excessive browse and exotic invasive plants is the desired future condition. The current cover types present in the stand should be maintained, while promoting an increased share of site-suited species at all levels of the stand. Maintaining healthy and vigorous trees while providing conditions for the establishment of diverse tree regeneration will help this stand to provide important ecosystems services including soil and water quality protection, carbon storage and sequestration, and enhance the valuable wildlife habitat qualities in the stand. Monitoring deer browse and the spread of invasive plants in natural and created canopy gaps, will

be important for determining whether targeted interventions would be beneficial. Setting aside riparian areas, recreational use area, and areas with vulnerable saturated soils or steep slopes as reserves will protect important functions. Hazardous trees in the vicinity of trails may be best to cut and leave in place.

Stand 2. Beaver Pond – Wetland Complex

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	2	BP	15.5	n/a	n/a	n/a MBF CDS	n/a

Overstory	*Canopy Height*	**10'-40'**
	% Canopy Cover	**0-5%**
	Canopy Gaps	**n/a**
	Stocking Level	**n/a**
	Distribution	**Small patches of trees**
	Type	**Swamp Hardwoods**
	Species Diversity	**Low**
	Species Present	**RM, WA, WP**
	Forest Health	**No concern – under natural disturbance dynamic**
	%at-risk trees	**10%**
Midstory	*% cover*	**0-25%**
	Distribution	**Variable**
	Type	**Shrub Swamp**
Understory	*% cover (woody)*	**50-100%**
	Distribution	**Variable**
	Type	**Shallow Marsh, Shrub Swamp**
Regeneration	*Seedling/Sapling Diversity*	**Low**
	Species Present	**RM**
	% At-Risk Trees	**0%**
	Browse Impact	**Low**
Invasive Species	*% Cover*	**2%**
	Species Present	**Multiflora rose, Phragmites**
Other Habitat Characteristics	*Soft Mast*	**High**
	Leaf Litter	**Adequate**
	Course Woody Material	**Adequate**
	Fine Woody Material	**Adequate**
	Standing Dead Trees	**Adequate**

Stand Narrative Stand 2 consists of the open water of the Otter pond and a continuum of vegetated wetland conditions ranging from shallow marsh to shrub and red maple dominated swamp. This flat and low depression has developed soils that are very deep and very poorly drained formed in thick organic deposits. The dominant

soil type is of the Freetown Series. This is a fairly dynamic system that is determined by depth of water over the course of the year which is function of precipitation, underlying topography of the area, and conceivably the extent and condition of beaver dams on the watershed. Vegetation ranges from floating and submergent plants, interspersed and bordered by emergent cattails, bulrushes, grasses, rushes, and sedges. Waterlogged edges are dominated by shrubs such as winterberry, elderberry, gray dogwood, highbush blueberry, and steeplebush. Trees occur mainly on the southern basin edge and the vast majority are pole-sized red maple and occasional white ash and white pine. A shifting seasonal and annual water table has left many snags, especially of less flood tolerant softwoods within the wooded marsh and edges.

The stand appears to be functioning as a healthy and dynamic beaver influence wetland occupied primarily of a great diversity of native plants. Small patches of phragmites have established in coves along edges of the stand. This non-native invasive is able to completely exclude other plants where it grows and can be a major threat to native biodiversity where it becomes dominant in marshes. While not a major problem at present, it's spread is a significant concern. Of less immediate concern, but no less problematic, is the presence of mature multiflora rose within shrub and wooded swamp areas.

Habitat This area is the core of the wildlife habitat of statewide importance on the property. A large number of species potentially utilize this area, which has characteristics vital to the lifecycles of diverse taxa, including amphibians, reptiles, mammals and birds, especially waterfowl. Shrub-dominated wetlands and forested wetlands provide ideal nesting and foraging for an array of birds, including black-and-white warbler, American redstart, veery, Canada warbler, and American woodcock. American redstart prefers to nest low on maple trees, which are abundant in this stand. This area also provides important diversity to the property in that it hosts abundant fruiting shrubs or soft mast species. Gray catbird, hermit thrush, scarlet tanager and cedar waxwing all enjoy the nutrient-rich fruits of the shrub layer found here such as winterberry.

Climate Change & Adaptation The threat of climate change on the diverse conditions found in this stand is uncertain but if the current hydrological regime of beaver and human influenced drainage continues, the ecosystem should be highly resilient. The shifting mosaic of beaver-influenced vegetative communities should continue to provide valuable refuge for a wide range of species despite the expected climatic impacts. Beavers are incredibly adaptable and are well suited to a wide range of climates. Even with intensified heat, precipitation and storm events that could directly or indirectly impact the beaver population or hydrology, the topography and soils should allow wetland conditions to persist and rebound. The threat of rapid spread of wetland invasive plants is the largest concern and should be preventatively controlled before allowed to degrade the quality of the habitat.

Stand 2. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Low	**Short-Term:** Diverse vegetative conditions will allow for rapid adaptation of the stand and continued provision of valuable habitat.

	Long-Term: Improved growing conditions and competitiveness of invasive plants could degrade some of the habitat quality, biodiversity, and resilience.
Forest Strata	**Climate Vulnerability and Adaptation Options**
*** Canopy**	**Vulnerabilities:** White pine and ash susceptible to mortality due to pests/pathogens. **Carbon:** Open light conditions are tempered by limited growth rates due to the high water table. **Adaptation:** Allow natural disturbance to create conditions for natural succession. Any regeneration of site-suited hardwoods in the diverse light conditions along the significant wetland edge are vulnerable to selective use by beavers.
*** Midstory**	**Vulnerabilities:** Relatively low abundance and species diversity at this level but high proportion of red maple is well-suited for site conditions. **Carbon:** Open light conditions are tempered by limited growth rates due to the high water table. **Adaptation:** Efforts to improve age and species diversity here would be tempered by beaver activity.
*** Regeneration**	**Vulnerabilities:** Red maple is well-suited for site conditions. **Carbon:** Open light conditions are tempered by limited growth rates due to the high water table. **Adaptation:** Allow natural disturbance to maintain diverse conditions for a variety of species to establish in. It's important that good species diversity is maintained across the property to allow for the potential of site-suited species to regeneration naturally.

Stand 2. Desired Future Condition

The desired future condition of this vital habitat is sustained ecological integrity and protected habitat quality from both within the property and the surrounding landscape. Passively allowing natural disturbance and succession to occur will sustain most benefits in the stand. Responding to invasive plant infestations is the most pertinent active prevention of habitat degradation. As an interconnected system, the land within the watershed of the pond, both upstream and downstream has a role in preserving the health and integrity of the ecosystem as well.

Stand 3. White Pine

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	3	WP	22.8	14.0"	153 sq ft.	16.24 MBF 8.8 CDS	64-WP
Overstory			*Canopy Height* *% Canopy Cover*			**>60'** **>80%**	

OBJECTIVE CODE: CH61 = stands classified under CH61/61A/61B STEW= stands not classified under CH61/61A/61B
STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

	Canopy Gaps	**Small, irregular**
	Stocking Level	**Adequate**
	Distribution	**Regular, partially lightly thinned in past**
	Type	**White pine**
	Species Diversity	**Low**
	Species Present	**WP, HK, BO, WO, RO, RM, BB**
	Forest Health	**Moderate-high concern: low diversity to overcome potential species decline, tempered somewhat by good growing sites**
	%at-risk trees	**92%**
Midstory	*% cover*	**15-35%**
	Distribution	**Scattered with moderate density patches**
	Type	**Hemlock-hardwood**
Understory	*% cover (woody)*	**1-20%**
	Distribution	**Scattered with small patches**
	Type	**Hemlock-hardwood**
Regeneration	*Seedling/Sapling Diversity*	**low**
	Species Present	**HK, RM, AB, BB, YB, WP**
	% At-Risk Trees	**50%**
	Browse Impact	**Negligible**
Invasive Species	*% Cover*	**1%**
	Species Present	**Japanese barberry, phragmites**
Other Habitat Characteristics	*Soft Mast*	**Very low**
	Leaf Litter	**Adequate**
	Course Woody Material	**Medium**
	Fine Woody Material	**Adequate**
	Standing Dead Trees	**Moderately abundant**

Stand Narrative Stand 3 is located in the southwestern portion of the eastern parcel between Hoe Shop Road and Otter Pond and the associated open field (Stand 5a). It comprises a largely even-aged white pine forest that has been thinned lightly in the majority of the stand at least a few decades ago. Evidence of past cutting also includes frequent large muti-stemmed red, black and white oaks in places. An mature and emergent overstory and midstory of hemlock is present throughout most of the stand, as well as occasional black birch and red maple. Scattered hardwoods including black birch, red maple, red/black/white oak are also found in the midstory, especially in and around small gaps created in past thinning. The understory is sparsely populated by shade tolerant beech, yellow/black birch and hemlock except for small gaps where black birch, hemlock, white pine and red maple grow in moderately dense pockets. Striped maple, hophornbeam, witch hazel, highbush blueberry, mountain laurel, and sweetfern also populate the understory at typically low densities.

The stand encompasses the central drainage of the eastern parcel which feeds Otter Pond from a shrub-dominated swamp in the south of the stand. A densely overstocked stand of pure white pine lies just to the east of the drainage and shrub swamp. The quality and health of trees in this area is drastically lower than the rest of

the stand, having regrown from open conditions and having all the associated defects from past white pine weevil infestation (multi-stemmed, limby, crooked) and having passed the optimal time to thin the stand to promote the healthiest individual trees. The other forest health concern is the presence of occasional invasive exotic plants, mostly in moist soils but also scattered throughout the woods. Japanese barberry is the main presence, and phragmites occurs on the edge of the swamp.

The landform here is gently sloping and rolling terrain among occasional steep pitches on the slopes of glacial eskers. Soils are primarily of the Cardigan-Kearsarge Complex. These are excessively well-drained, rocky soils with frequent outcrops and shallow on slopes, making them prone to erosion if thinned too heavily. These are well-suited, if not very productive, for pine and oak growth and regeneration. The flat and low terrain in and around wetlands consist of poorly drained Whitman soils which are very poor for tree growth.

Habitat Like in stand 1, The high density of pines is preferred by a number of songbirds, including pine warbler, Blackburnian warbler, black-throated green warbler, and hermit thrush. Also like stand 1, but more pronounced in this more even-aged stand, canopy closure has progressed such that there is a lack of gaps large enough to sustain nesting sites for interior-forest birds that nest in young forest patches. This stand's canopy is also much less compositionally diverse than stand 1, so birds who prefer hardwoods would likely not thrive here. The variety of wetland conditions that occur in the stand provide important habitat diversity for numerous species.

Climate Change & Adaptation White pine and hemlock are at high risk from climate change-exacerbated pest infestations, temperature rise, and drought. However, most of the pine and hemlock in the stand occurs in relatively cool micro-climates on north or east facing aspects within pockets of rolling terrain or sites with good moisture availability in the vicinity of wetlands, both conditions should remain relatively suitable. These good growing sites potentially provide pine and hemlock the means to resist worsened drought and pest outbreaks, respectively. At the same time, these refuges benefit the aquatic ecosystem by holding the soil, filtering water, and cooling water temperatures, which is vital to many wildlife species.

The lack of diversity of species and age in the stand reduces its inherent resilience in the face of climate change. These traits, while maintained to a degree by natural disturbance, would be enhanced with active management of the overstory, with the goals of reducing the proportion of relatively vulnerable species and promoting a greater diversity of species and allowing advanced regeneration to develop and create space for new trees where they are currently lacking. Red oak, for instance, is a well-suited species that is currently underrepresented and is too shade intolerant to establish reliably without management. Monitoring the impact of deer browse on seedlings of desirable species such as oak, as well as the spread of invasive species will be important for the long-term resilience of the stand.

Stand 3. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon

Low/medium	**Short-Term:** White pine and hemlock decline may accelerate as the combined stresses of pest/pathogen damage and drought increasingly impact trees. **Long-Term:** Mixed pine, hemlock, and hardwood species should fare well overall here. The site is well-suited for the current mix of cover types, with varying suitability for different species across different site conditions.
Forest Strata	**Climate Vulnerability and Adaptation Options**
*** Canopy**	**Vulnerabilities:** Disproportionate abundance of vulnerable species (white pine & hemlock) and lack of abundance and diversity of potentially more site-suited species. **Carbon:** Carbon storage is at an adequate level for this forest type, site condition, and stocking level (68th percentile of carbon stocking in northeastern coastal zone). **Adaptation:** Increasing species diversity will help with long-term resiliency.
*** Midstory**	**Vulnerabilities:** Relatively low abundance and species diversity at this level and high proportion of relatively vulnerable hemlock means desirable replacements for overstory trees are not well established. **Carbon:** The high shade environment in most of the midstory yields low sequestration and storage of slow growing shade tolerant species. **Adaptation:** Improving age diversity by helping trees in the understory develop a more robust midstory will help sustain a suitable species mix.
*** Regeneration**	**Vulnerabilities:** Diverse tree regeneration is at risk of mortality from overstory/midstory competition which favors highly shade tolerant hemlock and beech across much of the stand. **Carbon:** Sequestration and long-term storage could be increased substantially by releasing this layer from overstory competition and establishing additional area for regeneration. **Adaptation:** Creating conditions for species with a range of shade tolerances to establish and develop will increase resilience of the stand in the face of climate exacerbated decline of overstory trees.

Stand 3. Desired Future Condition

The desired future condition is improved species and age diversity to increase the resilience of the stand to climate change-exacerbated natural disturbance especially invasive pests, fungal pathogens, and drought. The stand should also continue to provide interior forest habitat qualities and continue to protect riparian habitat and soil and water quality. While passive management and reliance on the disturbance regime of the stand (fluctuating water table, blowdown, species decline from pests/pathogens) may ultimately accomplish these goals, actively promoting desirable, site-suited species that are predicted to fare well in our region (eg. oak and hickory species) will decrease the vulnerability of stand while sustaining and enhancing the beneficial, dense forest wildlife habitat qualities created in previous thinning. Like Stand 1., monitoring deer browse and the spread of invasive plants in natural and created canopy gaps, will be important for determining whether targeted interventions would be beneficial. Setting aside riparian areas, recreational

use area, and areas with vulnerable saturated soils or steep slopes as reserves will protect important functions. Hazardous trees in the vicinity of trails may be best to cut and leave in place.

Stand 4. White Pine / Mixed hardwood

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	4	WH	22.6	15.6"	210 sq ft.	19.29 MBF 10.3 CDS	63-WP

Overstory	*Canopy Height*	**>60'**
	% Canopy Cover	**>80%**
	Canopy Gaps	**Small, occassional**
	Stocking Level	**Overstocked**
	Distribution	**Variable**
	Type	**White pine hardwood**
	Species Diversity	**High**
	Species Present	**WP, BO, RO, WO, RM, HK, HIC, SM, BB**
	Forest Health	**Low concern: adequate diversity to overcome potential species decline**
	%at-risk trees	**38%**
Midstory	*% cover*	**10-33%**
	Distribution	**Variable**
	Type	**Hemlock hardwood**
Understory	*% cover (woody)*	**10-33%**
	Distribution	**Variable**
	Type	**Hemlock hardwood**
Regeneration	*Seedling/Sapling Diversity*	**High**
	Species Present	**HK, BB, AB, WP, RM, SM, YB, RO**
	% At-Risk Trees	**50%**
	Browse Impact	**Negligible**
Invasive Species	*% Cover*	**1%**
	Species Present	**Japanese barberry**
Other Habitat Characteristics	*Soft Mast*	**Lacking**
	Leaf Litter	**Adequate**
	Course Woody Material	**High**
	Fine Woody Material	**Moderate**
	Standing Dead Trees	**Adequate**

Stand Narrative Stand 4 is located in the southeast of the eastern parcel. This is a highly varied stand in terms of terrain, soils, species composition and distribution. The unifying characteristic is the important presence (roughly 25% of basal area) of well-spaced, large white pine. The stand is also defined in two characteristic

qualities: flatter low-lying terrain with poorly drained soils (Walpole & Whitman Soils) adjacent to the central wetland complex and drainages, and more rocky, rolling upland terrain associated with glacial eskers (Canton, Cardigan, Kearsarge, Dutchess, and Merrimac). On average these soils provide good growing sites for white pine and red oak which are found throughout the stand. Enriched sites such as those on Dutchess-Cardigan soils can support good growth of a wider range of hardwoods, and this is reflected in the higher proportions of white oak, black oak, sugar maple, and hickory species that occur here. Red maple and hemlock are the main associates on thinner soils, both of more poorly drained and droughty soils alike, illustrating their adaptability.

The tree canopy is mostly completely closed across the stand, with the exception of small gaps largely due to blowdown or snapped large white pines and weaker, shorter-lived hardwoods like red maple and white birch. Low- to medium-density midstory and understory trees are scattered or concentrated around small gaps. Hemlock and red maple make up the bulk of the midstory, along with occasional oaks, black birch, yellow birch, hickory, black cherry, and white ash. Tree regeneration consists largely of hemlock, beech, black/yellow birch, red maple and occasional sites where white pine, sugar maple, and red oak are slightly more prevalent. Also scattered at a low density throughout the understory is striped maple, witch hazel, American hornbeam, mountain laurel, and American chestnut sprouts.

Forest health is good for the most part. The hemlock component has seen defoliation or thinned foliage from past and present infestations by the exotic invasive insects, hemlock woolly adelgid and elongate scale, both of which were identified during field work. In spite of this, hemlock appears generally healthy and not in steep decline here, likely due to the suitability of the growing sites where it is most commonly found. Low densities of the invasive Japanese barberry were identified, especially in the north of the stand in the vicinity of the Otter Pond wetland complex.

Habitat Similarly to Stands 1 & 3, there are dense, closed canopy conditions with small gaps and little vertical heterogeneity in this stand, and thus there are some beneficial qualities for interior forest birds but nesting sites in patches of young growth are lacking. Also like the other stands, there is a riparian and bordering wetland aspect to the habitat which provides cover for numerous species. In particular, significant areas of flat saturated soils in the north of the stand bordering swamp are ideal for American Woodcock. The habitat quality that sets this stand apart from the rest of the stands on the property is the proportion of mature hardwoods. The hardwood component provides abundant hard and soft mast in the form of acorns, hickories and black cherries. Hard mast is an important food source for blue jays, wild turkeys, and mammals. Cherries are a nutrient-rich food for many songbirds, including scarlet tanagers, cedar waxwings, thrushes, and woodpeckers. Hardwood-dominated areas are also favored by some interior forest birds such as eastern wood peewee, wood thrush, ovenbird, and American redstart. Ovenbird and wood thrush may find this area suitable for foraging and nesting in leaf litter in open understory conditions.

Climate Change & Adaptation Like Stand 3, white pine and hemlock are at high risk from climate change-exacerbated pest infestations, temperature rise, and drought. However, most of the pine and hemlock in the stand occurs in relatively cool, moist micro-climates that should remain highly suitable and provide the growing conditions to potentially provide these species the means to resist worsened pest/pathogen outbreaks. These softwood refuges also benefit the aquatic ecosystem by holding the soil, filtering water, and cooling water temperatures, which is vital to many wildlife species.

The diversity of species at all levels across the stand lends it some inherent resiliance in the face of climate change, especially given the proportion of species considered well suited to future climates here such as the oak species, hickories, maples, birches and black cherry. The dense canopy and lack of abundance in the lower stand levels will continue to favor the regeneration of shade tolerant species of lower climate suitability such as hemlock and beech. The diverse terrain and soil conditions across the stand lends itself well to site-specific management with the goal of promoting a variety of more suitable species across a continuum of site richness from maples, birches and cherry to hickories and oaks.

Stand 4. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Low	**Short-Term:** White pine and hemlock decline may accelerate as the combined stresses of pest/pathogen damage and drought increasingly impact trees. **Long-Term:** A wide variety of hardwoods and hemlock and pine should fare well overall here, with varying suitability for different species across different site conditions.
Forest Strata	**Climate Vulnerability and Adaptation Options**
* Canopy	**Vulnerabilities:** Good diversity of site-suited species helps to minimize the vulnerability in this stand. **Carbon:** Carbon storage is at a level expected for this forest type, site condition, and stocking level (92nd percentile of carbon stocking in northeastern coastal zone) **Adaptation:** Maintaining good species diversity will help with long-term resiliency
* Midstory	**Vulnerabilities:** Relatively low abundance and high proportion of relatively vulnerable hemlock means desirable replacements for overstory trees are not well established. **Carbon:** The high shade environment in most of the midstory yields low sequestration and storage of slow growing shade tolerant species. **Adaptation:** Improving age diversity by helping trees in the understory develop a more robust midstory will help sustain a suitable forest type for this site.
* Regeneration	**Vulnerabilities:** Diverse advanced tree regeneration is suppressed by overstory competition which favors highly shade tolerant hemlock and beech across much of the stand. **Carbon:** Sequestion and storage could be increased substantially by releasing this layer from overstory competition and establishing additional area for regeneration. **Adaptation:** Creating conditions for species with a range of shade tolerances to establish and develop will increase the ability of the stand to respond to predicted and unknown climate-exacerbated decline of overstory trees.

Stand 4. Desired Future Condition

The desired future condition is sustained species diversity across all levels of the stand and increased abundance of species of a range of shade tolerance in the lower levels. Interior forest habitat qualities should be sustained to continue to protect soils and water quality. While passive management and reliance on the disturbance regime of the stand (fluctuating water table, blowdown, species decline from insect pests) will accomplish these goals, actively promoting desirable, site-suited species including oaks, hickories, sugar maple, and black cherry will decrease the vulnerability of stand while enhancing wildlife habitat qualities, and ensure that the desired conditions are created. Monitoring the impact of deer browse on seedlings of desirable species such as oak, as well as the spread of invasive species will be important for the long-term resilience of the stand. Setting aside riparian areas, recreational use area, and areas with vulnerable saturated soils or steep slopes as reserves will protect important functions. Hazardous trees in the vicinity of trails may be best to cut and leave in place.

Stand 5. Grasses and Forbs

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	5a 5b 5c	GF	2.1 1.8 8.719	n/a	n/a	n/a	n/a

Overstory	*Canopy Height*	**20-60'**
	% Canopy Cover	**1%**
	Canopy Gaps	**n/a**
	Stocking Level	**None**
	Distribution	**Scattered**
	Type	**Northern hardwood**
	Species Diversity	**Low**
	Species Present	**RM, WA**
	Forest Health	**Low concern**
	%at-risk trees	**33%**
Midstory	*% cover*	
	Distribution	**n/a**
	Type	
Understory	*% cover (woody)*	**5%**
	Distribution	**Highly variable**
	Type	**Shrubs**
Regeneration	*Seedling/Sapling Diversity*	**low**
	Species Present	**RM, BB, WA**
	% At-Risk Trees	**50%**
	Browse Impact	**Negligible**
Invasive Species	*% Cover*	**5%**

OBJECTIVE CODE: CH61 = stands classified under CH61/61A/61B STEW= stands not classified under CH61/61A/61B
STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

	Species Present	**Japanese barberry, multiflora rose, glossy buckthorn**
Other Habitat Characteristics	*Soft Mast*	**Low**
	Leaf Litter	**Low**
	Course Woody Material	**None**
	Fine Woody Material	**Low**
	Standing Dead Trees	**Very Low**

Stand Narrative Stand 5 consists of three distinct maintained open fields. 5a lies directly upslope to the south of Otter Pond on a slight north-facing rise. This area is associated with a demolished home-site and has been kept open for its aesthetic appeal and recreational use. 5b is a flat rectangular hayfield off of the west side of Hoe Shop Road and adjacent to the cut out house lot in that part of the property. 5c is a long narrow plain adjacent to the Fall River and a small upland meadow that marks the northwest of the property.

These areas provide scenic and recreational diversity as well as early successional habitat that is vital for some species and utilized at various times in the lifecycles of numerous others. All three sites are occupied by a mixture of grasses and forbs as well as various interspersed shrubs, young trees and occasional large open-grown trees. 5c includes the strip of trees along the banks of the Fall River. Small numbers of exotic invasive barberry, multiflora rose and glossy buckthorn are scattered throughout and at the margins of these sites, and are mostly kept in check by periodic mowing.

Habitat The habitat value of these openings in relation to the closed canopy forest and aquatic ecosystems across the property is high. Beneficial qualities include a diversity of plant species not found elsewhere in the property, on the edge habitat transition from herbaceous plants to shrubs and young trees. This structure benefits a variety of species that utilize these areas at various times in their lifecycles. Habitat qualities could be marginally improved through passive and active means, though these should be balanced with the scenic and recreational values of these sites. In the case of 5a and 5b, important access for management activities in other stands is also a consideration.

Climate Change & Adaptation The current vegetative community in this stand has relatively low vulnerability to climate change. As the most actively managed area on the property, the goals and management practices employed stand to have a large impact on the climate vulnerability on the long-term. In general, as an area managed for early successional habitat and recreational access, the chief climate-related issues that this stand will face in the future are the likely increases of invasive plant competitiveness and deer browsing. Invasive management is fairly straightforward, but diligence and quick action are required to minimize costs associated with management. Combatting deer browsing is less straightforward. Deer likely frequent these areas due to the density of low browse available throughout the year which must lead to a decrease in herbaceous and woody species diversity. This is detrimental to the overall biodiversity, since the habitat will support fewer specialized insects and will favor the spread of invasive exotic plants.

Stand 5. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Low/medium	**Short-Term:** Regular mowing may increase vulnerability of soils to erosion during more extreme precipitation events. **Long-Term:** A growing deer herd and temperature increase may lead to a build up of invasive plant species and further loss of biodiversity.
Forest Strata	**Climate Vulnerability and Adaptation Options**
* Canopy	**Vulnerabilities:** Emerald ash borer threatens to kill much of the ash in the stand in the next several years. **Carbon:** n/a **Adaptation:** Selectively treating ash with a systemic herbicide to kill EAB may help maintain this species' presence on the property.
* Regeneration	**Vulnerabilities:** Brush hogging keeps shrubs/trees at deer browse height and favors invasive shrub spread. **Carbon:** Sequestration and respiration of CO2 from decaying plant matter is likely balanced at best and there may be a net loss of carbon here. **Adaptation:** Devote forest and stream edge buffers to allowing dense shrub/trees to establish and grow and remove invasive plants.

Stand 5. Desired Future Condition

The desired future condition is primarily for these areas to continue to provide valuable habitat diversity and recreational access for the property. Setting up an intentional mowing rotation where some areas are mowed annually to maintain grass and forb cover and facilitate recreational access, while others are allowed to grow up to woody cover and either brush-hogged less frequently or succeed into young forest, could enhance the wildlife habitat and resistance to climate impacts of this stand. In particular, shrub and tree dominance in places with saturated or periodically flooded soils would likely have a soil stabilization benefit as well as increasing valuable bird nesting and cover conditions. Any change to the mowing regime should be coupled with a program for controlling invasive plants either annually or biennially.

Stand 6. White Pine/hardwood

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	6	WH	17.5	16.8"	147 sq ft.	15.68 MBF 3.7 CDS	70-WP

OBJECTIVE CODE: CH61 = stands classified under CH61/61A/61B STEW= stands not classified under CH61/61A/61B
STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

STAND DESCRIPTIONS

Overstory	*Canopy Height*	**>60'**
	% Canopy Cover	**>80%**
	Canopy Gaps	**Small, occasional**
	Stocking Level	**Adequate**
	Distribution	**variable**
	Type	**White pine hardwood**
	Species Diversity	**Low**
	Species Present	**WP, RM, BB, BO, WO**
	Forest Health	**Medium concern: inadequate diversity to overcome potential species decline**
	%at-risk trees	**59%**
Midstory	*% cover*	**10-33%**
	Distribution	**Variable**
	Type	**Oak - hardwood**
Understory	*% cover (woody)*	**10-33%**
	Distribution	**Variable**
	Type	**Hemlock - hardwood**
Regeneration	*Seedling/Sapling Diversity*	**low**
	Species Present	**HK, RM, AB, BB**
	% At-Risk Trees	**50%**
	Browse Impact	**Negligible**
Invasive Species	*% Cover*	**1-5%**
	Species Present	**Japanese barberry, multiflora rose, glossy buckthorn**
Other Habitat Characteristics	*Soft Mast*	**Very low**
	Leaf Litter	**Adequate**
	Course Woody Material	**High**
	Fine Woody Material	**Abundant**
	Standing Dead Trees	**Abundant**

Stand Narrative Stand 6 is located in the northwest of the western parcel, occupying the riparian forest along an unnamed drainage and the slopes rising to the east to a nearly flat terrace above the houselot cut-out. The bottomland portion of the stand has predictably wet soils. The soils and sharply rising slopes to the north and east make this part of the stand unfeasible for management involving machine access. There is an old cement foundation dug into the bottomland area that is speculated to be the site of an old fish hatchery. The upland plateau portion is much more favorable for access and operability, except for the presence of depressions in the rolling terrain that are seasonally wet and likely serve as vernal pools and should thus be buffered with undisturbed cover to protect these important habitat features.

The unifying characteristic of the stand is the dominance of large overstory white pine. Associated species in the overstory are small components of hemlock, red maple, black birch, black oak and white oak. The oldest of the white pine is of relatively low timber quality, likely being open grown from pasture and having sustained damage

from white pine weevil and subsequent wind and ice storms. At this stage it appears to be in a long period of decline, with large standing dead, snapped, and blowdown pines found at fairly regular intervals. This, in combination with past light thinning in the most accessible sites has created a second age-class of overstory white pine which are smaller, healthier and with fewer form defects.

Beneath the pine canopy and within small gaps, there is a small scattered mid-story hardwood component that is mostly black birch and red maple, but includes occasional red oak of large pole-size. Within more recent gaps, there are low to moderately dense saplings of hemlock, beech, red maple, and black birch. Witch hazel is somewhat common, especially where soils are moist. In the wettest soils in the bottomland where there is lower overstory density, higher numbers of shrubs and herbaceous plants are found, including dogwoods, winterberry, and elderberry. Unfortunately, this also includes relatively high numbers of invasive barberry, multiflora rose, and glossy buckthorn.

Habitat Conditions in this stand are similar in ways to those found in stand 1., with a high proportion of mature and dead/declining white pine and the habitat complexity created by that structure that benefit interior forest birds that nest in young growth in small gaps. However, unlike Stand 1. there is less tree species diversity and a greater dominance of pine, which favors mature forest birds that prefer pine such as pine warbler, and doesn't favor those that a hardwood component like ovenbird. Additionally, there is a significant riparian, wetland and vernal pool component in the stand which has very vertically heterogenous tree/shrub cover and support a wide array of wildlife.

Climate Change & Adaptation Like the other pine-dominated stands on the property, this stand is considered to be somewhat vulnerable to climate change due to climate change-exacerbated impacts of increase in pathogen load from wetter spring and early summer paired with more frequent late season drought, on large pine weevil and storm damaged pines. This stand also has site variability will likely buffer pine from these impacts somewhat, but is also vulnerable for the lack of species diversity and age distribution in the upland portion of the stand. This area also has the highest ease of access and operability to actively improve the stand structure to promote age and species diversity to improve resilience and habitat characteristics.

Stand 6. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Low/medium	**Short-Term:** White pine decline may accelerate as the combined stresses of pest/pathogen damage and drought increasingly impact mature trees. **Long-Term:** Mixed softwood and hardwood species should fare well overall here, with the exception of occasional large, weevil/storm-damaged white pine, which are already showing natural decline.
Forest Strata	**Climate Vulnerability and Adaptation Options**

*** Canopy**	**Vulnerabilities:** Low diversity of site-suited species increases vulnerability.
	Carbon: Carbon storage is at a level expected for this forest type, site condition, and stocking level (65th percentile of carbon stocking in northeastern coastal zone)
	Adaptation: Increased species diversity will help with long-term resiliency
*** Midstory**	**Vulnerabilities:** Low abundance and diversity at this level but relatively high proportion climate-suited hardwoods are desirable replacements for overstory pine.
	Carbon: The high shade environment in most of the midstory yields low sequestration and storage rates.
	Adaptation: Opening the canopy to allow the midstory to grow and diversify the overstory will also create conditions for a more robust midstory with a suitable species assemblage for this stand.
*** Regeneration**	**Vulnerabilities:** Diverse advanced tree regeneration is at risk of mortality from overstory competition which favors highly shade tolerant hemlock and beech across much of the stand.
	Carbon: Sequestion and storage could be increased substantially by releasing this layer from overstory competition and establishing additional area for regeneration.
	Adaptation: Creating conditions for species with a range of shade tolerances to establish and develop will increase resilience of the stand in the face of climate exacerbated decline of overstory trees.

Stand 6. Desired Future Condition

The main desired future condition is to sustain the protective functions for aquatic habitat and soil and water quality that the stand currently performs. Increasing the resilience of the stand by increasing species diversity and age distribution in accessible areas in the north of the stand will build off of the natural succession of mature, low quality pine to a more mixed forest, but will create conditions for more future climate suited species to establish. Monitoring the impact of deer browse on seedlings of desirable species such as oak, as well as the spread of invasive species will be important for the long-term resilience of the stand.

Stand 7. Hemlock / hardwoods

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	7	HH	22.5	15.4"	220 sq ft.	21.6 MBF 17.1 CDS	58-RO

Overstory	*Canopy Height*	**20'-80'**
	% Canopy Cover	**>80%**
	Canopy Gaps	**Small, occasional**
	Stocking Level	**Overstocked**

OBJECTIVE CODE: CH61 = stands classified under CH61/61A/61B STEW= stands not classified under CH61/61A/61B
STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

	Distribution	**Uniform**
	Type	**Hemlock hardwood**
	Species Diversity	**Adequate**
	Species Present	**HK, RM, WO, RO, WP, BB, BO**
	Forest Health	**Moderate concern: lacking diversity to overcome potential species decline**
	%at-risk trees	**60%**
Midstory	*% cover*	**10-20%**
	Distribution	**Variable**
	Type	**Hemlock hardwood**
Understory	*% cover (woody)*	**1-10%**
	Distribution	**Sporadic**
	Type	**Hemlock**
Regeneration	*Seedling/Sapling Diversity*	**Very low**
	Species Present	**HK**
	% At-Risk Trees	**75%**
	Browse Impact	**Undetermined**
Invasive Species	*% Cover*	**0-1%**
	Species Present	**n/a**
Other Habitat Characteristics	*Soft Mast*	**Lacking**
	Leaf Litter	**Lacking**
	Course Woody Material	**Moderate**
	Fine Woody Material	**Moderate**
	Standing Dead Trees	**Moderate**

Stand Narrative Stand 7 is a long upland stand parallel to the west side of Hoe Shop Road. Hemlock dominates all levels of the stand (60% of basal area). Red maple is the chief associate in the overstory and midstories. White oak is the next most common species. Small components of red oak, black oak, white pine, black birch also populate the overstory. The dense closed canopy is interrupted by the occasional dead hemlock or oak, and some snaps and blowdown. These gaps are populated by emerging hemlock, red maple, and black birch. The other interruption in the overstory is within a narrow wetland corridor in the center of the stand that is partially forested by red maple and hemlock and contains a high density of shrubs, particularly winterberry and highbush blueberry, dogwoods, elderberry, and steeplebush.

The dominant soil type is Cardigan-Kearsarge which is poor to moderately productive, which is reflected in the relatively low canopy height in places especially in the more rocky esker slopes. Flatter and lower-lying ground hosts some trees of good to excellent quality. A small remote area west of the central wetland with deeper Warwick soils has yielded especially consistently healthy hemlock.

In spite of the invasive pests that plague hemlock, the hemlock in the stand generally appear healthy. Hemlock is likely very well suited to the sheltered, shady sites with ample water availability in the interior of the stand. HWA is expected to cause more damage on drier and wetter soils than on soils with adequate but not excessive

moisture. The edge of the wetland is less suitable. Changing water levels and exposure to high winds and sun contribute to higher mortality of hemlock here. Trees are likely to decline more rapidly if HWA and EHS are found together or if other stressors such as drought or defoliation are combined with one or both exotic insects. Invasive plants are conspicuously lacking even in the wet soils and road frontage in this stand where they would be expected to occur – a good thing!

Habitat Dense hemlock stands perform an important function in providing good cover for wildlife and protection from the elements during winter months. Hemlock seed is a preferred source of food for chickadees and goldfinches and ruffed grouse will eat both seeds and needles. The twigs are browsed by porcupine, deer, red squirrel, snowshoe hare and cottontail rabbit. Like most stands on the property, the dense forest conditions and small canopy gaps created by natural disturbance contribute to similar conditions on much of the surrounding landscape in favoring habitat for forest interior dwelling wildlife species. As the only hemlock-dominated stand on the property, it provides important conditions that favor bird species that prefer hemlock such as black-throated green warbler, blue-headed vireo, brown creeper, and mourning warbler. The saturated soils and shrub-dominated and forested wetlands within the stand also provide rich habitat for numerous species.

Climate Change & Adaptation Like the other softwood stands on the property, hemlock is generally at risk from climate change-exacerbated pest levels, temperature rise, and drought. Warm winter temperature and summer drought are important factors in mortality of HWA or EHS infested hemlocks. The combined stress in these areas also weakens hemlock trees and increases their likelihood of breakage, blowdown, and death in climate change-intensified storm events. Relatively low species diversity and lack of young forest growth other than hemlock, also puts the stand at risk of overdominance of this species in the long term.

Like in other stands, on the positive side, much of the hemlock stand occurs in relatively cool, moist micro-climates that should remain highly suitable growing sites. These good growing conditions potentially provide hemlock the means to resist worsened pest outbreaks. At the same time, these hemlock refuges benefit the aquatic ecosystem by holding the soil, filtering water, and cooling water temperatures, which is vital to many wildlife species. In spite of the site favorability of hemlock, the potential to promote other site-suited species is present, with good seed trees oaks and other hardwoods represented. These could be released from overstory competition in conjunction with creating canopy gaps to give enough space to regenerate species with a range of shade tolerances.

Stand 7. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	Vulnerability Time Horizon
Moderate	**Short-Term:** Lack of diverse tree regeneration beneath main canopy; hemlock dominant. **Long-Term:** Potential high mortality in the overstory due to HWA and elongate scale, tempered somewhat by ample good growing conditions for hemlock.

Forest Strata	Climate Vulnerability and Adaptation Options
* Canopy	**Vulnerabilities:** Hemlock and pine susceptible to mortality due to pests/pathogen load.
	Carbon: Current storage is at an exceptional level, though there is a risk of loss from pests without good regeneration to replace existing stock (95th percentile of carbon stocking in northeastern coastal zone)
	Adaptation: Allow natural disturbance and targeted thinning to create conditions for succession of site-suited hardwoods.
* Midstory	**Vulnerabilities:** Low abundance and species diversity at this level and high proportion of hemlock means desirable replacements for overstory trees are not well established.
	Carbon: The high shade environment in most of the midstory yields low sequestration and storage of slow growing shade tolerant species.
	Adaptation: Releasing healthy, site-suited trees in this layer will help create a more diverse and suitable forest type.
* Regeneration	**Vulnerabilities:** Very low abundance and species diversity and high proportion of hemlock provide little means for healthy response to disturbance.
	Carbon: Sequestion and storage could be increased substantially by selectively opening the overstory to promote fast growing regeneration.
	Adaptation: Creating conditions for species with a range of shade tolerances to establish and develop would increase resilience of the stand in the face of climate exacerbated decline of overstory trees.

Stand 7. Desired Future Condition

The desired future condition is a fortified and diversified hemlock forest through a combined approach of passive management and actively improving growing conditions for healthy trees and improving resilience to climate-exacerbated disturbances. A substantial portion of the stand should remain unmanaged in order to protect sensitive soils, water quality and wildlife habitat. Thin and wet soils that have little productivity for tree growth (especially for preserving pest and climate stressed hemlock) should be allowed to undergo natural disturbance and succession toward a more diverse hardwood-hemlock-pine stand. In less sensitive and better growing sites, reducing stocking so that healthy trees have less competition for light and moisture can also improve their resistance to combined stressors. Caution should be taken not to thin the canopy too much which can expose hemlock to greater heat and dryness. Thinning should mostly be "from below" or consist of declining or suppressed trees. Lastly, small group removals in the vicinity of seed trees of desirable species would create conditions for improved age and species diversity and thus improve the ability of the stand to respond resiliently to future disturbances.

Stand 8. White Pine/oak

Summary of Average Habitat Conditions Across Stand

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	8	WO	10.1	14.0"	160 sq ft.	15.1 MBF 10.8 CDS	67-WP

Overstory	*Canopy Height*	**20' – 80'**
	% Canopy Cover	**30-90%**
	Canopy Gaps	**Moderate size, irregular distribution**
	Stocking Level	**Adequate**
	Distribution	**Variable**
	Type	**White pine - oak**
	Species Diversity	**Moderate**
	Species Present	**WP, RO, HK, BO, RM, WO, BB**
	Forest Health	**Low concern: good representation of site-suited species**
	%at-risk trees	**40%**
Midstory	*% cover*	**20 - 50%**
	Distribution	**Variable**
	Type	**Hemlock hardwood**
Understory	*% cover (woody)*	**10-33%**
	Distribution	**Highly variable**
	Type	**WK (white pine – hemlock)**
Regeneration	*Seedling/Sapling Diversity*	**low**
	Species Present	**HK, WP, BB**
	% At-Risk Trees	**50%**
	Browse Impact	**Negligible**
Invasive Species	*% Cover*	**None identified**
	Species Present	**n/a**
Other Habitat Characteristics	*Soft Mast*	**Low**
	Leaf Litter	**Adequate**
	Course Woody Material	**High**
	Fine Woody Material	**High**
	Standing Dead Trees	**Abundant**

Stand Narrative Stand 8 is located in the southwest of the property on relatively flat upland terrain that is very rocky and includes a significant rock outcropping. Soils are excessively drained Cardigan-Kearsarge and Warwick fine sandy loams. Medium to large sawtimber white pine and hemlock are common throughout the stand along with a fairly even mix of red, black, and white oak. Red maple and black birch are less common associated species. Overall tree form and timber quality are quite good. There is a small hilltop roughly in center of the stand that is especially dry and tree growth is relatively less productive.

Throughout the stand there is a moderately dense midstory of hemlock and red oak with varying distributions of white pine, white oak, and red maple. The understory is sparsely stocked, primarily with scattered hemlock and occasional slightly more dense white pine and black birch seedlings/saplings. Highbush blueberry is also scattered throughout the understory. Forest health is generally good despite the relatively poor growing sites. The species present are well adapted to the dry conditions here. The main concern is that the overstory has higher stocking than what would allow most vigorous growth. Illustrating this is the amount of dead standing white pine of especially midstory trees which have been shaded-out by their neighbors. The area adjacent to Bascom Road also sustained some damage from microburst storms occurring in the summer of 2023. Large blowdown pine and hemlock are present throughout the stand and especially common in the southern stretch.

Habitat This stand contributes similar dense maturing forest habitat as much of the property. The mixed wood composition, abundant snags and coarse woody debris, and high proportion of hard mast species add richness and complexity to this portion of the forest that is adjacent to the nearly pure hemlock stand (Stand 7). Comparatively large canopy gaps, developed midstory, and patches of robust understory add habitat diversity seldom seen on the property. Hardwood/mixed wood loving species that utilize dense understory growth within dense, mature forests such as black and white warbler or Canada warbler, may find this stand suitable.

Climate Change & Adaptation White pine and hemlock are at elevated risk from climate change-exacerbated combined stressors of pest/pathogen infestations, temperature rise, and drought on some excessively drained sites in this stand. The relatively good diversity of site- and climate change suited species and multi-age structure in the stand does lend it some inherent resiliance in the face of climate change. These traits, while maintained to a degree by natural disturbance, would be enhanced with active management of the overstory, with the goals of reducing the proportion of relatively vulnerable species and promoting a greater diversity of species and allowing advanced regeneration to develop and create space for new trees where they are currently lacking. Red oak and white oak for instance, are well-suited species that have established in the midstory but are almost absent in the understory. Both species are too shade intolerant to continue to establish reliably without management. Monitoring the impact of deer browse on seedlings of desirable species such as oak, as well as the spread of invasive species will be important for the long-term resilience of the stand.

Stand 8. Climate Vulnerabilities by Forest Component

Stand Vulnerability Rating	**Vulnerability Time Horizon**
Low	**Short-Term:** White pine and hemlock decline may accelerate, especially on sites with excessively drained soils. **Long-Term:** A variety of hardwoods, hemlock and pine should fare well overall across the different sites within this stand.
Forest Strata	**Climate Vulnerability and Adaptation Options**
*** Canopy**	**Vulnerabilities:** Good representation of highly site-suited species (oaks and red maple) helps to minimize the vulnerability in this stand.

	Carbon: Carbon storage is at a level expected for this forest type, site condition, and stocking level (62nd percentile of carbon stocking in northeastern coastal zone)
	Adaptation: Maintaining good species diversity will help with long-term resiliency
*** Midstory**	**Vulnerabilities:** Relatively good representation of site suited hardwoods at this level are desirable replacements if overstory trees decline. Hemlock decline at this level wouldn't jeopardize resilience overall.
	Carbon: Patchy gaps allow for good sequestration rates among emergent trees.
	Adaptation: Sustaining/enhancing age diversity will help sustain a suitable forest type for this site.
*** Regeneration**	**Vulnerabilities:** Diverse seedlings/saplings are at risk of mortality from overstory/midstory competition which favors highly shade tolerant hemlock across much of the stand.
	Carbon: Sequestion and storage could be increased substantially by releasing this layer from overstory competition (from vulnerable or declining trees) and establishing additional area for regeneration.
	Adaptation: Creating conditions for species with a greater range of shade tolerances to establish and develop will increase resilience of the stand in the face of climate exacerbated decline of overstory trees.

Stand 8. Desired Future Condition

The desired future condition is sustained species and age diversity to sustain beneficial habitat qualities not commonly found on the property and to sustain the stands resilience to climate change exacerbated natural disturbance, especially drought. While passive management and reliance on the disturbance regime of the stand (pests/pathogens, heat/drought stress, ice/wind) may accomplish these goals to an extent, actively promoting desirable, site-suited species including oak species will decrease the vulnerability of stand while enhancing wildlife habitat qualities, and ensure that the desired conditions are created. Enrichment planting of underrepresented, future climate adapted species such as oaks, hickories, maples, and cherry, with protection of seedlings from herbivory could be highly beneficial in this stand.

Summary of Management Recommendations 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.

Stand(s)	Obj Code	Goal	Practice	Timing	Benefits			Value/Cost/Cost Share
					Bird Habitat	Adaptation	Carbon	
1 2 3 5 6	STEW	Reduce levels of invasive plant populations and associated impacts on native plant regeneration	Invasive plant control (Chemical)	2026-2028	Liberate native plants to increase insect and soft mast diversity and bird foraging and cover resources	Improved conditions for growth of native trees and plants, especially those with good adaptation capacity	Improved establishment and growth of long-lived native plants. Long term gain	Cost per acre or hourly Potential cost-share thru: - Audubon Forest Climate Resilience Program (FCRP) - DCR Community Forest Stewardship Grant Program
5	STEW	Maintained/ improved structural and species diversity for wildlife benefit	Early successional habitat maintenance - Reducing the area of maintained openings or establishing a rotation of brush-hogging open areas less frequently will sustain early successional conditions at a variety of ages. - Creation of young forest "feathered edges".	2025-2034	Improved diversity of habitat and fodder/cover/ nesting resources for the large number of species that utilize forest edge and ESH habitat at various times, and especially ground nesting birds like ruffed grouse and American woodcock.	Maintained species and age diversity and increased share of species with good adaptive capacity. Enhanced soil and water quality protection.	Increased sequestration storage and enrichment of deadwood and soil carbon pools	Cost per acre or hourly Potential cost-share thru: - Audubon Forest Climate Resilience Program (FCRP) - DCR Community Forest Stewardship Grant Program

Stand(s)	Obj Code	Goal	Practice	Timing	Benefits			Value/Cost/Cost Share
					Bird Habitat	Adaptation	Carbon	
All	STEW	Establish areas within each stand to protect special natural areas for recreation, habitat, carbon storage, soil and water quality.	Establish Forest Reserves -Passive management	2025	Protect vital habitat qualities and minimize disturbance especially where ecosystem functions may be vulnerable.	Protecting a variety of conditions should maintain ecological function and integrity that buffer the impacts of climate change and may help recover from greater disturbances.	Undisturbed carbon cycle	
1 3 4 6 7 8	STEW	Improved health, quality, vigor, stand structure, and species diversity.	Enhance adaptive capacity in forests (Resilience) – individual and group selection	2026 - 2029	Increased foraging & nesting opportunities in small canopy and midstory gaps and dense understory growth within a dense maturing forest will benefit such species as Black-throated blue & Black-throated green warblers Wood thrush Veery Scarlet tanager American redstart	Enhance growing conditions for healthy, vigorous trees of all species and enhancing structural complexity while improving resistance/resilience to hazards	Establish new cohort of healthier young trees. Increase sequestration rate and long-term carbon storage potential	Market value for merchantable sawtimber, cordwood, and pulpwood. Potential cost-share - Audubon Forest Climate Resilience Program (FCRP) - DCR Community Forest Stewardship or C-SIP Programs

Stand(s)	Obj Code	Goal	Practice	Timing	Benefits			Value/Cost/Cost Share
					Bird Habitat	Adaptation	Carbon	
1 3 4 6 7 8	STEW	Management operations with minimal impact on soil and water quality and recreational infrastructure	Access improvement and post-harvest road stabilization and recreational footpath improvement	2026 - 2029	Reduced possible damage to native vegetation and foraging/cover resources	Minimized impacts on soils and water from extreme weather events	Minimized disturbance to soil and hydrology	Cost per linear foot Potential cost-share thru: - Audubon Forest Climate Resilience Program (FCRP) - DCR Community Forest Stewardship or C-SIP Programs
8	STEW	Sustained and enhanced species diversity	Plant trees to increase forest stocking and protect seedlings and saplings from deer browse – enrichment planting with tree shelters	2028-2030	Increased tree diversity to support greater insect and mast diversity, and understory cover and nesting structure	Successful regeneration and Increased diversity off native trees and plants, with good adaptation capacity, well suited to site- and future-climate conditions.	Improved establishment and growth of long-lived native species. Long term gain	Cost per acre or hourly Potential cost-share thru: - Audubon Forest Climate Resilience Program (FCRP) - DCR Community Forest Stewardship or C-SIP Programs

MANAGEMENT PRACTICES

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOTAL VOL	
STEW	1 2 3 5 6	WO BP WP GF WH	Removing non-native Invasive Vegetation (Chemical-light)	20±	n/a	n/a	2026- 2028

Purpose

To significantly diminish the population of non-native invasive plant species that are currently found on the property so that native plants can flourish and provide the beneficial cover and fodder that native wildlife is adapted to. Improving conditions for the regeneration of native tree species also supports the adaptation to climate change.

Treatment

Exotic invasive plants can be spread by multiple methods including wind, migrating wildlife, and the recreating public. With this understanding it is not realistic to assume that complete eradication of these plants can be achieved. However, reducing their numbers to a level where native plants can thrive and the ability of invasives to spread is dramatically reduced will constitute effective control. While manual pulling or cutting by hand or machine will kill the aboveground portion of the plant, remnants of the root system will produce new shoots immediately or in the next growing season. For that reason, the use of chemical herbicides in controlling these plants is often the most successful and cost-effective approach, because it can control resprouting and allows native plants to repopulate sooner.

Multiflora rose, Japanese barberry, and oriental bittersweet are the three most prevalent non-native species and are presently found scattered at low densities. Furthermore, they are mostly below chest height at this stage making it realistic to control with a directed foliar spray from a backpack sprayer. Effective control will require at least one re-entry to eradicate any sprouts or seedlings that appear after the initial treatment. Occasional larger individuals of rose and glossy buckthorn will need to be cut at the base and have a basal herbicide applied to the cut stem to effectively kill the root system. At this stage the most efficient treatment program would consist of patrolling a swathe of ground at wetland, road and field edges and 150ft. or so within forested stands, in order to mitigate the build up of invasives within open canopy areas and slow their spread further within the forest.

Small isolated patches of phragmites in **Stand 2** are a concern to the aquatic environment. At least two years of foliar herbicide application should be effective, but continual monitoring and spot-treatment are necessary to keep it at bay. Effective control would be to reduce the chance of spreading it further into the marsh by killing it where it is along the shores at this point.

Special Considerations

The introduction of additional light onto the forest floor through other management practices will create conditions favorable to the spread of many invasive plant species. Therefore, invasive plant control efforts should be performed prior to any other vegetation management activities near the invasive treatment area.

OBJECTIVE CODE: CH61 = stands classified under CH61/61A/61B STEW= stands not classified under CH61/61A/61B
STD= stand AC= acre MSD= mean stand diameter MBF= thousand board feet BA= basal area VOL= volume

Owner(s): Town of Gill – Blake Town Forest Town(s): Gill & Bernardston

MANAGEMENT PRACTICES

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOTAL VOL	
STEW	5	GF	Early Successional Habitat management -Rotational brush hogging	12	n/a	n/a	2025- 2027

Purpose To increase structural diversity and complexity of valuable young forest habitat.

Treatment Areas that are currently mowed on an annual basis could be allowed to regrow with trees and shrubs. These areas may then be brush-hogged in different years to create a mosaic of different ages of early successional habitat to ensure the availability of a diversity of species and ages which are preferred by different birds and other wildlife at different stages in their lifecycle. This practice will also sequester more carbon and enrich the deadwood and soil carbon pools in these areas.

Designating areas along stream and wetland edges to allow to revert to shrubland/forest will have the additional benefit of stabilizing soils and protecting water quality in the event of high precipitation, as is predicted to increase in frequency and severity with climate change. Similarly designated field/forest edges to expand successional young forest area in a "feathered edge" between the forest and periodically cut early successional habitat will further diversify conditions and increase long term sequestration and storage.

Special Considerations Given the open conditions in these sites invasive plant control should be conducted prior to brush hogging, and they should be monitored for invasive plant re-establishment.

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOTAL VOL	
STEW	All	All	Establish forest reserves -passive management to protect rare and sensitive sites	80	n/a	n/a	2025

Purpose To maintain ecological functions and ecosystem services such as the protection of sensitive soils, water quality, unique wildlife habitat types, long-term carbon storage and structural diversity through natural disturbance regimes, as well as to preserve scenic and recreational values.

Treatment Within each stand, areas that meet the above criteria should be set aside for intentional passive management. These areas will serve the overall goals for management of the property better by allowing natural disturbance and succession to guide their development and leaving them undisturbed by machinery required to actively meet the goals for the property. Reserving these areas will promote a very carbon rich environment owing to the combination of frequent large standing trees, frequent woody debris from windthrow on rocky and saturated soils, and higher soil carbon storage capacity in wet soils. They will also preserve core wildlife habitat conditions present on the property and retain these elements while other areas are actively treated to increase habitat diversity and the attendant benefits to climate resilience.

Special Considerations This area should be monitored for the impact of pests/pathogens, invasive plants and deer/moose/beavers on native vegetation and natural succession.

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Owner(s): Town of Gill – Blake Town Forest Town(s): Gill & Bernardston

MANAGEMENT PRACTICES

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC (Sq. ft.)	TOTAL VOL (MBF, Cds)	
STEW	1	WO	Individual and Group Selection Harvest	14	50 (33%)	80, 40	2026 - 2029
	3	WP		9	40 (25%	40, 60	
	4	WH		5	69 (33%)	32, 45	
	6	WH		6	48 (33%)	42, 22	
	7	HH		5	72 (33%)	30, 70	
	8	WO		6	52 (33%)	30, 50	
Carbon and Adaptation Practice(s)			-Enhance Adaptive Capacity of Forests				

Summary Small groups and individual mature and declining overstory trees may be selected for removal to release healthy overstory trees of crown competition, as well as release healthy midstory trees and established regeneration, where it exists, as well as to create light conditions for the establishment of species with a range of shade tolerance.

Purpose This practice will be designed to improve the health and growth of the current native forest vegetation in response to climate change. Improving the growing conditions for healthy trees and diversifying stand structure and composition of climate-adapted species will lead to long-term increases in forest carbon sequestration and storage and increase the adaptability to current and future stressors and disturbances.

Treatment Following an improvement approach, individual and group selection will be adapted to the specific site conditions within each stand. The focus will be on removing damaged and declining white pine and hemlock. Midstory and overstory trees will be selected for removal to accomplish a variety of goals based on these site conditions. Liberation cutting may take place in areas with relative abundance of established regeneration, whereas crop tree release will be performed where lower quality trees are in competition with healthy individuals of desirable species for the stand. Small irregular sized gaps of roughly 1-2 times the height of neighboring trees may be created in the vicinity of healthy seed trees of desirable species such as red and white oak or to expand on existing small gaps to create a range of light conditions on the forest floor. All present species and ages will be considered for retention in order to promote their healthy long-term growth in the stands. In particular, mast-producing species such as oaks, hickories, and black cherries will be favored for retention for their value to wildlife. Diseased, damaged, suppressed, individuals of all ages and species present will be favored for removal, with the exception of good cavity trees or trees that have good potential to become den/nest trees. Snags and coarse woody debris will be left undisturbed.

Operational Considerations These cuts are entirely optional and should be considered in relation to recreational uses of the property since access to some or parts of the stands would necessarily utilize or potentially impact portions of the recreational infrastructure. Multiple small log landings along Hoe Shop Road are recommended in order to minimize stream and/or wetland crossing and impact on trails.

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MANAGEMENT PRACTICES

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOTAL VOL	
STEW	All	All	Access improvement and road stabilization -Climate-Informed Forest Access and Forestry Operations	n/a	n/a	n/a	2026-2029

Purpose To reduce impacts to hydrology, soils, and nutrient cycling associated with shorter winters, extreme precipitation events, and other climate changes.

Treatment Best management practices will be employed in designing access layout, following updated guidelines for dealing with adverse conditions exacerbated by climate change. Road layout will be determined to minimize disruption to soils such as avoiding thin, sloping, or saturated soils. Existing trail infrastructure will also be avoided to the highest degree possible. At the close of the cutting operation properly spaced water bars should be installed in all roads that occur on sloping ground. Portions of these roads with disturbed soil on slopes can be seeded to provide for further stabilization and to minimize erosion and sedimentation into riparian areas. At the close of the cutting operations, slash utilized for road stabilization will be left in place to prevent additional soil disturbance, unless it is desirable to remove debris to allow for ease of access for recreational use.

Conducting cutting activity during frozen ground conditions or the driest part of the growing season will reduce soil disruption, potential erosion and sedimentation into streams and wetlands. Any stream crossings associated with timber harvesting should be kept to a minimum and should take place in areas where stream banks can remain stable. "MA Best Forestry Management Practices" should be utilized in conjunction with this activity to maintain water quality in the area. Appropriate filter strips should be placed along streams and adequate buffers should be maintained around seeps that occur within these stands.

Special Considerations Recreational footpath construction should be considered in layout and treatment of forest access and trail network. The best access options may be through neighboring property.

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOTAL VOL	
STEW	8	WH	Enrichment planting and deer exclusion -Planting trees to increase forest stocking -Protect seedlings from deer browse	2	n/a	n/a	2028 - 2030

Purpose To establish a new cohort of young trees of site- and future climate- suited species in order to enhance species and age diversity and structural complexity of the forest.

Treatment Following a potential group selection timber harvest, enrichment planting can be conducted within canopy gaps. The tree seedlings that are planted should be species with good climate adaptation capacity that are desired as a greater component of the future stand; mainly, native oaks, hickories, black cherry and possibly other hardwood species such as sugar maple or red

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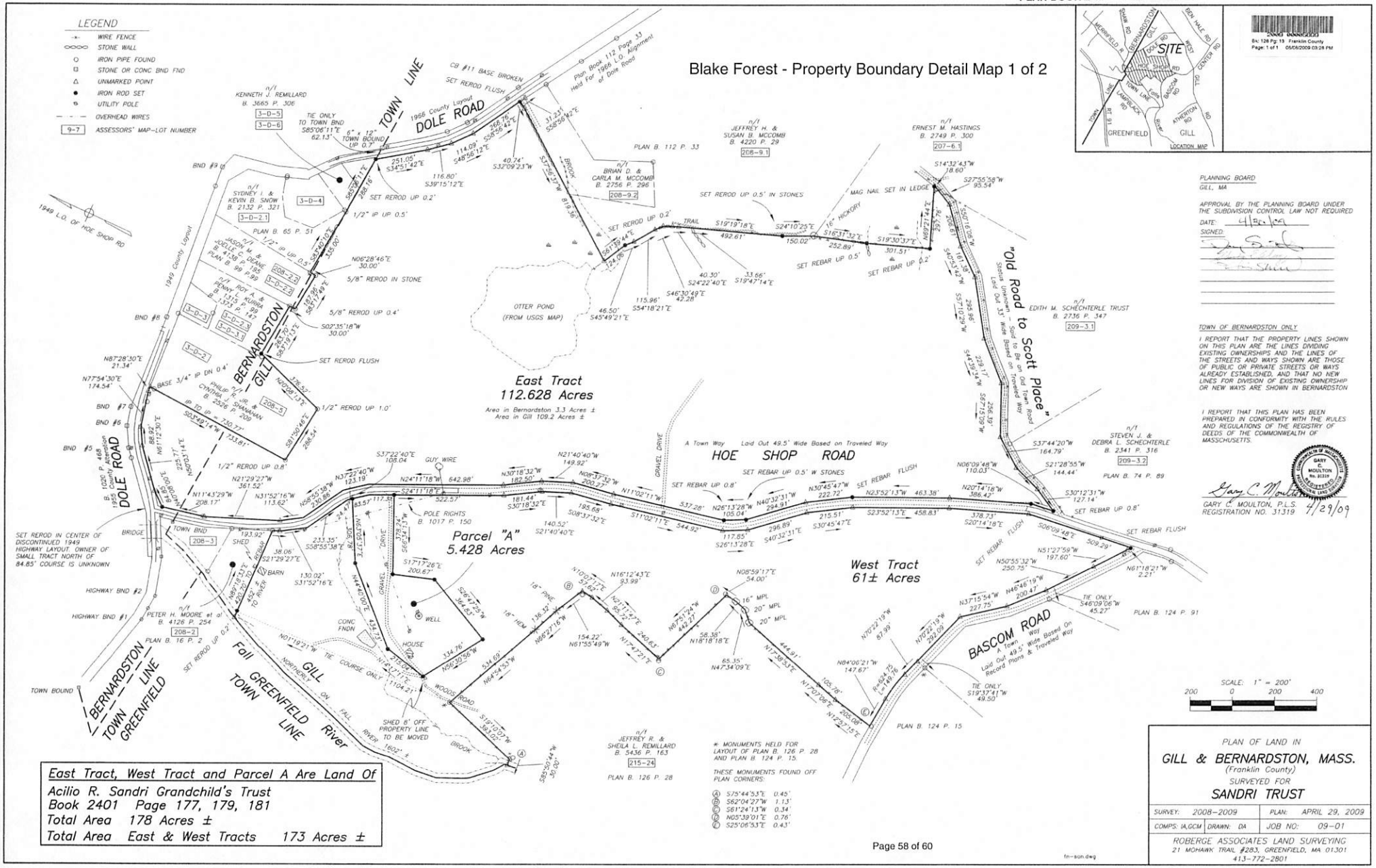
	maple depending on the site. Native shrubs, especially those that produce soft-mast may also be planted. Since planted seedlings will be vulnerable to deer browse, they should be planted within patches that are protected from deer browse prevention measures by deer exclosure fencing. In smaller patches, or if deer exclosure fencing is not practical over a number of patches, measures such as mesh tubes for seedlings should be used. It may be best to plant trees near trails or other easy-to-access locations so that they can be easily monitored and released from competition as necessary.
Special Considerations	Cost-share funding may be applied for to support this activity.

PLAN BOOK 128 PAGE 13



PLAN OF 4 LOTS IN

GILL (Franklin Co.) MASS.

SURVEYED FOR

FRANKLIN LAND TRUST

SURVEY: NOV, 2008	PLAN: MAY 12, 2009
COMPS: GCM DRAWN: DA	JOB NO: 08-41

ROBERGE ASSOCIATES LAND SURVEYING
21 MOHAWK TRAIL #283, GREENFIELD, MA 01301
413-772-2801

FN-FLT.dwg

SCALE: 1" = 60'

60 0 60 120

NOTE
THIS PLAN WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND IS SUBJECT TO ANY AND ALL RIGHTS AND ENCUMBRANCES THAT SUCH A REPORT MAY DISCLOSE.

PLANNING BOARD
GILL, MA

APPROVAL BY THE PLANNING BOARD UNDER THE SUBDIVISION CONTROL LAW NOT REQUIRED

DATE: _____

SIGNED: _____

SUFFICIENT AREA AND FRONTAGE REMAIN TO CONFORM TO CURRENT ZONING REQUIREMENTS.

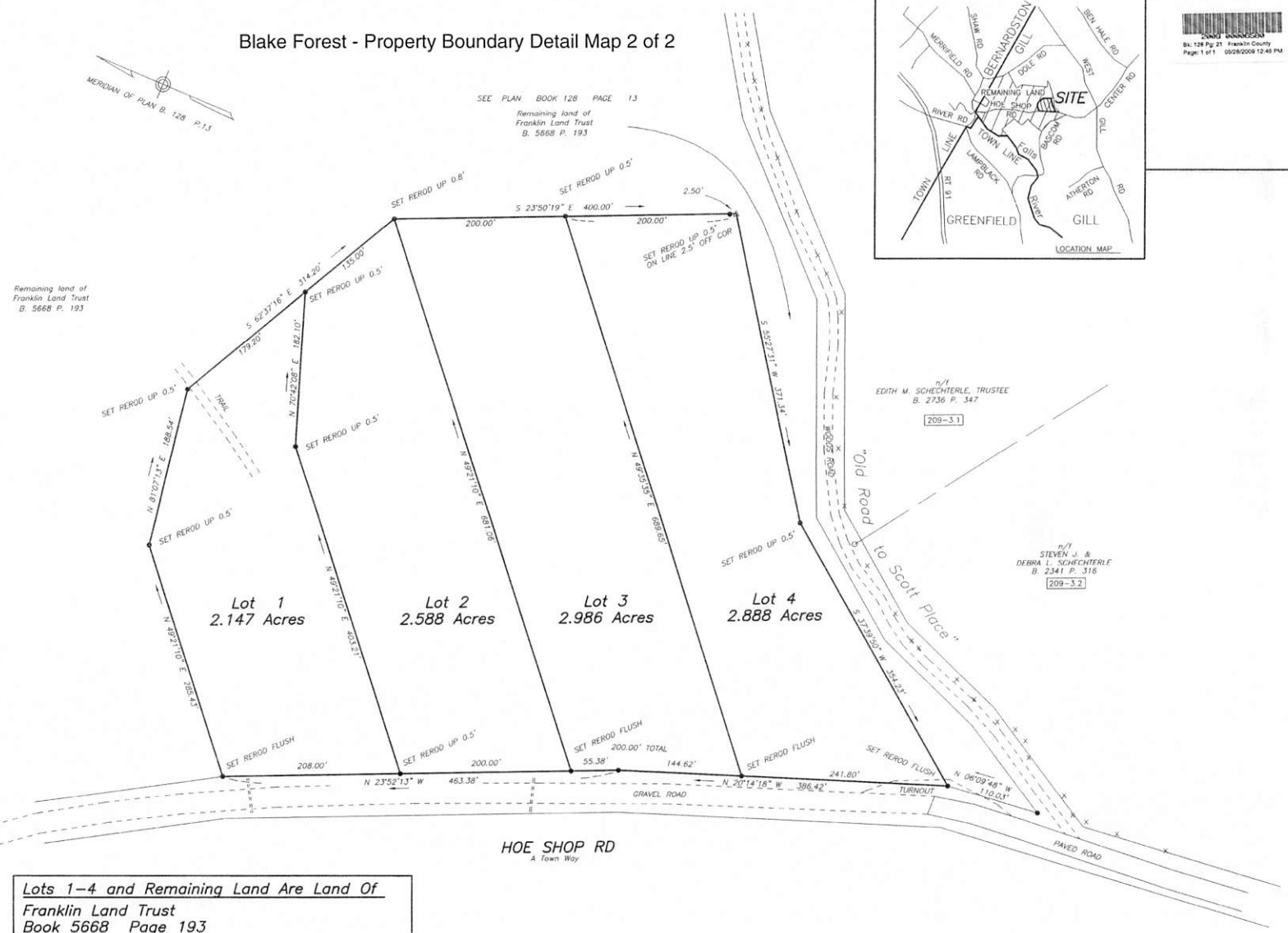
I REPORT THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

COMMONWEALTH OF MASSACHUSETTS GARY C. MOULTON No. 31319 REGISTERED LAND SURVEYOR

GARY C. MOULTON, P.L.S.
REGISTRATION NO. 31319

5/12/09

Blake Forest - Property Boundary Detail Map 2 of 2



LEGEND

- -x- WIRE FENCE
- ○ IRON PIPE FOUND
- □ STONE OR CONC BND FND
- △ UNMARKED POINT
- ● IRON ROD SET
- ------ CULVERT
- 9-7 ASSESSORS' MAP-LOT NUMBER

Lots 1-4 and Remaining Land Are Land Of
Franklin Land Trust
Book 5668 Page 193
Total Area Lots 1-4 = 10.609 Acres

SEE PLAN BOOK 128 PAGE 13

Signature Page Please check each box that applies.

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

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

Signed under the pains of perjury:

Owner(s) [signature] Gill Town Forest Chair Date 6/9/25

Owner(s) _____ Date _____

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

Plan Preparer [signature] Date 6/22/25
Tobias Carter

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

Approved, Service Forester [signature] Date 7-8-25

Approved, Regional Supervisor [signature] Date 7/16/25

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

☐ Amendment

Signed under the pains of perjury:

Owner(s) _____ Date _____

Plan Preparer _____ Date _____

Description of Amendment: _____

_____

_____

Approved, Service Forester _____ Date _____

Owner(s) Town of Gill Town(s) Gill