Buffam Brook Community Forest Stewardship Plan

A partnership between:

The Town of Pelham Conservation Commission

Kestrel Land Trust

MA Department of Conservation & Recreation

U.S. Forest Service Open Space and Community Forest Program

November 2017

The Buffam Brook Community Forest was generously funded for acquisition and planning through the United States Forest Service Community Forest and Open Space Program (USFS CFOSP). This summary is offered as an addendum to the Forest Stewardship Plan approved November 2017.

Objectives:

1. FOREST STEWARDSHIP: Create a scientifically-informed sustainable forest management plan that enhances the overall resilience of the forest, in such a way that protects wildlife habitat and water quality, while demonstrating an appropriate spectrum of forestry techniques, from the selective harvest of marketable timber to management of the forest for mature late-successional conditions. (NOTE: Resilience is defined by Catanzaro, D'Amato and Huff "as the capacity of a forest to respond to a disturbance by resisting damage or stress and recovering quickly.")

a. Within defined riparian zones, allow trees to grow to large size and plan to allow these trees to experience normal mortality and become large woody material in and near streams as well as create dead stems to enhance habitat for cavity nesting birds and increase coarse woody debris inputs to Buffam Brook and its tributaries.

b. Promote the retention of woody material (slash, coarse woody debris, snags, etc.) to provide soil protection and to improve future infiltration and water storage properties of the soil.

c. Identify areas that should be left to grow wild, allowing natural processes to take their course.

d. Identify and pursue opportunities for providing a sustainable wood supply in appropriate locations that would increase the diversity and complexity of forest structure. Any net profit earned by sale of wood products is to be retained by the Pelham Conservation Commission for reinvestment back in the Buffam Brook Community Forest for forest stewardship activities.

e. Protect and enhance habitat for the Eastern box turtle, which is a rare species known to live in this area by following conservation management practices as described by Massachusetts Natural Heritage and Endangered Species.

f. Provide desirable breeding habitat for forest-interior birds. This includes creation and/or maintenance of early successional habitat and intermediate "shelterwood" condition (tall, partial-overstory with a thick shrub and/or sapling layer), within an overarching framework of mature, closed-canopy forest. This will include increasing the amount of late-successional structure, most noticeably by addressing the general lack of large snags and large downed logs in the short term.

g. Minimize and control the spread of invasive plants.

h. Provide open access for hunting and fishing.

i. Mark and maintain boundaries to limit encroachment, identify ownership and permissible uses and to facilitate monitoring and treatments (e.g. invasive plants).

j. Monitor and maintain all culverts, bridges, and fords over streams, or consider removing these. Address the failed bridge on Old Stage Road. Any access routes for logging should minimize

stream crossings and use portable bridges in situations where stream banks or approaches need maximum protection.

2. FOREST EDUCATION: Create opportunities for forest-based experiential learning and forest stewardship education for students, the community, and private landowners

a. The forest will contain areas that are in a phase of active or recent management as well as areas that have not been managed within the last few decades. This will provide the opportunity to see natural areas with both active management and the longer-term results of past actions, including areas to monitor the benefits of early successional forest for some species of shrubland song birds.

b. Collaborate with the Kestrel Land Trust, Hitchcock Center, and UMass to provide programs for nature-based education for children and adults, land use-history, and forest management education for landowners.

3. PUBLIC ACCESS FOR RECREATION: Guarantee public access for recreational benefits such as hiking and cross-country skiing on designated trails, as well as hunting and fishing

a. Identify existing trails intended for recreational uses as well as potential future trails and mark and maintain these in a manner so that they can be safely used.

b. To the extent possible, keep recreational trails separate from other trails used specifically for logging and where this is not possible, strive to have logging trails cross recreational trails at right angles rather than run along the same route. Where logging trails and recreational trails must be one and the same, ensure that post logging clean-up is more than adequate so that a safe recreational experience is provided.

c. Identify (with signs) parking rules at any allowable parking area.

4. LANDSCAPE-SCALE COLLABORATION: Promote collaboration for a landscape-level sustainable forest management approach shared among the proposed BBCF, adjacent lands, the Town of Amherst's watershed lands, UMASS Cadwell Forest, and the Quabbin Reservoir

a. Share the BBCF Forest Stewardship Plan with other large conservation owners to encourage awareness about how each forest management approach relates and interacts with each other.

Benefits:

The benefits of this Community Forest are expected to be as follows:

I. A landscape that supports wildlife movement and habitation;
II. Open space that provides public access for passive recreation, hunting and fishing;
III. Forestland that supports the quality of the drinking water supply;
IV. A living laboratory that provides a free space for community members, students, and researchers to engage in active, hands-on learning;
V. A well-managed forest that will support the local wood products local economy through sustainable harvests of timber.

Strategies for Implementation:

1. ***Public Process:*** The forest stewardship plan went before a public meeting on October 13th, 2017 for review and public comment. This process ensured Pelham community members interests are represented in this plan, thereby encouraging community support for achieving these outcomes.

2. ***Partner Engagement:*** To increase capacity to achieve the objectives laid out in this plan and summarized above, the Town of Pelham Conservation Commission and Kestrel Land Trust as partners in perpetual protection and ownership of this community forest, will engage the following organizations to facilitate learning and meaningful experiences on the land, as well as encourage collaborative forest management and stewardship efforts across the landscape:
    a. Hitchcock Center for the Environment
    b. Pelham Elementary School
    c. University of Massachusetts – Amherst
    d. Town of Amherst Department of Public Works (Watershed Lands Management)

3. ***Public Enhancements:*** Through the use of volunteerism and grant-supported professional contractors, the trail system and parking area enhancements will create a welcoming experience for visitors to the Community Forest. Making the entrances safe and comfortable and the trails navigable, visitors will be encouraged to use of the land for all types of passive recreation.

4. ***Stewarding the Land:*** Kestrel Land Trust, holding the Conservation Restriction, is an accredited Land Trust, held to national standards of best practices. The annual obligation of monitoring and the perpetual obligation to preserve the conservation values documented in the Conservation Restriction, are required legally and by the organization's mission and goals. The Town of Pelham Conservation Commission is under obligation to follow the actions set forth in the Forest Stewardship Plan approved November 2017. These actions will focus on achieving the objectives listed above for Forest Stewardship.

Contents

FOREST MANAGEMENT PLAN

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

CHECK-OFFS					Administrative Box			
CH61	CH61A	CH61B	STWSHP	C-S	Case No.		Orig. Case No.	
cert. ☐	cert. ☐	cert. ☐	new ☒	EEA ☐	Owner ID		Add. Case No.	
recert. ☐	recert. ☐	recert. ☐	renew ☐	Other ☒	Date Rec'd		Ecoregion	
amend ☐	amend ☐	amend ☐	FSC ☐	Birds ☒	Plan Period		Topo Name	Shutes
			Conservation Rest. ☒		Rare Spp. Hab.		River Basin	CT.
Plan Change: _____ to _____			CR Holder Kestrel Trust					

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Pelham, c/o Conservation Commission **Buffam Brook Community Forest**
Mailing Address 351 Amherst Road, Pelham, MA, 01002 Phone 413 253 9362
Email Address mcdnda8@aol.com

Property Location: Town(s) Pelham Road(s) see bottom of page

Plan Preparer **Michael Mauri, Forester** Mass. Forester License # 161
Mailing Address 20 West Street, South Deerfield, MA 01373 Phone (413) 665-6829

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
SEE	NEXT	PAGE						
			TOTALS	SEE	NEXT	PAGE		

Excluded Area Description(s) **(if additional space needed, continue on separate paper)**
NONE.

HISTORY

Year acquired 2017 Year management began 2017

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

What treatments have been prescribed, but not carried out (last 10 years if plan is a recert.)?

stand no. _____ treatment _____ reason _____
(if additional space needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date

Remarks: (if additional space needed, continue on separate page)
*North Valley, Buffam, Boyden, Old Stage and Robinson Roads

Records: Buffam Brook Community Forest & Moosetracks

Parcel	Stand	Deed Book	Deed Page	Tax Map	Lot	Forest Stewardship Acres	Forest Stewardship Excluded Acres	BBCF CR Reference*
Gurvitch	1	12542	129	10	16	53.966	0	Tract 2
Moosetracks East (Wilson)	2	7023	126	9	32	17.000	0	N/A
Moosetracks Central (Weeks)	3	7178	174	10	13A	57.483	0	N/A
Moosetracks North (Weeks)	3	8636	175	10	13-2	12.401	0	N/A
Olver North	4	12542	129	9	28	26.000	0	Tract 1 Parcel 1
Hepler-Westhead	5	12542	129	9	8	41.086	0	Tract 3
Olver South	6	12542	129	9	10	43.846	0	Tract 1 Parcel 2
					Total	251.782	0	

*CR reference as shown in figure CR-B in deed recorded at BK 12542 PG 129

THIS PAGE REQUIRED FOR FSP

Landowner Goals

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

Goal	Importance to Me			
	High	Medium	Low	Don't Know
Enhance the Quality/Quantity of Timber Products*			X	
Generate Immediate Income			X	
Generate Long Term Income			X	
Produce Firewood			X	
Defer or Defray Taxes				N/A
Promote Biological Diversity	X			
Enhance Habitat for Birds	X			
Enhance Habitat for Small Animals	X			
Enhance Habitat for Large Animals	X			
Improve Access for Walking/Skiing/Recreation	X	X		
Maintain or Enhance Privacy				N/A
Improve Hunting or Fishing	X	X		
Preserve or Improve Scenic Beauty	X	X		
Protect Water Quality	X			
Protect Unique/Special/ Cultural Areas	X			
Attain Green Certification				N/A
Other:				

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

In your own words, describe your goals for the property:
water quality, habitat improvements, climate change resilience, improved public access

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 sustainably for long-term forest health, productivity, diversity, and quality.
2. Conserving or enhancing water quality, wetlands, soil productivity, carbon sequestration, 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:** 11-9-2017

Owner(s) (print) Dana MacDonald

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

Page _____ of _____

Eastham Conservation Commission

Property Overview: Land of Town of Pelham
Buffam Brook Community Forest (BBCF) including Moosetracks (aka Robinson Road) Conservation Area)

Project Background

The project area consists of a cluster seven parcels owned by the Town of Pelham. Four of the parcels were recently acquired and protected with the help of a USFS grant and various local contributions (these parcels form the Buffam Brook Community Forest). The three other parcels (known collectively as "Moose Tracks Conservation Area") were acquired by the town at an earlier time. The acquisition of the four BBCF parcels represents a significant conservation accomplishment: the parcels were placed under a conservation restriction (CR) and will be protected in perpetuity from development but will be actively managed over time to promote a diversity of desirable functions offered by a healthy, or resilient, forest landscape.

The project parcels are listed in the following table and shown on the following map.

Parcel	Stand	Deed Book	Deed Page	Tax Map	Lot	Forest Stewardship Acres	Forest Stewardship Excluded Acres
Gurvitch	1	12542	129	10	16	53.966	0
Moosetracks East (Wilson)	2	7023	126	9	32	17.000	0
Moosetracks Central (Weeks)	3	7178	174	10	13A	57.483	0
Moosetracks North (Weeks)	3	8636	175	10	13-2	12.401	0
Olver North	4	12542	129	9	28	26.000	0
Hepler-Westhead	5	12542	129	9	8	41.086	0
Olver South	6	12542	129	9	10	43.846	0
					Total	251.782	0

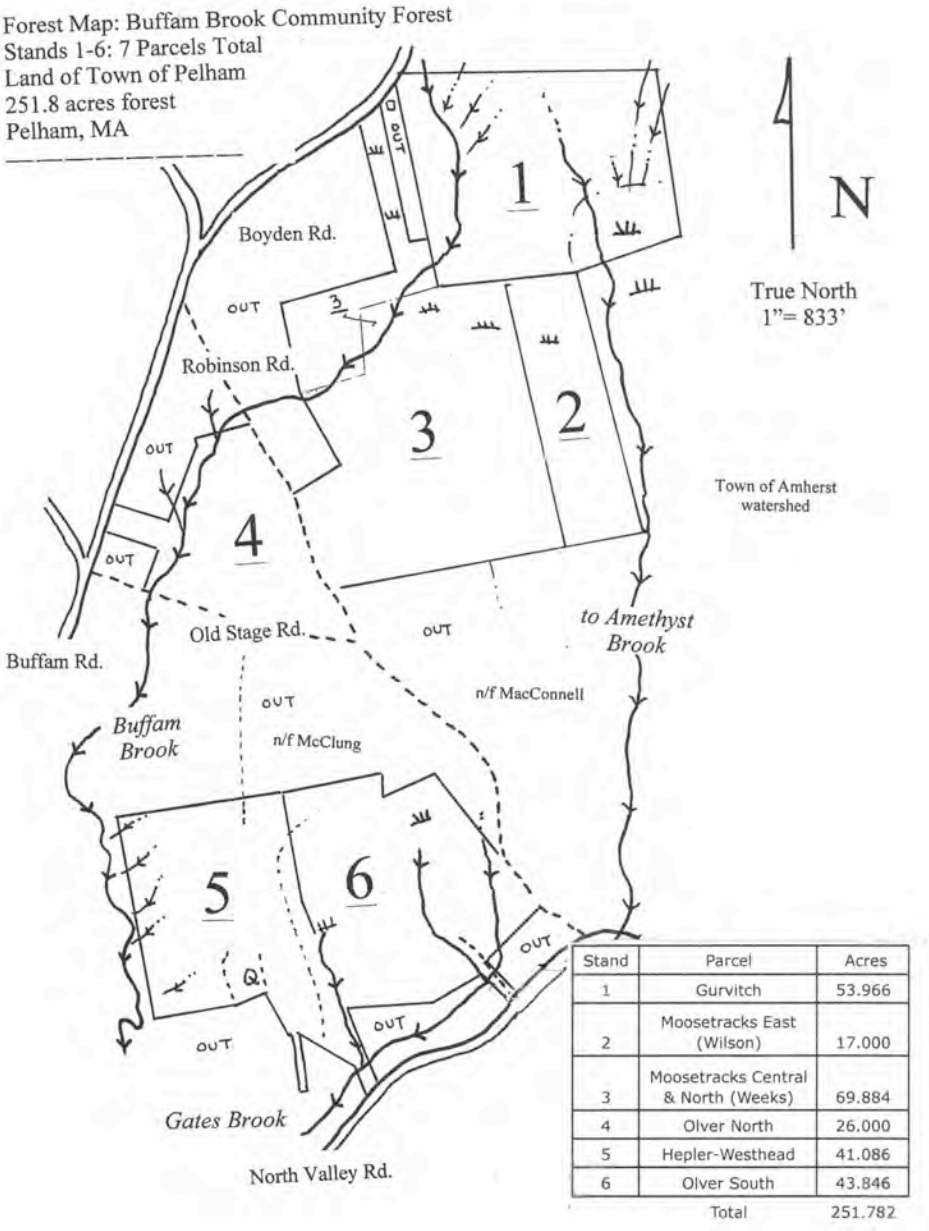


Figure 1: Property and stand locator map. This maps shows the locations of the parcels and the stand number assigned to them for the purposes of this Forest Stewardship Plan. The scale is not accurate as reproduced here.

A sampling of sources for further reading on the BBCF project is provided below (note: acreages vary in the accounts).

— "The focus of the forest stewardship plan will be to support forest resilience by increasing the species diversity and structural diversity of the forest in order to decrease recovery time in the event of a large disturbance, like severe weather events associated with climate change, including flood, hurricane, tornado or drought."

From: https://www.kestreltrust.org/new-community-forest-promotes-climate-change-resilience/

— "This Pelham Community Forest will be a living laboratory to demonstrate the climate action benefits of sustainable forestry."

From: https://www.kestreltrust.org/new-community-forest-promotes-climate-change-resilience/

— "The 185-acre community forest will provide the local community with a place to demonstrate scientifically-informed sustainable forestry practices, wildlife habitat resiliency and connectivity to other protected lands, sustainable forestry and forest conservation education opportunities, and opportunities for public recreation and enjoyment of forest. The Town of Pelham seeks to use the sustainable forestry model of selective harvest to provide wood to support the local wood products industry."

From: https://www.fs.fed.us/news/releases/forest-service-announces-19-million-community-forests

— 'Demo forest' in Pelham to fight climate change (headline)

From: http://www.gazettenet.com/Pelham-forestland-to-become-community-forest-8302216

Property Overview

The project area is bounded by Buffam, Boyden and North Valley Roads in the north part of town. The parcels primarily fall on the western and northern slopes of a broad, flat-topped knoll. Slopes are milder in the northern section but sometimes steep in the western or southern sections that drop down steeply toward Buffam or Gates Brooks. The forest contains a diversity of tree species dominated by white pine and red oak and is described in detail in the next section. The overstory appears to be > 100 years old. There are a number of hydrological features, including Buffam and Gates Brooks, which are large, stony streams, and the property includes part of a large wetland area that extends onto abutting Amherst watershed property. There are a number of vernal pools. Historically there were a number of small stone quarries in the area, shown as "granite quarries" on an 1860 map of Hampshire County. The stone is also referred to as

"gneiss" (i.e. as "Pelham gneiss"). A major quarry is located on the BBCF Hepler-Westhead parcel. There are also a number of small but conspicuous pits that may have been exploratory in nature.

Landscape Context and Landscape-Level Habitat

The property is located in an area of Pelham that is primarily forested due to the rugged terrain, with small remnant agricultural grasslands remaining. There is significant protected land nearby, including the Quabbin Reservoir about 3 miles to the east and over 1,000 acres of Amherst watershed forest directly abutting the project area to the east. There are various, smaller reservoirs within a 2-mile radius of the property. Along the roads, in between scattered older houses, much of the readily-buildable frontage has been developed into single-family residences in recent decades, sometimes accessed by long driveways, though most of the backland remains in forest (see Figure 2). Cross-country skiing, hiking, and hunting as well as logging for firewood and timber are typical uses of the land in this area.

The project area drains into Buffam Brook on the north side and Gates Brook on the south side. These brooks join further downstream and later join with Harris Brook, then flow into Amethyst Brook, flowing through a steep swale northeast of West Pelham, then into the Fort River just east of the East Village section of Amherst. The Fort River flows through the Mill Valley section of Amherst, then to the south of the historic center of Hadley, then into the Connecticut River about ¾ mi. north of Mt Holyoke (location of the Summit House).

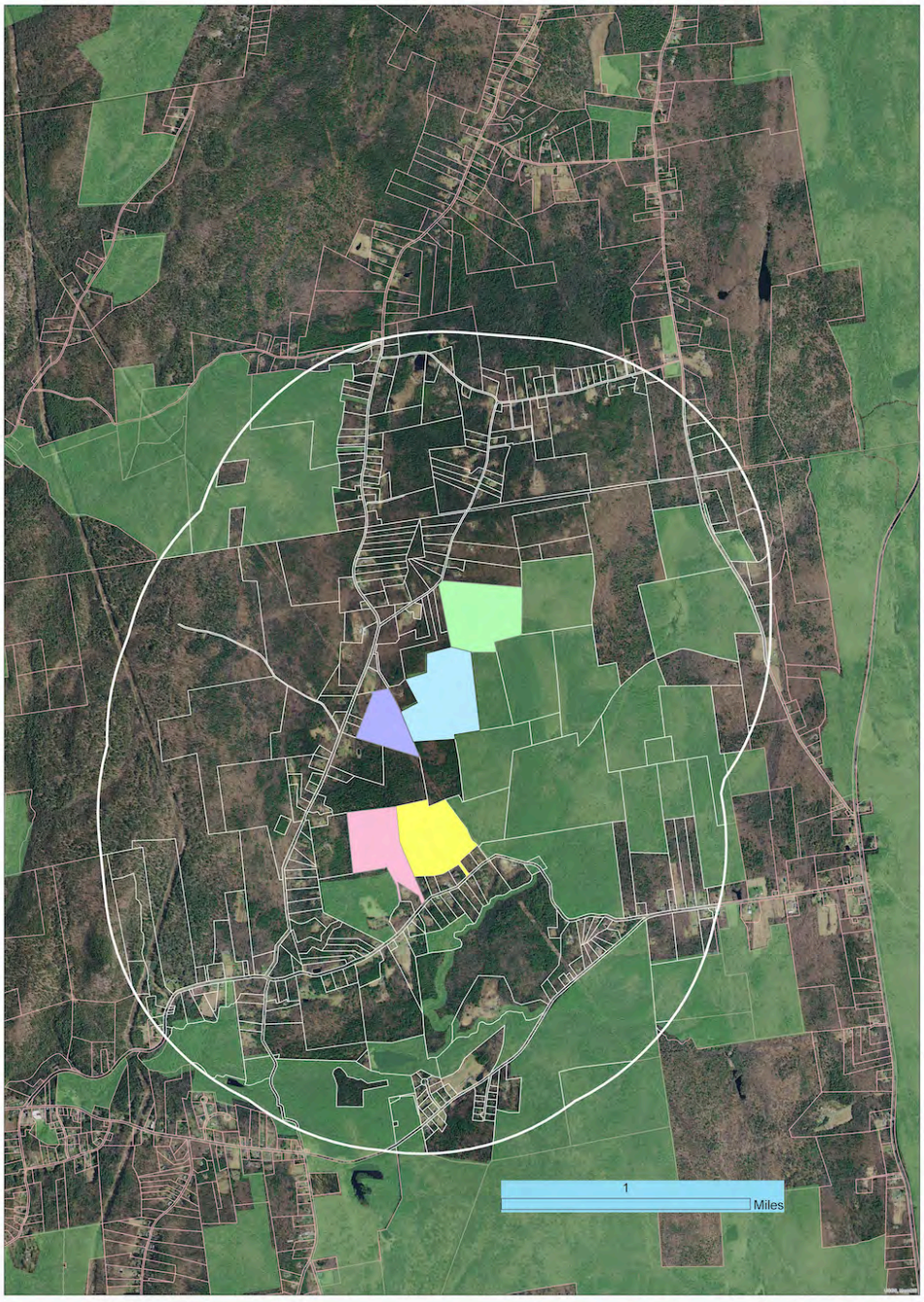


Figure 2: Aerial photo (source Mass GIS) showing a one-mile buffer containing approximately 4,200 acres around the BBCF & Moose Tracks parcels, which are shown in solid shading (note: Moose Tracks north is not highlighted). Partially shaded parcels nearby are primarily protected forestland. Large parcels nearby that are not protected are also primarily forestland. Small residential lots are clustered along the main roads. The aerial photo depicts an overwhelmingly forested landscape with a concentration of fragmentation occurring along major roads. Scale is as show; no north arrow is provided but north is "up".

From a landscape-level wildlife habitat and breeding bird habitat perspective, BBCF is situated within a vast, relatively unfragmented forested landscape that includes the Quabbin forest. In the more immediate landscape, most of the 4,000+ acres located within a mile of BBCF are covered with a mix of hardwood and softwood forest types, presumably with red oak, red maple, white pine and hemlock playing the dominant role. It is reasonable to assume that the majority of the forest is in a closed-canopy or partially closed-canopy condition, and that early-successional forest habitat occurs mainly in areas that have undergone heavy logging within the past 10 years as well as along powerline ROWs and large shrub swamps. A significant portion of the 4,000+ acre area is protected land, including sections of the Amherst watershed forest as well as private land under CR. The main forms of non-forest use are roads and residential development concentrated along the main roads; many of the 379 tax parcels within the 1-mile buffer are small, residential lots. Roads and residential lots are the main cause of habitat fragmentation within the 4,000 acres. Both roads and residential lots foster and perpetuate the progressive spread of non-native invasive plants. Roads pose a severe risk to turtles. Residential lots tend, as a group, to support elevated levels of nest predators of birds and also Eastern box turtle such as raccoons and skunks and also seem to support elevated deer populations, which can overbrowse native vegetation. A high density of residential lots also increases the possibility that management of adjacent properties will meet with resistance, but this does not have to be the case if outreach is handled in a constructive manner. An important component of forest stewardship in the project area may be developing a cooperative esprit of stewardship to eliminate or minimize known fragmenting factors. Though powerline ROWs can provide valuable early-successional habitat, they are also a form of fragmentation to the extent that they foster and perpetuate the progressive spread of non-native invasive plants, which is the case here. From a forest-interior breeding bird perspective, the wider landscape is likely to be very well suited to those birds that breed in relatively undisturbed forests or in forests with some level of intermediate disturbance. Those birds that breed in early-successional habitats will find that their preferred or essential breeding habitat is available to a limited extent. It is known that most species of terrestrial wildlife prefer to use early-successional habitats at some point during their life cycle or in a given year, and so a paucity of early-successional habitat will affect most species of wildlife to some degree.

Forest-Interior Breeding Bird Habitat

Not surprisingly, the BBCF parcels are dominated by closed-canopy and partially-closed canopy breeding bird habitat. Please see Stand Descriptions section for a breakdown of breeding bird habitat by canopy cover.

Eastern Box Turtle Habitat and Certified Vernal Pools

Approximately 134 acres, or 53% of the BBCF acreage falls within the NHESP Priority and Estimated Habitat polygon for the Eastern Box Turtle (see map below). There is one certified vernal pool on the property (in the old Quarry on the Hepler-Westhead parcel) and several others near the boundary (near Olver South, Weeks and Gurvitch). Special protections required during any logging operation would be determined by NHESP at the time the Forest Cutting Plan is submitted to the Commonwealth for approval.

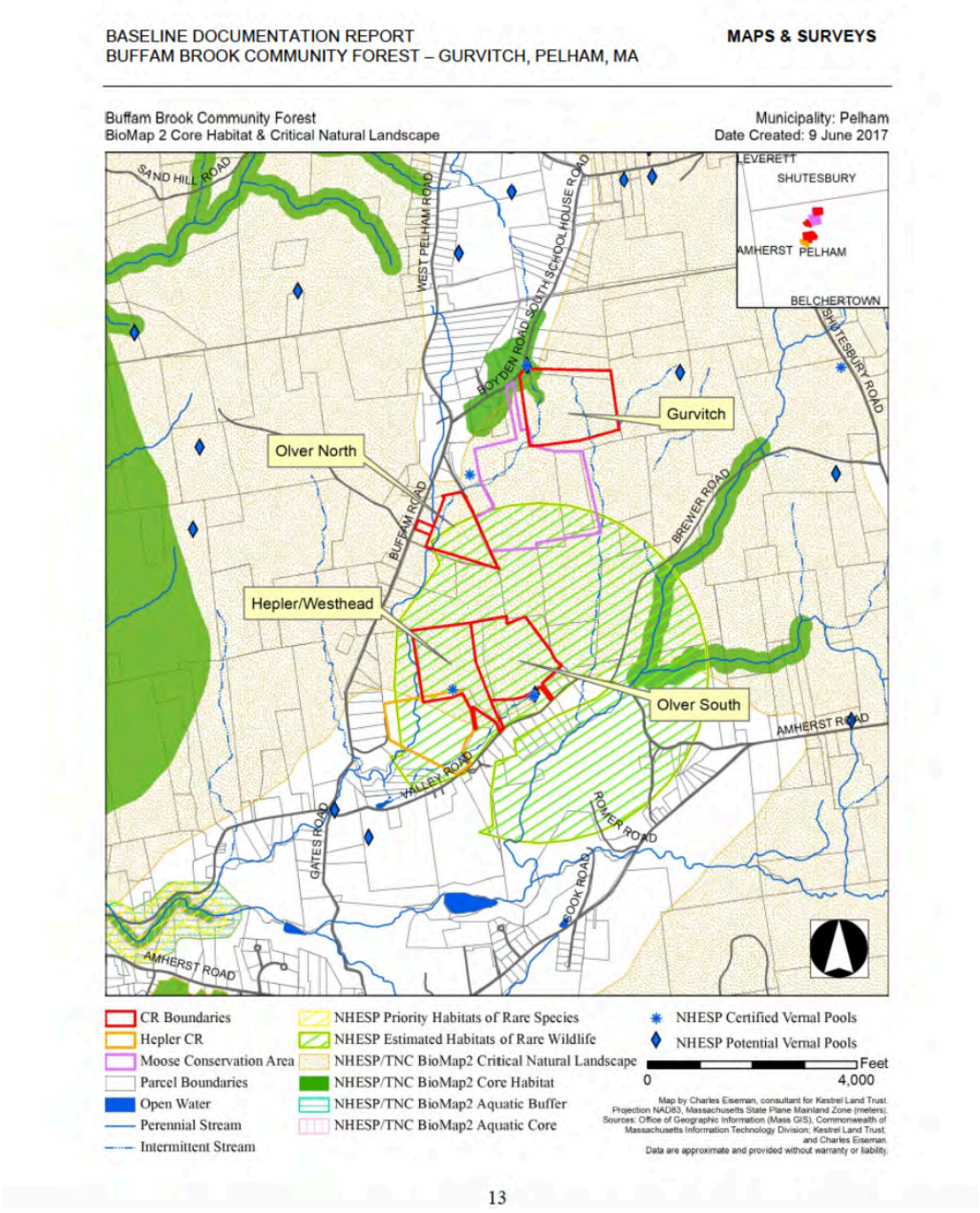


Figure 3: Map provided by Kestrel Trust showing habitat "bubble" for Eastern Box Turtle covering about 53% of the BBCF area.

Forest History

It appears that most parts of the original forest in project area were certainly cleared for tillage and grassland farming, as attested by roads, stone walls, cellar holes and old farmsteads surviving to this day that are located within and around the project area. All lands that were once cleared have grown back into forest. This has occurred naturally and without planting. The first phase of growth was (typically and presumably) into white pine forest. It appears that all of these re-grown forest areas have been cut heavily at least once since they grew back. Much of this cutting occurred roughly 100 years ago, based on the age of recently cut oak stumps.

Pelham stands out among Massachusetts towns as one in which a surprising amount of forest was not cleared for agriculture, and in the early phase of research for this plan it seemed possible that some portions of the project area were never truly cleared for farming (this was suggested by a map of estimated forestland in 1830 available through Harvard Forest), meaning that they were kept in some sort of forested condition. However, a cellar hole and various stone walls within this potential area (Gurvitch) dispelled with that theory.

The harvesting and use of wood played an important role in Pelham's past. Indications of the types and scale of uses of the forest in Pelham can be gleaned from a history of the Town of Pelham (History of Pelham, Mass: From 1738 to 1898, Including the Early History of Prescott, by Charles Oscar Parmenter, 1898). Wood was cut for many purposes including sawmilling (the last water-powered mill was built in 1870; later, portable mills became popular), railroad ties, tannery chemicals, and charcoal (made in piles of 10 or 15 cords at a time or, later, in larger brick kilns) for Amherst, Northampton, Springfield and Chicopee. A Mr Shores was said to produce as many as 150,000 bushels of charcoal per year. Apparently quite a wood baron, the said Mr Shores was said to own up to 1,200 acres of land and, during his ownership tenure was able to go back in and cut railroad ties from woodlots he had previously cut off for charcoal. This last bit suggests vigorously growing trees – probably chestnut.

Another enterprising Pelham resident, W. Orcutt Clough, cut stovewood. Over a 19-year period he was said to have brought out 8,000 one-horse loads of stovewood, all with the same horse.

Total household cordwood usage would have been impressive.

In recent decades the forest has experienced some major ups and downs. After outright clearing or very intense usage, the forest has been allowed to grow back into a forest of many large trees, and has done so in a very vigorous manner. Along the way we effectively lost one important species – the American chestnut – to an introduced pathogen. The 38 hurricane, and other hurricanes and storms, have battered the forest, and gypsy moths, also introduced, have weakened many trees during various outbreaks, but the forest has persisted. Our forest is now what is sometimes referred to as a "tall forest". This fundamental fact is the basis for our claim, in 2017, to live in a forested landscape. As the forest has regrown in its dramatic way, a number of factors are conspiring to cast doubt on whether the renaissance of regrowth can be perpetuated into the future in a recognizable and desirable way. A startling array of introduced forest pests and pathogens has invaded the landscape, having a profound effect on the composition of the

forest, most noticeably affecting large trees in the forest overstory. Now non-native invasive forest plants have joined this rogue's gallery of harmful biological agents, with the ultimate potential to completely wipe out the forest as they overrun the understory and, in worst-case future scenarios, become the new overstory. Likewise, deer, once relatively scarce, have rebounded to a remarkable, probably unprecedented level and are having an impact on the understory that is also profound. It goes without saying that the understory is the starting point for all our future trees and is also the habitat of a vast array of native vegetation. Compounding these effects is a tendency for the vigorously re-growing forest to become overcrowded as intense competition amongst trees mutually restricts the growth of neighboring trees and deprives the understory of necessary sunlight to fuel germination and growth, and to some extent reduces available soil water. As this overcrowding has occurred across the landscape, the amount of young forest habitat has dramatically decreased, with some trees "fading" out of the mix (e.g. paper birch, pin cherry, bigtooth poplar) and with a sharp drop in highly desirable bird habitat. Known as early-successional forest, or sometimes as "shrubland", there are a number of birds that require this type of habitat for breeding (as wonderful as large trees are, some bird species simply will not use them to breed). But also, most species of terrestrial wildlife, include birds that do breed in mature forests, use these early-successional forest areas quite heavily, as they are rich in nutritious, young vegetation, insects that feed on the vegetation, and often fruits (e.g. blackberries, pin cherries) and, for pollinators, floral resources.

Within the framework of internal forest recovery leading to challenges, the forest itself has been carved up into modern-day houselots, mostly in the vicinity of road frontage in a process referred to as fragmentation (i.e. outright loss of forest). Though relatively small in acreage at times, the harmful impacts of fragmentation can extend well-beyond the actual construction and yardscape footprints, especially if fragmented areas are breeding grounds for invasive plants, base camps for unchecked housecat predation in the surrounding forest. These impacts will not be elaborated or dwelled on here, but do need to be mentioned. Now, adding to this, we are faced with uncertain but potentially harmful changes in the climate that could cause, for example, greater periods of drought triggered by unprecedented rain patterns or warmer winters that trigger a different type of drought stress, ill-timed patterns of leafing and flowering, greater survival of overwintering pests, etc. But we don't really know what will happen.

Taken together, the outlook for the forest in general is very mixed, with the potential for a diverse, mature forest still remaining, but the possibility of a very degraded post-forest landscape not out of the question.

To wrap this up on a positive note, the starting point of this project area is very good, and, with watchful eyes and a thoughtful approach to stewardship, the chances of sustaining a desirable forest in this project area are probably about as good as they are anywhere in the region.

Forest Health

Forest health is an extremely problematic term. Used in a short-hand way in conversation, it sort of means "is everything OK in the forest?" or, maybe in the broadest sense, "is the forest still a forest?" In that broadest sense, the forest is still a forest and trees keep growing, so that is good.

In the less-broad sense, though, it is hard to think of the forest as "OK" when a number of introduced pests and pathogens are threatening the future species composition, structure, and economic utility of the forest to such a degree that it is difficult to say for sure, 100 years from now, that we will be able to enjoy the same type of tall, closed-canopy, mixed-species forest we do at this point in time.

The main challenges facing the forest now are introduced pests of hemlock (hemlock woolly adelgid and elongate hemlock scale), introduced pathogens of white pine (both needle disease fungi as well as a stem canker fungus), and an introduced pest of ash species (emerald ash borer) that is projected to devastate ash. Joining this rogue's gallery are a host of non-native invasive plants, including oriental bittersweet, glossy buckthorn, winged euonymous (burning bush) and garlic mustard, not to mention multiflora roase, japanese knotweed and Japanese barberry. With their ability to crowd out and outcompete native vegetation, there is a severe risjk that native vegetation will gradually be replaced, to a large extent, bythese plants, and that the idea of a tall, closed-canopy forest of native trees will become a legend of the past. Adding to this, a high population of deer serves to magnify the harmful impacts of non-native invasive plants and tends to allow only a limited subset of native vegetation to thrive. Many of the desirable native tree species, such as oaks and sugar maple, are at a severe disadvantage in the presence of high deer populations. Taken together, this is a very troubling set of factors. When you add to this projected changes in climate which, it is said, may bring with them a number of harmful effects such as an increase drought, harmful timings of spring frosts, more favorable temperatures for overwintering pests, etc., it is difficult to maintain a rosy attitude. But an awareness of these threats can help motivate actions that can be beneficial to the overall condition of the forest during our watch.

Hemlock is abundant in some areas , especially Stands 2, 5 & 6. White pine is abundant in all areas. White ash is not a major component of this forest, but is an important component the in riparian areas along the brooks, especially in Olver North. Fortunately, and remarkably, most of the interior areas of BBCF are free of invasives; invasive plant infestations are mainly limited to road frontage areas along North Valley and Buffam Roads and along the portions of the powerline ROW (see below). Deer browse levels seem typical of the wider landscape. Interestingly, all of the young hemlocks observed at BBCF had been heavily browsed back by moose.

Forest Health Focus: Non-native Invasive Plants

Most of the interior areas of BBCF are free of invasives. Invasive plant infestations are mainly limited to the following areas:

Stand 3 — near the building lot road frontage dogleg on Boyden Road (Weeks): this is mostly Japanese knotweed near the culvert and bittersweet near the road edge

Stand 4 — the entrance to Old Stage Road from the west (this is mostly off the property) / Olver North: this off-property infestation includes oriental bittersweet and garlic mustard as well as black locust, all of which can continue to spread inward to the property.

Stand 4 — the power line ROW / Olver North: Glossy buckthorn is very well established, with tall, large plants, where the stream crosses the ROW, but is also starting to spread along the edge of the ROW and into the surrounding forest.

Stand 4 — road building lot road frontage on Buffam Road / Olver North: this rogue's gallery of winged euonymous, oriental bittersweet, glossy buckthorn and multiflora rose, along with garlic mustard is thickest along the road and in the old borrow pit but has reached Buffam brook.

Stand 5 — road frontage areas along North Valley Road (Hepler-Westhead): between the road frontage and Gates Brook, in a sort of forgotten no-man's land, bittersweet is very well established including large vines. Nearby properties have unchecked bittersweet, winged euonymous and autumn olive.

Stand 6 — the power line ROW / Olver South: there is some glossy buckthorn in the ROW which may be off the property but in any case it is close by.

All of the areas mentioned above should be a priority for treatment. The treatment of the ROW may be able to be coordinated with the ROW operator. Areas off the property can only be treated in cooperation with the respective owners. Some areas may be within the town highway right of way and may potentially be treated under those auspices.

Disturbances to the forest can provide an opportunity for invasive plants to penetrate uninfested areas. Disturbances also give a boost to existing invasive plant populations. This is a gigantic conundrum because disturbance (a word that sounds negative) is inevitable (driven by natural causes) and sometimes desirable (occurring with pro-active management). The trend over time will be for invasive plants to increase. This knowledge brings with it the onus to provide adequate monitoring of all areas, especially those with know established populations and those areas that have been disturbed in the recent past, and to achieve effective control of invasive plants so that the many desirable functions of forests are not impeded.

Desired Future Condition

Desired: a resilient woodlot growing the full native diversity of native trees with a diverse age and habitat structure in a manner that addresses the concerns and achieves property-wide stewardship interests stated below.

Property-Wide Stewardship Resiliency Concerns

In pursuing the property-wide stewardship interests under the overarching concern of maintaining forest resiliency in the face of current and future stressors, the following concerns are raised (cf. Increasing Resiliency for an Uncertain Forest Future, D'Amato, Catanzaro and Huff, 2016)

1) Negative impacts of pests and disease.

2) Negative impacts of non-native invasive plants.

3) Loss of forest to conversion and long-term fragmentation.

4) Excessive consumption of young vegetation by high deer populations.

5) Overcrowding of large trees and loss of early-successional forest.

6) Multi-faceted negative impacts of climate change.

7) Need for adequate and sustainable infrastructure to accomplish forest stewardship.

Role/Impact wrt. nearby Protected Lands

Nearby protected lands include the directly abutting Hepler parcel (this parcel is protected from further development by conservation restrictions held by the Kestrel Land Trust). Amherst watershed land abuts to the east and is nearby to the NW. The Quabbin Reservoir is nearby.

Water supply: This property does not lie within the watershed of a surface drinking water supply. No threat to water supplies is anticipated from any expected activities on this property.

Wildlife habitat: The anticipated uses should sustain or enhance the current mature and maturing, complex forest habitats and add a component of early-successional habitat. No negative effect on habitat on any nearby land is anticipated.

Recreation: any active management will be designed to minimize disruptions to allowed recreational activities.

The between-property impact of any management: is expected to be either essentially non-existent or neighborhood-friendly.

Property-Wide Stewardship Interests and Corresponding Management Recommendations (text preceded by caps: Kristin Deboer, Kestrel Trust; bold text preceded by dash: Pelham Conservation Commission; italics: Michael Mauri, consulting forester)

A. Undertake a scientifically-informed sustainable forest management plan that demonstrates a spectrum of forestry techniques, from the selective harvest of marketable timber to management of the forest for mature conditions. This includes:

— Identify and pursue opportunities for a working forest providing a sustainable wood supply.
— Provide adequate access for working utilization and stewardship of the forest.

Management Action: silviculture. Conduct silviculturally-based harvesting to support goals of working forest, water quality protection, habitat resiliency and education/demonstration. These goals are probably best organized under an effort to increase the diversity and complexity of forest structure, which will serve the twin goals of providing a greater range of habitats (at the early- and late-successional ends of the spectrum and in an intermediate "shelterwood" condition, i.e. a tall partial overstory with a thick shrub and/or sapling layer) and improving the vigor of trees in the forest canopy (by reducing crowding), which improves tree health but not forest health per se. In the course of these activities, the goals of local wood supply, water quality, and education/demonstration will be achieved. It should be noted that the results of any efforts to create early- successional or shelterwood-type habitat are temporary, with benefits typically lasting less than 15 years. It should also be noted that the goal of water quality will be further served by avoidance of cutting in riparian areas (see below and also section B below).

Specific silviculturally-based harvesting efforts will be intended to provide an appreciable component of early successional wildlife habitat that will benefit not only the breeding activity of early successional forest interior birds and forest understory birds but also will benefit mature forest birds in the post-fledging and pre-migration phase. Many other species of wildlife will benefit as well, including bear and moose. The ability to accomplish this goal will depend to a large extent on having suitable management access. In addition to early-successional work, efforts can be made to increase the amount of late-successional structure, most noticeably by addressing the general lack of large snags and large downed logs in the short term, but also by thinking strategically about providing these in the longer term (e.g. by attempting to establish bigtooth poplar and/or paper birch). In keeping in mind the differing light requirements that drive the diversity of native forest vegetation, thought will be given to providing opportunities for species that require large gaps in order to become successfully established (e.g. black gum).

Management Action: access. Carry out access improvements and maintenance to facilitate recommended harvesting and other forest management, recreation, and education. Separate access is needed is needed for Stands 1-4 (North) and Stands 5& 6 (South).

Management Access to BBCF South: Good access is available through the Olver South parcel, with a graveled truck road to a landing within the property. The maximum skid distance is about 2,500 feet. Two stream crossings are established as permanent culverts. One other stream crossing would be needed and this would be over a well-defined streams at right angles. This crossing could be temporary or permanent. Access at the other road frontage on North Valley Road is not practical do to the stream and a large, wet riparian area, steep terrain once the stream is crossed, and the apparent lack of parking.

Management Access to BBCF North: Access is less than ideal due to the presence of streams, vernal pools and wetlands and/or to insufficient or uncertain legal status that make traditional access points of Old Stage Road, Robinson Road, and the Gurvitch frontage problematic. A long sliver of land with frontage on Boyden Road has very limited potential. Consider engaging with abutters to see if permission can be granted to use the portion of Robinson Road that crosses private property.

Management Action: non-native invasive plant control. Conduct non-native invasive plant control to support all forest benefits including forest product growth and yield, water quality, wildlife habitat, education/demonstration, and overall resiliency. This would entail not only on-property control efforts but also a neighborhood-wide outreach effort in the hope that non-native invasive plants can be reduced on abutting properties.

Management Action: deer hunting. Support to the extent possible an appropriate level of deer hunting to support all forest benefits including forest product growth and yield, water quality, wildlife habitat, education/demonstration, and overall resiliency.

Management Action: property boundary maintenance. Mark and maintain boundaries to limit encroachment, identify ownership and permissible uses and to facilitate monitoring and treatments (e.g. invasive plants) to support all forest benefits including forest product growth and yield, water quality, wildlife habitat, education/demonstration, and overall resiliency. Use signs to indicate hiking access and parking areas. Monitor these areas for unintended uses such as dumping. Block roads into BBCF parcels to prohibit off-road vehicles as needed.

B. Protect the forest for the benefit of water quality in Buffam Brook. This includes:

— Provide forest-based source-water protection.

In addition to following normal BMPs during any harvesting under a CH 132 permit, consider the following actions:

Management Action: riparian forest. Pursue a riparian forest concept that allows trees to grow to large size within a defined riparian area and plan to allow these trees to experience normal mortality and become large woody material in and near streams. In

the near term, plan to augment the natural rate of snag formation.

Management Action: old roads. Fix washed-out and washing-out roads so that they can be used (e.g. Robinson Road and Old Stage Road). If this is not possible, then these roads should be stabilized and closed for good.

Management Action: Maintain necessary stream crossings (culverts, bridges, fords) in a functional condition or remove any that cannot be maintained. Monitor and maintain all culverts or consider removing these. Address the failed bridge on Old Stage Road. In future logging, plan access routes so as to minimize stream crossings and use portable bridges in situations where stream banks or approaches need maximum protection.

Management Action: promote the retention of woody material (slash, coarse woody debris, snags, etc.) at the forest-wide level wherever possible to provide soil protection and to improve future infiltration and water storage properties of the soil.

C. Enhance wildlife habitat for resiliency to climate change. This includes:

— Provide sufficient protection and habitat for the Eastern box turtle.
— Provide desirable breeding habitat for forest-interior birds. This includes a full range of forest structures from mature/closed-canopy to partially-open/intermediate to early-successional habitat.

Management Action: Follow Conservation Management Practices for the eastern box turtle provided by the Natural heritage and Endangered Species Program as outlined on pages 6 & 7 of "Massachusetts Forestry Conservation management Practices for Eastern Box Turtles, version 2007.1, revised December, 2016." Key practices include limiting the timing of logging to winter (potentially November 1 to April 15), and avoiding mechanical scarification of the soil. The area to be covered by the restricted logging window would be at least the area indicated in relevant NHESP habitat maps available at that time. It is important to mention that timber harvesting should be limited to trees marked with paint by a forester.

Management Action: Pursue an approach to creation and/or maintenance of early successional and intermediate bird habitat within an overarching framework of mature, closed-canopy forest. See discussion in section A.

D. Create opportunities for forest-based experiential learning and forestry education for the community. This includes:

— Identify forest-based educational opportunities including demonstration of forest stewardship.

Management Action: Plan silviculturally-based harvesting efforts so that the forest will contain areas that are in a phase of active or recent management as well as areas that

have not been managed within the last few decades. This will provide the opportunity to see natural areas with both an obvious and a less obvious level of human activity. Opportunities will exist for nature-based education (e.g. organized by the local Hitchcock Center), forest management education (e.g. in conjunction with the forestry program at UMass) and for Pelham and other landowners to experience both active management and the longer-term results of past actions.

E. Serve as a replicable model of effective forest stewardship for private landowners

Management Action: Use the BBCF to demonstrate the specific forest management actions that would be taken and provide explanations of the reasons why, the methods used, and the desired results as examples of how to think about forest management opportunities and challenges. In outreach settings, remind participants that each private woodlot and ownership situation is unique and will require unique thinking and solutions. Bear in mind that the demonstration value is in showing people that a specific situation was addressed in a specific and unique way and that the challenge in any situation is to find a fruitful and site-specific set of treatments (there could be more than one type of pathway) at a beneficial and economical scale and in a spatial and temporal pattern that makes sense, all being done in a manner which is consistent with all of the other interests and is also acceptable to the landowner and the wider community.

F. Promote collaboration for a landscape-level sustainable forest management approach shared among the proposed BBCF, the Town of Amherst's watershed lands, UMASS Cadwell Forest, and the Quabbin Reservoir.

G. Guarantee public access for recreational benefits such as hiking and cross-country skiing on designated trails, as well as hunting and fishing. This includes:

— Provide adequate access for *sustainable* forms of passive and active recreation and education including connectivity to other trails

Management Action: Identify existing trails intended for recreational uses as well as potential future trails and mark and maintain these in a manner so that they can be safely used. Identify (with signs) parking rules at any allowable parking area (see Section A).

Management Action: To the extent possible, keep recreational trails separate from other trails used specifically for logging and where this is not possible, strive to have logging trails cross recreational trails at right angles rather then run along the same route. Where logging trails and recreational trails must be one and the same, ensure that post logging clean up is more than adequate so that a safe recreational experience is provided.

Overview of Forest Habitat Features: BBCF

Stand	Type	Ac.	Canopy	Midstory	Understory	Hard mast	Soft mast	Leaf litter	Coarse woody debris	Fine woody debris
1	OH	54.0	tall, mostly closed-canopy, 80-100% cover	moderate witch hazel & other shrubs, some thick hobblebush	generally sparse, often bare leaf; spagnum and fern in wetter areas	abundant oaks	minor viburnum other than abundant hobble in some areas	thick oak	present to some extent	sparse/ normal
2	WK	17.0	tall, mostly closed-canopy, 60-100% cover	moderate witch hazel & other shrubs, some thick hobblebush	generally sparse, often bare leaf; spagnum and fern in wetter areas	red & scarlet oak	minor blueberry other than abundant hobble in some areas	thick oak and pine	present to some extent	sparse/ normal
3	WH	69.9	tall, mostly closed-canopy, 60-100% cover	moderate or thick witch hazel & other shrubs	generally sparse, often bare leaf	abundant oaks	minor except in thick huckleberry lowbush blueberry	thick oak and pine	present to some extent	sparse/ normal
4	BB	26.0	tall, mostly closed-canopy, 60-100% cover	moderate or thick witch hazel & other shrubs	generally sparse, often bare leaf; spagnum and fern in wetter areas	red oak	minor	thick oak or sometimes nearly bare soil	present to some extent	sparse/ normal
5	WK	41.1	tall, mostly closed-canopy, 80-100% cover	sparse shrubs, sometimes thick huckleberry	generally sparse, often bare leaf; spagnum and fern in wetter areas	abundant oaks	minor except in thick huckleberry lowbush blueberry	thick oak and pine	present to some extent	sparse/ normal
6	WK	43.8	variable, irregular, 0-60% cover	thick shrub layer where recently cut, diverse but otherwise mostly witch hazel	generally sparse, often bare leaf under witch hazel	red oak, beaked hazel	vibrunumalso black raspberry in recently logged areas	thick oak and pine	somewhat abundant due to recent logging and includes large oak stumps	sparse/ normal

Climate Change Adaptation & Forest Carbon

Forests are always changing and responding to new conditions. At the same time, the climate is changing in ways that humans have never experienced before, resulting in rising temperatures and shifts in seasonal precipitation patterns. Past and future climate changes in Massachusetts include:

- Temperatures have risen more than 2°F since the late 1800s, with the greatest warming occurring in winter (more than 3°F increase). By the end of this century, average annual temperatures are projected to increase another 5-10°F, increasing both the length of the growing season and the frequency of extremely hot days.
- Annual precipitation has increased by several inches during this time. The heaviest rainfall events increased 71% in the Northeast U.S. during 1958 to 2012, and this trend is expected to continue. Additionally, warmer temperatures will result in more rain than snow.
- A longer growing season, warmer temperatures, and more variable summer rain are likely to increase summer moisture stress leading to potentially harmful droughts.
- As the climate continues to change, conditions are expected to become less favorable for the traditional northern trees in Massachusetts. Common trees like maple, birch, and beech are likely to experience greater stress, particularly on warmer and drier sites. Trees that are more common farther south may benefit from warmer conditions, such as oaks and hickories.

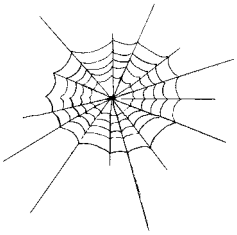
Climate change will not affect all forest species, communities, and parts of the landscape in the same way (additional information on climate change and New England forests is available at www.forestadaptation.org/ne-assessment). Additional stress will amplify some threats that forests already face, such as invasive species, insect pests, forest diseases, and deer browse. Species and forest types that are more tolerant of disturbances may have less risk from climate change, and forests with greater diversity (species, genetic, and structural diversity) may also have less risk.

The Buffam Brook Community Forest has several features that may enhance its ability to adapt to a changing climate, including a diverse mix of tree species and relatively low levels of stress from insect pests, diseases, and invasive plant species. Forest management activities can be used to respond to climate change in different ways, and the Adaptation Workbook (www.forestadaptation.org/far) was used to consider how climate change may affect the Buffam Brook Community Forest. Actions that will meet the management objectives and goals for the property were evaluated to ensure that they will also help the forest adapt to climate change and other stressors; these are described in the stand descriptions section of this plan and also with more detail in the Adaptation Workbook process that was guided and summarized by the USFS (Maria Janowiak) and which is provided in Appendix 1.

Ensuring that forests can adapt to climate change will also help ensure that forests continue to remove greenhouse gases from our atmosphere. Forests play a vital role in the earth's carbon cycle, as they remove carbon dioxide from the atmosphere and store it in biomass (trunks, branches, foliage, and roots) and soils. Sustainable forestry practices can increase the ability of forests to absorb and store atmospheric carbon while enhancing other ecosystem services, such as soil and water quality. Harvesting and regenerating forests can also result in net carbon sequestration in wood products and new forest growth.

Stewardship Issues

Massachusetts is a small state, but it contains a tremendous variety of ecosystems, plant and animal species, management challenges, and opportunities. This section of your plan will provide background information about the Massachusetts forest landscape as well as issues that might affect your land. **The Stand Descriptions and Management Practices sections of your plan will give more detailed property specific information** on these subjects tailored to your management goals.



Biodiversity: 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 has become an important resource management goal.

While the biggest threat to biodiversity in Massachusetts is the loss of habitat to development, another threat is the introduction and spread of invasive non-native plants. Non-native invasives like European Buckthorn, Asiatic Bittersweet, and Japanese Honeysuckle spread quickly, crowding out or smothering native species and upsetting and dramatically altering ecosystem structure and function. Once established, invasives are difficult to control and even harder to eradicate. Therefore, vigilance and early intervention are paramount.

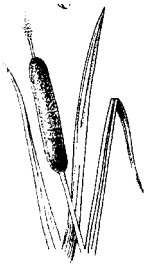
Another factor influencing biodiversity in Massachusetts concerns the amount and distribution of forest growth stages. Wildlife biologists have recommended that, for optimal wildlife habitat on a landscape scale, 5-15% of the forest should be in the seedling stage (less than 1" in diameter). Yet we currently 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"). See more about how you can manage your land with biodiversity in mind in the "Wildlife" section below. (Also refer to *Managing Forests to Enhance Wildlife Diversity in Massachusetts* and *A Guide to Invasive Plants in Massachusetts* in the binder pockets.)

Rare 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. The maps of your property will be compared to these rare species maps and the result indicated on the upper right corner of the front page of the plan. 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.



Riparian and Wetlands Areas: Riparian and wetland areas are transition areas between open water features (lakes, ponds, streams, and rivers) and the drier terrestrial ecosystems. More specifically, a **wetland** is an area that has hydric (wet) soils and a unique community of plants that are adapted to live in these wet soils. Wetlands may be adjacent to streams or ponds, or a wetland may be found isolated in an otherwise drier landscape. A **riparian area** is the transition zone between an open water feature and the uplands (see Figure 1). A riparian zone may contain wetlands, but also includes areas with somewhat better drained soils. It is easiest to think of riparian areas as the places where land and water meet.

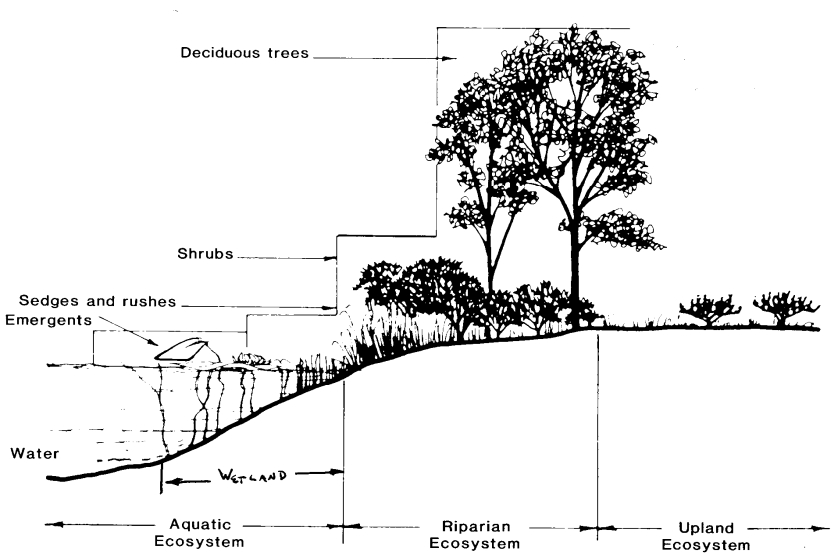


Figure 1: Example of a riparian zone.

The presence of water in riparian and wetland areas make these special places very important. Some of the functions and values that these areas provide are described below:

Filtration: Riparian zones capture and filter out sediment, chemicals and debris before they reach streams, rivers, lakes and drinking water supplies. This helps to keeps our drinking water cleaner, and saves communities money by making the need for costly filtration much less likely.

Flood control: By storing water after rainstorms, these areas reduce downstream flooding. Like a sponge, wetland and riparian areas absorb stormwater, then release it slowly over time instead of in one flush.

Critical wildlife habitat: Many birds and mammals need riparian and wetland areas for all or part of their life cycles. These areas provide food and water, cover, and travel corridors. They are often the most important habitat feature in Massachusetts' forests.

Recreational opportunities: Our lakes, rivers, streams, and ponds are often focal points for recreation. We enjoy them when we boat, fish, swim, or just sit and enjoy the view.

In order to protect wetlands and riparian areas and to prevent soil erosion during timber harvesting activities, Massachusetts promotes the use of "Best Management Practices" or BMPs. Maintaining or reestablishing the protective vegetative layer and protecting critical areas are the two rules that underlie these common sense measures. DCR's Massachusetts Forestry Best Practices Manual (included with this plan) details both the legally required and voluntary specifications for log landings, skid trails, water bars, buffer strips, filter strips, harvest timing, and much more.

The two Massachusetts laws that regulate timber harvesting in and around wetlands and riparian areas are the Massachusetts Wetlands Protection Act (CH 131), and the Forest Cutting Practices Act (CH132). Among other things, CH132 requires the filing of a cutting plan and on-site inspection of a harvest operation by a DCR Service Forester to ensure that required BMPs are being followed when a commercial harvest exceeds 25,000 board feet or 50 cords (or combination thereof).

Soil and Water Quality: Forests provide a very effective natural buffer that holds soil in place and protects the purity of our water. The trees, understory vegetation, and the organic material on the forest floor reduce the impact of falling rain, and help to insure that soil will not be carried into our streams and waterways.

To maintain a supply of clean water, forests must be kept as healthy as possible. Forests with a diverse mixture of vigorous trees of different ages and species can better cope with periodic and unpredictable stress such as insect attacks or windstorms.

Timber harvesting must be conducted with the utmost care to ensure that erosion is minimized and that sediment does not enter streams or wetlands. Sediment causes turbidity which degrades water quality and can harm fish and other aquatic life. As long as Best Management Practices (BMPs) are implemented correctly, it is possible to undertake active forest management without harming water quality.

Forest Health: Like individual organisms, forests vary in their overall health. The health of a forest is affected by many factors including weather, soil, insects, diseases, air quality, and human activity. Forest owners do not usually focus on the health of a single tree, but are concerned about catastrophic events such as insect or disease outbreaks that affect so many individual trees that the whole forest community is impacted.

Like our own health, it is easier to prevent forest health problems then to cure them. This preventative approach usually involves two steps. First, it is desirable to maintain or encourage a wide diversity of tree species and age classes within the forest. This diversity makes a forest less susceptible to a single devastating health threat. Second, by thinning out weaker and less desirable trees, well-spaced healthy individual trees are assured enough water and light to thrive. These two steps will result in a forest of vigorously growing trees that is more resistant to environmental stress.

Fire: Most forests in Massachusetts are relatively resistant to catastrophic fire. Historically, Native Americans commonly burned certain forests to improve hunting grounds. In modern times, fires most often result from careless human actions. The risk of an unintentional and damaging fire in your woods could increase as a result of logging activity if the slash (tree tops, branches, and debris) is not treated correctly. Adherence to the Massachusetts slash law minimizes this risk. Under the law, slash is to be removed from buffer areas near roads, boundaries, and critical areas and lopped close to the ground to speed decay. Well-maintained woods roads are always desirable to provide access should a fire occur.

Depending on the type of fire and the goals of the landowner, fire can also be considered as a management tool to favor certain species of plants and animals. Today the use of prescribed burning is largely restricted to the coast and islands, where it is used to maintain unique natural communities such as sandplain grasslands and pitch pine/scrub oak barrens. However, state land managers are also attempting to bring fire back to many of the fire-adapted communities found elsewhere around the state.

Wildlife Management: Enhancing the wildlife potential of a forested property is a common and important goal for many woodland owners. Sometimes actions can be taken to benefit a particular species of interest (e.g., put up Wood Duck nest boxes). In most cases, recommended management practices can benefit many species, and fall into one of three broad strategies. These are **managing for diversity, protecting existing habitat, and enhancing existing habitat**.

Managing for Diversity – Many species of wildlife 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. A thick area of brush and young trees might provide food and cover for grouse and cedar waxwing; a mature stand of oaks provides acorns for foraging deer and turkey; while an open field provides the right food and cover for cottontail rabbits and red fox. It is often possible to create these different habitats on your property through active management. The appropriate mix of habitat types will primarily depend on the composition of the surrounding landscape and your objectives. It may be a good idea to create a brushy area where early successional habitats are rare, but the same practice may be inappropriate in the area's last block of mature forest.

Protecting Existing Habitat – This strategy is commonly associated with managing for rare species or those species that require unique habitat features. These habitat features include vernal pools, springs and seeps, forested wetlands, rock outcrops, snags, den trees, and large blocks of unbroken forest. Some of these features are rare, and they provide the right mix of food, water, and shelter for a particular species or specialized community of wildlife. It is important to recognize their value and protect their function. This usually means not altering the feature and buffering the resource area from potential impacts.

Enhancing Existing Habitat – This strategy falls somewhere between the previous two. One way the wildlife value of a forest can be enhanced is by modifying its structure (number of canopy layers, average tree size, density). Thinning out undesirable trees from around large crowned mast (nut and fruit) trees will allow these trees to grow faster and produce more food. The faster growth will also accelerate the development of a more mature forest structure, which is important for some species. Creating small gaps or forest openings generates groups of seedlings and saplings that provide an additional layer of cover, food, and perch sites.

Each of these three strategies can be applied on a single property. For example, a landowner might want to increase the habitat diversity by reclaiming an old abandoned field. Elsewhere on the property, a stand of young hardwoods might be thinned to reduce competition, while a "no cut" buffer is set up around a vernal pool or other habitat feature. The overview, stand description and management practice sections of this plan will help you understand your woodland within the context of the surrounding landscape and the potential to diversify, protect or enhance wildlife habitat.

Wood Products: If managed wisely, forests can produce a periodic flow of wood products on a sustained basis. Stewardship encompasses finding ways to meet your current needs while protecting the forest's ecological integrity. In this way, you can harvest timber and generate income without compromising the opportunities of future generations.

Massachusetts forests grow many highly valued species (white pine, red oak, sugar maple, white ash, and black cherry) whose lumber is sold throughout the world. Other lower valued species (hemlock, birch, beech, red maple) are marketed locally or regionally, and become products like pallets, pulpwood, firewood, and lumber. These products and their associated value-added industries contribute between 200 and 300 million dollars annually to the Massachusetts economy.

By growing and selling wood products in a responsible way you are helping to our society's demand for these goods. Harvesting from sustainably managed woodlands – rather than from unmanaged or poorly managed forest – benefits the public in a multitude of ways. The sale of timber, pulpwood, and firewood also provides periodic income that you can reinvest in the property, increasing its value and helping you meet your long-term goals. Producing wood products helps defray the costs of owning woodland, and helps private landowners keep their forestland undeveloped.

Cultural Resources: Cultural resources are the places containing evidence of people who once lived in the area. Whether a Native American village from 1,700 years ago, or the remains of a farmstead from the 1800's, these features all tell important and interesting stories about the landscape, and should be protected from damage or loss.

Massachusetts has a long and diverse history of human habitation and use. Native American tribes first took advantage of the natural bounty of this area over 10,000 years ago. Many of these villages were located along the coasts and rivers of the state. The interior woodlands were also used for hunting, traveling, and temporary camps. Signs of these activities are difficult to find in today's forests. They were obscured by the dramatic landscape impacts brought by European settlers as they swept over the area in the 17th and 18th centuries.

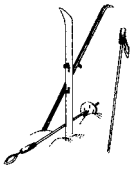
By the middle 1800's, more than 70% of the forests of Massachusetts had been cleared for crops and pastureland. Houses, barns, wells, fences, mills, and roads were all constructed as woodlands were converted for agricultural production. But when the Erie Canal connected the Midwest with the eastern cities, New England farms were abandoned for the more productive land in the Ohio River valley, and the landscape began to revert to forest. Many of the abandoned buildings were disassembled and moved, but the supporting stonework and other changes to the landscape can be easily seen today.

One particularly ubiquitous legacy of this period is stone walls. Most were constructed between 1810 and 1840 as stone fences (wooden fence rails had become scarce) to enclose sheep within pastures, or to

exclude them from croplands and hayfields. Clues to their purpose are found in their construction. Walls that surrounded pasture areas were comprised mostly of large stones, while walls abutting former cropland accumulated many small stones as farmers cleared rocks turned up by their plows. Other cultural features to look for include cellar holes, wells, old roads and even old trash dumps.

History of Natural Disturbance:

As noted above, the mid 19th century was the height of forestland clearing for agriculture and pasturing. The availability of richer, more productive farmland in the Midwest resulted in farm abandonment and subsequent regrowth of white pine, chestnut, and mixed hardwoods including red oak. In the early 20th century these stands, particularly white pine, were cut to supply the wood container industry. Farm activity on the newly cleared land was truncated by World Wars I and II and brought about another wave of farm abandonment and regrowth. Natural disturbances since 1900 include the Chestnut blight of 1900-1908, the hurricane of 1938, the Gypsy Moth outbreak of 1980-1982, wind events, and ice damage, most notably in December 2008.



Recreation and Aesthetic Considerations: Recreational opportunities and aesthetic quality are the most important values for many forest landowners, and represent valid goals in and of themselves. Removing interfering vegetation can open a vista or highlight a beautiful tree, for example. When a landowner's goals include timber, thoughtful forest management can be used to accomplish silvicultural objectives while also reaching recreational and/or aesthetic objectives. For example, logging trails might be designed to provide a network of cross-country ski trails that lead through a variety of habitats and reveal points of interest.

If aesthetics is a concern and you are planning a timber harvest, obtain a copy of this excellent booklet: *A Guide to Logging Aesthetics: Practical Tips for Loggers, Foresters & Landowners*, by Geoffrey T. Jones, 1993. (Available from the Northeast Regional Agricultural Engineering Service, (607) 255-7654, for $7). Work closely with your consultant to make sure the aesthetic standards you want are included in the contract and that the logger selected to do the job executes it properly. The time you take to plan ahead of the job will reward you and your family many times over with a fuller enjoyment of your forest, now and well into the future.

Invasive Species Management: Invasive species pose immediate and long-term threats to the woodlands of MA. Defined as a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human, animal, or plant health, invasives are well-adapted to a variety of environmental conditions, out-compete more desirable native species, and often create monocultures devoid of biological diversity. The websites of the Invasive Plant Atlas of New England, www.nbii-nin.ciesin.columbia.edu/ipane, and the New England Wildflower Society,

www.newfs.org are excellent sources of information regarding the identification and management of invasive plants. Some of the common invasive plants found in MA are listed below.

- Oriental Bittersweet (Celastrus orbiculata)
- Glossy Buckthorn (Frangula alnus)
- Multiflora Rose (Rosa multiflora)
- Japanese Barberry (Berbis thunbergii)
- Japanese Knotweed (Fallopia japonica)
- Autumn Olive (Eleaeagnus umbellata)

Early detection and the initiation of control methods soon after detection are critical to suppressing the spread of invasive species. Selective application of the proper herbicide is often the most effective control method. See the next section for information on the use of chemicals in forest management activities.


Asian Longhorned Beetle

Pesticide Use

Pesticides such as herbicides, insecticides, fungicides, and rodenticides are used to control "pests". A pest is any mammal, bird, invertebrate, plant, fungi, bacteria or virus deemed injurious to humans and/or other mammals, birds, plants, etc. The most common forest management use of a pesticide by woodland owners is the application of herbicide to combat invasive species. MA DCR suggests using a management system(s) that promotes the development and adoption of environmentally friendly no-chemical methods of pest management that strives to avoid the use of chemical pesticides. If chemicals are used, proper equipment and training should be utilized to minimize health and environmental risks. In Massachusetts, the application of pesticides is regulated by the MA Pesticide Control Board. For more information, contact MA Department of Agricultural Resources (MDAR), Pesticide Bureau at (617) 626-1776

Please refer to FSC Pesticides Policy: Guidance on Implementation (FSC-GUI30-001 Version 2-0 EN, May 5, 2007) for information on chemicals banned from use on MA Private Lands Group Certification member properties.

This is your Stewardship Plan. It is based on the goals that you have identified. The final success of your Stewardship Plan will be determined first, by how well you are able to identify and define your goals, and second, by the support you find and the resources you commit to implement each step.

It can be helpful and enjoyable to visit other properties to sample the range of management activities and see the accomplishments of others. This may help you visualize the outcome of alternative management decisions and can either stimulate new ideas or confirm your own personal philosophies. Don't hesitate to express your thoughts, concerns, and ideas. Keep asking questions! Please be involved and enjoy the fact that you are the steward of a very special place.

Notes applying to all Forest Stands

Maps

Please refer to the attached USGS Locus Map, Forest-Wide Parcel and Stand Locator Map and Forest Maps at the stand level.

Boundaries

The Gurvitch, Weeks, Hepler-Westhead and Olver South properties are covered by recorded surveys. These are referenced on the Forest maps for these stands. The Wilson and Olver North properties are not covered by complete surveys though portions of their boundaries are shown in recorded surveys, and these are also referenced on the Forest maps for these stands. The property boundaries are partially marked but a consistent, first-time or refreshed marking is needed for all external boundaries.

Public Access to BBCF

"Public Access" as used here refers to the essential ability for the public to get from legal town highways onto the property to use it for a variety of purposes. The two main types of access are access on foot for recreational, educational and monitoring purposes, and access for vehicles for management or other purposes.

Foot Access: The BBCF is open to hiking. Parking is limited to the Gurvitch road frontage of the Olver South logging road entrance. Arriving on foot, the public can easily access Old Stage Road (leading to Olver North). Other access points (e.g. Boyden Road dogleg, Robinson Road and North Valley Road dogleg) are either unclear or not ideal for hiking access. The Gurvitch trail leads into the abutting Amherst watershed property. The North and South sections of BBCF are discontiguous but are connected by trails across private land. No formal agreement exists for the use of these trails.

Vehicle Access: Vehicle access is essential to accomplish most silvicultural work and may be necessary for other work such as controlling invasive plants.

BBCF South: The southern BBCF parcels have good access through a modern, well-constructed gravel road off North Valley Road.

BBCF North: The Gurvitch parcel possesses good road frontage and an old skid road. However, the old skid road is wet crosses numerous streams and is in the vicinity of at

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

least two vernal pools. The stream crossings do not have well-defined banks that could be easily bridged. Furthermore, the old skid road has become a well-used hiking trail. All in all, this is a very problematic situation for future logging access. There is a risk of having significant mud, sediment flow and compaction and also of angering hikers. With a very substantial investment, a modern, graveled road with culverts could be constructed into the middle of the property, but this seems like overkill ansd also would greatly alter the hiking experience.

Robinson Road offers the best logistics for access. Robinson Road is a historic road that once connected Buffam Road to North Valley Road, joining it at what was once a schoolhouse. There were at least two farms along the way (based on 1860 & 1873 maps of Pelham). Both the Olver North and the Moosetracks/Weeks have frontage on Robinson Road. Robinson Road provides the best access to the Olver North and the Moosetracks (Weeks & Fiske) parcels. Currently, the northern part of Robinson Road is used to access two houses. Recently, there was an unsuccessful attempt by the previous owner of Olver North to use Robinson Road for logging access. This was handled in various town committees. The upshot was explained to me by Dana McDonald on 10/3/2017, as follows (Dana's explanation is summarized in parentheses): (Robinson Road is a town highway that has never been discontinued. However, sometime around 1900, part of the active roadbed of Robinson Road was moved onto adjoining private property. As a result, the first 60' of what appears to be Robinson Road today is actually private property. Thus, there does not appear to be legal access to BBCF coming off Buffam Road at this time. It is possible that an agreement could be reached with the pertinent private parties to establish access of some kind. A major concern of the private landowners would be the maintenance and condition of the road, which currently is paid for by the two property owners who use Robinson Road as a driveway. The scope of establishing this goes beyond the scope of this Forest Stewardship Plan but a recommendation will be that this option be researched in an amicable way with the relevant owner and abutters.)

If an agreement can be reached, this would provide the best access for logging. A further option would be to research the location of the original roadbed that has not been closed and evaluate whether this can be re-opened. This road is possibly a very contentious issue, as is often the case with old roads. If access is possible, though, it could allow the Town to leave the Gurvitch access as a hiking trail; a major benefit of this is that the impact to a number of seasonal streams and vernal pools in the northern part of Gurvitch would be mininimized or even avoided altogether.

Overview of Soils

All soils here derive from deposits of glacial till often combined with wind-blown or meltwater-transported deposits (information is taken from the Web Soil Survey of

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Hampden and Hampshire Counties, Massachusetts, Eastern Part, and combined with first-hand comments suitability observations). Soil names and selected properties are shown below.

Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

The parent material consists of coarse-loamy lodgment till derived from gneiss, granite, and/or schist.

Depth to restrictive feature: 15 to 35 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very high
Depth to water table: About 0 to 6 inches

Comment: In addition to occurring on this site on mildly sloping terrain along streams in a rich-mesic-like setting with sugar maple, the Ridgebury type also includes flat, very poorly drained with thick sphagnum moss as well as vernal pools.

Suitability for tree growth: This soil is well-suited for tree growth. In addition to its suitability for generalist species such as red oak, white pine, hemlock, red maple and black birch, this soil is also well-suited to sugar maple, yellow birch, white ash and black gum. Nonetheless, fertility is moderate (site index or 63 for white pine and 57 for red oak).

Suitability for logging: This soil is poorly-suited for logging unless conditions are very dry or frozen. There is a high risk of rutting and root damage as well. If logging must occur on this soil type it is best done with optimal ground conditions (dry or frozen), lighter equipment, and with brush being used in skid trails to spread weight and slow any overland flow of water.

Deerfield loamy fine sand

The parent material consists of loose sandy glaciofluvial deposits.

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Depth to water table: About 18 to 36 inches

Comment: On this site, the Deerfield type seems both shallower and more poorly drained than the general type. There are vernal pools and various seasonal streams that seem to be channeled by swales of shallow bedrock.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Suitability for tree growth: This soil is well-suited to growing trees and is moderate in fertility (site index of 65 for white pine and 55 for red oak). In low areas, white ash, red maple and yellow birch are abundant, but scarlet oak, which tends to occur on droughtier soils, occurs here as well on small rises in terrain caused presumably by bedrock.

Suitability for logging: This soil is wetter than indicated in the soil survey. On this site, the same limitations and precautions indicated for Ridgebury apply here.

Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony

The parent material consists of friable coarse-loamy eolian deposits over dense sandy lodgment till derived from granite and gneiss.

Depth to restrictive feature: 18 to 46 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: High
Depth to water table: About 18 to 36 inches

Comment: This soil occurs in a broad, minimally sloped area with the result that it is probably wetter than the type indicates. Just to the east, the land grades down slightly into a vast wetland and in the small topographic saddle in the northern part of Stand 2 there are many small vernal pools within a seasonal drainage.

Suitability for tree growth: This soil is well-suited to growing trees and is moderate in fertility (site index of 65 for white pine and 61 for red oak). There was a surprising amount of yellow birch and black gum on this soil type (in Stand 3), including black gums that were not merely clustered around vernal pools but which had regenerated as part of the general forest mix in cutting that occurred long ago. More recently, on this soil type in Stand 6, past cutting in modern times resulted in black gum being regenerated (trees 3”-8”), which is uncommon. Black gum regenerates well in full sun, but this does not often occur with modern logging restrictions on wet soils.

Suitability for logging: This soil is wetter than indicated in the soil survey. On this site, the same limitations and precautions indicated for Ridgebury apply here.

Gloucester gravelly fine sandy loam, 3 to 25 percent slopes, extremely stony

The parent material consists of friable sandy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Depth to water table: More than 80 inches

**(interpret the site index and the site’s suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Comment: This is the most prevalent soil on the property and often has a firm and gravelly feel underfoot.

Suitability for tree growth: This soil is well-suited to growing trees but is moderate in fertility (site index of 61 for white pine and 60 for red oak) and is in fact droughty. Scarlet oak, which tends to occur on droughtier soils, is found here, as were several pitch pines. Fertility seems to increase markedly near streams, where yellow birch and ash become more common.

Suitability for logging: This soil is generally well-suited for logging. Logging can be carried out here with fewer restrictions on season or equipment. But it is nonetheless important to take measures to minimize any negative impacts of equipment weight.

Percent of Area Covered by Soil Type at BBCF

Soils	North	South	Overall
Ridgebury	25.0%	0.2%	17%
Deerfield	8.3%	0.0%	5%
Scituate	30.6%	6.5%	23%
Gloucester	36.2%	93.2%	55%
	100%	100%	100%

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Stand delineation, acreage and type classification

Stand delineations are based broadly on forest or habitat type but are designed with the purpose of organizing the forest into practical management units that are recognizable on the ground. A forest type (e.g. white pine and hardwoods, oak and hardwoods, etc.) is provided as a broad "best fit" for each stand. In the case of BBCF, forest types largely correspond to ownership history and therefore the stands were delineated on the basis of constituent parcel boundaries (i.e the former Gurvitch Lumber parcel is Stand 1, the former Weeks property is Stand 2, etc.). Within each stand there are unique or noteworthy areas (e.g. wetlands or riparian areas) resulting in a different management suitability from the main body of the stand (e.g. some areas may be too wet for logging). A decimal system is used to refer to each area within a stand (e.g. in Stand 1 there may be area 1.1, 1.2…, 2.1,…etc.). These are shown on the map, and management recommendations are made for each unique area.

Inventory 2017 — field method for volume per acre

In September, 2017, an 83-point angle-gauge sample cruise was conducted to determine overstory composition, structure, and wood volume. The cruise was laid out on a 360' by 360' grid, capturing about 3 acres per cruise point in a non-biased, systematic manner. At two points, non-biased offsets were used to avoid sampling within the power line right of way within Stand 4 / Olver North.

At all cruise points, all live trees ≥ 2" and all snags ≥ 6" were sampled using a BAF-20 prism. The purpose of including in the inventory small trees with no commercial value (generally trees 2"-6" diameter and classified as "misc.") and snags (standing dead trees) was to be able to quantify these from a forest structure / ecological perspective and the forest-wide level. Forest structure values and product volumes were calculated using Forest Metrix 2.3, a forestry software package. The forest-wide level results are presented and discussed below. Inventory precision for the all-inclusive forest-wide cruise was as follows: at the 90% confidence level, the timber volume is within 14.2% of the mean, the total cord volume is within 8.2% of the mean, and the basal area is within 7.8% of the mean.

Because small trees and snags are not generally included in a forest management cruise, the cruise results were re-calculated without these and presented and used for stand-level description and management recommendations.

The Forest: The Buffam Brook Community Forest is a tall, closed-canopy forest dominated by a mix of site-adapted, mature native hardwood and softwood species occupying a continuum of sites ranging from droughty to well-drained to wet. The forest

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

is loaded with trees, having 68,128 trees overall (trees ≥ 2"), of which 12,841 are trees ≥ 12" diameter. The species mix is dominated by varying combinations of red oak, white pine and red maple across most of the soil moisture spectrum, with less-abundant species tending to occur on the drier (e.g. scarlet oak and, rarely, pitch pine), or wetter (e.g. yellow birch or white ash), or richer (e.g. sugar maple) sites that support them. The forest displays a notable lack of blowdowns, snapped tops and other signs of recent disturbance from weather-related events such as wind, and there are few large snags.

With about 1.8 million board feet of timber and 3,500 cords of roundwood firewood and pulp, the Buffam Brook Community Forest is loaded with forest products. This translates to about 460 tri-axle truckloads of timber and 500 truckloads of firewood and pulp. If the forest was entirely clearcut and entirely chipped, approximately 13,700 of biomass would be generated, filling about five hundred and fifty 18-wheeler loads.

It is important to not that all areas of the forest appear to have originated following heavy logging 100 or more years ago, giving the forest a consistent look. Most areas were last logged, on a partial basis, at least 30 years ago, partially opening the canopy (though it has since reclosed for the most part). The former Olver properties are the main exception. Stand 6 / Olver South has been logged a number of times since the late 1980s with the specific intention of establishing and releasing younger trees, and is currently in a much younger condition than the forest as a whole, with smaller trees and a partially open canopy. Stand 4 / Olver North was also cut in the late 1980s but has been cut less since that time is at this time a closed-canopy forest with a mix of larger and smaller trees.

The Buffam Brook Community Forest is further characterized below from the point of view of forest composition, forest structure, and forest products.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Forest Composition

Table 1

Species	Basal Area	% of Basal Area	Trees per acre	% of Trees per acre	Total Cord Equiv. of Biomass	% of Total Biomass	Diameter (QMD) (inches)
Pine WHITE	33	27%	52	19%	3,107	22%	10.8
Oak RED	31	25%	37	14%	4,682	33%	12.4
Maple red	20	16%	58	21%	2,119	15%	8.1
Birch yellow	10	8%	48	18%	992	7%	6.2
Hemlock	8	7%	11	4%	1,054	7%	11.5
Birch black	7	5%	28	10%	621	4%	6.5
Oak scarlet	6	5%	10	4%	819	6%	10.6
Ash white	2	2%	5	2%	192	1%	9.7
Birch paper	2	2%	7	3%	218	2%	7.5
Maple sugar	2	1%	2	1%	209	1%	12.6
Oak white	1	1%	2	1%	106	1%	8.6
Cherry black	1	1%	5	2%	42	0%	4.9
Gum black	1	1%	1	0%	82	1%	10.6
Hickory shag.	0	0%	3	1%	18	0%	4.0
Tract Total	125	100%	271	100%	14,261	100%	9.2

Table 1 shows the species composition, size structure and density of the forest overstory by species. Composition is represented by three measures: basal area, trees per acre, and total cords of biomass equivalent. In terms of basal area, which can be interpreted to represent importance, abundance or influence, white pine and red oak comprise just over 50% of the forest overstory, with red maple, yellow birch, black birch, hemlock and scarlet oak comprising another 40% of the forest overstory. Species with a minor representation were white ash, paper birch, sugar maple, white oak, black cherry, black gum and shagbark hickory. White Pine and red oak are the dominant species in all measures of composition, making up over 50% of total biomass. Red maple is also abundant, but rarely as a large-crowned canopy tree, but instead typically taking the form of tall but crowded trees or smaller trees, with more trees per acre than any other species. Hemlock, generally taking the form either of larger trees or of completely suppressed midstory trees, is abundant only in some areas. Black birch is rarely a large canopy tree but is abundant where cutting occurred within the recent (i.e. Olver). Taken together, it is not surprising that the forest is dominated by white pine, red oak, red maple, hemlock, and black birch. A surprise was the abundance of yellow birch, mainly in the form of small trees that seemed to become established after logging about 30 years

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

ago. Yellow birch is generally indicative of wetter soils, and in many areas the soils seem to be wetter in some areas than the soil survey suggests. It is very unusual for black gum to show up in a forest inventory, and the presence of black gum lends support to the wet soil hypothesis. Scarlet oak is more characteristic of dry, less-fertile sites and is found mainly on Gurvitch, Hepler-Westhead and Olver South (Stands 1, 5 & 6). The pitch pines observed (but not picked up by the inventory) were on Helper-Westhead. White ash and sugar maple are minor species overall but are abundant along Buffam Brook in Olver North (Stand 4). Trees that were observed to an extremely minor extent but did not fall within the cruise include American beech, American chestnut, American elm, pitch pine and box elder. The forest has a "large tree feel": the 65 largest trees per acre averaged 12.9" in diameter (BA=59). The remaining 206 trees per acre averaged 7.6" in diameter (BA=66).

Table 2

Species	Stand 1	Stand 2	Stand 3	Stand 4	Stand 5	Stand 6
Ash white			1%	**8%**		2%
Beech						
Birch black	3%		3%	3%	9%	13%
Birch paper	1%		1%	3%	2%	
Birch yellow	3%		4%	**47%**	6%	4%
Black cherry						
Gum black			1%			
Hemlock	3%	21%	1%		13%	11%
Hickory			1%			2%
Maple red	25%	21%	13%	11%	14%	6%
Maple sugar	1%			**11%**		
Oak Chestnut						
Oak Black						
Oak RED	**39%**	**26%**	**27%**	**18%**	**26%**	**21%**
Oak scarlet	**12%**		5%		3%	9%
Oak white	1%		1%		1%	
Pine PITCH						
Pine WHITE	**13%**	**31%**	**41%**		**26%**	**32%**
Poplar						

Table 2 shows the stand-level variability in species composition (as a percent of basal area). Red oak and white pine dominate all stands, generally together with either red maple and/or hemlock. An exception is Stand 4 (Olver North), which is dominated by red oak and yellow birch, along with sugar maple and white ash. Species which did not appear in any stands were left in the table to illustrate their absence.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Forest Structure

Table 3

Range of Diameters (in.)	Trees per acre	% of Total Trees	Cumulative %
2 -- 7	163	60%	
8 -- 11	57	21%	81%
12--18	40	15%	96%
19--25	10.1	3.7%	99%
26--34	1.4	0.5%	100%
Total	271	100%	

Table 3 shows the size distribution of trees on a per acre basis. 60% of the trees are small (2" to 7'), and 81% are 11 inches or less. Only a tiny fraction (0.5%) of the trees are very large (≥ 26").

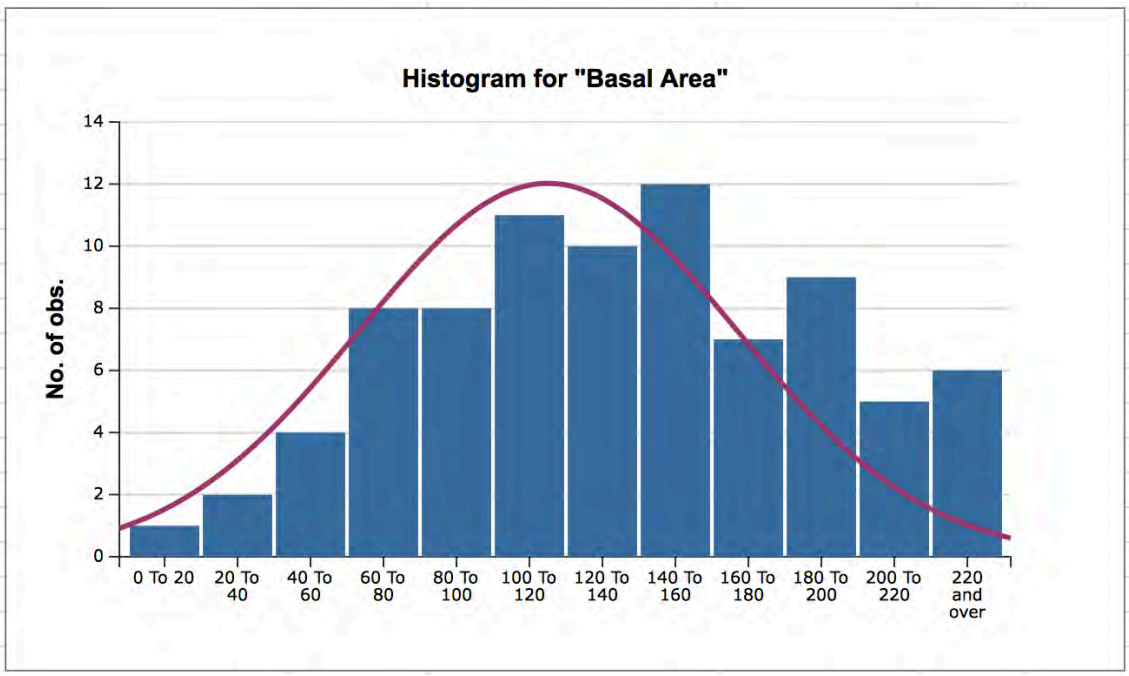


Figure 1 shows the basal area structure of the forest. Most of the forest is in a tall, closed-canopy condition and is somewhat crowded. The highest-quality early-successional structure falls in the 0-20 range and was found on about 3.6% of total acreage (one plot had BA = 0, 2 plots had BA = 20). Early-successional habitat was limited to Stand 6 (Olver South), occurring on about 9 acres total, or about 26% of total stand acreage.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Table 4

Habitat Type	Approx. Canopy cover	Basal Area Range 2017	Percent of Acreage 2017
Early-successional power line ROW Stand 4 (3 ac)	0%-30%	0-40	1.3%
Early-successional	0%-30%	0-40	8.4%
Intermediate	30%-80%	41-100	31.9%
Closed-canopy	80%-100%	101-240	58.4%
Total			100.0%

Table 4 shows the current distribution of breeding bird habitat structure types. The relationship between canopy cover and basal area is approximate. Most areas of the BBCF forest are in a closed canopy condition with a densely shaded understory. About a third of the acreage is in an intermediate condition having a partially closed overstory. Early-successional habitat, defined somewhat broadly, occurred on about 8.4 % of the acreage as a result of recent logging, and on another 3 acres (1.3%) due to ongoing powerline maintenance.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Table 5a

Snags	Trees / acre	Avg. Diameter	DCR/MAS target
6"-9"	9.8	7.1	N/A
10"-29"	4.6	12.4	≥5
Total	14.4		

Table 5b

Live Cavity	Trees / acre	Avg. Diameter	DCR/MAS target
< 12"	8.7	8.7	N/A
12"-18"	3.6	13.7	4
>18"	0.7	20.6	1 to 3
Total	13		

Table 5a & 5b: Mature Forest features: Table 5a shows the number of snags per acre broken into two size categories. The DCR/MAS target indicates a suggested minimum number of 5 larger snags per acre. Table 5b shows the number of live cavity trees per acre broken into three size categories. The DCR/MAS target indicates a suggested minimum number of 4 medium-sized and 1 to 3 larger snags per acre. Overall, BBCF hits the minimum targets suggested by DCR/MAS in all categories except large cavity trees.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Table 5c

Species	Snags / acre
Pine WHITE	6.3
Ash white	2.6
Maple red	1.6
Birch black	1.1
Birch paper	1.0
Cherry black	0.9
Maple sugar	0.7
Hemlock	0.2
Total	14.4

Table 5d

Species	Live cavity trees / acre
Maple red	3.7
Birch yellow	3.1
Pine WHITE	2.2
Hemlock	1.1
Birch black	1.0
Oak RED	1.0
Birch paper	0.9
Total	13.0

Table 5c & 5d: Mature Forest features:
Table 5c shows the number of snags per acre by species. Almost half of the snags are white pine; no snags are oak. Table 5d shows the number of live cavity trees per acre by species. Almost half of the snags are red maple, white pine, and yellow birch, with one oak live cavity tree per acre.

**(interpret the site index and the site's suitability for growing timber)*
OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Forest Products

Table 5

	All Saw (BF)		All Cords products		All volume Cords	
Species	**Acre**	**Stand**	**Acre**	**Stand**	**Acre**	**Stand**
Oak RED	2,777	699,227	3.7	920.4	18.6	4,681.7
Pine WHITE	3,032	763,450	3.6	899.8	12.3	3,107.3
Maple red	220	55,391	2.6	655.3	8.4	2,119.5
Hemlock	461	115,961	0.8	189.2	4.2	1,054.1
Birch yellow	49	12,305	1.1	278.7	3.9	992.1
Oak scarlet	496	124,818	0.8	195.5	3.3	819.0
Birch black	56	14,151	0.7	167.9	2.5	621.2
Maple sugar	58	14,625	0.2	44.3	0.9	218.3
Birch paper	-	-	0.2	44.7	0.8	209.0
Ash white	54	13,710	0.2	38.2	0.8	191.7
Oak white	38	9,516	0.1	27.1	0.4	106.3
Gum black	60	15,221	0.1	16.3	0.3	82.0
Cherry black	-	-	0.0	10.1	0.2	41.9
Hickory	-	-	0.0	4.1	0.1	17.7
Tract Total	**7,301**	**1,838,377**	**13.9**	**3,491.6**	**56.6**	**14,261.8**

Table 5 shows the product volumes (board feet and cords) by species. Red oak and white pine are the largest share of both the timber and cord volume. Only hemlock, scarlet oak, and, to a lesser extent, red maple have appreciable timber volume. Note: Table 4 cord volumes include small miscellaneous trees and snags to give a total biomass in cords.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Table 6

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
1	OH	54.0	12.9	121	7.85	9.7	16.3	62	59
2	WK	17.0	12.2	120	7.41	11.0	15.8	59	61
3	WH	69.9	12.3	124	9.72	8.9	16.1	57	59
4	BB	26.0	9.6	95	3.63	8.4	12.0	44	59
5	WK	41.1	11.7	132	9.74	8.5	15.3	63	60
6	WK	43.8	7.9	59	2.61	3.9	6.2	24	61
	Total	251.8	11.3	110	7.3	8.2	13.8	52	

Table 6: Basic stand information including stand number, stand acreage, tree size (stand-level quadratic mean stand diameter), basal area (square feet per acre), timber volume (thousand board feet per acre International ¼" rule), standing cords (of trees not classified as timber) per acre (1 cord = 128 cubic feet of wood, bark and air) but not including upper stemwood of timber trees or topwood, roundwood cords per acre (includes standing cords plus cords in timber tops). The site index is considered to be the height, in feet, of a vigorous, free-to-grow tree at age 50. A higher site index represents greater soil fertility for the species in question. Site index is red oak. The OBJ for all stands is Forest Stewardship. On a per-acre basis there are an estimated 7,300 board feet of saw timber and 13.8 cords of other products measured in cords, or 52 tons of biomass. Of the cord products, 8.2 cords were in standing cord-product trees while 5.6 cords was in the tops of timber trees. If all timber and cord products were converted to biomass, the total would be 52 tons per acre. This forest is well-stocked with timber and cord products.

**(interpret the site index and the site's suitability for growing timber)*

OBJECTIVE CODE: CH61 = stands classified under CH 61/61A; STEW = stands not classified under CH 61/61A; STD = stand; AC = acre; Mbf = thousand board feet; BA = basal area; VOL = volume; cds = cords

Gurvitch

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
1	OH	54.0	12.9	121	7.85	9.7	16.3	62	59

OH = red oak and hardwoods, mature condition

Tall, mature, closed-canopy hardwood forest dominated by red oak, scarlet oak, red maple and white pine, with a tall shrub layer of hobblebush, witch hazel or winterberry in some areas, a low, scrubby understory of huckleberry in other areas, and a thick layer of ferns and sometimes sphagnum moss in wetter areas. White pines occur in bunches mainly near the northern boundary and in portions of the center; some of the pines are quite large in diameter > 30") and rough, and are probably the largest trees on the entire BBCF property. A small amount of hemlock occurs near the southern boundary. This stand was previously owned by Gurvitch Lumber in Chicopee and was last logged around 1980. This may have coincided with or have been prompted by the gypsy moth infestation at that time; though there is some evidence of gypsy-moth-related mortality, there is not a lot of it, suggesting that trees were pre-emptively cut or else salvaged. Terrain ranges from shallow, ledgy upland to gently sloping, well-drained sites to seasonally wet swales to year-round wetland.

The understory ranges from sparse to thick, and where thick it includes witch hazel, winterberry, wild raisin (which usually is browsed back to a short stub by deer), maple-leaved viburnum, and arrowwood, but also striped maple, highbush blueberry, and chestnut, to name some. The overstory seems to be gradually shading out the shrub layer, leaving shade-tolerant witch hazel to become the dominant shrub in many areas. A big exception is Section 1.4 (see below) regeneration is very limited, and includes scattered oak seedlings > 12" tall.

Sections and Sivicultural Recommendations (cf. Forest Map):

1.1 This central area of the property is well drained and, based on the configuration of stone walls in the northern end, was once cleared for agriculture. This area is well-suited for logging and thinning is recommended. Access trees to cut through Moose Tracks rather than through Boyden Road frontage to avoid difficulties/impacts related to presence of vernal pools and streams.

1.2 This area includes a number of seasonal streams, including one draining out of a vernal pool area and into another vernal pool area. The streamflow concentrates into a main tributary of Buffam Brook, flowing through a broad, poorly-drained area in the SE corner. This area is not well-suited for logging and no logging is recommended. Snag creation is recommended.

1.3 This area rises and falls over a series of ledge formations just below the surface, and contains a number of significant ledge outcrops which, in turn, force drainage into a number of seasonal streams, some of which originate on the property and some of which flow onto the property. This area is marginally-suited for logging but no logging is recommended. Working around steep ledge to cut rough-looking trees and potentially making a mess of the hiking trail does not seem worthwhile. A portion of the old homestead, including the cellar hole, is in this section. A small vernal pool area is formed by a small stone dam that was constructed in one of the seasonal streams (dating back to the era of the cellar hole). Snag creation is recommended.

1.4 This area is a forested swamp transitioning along a concentric gradient of drainage from the upland mature oak type to a much shorter, smaller-sized, more widely-spaced mix of red maple and yellow birch, with minor hemlock, occurring on a thick bed of sphagnum moss with a thick shrub layer dominated by tall winterberry shrubs. The western area of this wetland, along the upland-wetland gradient, has a very thick understory of hobblebush, with plants as tall as 15'. The eastern part of the wetland features scattered, taller white pines with a tall sub-canopy of red maple and black gum. The black gums are vigorous, and tend to be between 3"-10" diameter. The tall white pines are bent to the northwest and appear to be remnants of the forest that was in place in 1938. A hemlock was almost totally uprooted in that storm but is still alive. Similar hemlocks were noted along the western boundary of Stand 2. This area is probably very well-suited to black-throated blue warbler and Canada warbler nesting. This area is not suited for logging and no logging is recommended. Snag creation is recommended.

Discussion of silvicultural options: Thinning is proposed for area 1.1 which is a large, central area with suitable terrain. Thinning will tend to accentuate the present overstory and is intended to maintain overall vigor over time. The other areas pose difficulties to logging; it would be difficult to log in these areas without impacting streams and wetland soils and without disrupting the Gurvitch hiking trail. These areas lend themselves to the continued development of late-successional features. The recommendation to create snags in these areas will support this.

Other options: Alternatively, if the landowner was less concerned about impacting riparian areas or trails, the acreage to include in a thinning could be increased. This option is not part of the recommendations.

Wilson

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
2	WK	17.0	12.2	120	7.41	11.0	15.8	59	61

WK = white pine, hemlock and hardwoods, mature condition

Tall, mostly closed-canopy of white pine, hemlock and red oak with a tall subcanopy of red maple and a scraggly midstory component of stringy black and yellow birch. Black gum occurs in and around a central, wet saddle. This stand was last logged around 1980, probably in conjunction with the Gurvitch logging. There is a thick understory of hobblebush in the NE area, on wet ground that, when it dips slightly, tends to fill up with sphagnum moss. Witch hazel and, less mountain laurel highbush blueberry, occur in other areas, along with cinnamon fern.

Sections and Sivicultural Recommendations (cf. Forest Map):

2.1 This is a small northern section of upland with hobble bush and mountain laurel. This area is well-suited for logging. No logging is recommended other than what is needed to cross this stand to access Gurvitch. Creation of snags is recommended.

2.2 This is a an interesting saddle that drains *diffusely* both to the NW and to the E. There are a number of potential vernal pools within this system. The eastern section has abundant sphagnum moss and a few remnant hemlocks that appear to have been bent in the'38 hurricane but which survived. Black gum occurs here. This area is not-suited for logging, but it was crossed the last time logging occurred. No logging is recommended.

2.3 This larger section is typical of type indicated for the stand. Some logging was done in this section (around 1980). This area is well-suited for logging, but in the interest of providing a strong contrast to planned logging in Stand 3, no logging is recommended. Creation of snags is recommended.

2.4 This small section is close to the tributary to Amethyst Brook and features a number of large hemlocks casting dense shade. Some logging was done in this section (around 1980). Hemlock that regenerated after the cutting has been browsed back into curious-

looking shrubs by moose (D. Stainbrook, pers. comm.). This area is well-suited for logging however I the interest of preserving hemlock, no logging is recommended.

Discussion of silvicultural options: No cutting is proposed at this time. The central wetland area poses difficulties to logging; it would be difficult to log in this area without impacting wetland soils. The upland areas to the north and south could be logged, but these areas, abutting the Amherst watershed, are well-suited to the continued development of late-successional features. The recommendation to create snags in these areas will support this.

Other options: Alternatively, if the landowner wanted a greater emphasis on harvesting and growing forest products or on creating early-successional habitat, these areas could be cut in a number of ways. This option is not part of the recommendations.

Weeks

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
3	WH	69.9	12.3	124	9.72	8.9	16.1	57	59

WH = white pine and hardwoods, mature condition

Tall, closed-canopy of white pine and red oak and scarlet oak, alternatingly wetter and drier, with a tall subcanopy of red maple and sometimes yellow birch. White pine and red oak occur in varying concentrations. Hemlock is largely lacking. This stand was last logged around 1980. A number of very long, deep ditches are found in Section 3.2 – these were created around 1970 in an attempt to "drain" the land. Some of the ditches are mapped (cf. Forest Map). Viewed in September, 2017, the ditches did not have water. Black gum occurs in a scattered way in some areas of this stand, suggesting a high water table in places. Black gums as large as 22" were observed, but in other cases there were small black gums in clusters that seem to have regenerated with the ca. 1980 cutting.

The understory ranges from sparse to thick, with witch hazel sometimes very dominant; other shrubs include, winterberry, hobblebush, wild raisin (which usually is browsed back to a short stub by deer), maple-leaved viburnum, shadbush, highbush blueberry, lowbush blueberry and, in dry areas, huckleberry, and chestnut. As in other areas, the overstory seems to be gradually shading out the shrub layer, leaving shade-tolerant witch hazel to

become the dominant shrub in many areas. Regeneration is limited mostly to scraggle white pine that seems unlikely to thrive, sometimes black birch 5'-15' tall, and sometimes red maple and red oak < 1' tall. Also chestnut.

Sections and Sivicultural Recommendations (cf. Forest Map):

3.1 This is a small northern section of upland dominated by mature pine and mixed oaks with a thick huckleberry understory. Portions of a broader network of stone walls are captured by this section. This area is well-suited for logging. Thinning is recommended to maintain this forest type in a vigorous condition.

3.2 This large section of upland dominated by mature pine and mixed oaks with a variable understory. This area is well-suited for logging. Witch hazel is very abundant in some areas, forming a dense subcanopy that shades out the understory beneath it. There are scattered large trees including a 40" hemlock (cf. Forest Map). An irregular shelterwood approach is recommended to diversify forest structure, including the creation of roughly10 acres of early-successional habitat along the southern boundary. Trees that may regenerate include yellow birch, paper birch and black gum.

3.3 This is the riparian buffer along the tributary to Buffam Brook. The brook in this stretch is wide and stony. There is a blown-out culvert below an old stream crossing. And there is a moss-covered capped shallow well just SE of the crossing. It is unknown whether this is in use. No logging is recommended. Creation of snags is recommended.

3.4 This section includes the diffuse NW outflow of the saddle in Stand 2 as it connects to the tributary to Buffam Brook. Black gum and hemlocks are found in the wettest areas, along with sphagnum moss and goldthread. It also includes the odd frontage dogleg created by modern-day parcelization-fragmentation. On paper, the dogleg seems to provide access to the backland, but on the ground there are a number of wetland areas within the dogleg as well as a vernal pool along the western boundary. No logging is recommended. Creation of snags is recommended.

Discussion of silvicultural options: Thinning and irregular shelterwood cutting is proposed at this time in sections 3.1 and 3.2. As recommended, the irregular shelterwood in Section 3.2 would include 10 acres of thinning, 20 acres of shelterwood-style intermediate cutting,a nd 10 acres of overstory removal/early-successional cutting. The tributary to Buffam Brook can be crossed at one of the pre-existing crossings. Section 3.3 has suitable terrain but the recommendation is to retain all existing trees in the riparian area. Section 3.4 is too wet for productive logging. Both 3.3. and 3.4 are well-suited to the continued development of late-successional features and so the recommendation is to create snags in these areas.

Other options: Alternatively, if the landowner wanted a greater, or lesser, emphasis on harvesting and growing forest products or on creating early-successional habitat, the proposed cutting could be modified in a number of ways.

Olver North

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
4	BB	26.0	9.6	95	3.63	8.4	12.0	44	59

BB= northern hardwoods, partially mature condition

Tall, partially closed-canopy of red oak, sugar maple, red maple and yellow birch, and a small amount of white ash, with a tall sub-canopy of paper birch and northern hardwoods in some places. The sugar maple tends to occur right along or near Buffam Brook. This is perhaps the most unique forest from a species composition. A small amount of white pine and hemlock is present, mainly along the southern and eastern boundary, but did not fall within the inventory grid. A minor amount of logging was begun within the last 4 years, but most of the marked trees were not cut. Witch hazel is very abundant here, reaching stem densities of 4,000 per acre and diameters, in the power line, of 4 inches and sometimes 7 inches, often forming forming a dense subcanopy that shades out the understory beneath it. This stand was last logged around 1980 and, to a minor extent, recently. Regeneration is limited to scattered red oak, red maple and white pine seedlings < 12" tall mostly but sometimes 2'-4'.

Though witch hazel is by far the dominant shrub, there are traces of beaked hazel, spicebush, maple-leaved viburnum, shadbush, hobblebush, hawthorn and musclewood, among others. Over time, lacking disturbance, shade-tolerant witch hazel is likely to increase and the others will decrease. There is a minor amount of wild grape near Buffam Brook – this was not detected anywhere else.

A 90'-wide power line right of way runs through the stand. This area is kept in a shrubby condition and is dominated in places by tall clumps of witch hazel or winterberry, and in other places by a thick bed of prickly dewberry, wintergreen and sphagnum moss. Glossy buckthorn is very well established, with tall, large plants, where the stream crosses the ROW, but is also starting to spread along the edge of the ROW and into the surrounding forest.

This stand comes with significant access challenges. The road frontage is not useable as management access and is at best marginally suited to recreational access. Old Stage Road is a problematic road that is washing out from the west and east and needs to be repaired and stabilized or closed altogether. The clogged, failed bridge causes water to

flow over the road itself, perpetually washing it out. The bridge should be removed and a better solution should be found. The legal status of the road may not be 100% determined and should be researched. Cooperation with abutters will be essential in trying to address the entire situation. Robinson Road is also a challenge and though it does not appear that the road is closed, a section of the road does not seem to exist on the ground and therefore cannot be used at this time, it offers the best hope of logging access to this stand as well as to Stands 1-3. This situation is discussed in more detail in the Overview.

Sections and Sivicultural Recommendations (cf. Forest Map):

4.1 This section includes Buffam Brook as well as the wider riparian area. Soil fertility and moisture are elevated throughout this section, which includes seasonal streams and a shallow water table. There is a large old borrow pit in the building lot road frontage dogleg, which may also serve as a vernal pool. This section has the largest infestation of non-native invasive plants on the entire BBCF; this occurs in 3 distinct areas (see overview section). The sugar maples along the brook are well established and have the potential to live a long time. This is the only concentration of sugar maple on the BBCF and, with abundant deer, it is very difficult to establish new sugar maple (althoughthis has occurred to a minor extent under the heavy cutting in Stand 6), therefore it would be a shame to cut any of these. This section was delineated to give a wide berth to Buffam Brook and to allow late-successional features to develop while at the same time minimizing the risk of continued spread of invasive plants, which is also elevated on the moist, fertile site. No logging is recommended. Creation of snags is recommended.

4.2 This section is similar in overstory vegetation but is on slightly higher and drier ground and therefore is both more suited to logging and also slightly less vulnerable to the spread of invasive plants. An irregular shelterwood approach is recommended that would use the shelterwood method to create a thick midstory underneath a partially-open canopy. This approach will also stimulate the growth of the diverse array of shrubs found here.

Discussion of silvicultural options: With the risk of invasive plants and the wetter soil, an argument could be made to avoid cutting altogether on this lot. If cutting does not occur on adjacent Stand 3, then in fact it would be very impractical to do the small amount of cutting that is recommended. The recommendation to carry out the shelterwood approach reflects the landowner's interest in managing for forest products where this makes sense, which would occur if access is created and nearby logging is occurring. Previous heavy cutting around 1980 gave rise to a nice midstory of pole-sized trees including the main concentration of paper birch on the entire BBCF. And there is an opportunity to perpetuate yellow birch. And so the recommended cutting can be thought of as being important to the overall species diversity of the BBCF.

Other options: Alternatively, cutting could be delayed until such time as sufficient control efforts have occurred such that invasive plants are not a threat.

Hepler-Westhead

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
5	WK	41.1	11.7	132	9.74	8.5	15.3	63	60

WK = white pine, hemlock and hardwoods, mature condition

Tall, closed-canopy of white pine, red oak, scarlet oak, red maple and hemlock occurring in very diverse mix of concentrations ranging from nearly pure hardwood to pure softwood. Most of the hemlock occurs in dense concentrations in the NW quadrant of the stand. Fertility varies dramatically with moisture, with white pines varying from 80' in the eastern ridge area to > 105' in the lower, western section, and possibly taller down on the steep slope. Oaks rarely reach heights > 80' on these sites. On the steep slope down to Buffam Brook there are pockets of very large, tall white pines and large individuals of red maple, red oak, white ash and yellow birch. This stand was last logged around 1977. Regeneration is sparse or absent, and includes scattered, stringy chestnut, red maple, black birch and white pine, sometimes occurring in small patches of 3'-6' trees. Huckleberry and lowbush blueberry are abundant in many areas with clubmosses and wintergreen. Witch hazel is common and there is a limited amount of mountain laurel. Overall the stand is quite open and walkable except in the thickest huckleberry.

Sections and Sivicultural Recommendations (cf. Forest Map):

5.1 This complex section lies mostly in the NE portion of the parcel on deep, in some areas droughty soils. This section also includes a gravelly knoll that protrudes toward Buffam Brook. On this knoll there are 3 pitch pine trees (one is dead and fallen) which seems to reflect both the xeric site conditions and, possibly, a legacy of fire (which would make sense: at the foot of the knoll, on Buffam Brook, there is an old mill site and so it is entirely possible that fires burned up the slope from time to time; potentially, fires were set by Native Americans traveling up Buffam Brook before that). This section also includes the major concentration of large hemlock, which takes the form of a mature, widely-spaced hemlock overstory with a tall sub-canopy of red maple and black birch. There is also a crowded upland pine-oak area. A beautiful old N-S cart road crosses this section, and there are other trails. In the hemlock section there is a small pit that may have been a primitive cellar hole. There are oak stumps from logging that occurred in 1977. There are many considerations here. From a proactive perspective, it would be nice to:

— try to establish pitch pine
— thin in an attempt to improve the health of hemlock
— thin in general to improve the health of other overstory trees on this dry site

In this spirit, the following an irregular shelterwood is proposed that would:

— create a 3-acre opening on top of the knoll to try to regenerate pitch pine (because machine scarification of the soil is not preferred under E. box turtle guidelines, some follow up scarification could be done by hand); (potentially, pitch could be seeded or planted into the opening natural seeding was not successful)

— in the hemlock area, cut most of the white pine and hardwoods so that hemlock has full sun (this will create a nice, thick midstory that will offer habitat that is not well-represented)

— in the other areas, thin to promote both health and diversity

5.2 This is also a dry, upland site with many trails and is the location of a major, impressive quarry that, through the sheer intensity of past disruption, now serves among other things as a vernal pool and as an impressive area of ledge habitat. The overstory is crowded and thinning would be a good way to ensure that many overstory trees remain vigorous, but this is difficult to coordinate within a density of trails and possibly a landowner preference to leave things "as they are" for now. No thinning and no creation of snags is recommended.

5.3 This section includes is defined to serve as an extended riparian protection zone to Buffam Brook. There are a number of streams (cf. Forest map) draining down a steep slope that is dry and gravelly in some places and moist and seepy in others. The streams tend to originate in small seepy wetlands at the top of the slope. There are a number of very impressive trees in this stand, especially a number of very tall, very large white pines (up to 35") on the slope with a few large hemlocks, and a few large red maple (32" snag), ash (23") and yellow birch (26") down on a damp alluvial-sphagnum terrace near the brook, with spicebush and cinnamon fern. There is a lot of partridgeberry on the slope. There is an impressive old ditch at the toe of the slope that connects in a no longer readily intelligible way to the site of the old mill. This section was delineated broadly by walking up all the streams and GPS-ing their seepy origin as could best be determined in a dry September (2017). No thinning and no creation of snags is recommended.

5.4 This section includes a seasonal stream draining out of a vernal pool and wetland that is mostly on the Olver North parcel. The stream drains through a swale falling steeply from the west to Gates Brook, which is set in a damp riparian area with an atypical mix

of large red maple, bigtooth poplar, white pine and red oak, with highbush blueberry, winterberry and cinnamon fern. Invasive plants are here as well (see Overview). There is a 2'-deep wash out caused by runoff from N. Valley Road that flows through an asphalt lip created to divert water off the road. This will continue to gully over time. No thinning and no creation of snags is recommended.

Discussion of silvicultural options: There are a number of possible ways to manage this property and the ultimate choice will reflect the landowner's wish. The recommended irregular shelterwood for section 5.1 is intended to accentuate and preserve part of what is special about this property, though the vehicle for accomplishing this (logging) will not be to everyone's taste. This is understandable. The recommendations of what to cut and where are coupled with recommendations of where not to cut in the hope of providing a beneficial balance overall.

Other options: Alternatively, cutting could be avoided altogether. This would perpetuate for the time being the forest conditions that prevail now which, in the long arc of forest history, began, just as they did in all of the other areas, by landclearing and logging and which, as recently as 1977, was cut in an intermediate way by a sawmill. A decision not to cut can always be re-evaluated in the future.

Olver South

Stand	Type	Total Acres	Size (QMD")	BA	Mbf per acre	Stan-ding Cords /acre	Round-wood Cords* /acre	Total Cords Biomass	Site Index OR
6	WK	43.8	7.9	59	2.61	3.9	6.2	24	61

WK = white pine, hemlock and hardwoods, irregular structure, immature condition

Mixture of mature and immature red oak and white pine with immature but free-to-grow black birch, red maple and yellow birch. A lot of mature oak has been cut out of this stand over recent entries. The oak is about 100 years old (based on ring counts on stumps). As a result of management, much of the immature red oak and white pine is also free to grow, and many of the white pines occur in glades of pruned trees, many in the 10"-16" size class. Black gum and ash are also abundant, along with red maple and yellow birch, in the northeastern section of this stand (mapped here as a wetland). Most of the mature red oak occurs in riparian areas along the seasonal minor streams and was probably left during past management in order to comply with basal area retention

regulations. With significant component of red maple and black birch in drier sections, and red maple, yellow birch and white ash in wetter sections. This stand differs the most from the rest in terms of structure: active timber management in recent decades has created a forest with an appreciable concentration of seedlings, saplings and pole-sized trees. Sassafrass and sweet fern, not observed anywhere else, were abundant in in disturbed areas near the woods road. Overall there is a nice diversity of shrubs, with beaked hazel, shadbush, maple-leaved viburnum, spicebush, striped maple, huckleberry and lowbush blueberry, witch hazel, mountain laurel, sheep laurel, spirea and box elder. There is a small grove of beech sprouts, 6'-8' tall. Ferns are thick in some areas, with hayscented fern mostly.

Both a ruffed grouse and a pileated woodpecker were heard in this stand; there were moose droppings, ample evidence of deer browse, and a porcupine-chewed hemlock.

Sections and Sivicultural Recommendations (cf. Forest Map):

6.1 This large upland section is accessed by a permanent culvert on a graveled road. This section contains a small amount of "true" early successional habitat (basal area of zero) and some areas of very low basal area (up to 20) as well as areas with a partial overstory of trees of at least two generations. The early successional habitat areas, i.e. those areas that have been cut the heaviest, feature by far the best regeneration of trees on the entire BBCF property, including red, white and scarlet oak. All of the oak sprouts or saplings (as well as the red maple) are being *heavily* browsed back by deer and are becoming multi-stemmed bushes. It would be nice to know that deer are not going to prevent all of the young oaks from growing. Management options could go in one of two major directions: let past work to develop the existing immature timber continue to come to fruition, or change direction and use this stand as an opportunity to provide early-successional forest structure. Expanding and re-intensifying past cutting would provide early-successional habitat and would quite likely serve to further stimulate the establishment, release and growth of oaks. If, with brush mowing, the vegetation is periodically cut back, the early-successional habitat can be perpetuated indefinitely and, when this is discontinued, there should be a very good population of oaks to release.

6.2 This smaller section of upland forest is bounded by two streams and is similar to 6.1. The same considerations and recommendations as Section 6.1 apply here.

6.3 This even smaller section of upland forest is bounded by two streams and is similar to 6.1. but involves another stream crossing to access. No logging or creation of snags is recommended.

6.4 This is the riparian buffer along a stony, quite flashy stream (as evidenced by the deep banks and exposed stones). Many of the mature oaks on the property are in the riparian

zones, and there is an infilling of witch hazel and red maple. No logging or creation of snags is recommended.

6.5 This section includes a large, sphagnum-hummocky wet area (a forested swamp with spice bush) and its drainage, diffuse in the upper reach and flashy and concentrated in the lower reach (cf. 6.4). The wetland was cut in the past (around 1980) and regenerated black gum (3”-6”), as well as red maple, ash (8”-10”, rarely 17”) and yellow birch and even a few black cherry. No logging or creation of snags is recommended.

6.6 This section includes a small wetland and potential vernal pool under a dense canopy. This area was cut around 1980 but has grown back nicely. The drainage is diffuse in the upper reach and then follows a swale into Stand 5. No logging or creation of snags is recommended.

Discussion of silvicultural options: As discussed above there are varying choices that can be made to best reflect the landowner’s wishes. To some extent the choices are mutually exclusive – i.e. favor continued growth of existing growing stock, or favor young forest habitat. The recommendation in this plan (pursue and maintain early-successional habitat in sections 6.1 & 6.2) was made within the context of the entire BBCF (goals and conditions).

Other options: Alternatively, the landowner could build on past efforts to develop young trees into timber with a combination of patience (let it grow) and non-commercial thinning (i.e cutting and leaving small competitor trees).

BBCF Suitability for Logging

Stand 1: Gurvitch	Location on Map	Well-Suited (ac.)	Marginal (ac.)	Not Suited (ac.)	Total
Central area	1.1	13.50			13.5
N of trail, E of N-S wall	1.2		9.1		9.1
Western Riparian & Wetland	1.3			17.4	17.4
Eastern Riparian & Wetland	1.4			14.0	14.0
Stand 1 Totals		13.5	9.1	31.4	54.0
Stand 2: Wilson					
North of saddle	2.1	2.0			2.0
South of saddle	2.2	10.1			10.1
SE Hemlock Corner	2.3			0.6	0.6
Riparian & Wetland Saddle	2.3			4.3	4.3
Stand 2 Totals		12.1	0.0	4.9	17.0
Stand 3: Weeks					
North of stream	3.1	7.3			7.3
South of stream	3.2	48.4			48.4
Buffam Brook Tributary	3.3			1.6	1.6
Saddle outflow + NE Dogleg	3.4			12.6	12.6
Stand 3 Totals		55.7	0.0	14.2	69.9
Stand 4: Olver North					
Upland Area	4.1	8.7			8.7
Broad Riparian Area	4.2			17.3	17.3
Stand 4 Totals		8.7	0.0	17.3	26.0
Stand 5: Hepler-Westhead					
Northeast area	5.1	16.5			16.5
Southeast area	5.2		10.3		10.3
Western riparian & slope	5.3			11.8	11.8
Eastern riparian	5.4			2.5	2.5
Stand 5 Totals		16.5	10.3	14.3	41.1

Stand 6: Olver South					
West Upland	6.1	24.2			24.2
Central Upland	6.2	5.6			5.6
East Triangle Upland	6.3		2.3		2.3
East Stream	6.4			1.1	1.1
Central Stream & Wetland	6.5			8.0	8.0
West Boundary Stream	6.6			2.6	2.6
Stand 6 Totals		29.8	2.3	11.7	43.8
Suitability for Logging		**Well-Suited**	**Marginal**	**Not Suited**	**Total**
Total Acres		136.3	21.7	93.8	251.8
Percent of Total Acres		54.1%	8.6%	37.3%	100.0%

Table XXX Suitability. In the recognition that within a stand there will be different levels of suitability for logging purposes, this table evaluates the suitability for logging of each of 24 subsections (cf. Forest Maps for each stand). Acreage is classified as "not-suited" if soils are exceedingly wet or steep such that the risk of negative logging impacts under less than perfect conditions is high. Acreage is classified as "marginal" if soils are limited in productivity by shallow depth or if an area has a high density of ledge outcrops, streams or some other feature that is not very compatible with logging. Acreage lacking significant impediments to normal logging operations is classified as "well-suited". 37.3% of the acreage was not suited for logging; 8.6 % of the acreage was marginally suited, and 54.1% was well-suited.

Table XXX Treatment by section. This table shows the recommended silviculture and treatment acreage for each of 24 subsections (cf. Forest Maps for each stand).

Silvicultural Practices for BBCF

Forest-Wide Resiliency Objectives

Silviculture at BBCF would be implemented with a unique focus at the stand level but, cumulatively, would be intended to improve forest-wide resiliency at the property level by accomplishing the following:

— improve the health of forest trees
— accentuate / perpetuate / enhance the diversity of tree species
— diversify age structure
— accentuate/support the development of late-successional features
— produce forest products in the near term
— promote conditions for sustained future growth of forest products
— diversify or maintain a diversity of habitat cover types
— promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular
— create sufficient amounts of regeneration so deer do not overwhelm it
— support a mixture of stable carbon storage and rapid carbon sequestration across the landscape

In allocating areas for silviculture and in implementing silvicultural practices, special focus will be placed on:

— minimizing, largely by avoidance or otherwise by mitigation, any impacts in riparian zones, as conceived in a broad, functional sense that could negatively affect water quality
— recognizing and protecting special or uncommon trees and special configurations of trees
— protecting the Eastern box turtle by avoiding negative impacts to individual turtles or their habitat (cf. NHESP Eastern Box Turtle CMP)
— limiting and pushing back the spread of non-native invasive plants
— not exacerbating the dominance of a very competitive native shrub (i.e witch hazel)
— protecting existing trails and promoting a positive trail-use experience

All of the above will be accomplished with an eye to its public outreach value.

In accomplishing the above, and with the support of the other management recommendations in this plan, silviculture will make a significant positive contribution toward the overall level of forest resiliency in the face of anticipated, hypothesized, and unknowable future events and conditions.

Five Types of Silvicultural Practices

Five types of silvicultural practices are recommended for the Buffam Brook Community Forest. The silvicultural practices fall into two broad categories – those involving timber harvesting, and those not involving timber harvesting. The silvicultural practices are listed below and are discussed in greater detail in the subsequent section. Breeding bird usage of the various methods is drawn partly from the 2016 DCR/Mass Audubon publication Managing Forests for Trees and Birds in Massachusetts and the 2017 paper *Area Requirements and Landscape-Level Factors Influencing Shrubland Birds* (The Journal of Wildlife Management), and partly from firsthand observation.

Silvicultural practices involving harvesting

— Thinning
— Irregular shelterwood with patch selection
— Full overstory removal (clearcut, release of advance seedlings & saplings, release of sprouts)

Silvicultural practices NOT involving harvesting

— Mowing or other cutting or fire, to maintain early-successional conditions
— Intentional creation of snags or small muti-snagopenings to support development of late-successional conditions without logging
— Passive / Allow forest process to operate / No active treatment during 10-year timeframe

Thinning

Practice purpose (how it helps create desired future condition): This practice creates wider spacing between trees in an established canopy, thus promoting individual tree health. Approximately 20% of the canopy is removed. This practice is classically used to promote the growth of timber and to generate forest products in the process, but can be used to promote trees for any reason. If desired, this practice can help sustain tree diversity by improving the vigor of crowded, less-common trees that are otherwise in a process of being outcompeted by dominant trees that are more abundant.

Harvest Intensity (cf. Managing Forests for Trees and Birds in Massachusetts p. 18-22): Low

Site Compatibility (which sites is this practice compatible with?): Well-suited and marginal

Habitat objective provided by forest structure: This practice promotes and sustains *breeding bird habitat* for birds preferring forests with small and infrequent levels of disturbance and is used in stands with tall, closed-canopy forest. This practice sustains the tall, closed-canopy conditions while introducing minor openings (generally < $1/20^{th}$ acre or less than about 50' across) between established overstory trees. These minor openings will tend to close back up over the subsequent 10 years. This practice mildly and temporarily stimulates the growth of shrubs, seedlings and other understory and midstory vegetation and inevitably will create minor areas of intermediate disturbance as well (see irregular shelterwood below). This practice can be combined with the intentional creation of snags to further support mature, closed-canopy habitat features (cf. "Support development of late-successional conditions by intentional creation of snags or small openings without logging" below).

Typical *breeding birds* that may benefit from this forest structure:

Black and white warbler
Black-throated blue warbler
Canada warbler
Eastern wood peewee
Wood thrush
Yellow-bellied sapsucker
Black-throated green warbler (if hemlocks are present)

Pine warbler (nesting on large white pine branches)
Scarlet tanager (nesting in large hardwood crowns)
Pileated woodpecker (nesting in large cavity trees or snags)
Downy and hairy Woodpecker (nesting in cavity trees or snags)

Economic perspective: as contemplated for the BBCF, this practice would tend to be revenue neutral ("break even") to the landowner. Main costs are forestry costs (to provide

tree selection and marking, permitting (if any), bidding, contracting and supervising) as well any necessary access improvements (e.g. road or landing construction or maintenance). The control of invasive plants may be an additional cost in some cases. Generally, the landowner does not pay the logger to log; rather, the logger pays the landowner for the timber and other products to be cut. In fulfilling the contract, the logger would cut all the marked trees, not only those with economic utility at that moment. Because this practice is *not* likely to remove an appreciable amount of valuable timber, the gross revenue and costs will generally offset each other, or be in the same ballpark one way or the other.

Contribution to forest resiliency: improve the health of forest trees; accentuate / perpetuate / enhance the diversity of tree species; accentuate/support the development of late-successional features; produce forest products in the near term; promote conditions for sustained future growth of forest products; support a mixture of stable carbon storage and rapid carbon sequestration across the landscape.

Trees to be removed & retained (types, conditions, sizes): Remove: generally about 20% of overstory basal area is removed. Trees to remove are competitors of other trees that have desirable traits. Trees in very poor health are not competitors and may be retained for habitat value. Trees to remove would be individually selected and marked, typically with paint, by a forester. Retain those trees that appear to have the potential to be vigorous and thrive over the next 10 years as well as trees of minor species so that these may be perpetuated. Also, defective trees with significant cavity potential should be left. Retain hemlocks.

Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.): none.

Special non-native invasive plant species considerations: monitor all areas to be affected by cutting on an ongoing basis and plan on killing/pulling/controlling any invasives in harvest areas.

Special soil considerations (erosion, seasonal timing, cultural, etc.): Ground must be adequately dry or frozen so that rutting/compaction are avoided or minimized. Avoid logging on wetter soils occurring in pockets or along wetland and riparian fringes.

Special equipment/logging-system considerations: Any system that can adequately protect the ground/soil and residual stand is acceptable; by selecting the logging system prior to marking the harvest, the harvest-layout can be optimized. The best system will have low ground pressure and operators who are willing and capable of usingtheir skills and experience to protect trees and soil. A whole-tree biomass system is the least likely to meet the multiple objectives of this plan and should be avoided if possible. However, these systems can be modified so that less than 100% of tops are removed so that overall forest structure is not excessively simplified and so that sufficient biomass is returned to the soil. If the landowner desires, a hybrid approach can be used that will leave tops in some of the areas.

Additional habitat improvements or maintenance to accomplish: Whenever possible, large woody debris should be left long. This approach differs from the notion of maximum utilization and generally looks messier, but the benefits of the woody material are significant. Look for and leave trees with stick nests, significant cavities, dead tops, etc.

Special cultural resource, trail and aesthetic considerations: minimize slash visibility from pre-existing roads or trails by establishing a slash setback distance. Minimize crossings of hiking trails and cross these at right angles whenever possible.

Irregular Shelterwood with Patch Selection

Practice purpose (how it helps create desired future condition: This variant of a traditional shelterwood system increases structural complexity and, over time, sustains the full range of forest plant diversity, by creating irregular spacing between trees in an established canopy. At the stand level this is an uneven-aged system. Spacing (gaps) between trees will be highly variable, ranging from tight, unthinned groups to larger openings > 3 acres. In addition to accomplishing, by turns, the objectives of thinning (see above) and overstory removal (see below), this practice reduces overstory cover by approximately 50% to stimulate the vigorous growth of shrubs, seedlings and other understory and midstory vegetation under partial shade. The relative allocation of thinning, shelterwood and overstory removal will reflect the prevailing forest conditions in a given area. Forests in our area tend to be highly variable and irregular: by combining a number of methods, this practice allows the greatest flexibility to work with the forest as it exists at the time of the management, and has the greatest potential to increase overall complexity, diversity and resilience. This practice is also compatible with snag creation.

Harvest Intensity (cf. Managing Forests for Trees and Birds in Massachusetts p. 18-22): Low, Moderate and High

Site Compatibility (which sites is this practice compatible with?): Well-suited and marginal

Habitat objective provided by forest structure: if used over a large enough area, this practice provides a *full spectrum of breeding bird habitats*, from areas of small and infrequent disturbance to areas of stand-replacing disturbance (see discussion of thinning above and both overstory removal and "passive" below). This practice is the most likely to provide the in-between category of habitat, i.e. intermediate levels of disturbance which take the form of small canopy gaps (generally < ¾ acre) over a broad area, allowing a thick understory and midstory to develop while maintaining a mature canopy, which is the bird breeding habitat type used the greatest number of forest interior birds. This practice can be designed to include significant retention of snags, cavity trees, and large coarse woody debris, and snags can be intentionally created. The inclusion of patches > 3 acres ensures that early-successional habitat is also provided.

Typical *breeding birds* that may benefit from this forest structure:

Black and white warbler
Black-throated blue warbler
Canada warbler
Eastern wood peewee
Wood thrush
Yellow-bellied sapsucker
Black-throated green warbler (if hemlocks are present)

Eastern Towhee
Chestnut-sided Warbler
Ruffed Grouse
Northern Flicker
Mourning Warbler (assuming hemlock is present)
White throated sparrow

Prairie warbler (assuming patch openings are large enough)
Common yellowthroat
Indigo bunting
Gray catbird

Pine warbler (nesting on large white pine branches)
Scarlet tanager (nesting in large hardwood crowns)
Pileated woodpecker (nesting in large cavity trees or snags)
Downy and hairy Woodpecker (nesting in cavity trees or snags)

Economic perspective: in most cases, including in any scenarios contemplated for the BBCF, this practice brings net revenue to the landowner. Main costs are forestry costs (to provide tree selection and marking, permitting (if any), bidding, contracting and supervising) as well any necessary access improvements (e.g. road or landing construction or maintenance). The control of invasive plants may be an additional cost in some cases. Generally, the landowner does not pay the logger to log; rather, the logger pays the landowner for the timber and other products to be cut. In fulfilling the contract, the logger would cut all the marked trees, not only those with economic utility at that moment.

Contribution to forest resiliency: improve the health of forest trees; accentuate / perpetuate / enhance the diversity of tree species; diversify age structure; accentuate/support the development of late-successional features; produce forest products in the near term; promote conditions for sustained future growth of forest products; diversify or maintain a diversity of habitat cover types; promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular; create sufficient amounts of regeneration so deer do not overwhelm it; support a mixture of stable carbon storage and rapid carbon sequestration across the landscape; not exacerbating the dominance of a very competitive native shrub (i.e witch hazel).

Trees to be removed & retained (types, conditions, sizes): Remove: generally about 20%-100% of overstory basal area is removed; over a large area the average removal might fall in the 40%-60% range. Removal guidelines would follow a thinning approach (see above) in many areas, or a slightly heavier thinning-like (i.e. shelterwood) approach in areas where greater emphasis is placed on stimulating the understory. In some areas all trees would be removed. These openings would range in size from ¼ acre to > 3 acres. Trees to remove would be individually selected and marked, typically with paint, by a forester. This would include determining the location of all openings. Retain those trees that appear to have the potential to be vigorous and thrive over the next 10 years as well as trees of minor species so that these may be perpetuated. Also, defective trees with significant cavity potential should be left. Retain hemlocks except where removal of these is needed to complete a patch.

Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.): in areas with viable regeneration, precautions may need to be taken to protect young trees during logging. This is mainly a concern for young trees that are not likely to sprout, such as white pine or hemlock.

Other special considerations: same as thinning unless otherwise noted below.

Full Overstory Removal (e.g. clearcut, release of advance seedlings & saplings, release of sprouts)

Practice purpose (how it helps create desired future condition: This practice provides high-quality early-successional habitat and sustains overall forest plant diversity by ensuring that conditions are provided for those plants that thrive in full sun. This is accomplished by removing as much as 100% of the overstory; depending on the situation, the midstory and understory may be removed as well or, alternatively, may be protected. Though this practice is known as the most likely to establish shade intolerant trees such as pin cherry, paper birch and bigtooth poplar, which are absent or not abundant in the BBCF forest, this is also the practice that most likely to establish the full range of hardwood species including oaks, hickories, sugar and red maple, black gum, black cherry, white ash, yellow birch and sassafrass, and is the practice with the greatest ability to overwhelm interfering shrubs such as witch hazel and mountain laurel. Most of the forest of the current BBCF forest was established with some version of this type of silviculture (albeit in the relative absence of deer, moose and non-native invasive plants). This practice has the greatest potential to overwhelm deer and moose so that some of their preferred browse species become part of the new overstory rather than being selectively removed from the future canopy. In conjunction with invasive species control, this practice has the greatest potential to successfully usher new trees through their potential competitive battle with non-native invasive plants and allow them to form a new, shading overstory. Retain hemlocks except where removal of these is needed to complete a patch.

Harvest Intensity (cf. Managing Forests for Trees and Birds in Massachusetts p. 18-22): High

Site Compatibility (which sites is this practice compatible with?): Well-suited and marginal

Habitat objective provided by forest structure: this practice promotes *breeding bird habitat* for birds that prefer dense, young vegetation growing in full sun (i.e. early-successional forest conditions). Breeding bird habitat for early successional birds begins to decline rapidly after 7-10 years, once the understory is in full shade of a new closed-canopy forest. Birds breeding in all forest conditions will use early-successional habitat for foraging after the breeding season. Pin cherries are a preferred soft mast. Poplar buds are a preferred food for ruffed grouse. Paper birch and poplar are important for their potential to form soft-interior snags.

Typical *breeding birds* that may benefit from this forest structure:

Eastern Towhee
Chestnut-sided Warbler
Ruffed Grouse
Northern Flicker
Mourning Warbler (assuming hemlock is present)

White throated sparrow
Prairie warbler
Common yellowthroat
Indigo bunting
Gray catbird

Economic perspective: same as irregular shelterwood (net revenue — see above) but with a higher yield per acre.

Contribution to forest resiliency: enhance the diversity of tree species; diversify age structure; produce forest products in the near term; promote conditions for sustained future growth of forest products; diversify or maintain a diversity of habitat cover types; promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular; create sufficient amounts of regeneration so deer do not overwhelm it; support a mixture of stable carbon storage and rapid carbon sequestration across the landscape by creating a concentrated area of rapid carbon accumulation as distinct from nearby areas of prolonged carbon storage; not exacerbating the dominance of a very competitive native shrub (i.e witch hazel).

Trees to be removed & retained (types, conditions, sizes): Remove: generally > 95% of overstory basal area is removed. Areas to be treated by this practice are chosen by a process that looks at suitability of the site as well as the trade-offs between sacrificing the current overstory in exchange for gaining the benefits provided by the system. Generally, the large trees to be removed would be individually selected and marked, typically with

paint, by a forester, whereas the small trees would be indicated by a prescription. Retain very few live trees but retain all snags as well as trees girdled to become snags. Retain large coarse woody debris to the extent possible.

Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.): in areas with viable regeneration, precautions may need to be taken to protect young trees during logging. This is mainly a concern for young trees that are not likely to sprout, such as white pine or hemlock.

Other special considerations: same as thinning unless otherwise noted below.

Special cultural resource and aesthetic considerations: even though there is overwhelming scientific support for the proper use of this practice, and even though it can accomplish many objectives at once, this is probably the silvicultural practice that is the most difficult for the public to accept. This is very understandable; there are many reasons why members of the public may object to this practice and it is important that this be recognized and addressed. In order to maintain the support of the public, the landowner must go the extra mile to (1) properly locate/site and implement this practice and (2) to provide adequate support (information, public walks, etc.) to the public in a pro-active way. In siting the practice it is essential to envision what the site will be like afterwards (e.g. what will the views into and across the site be from vantage points where the public is likely to be?). With artistic skill, this type of cutting can offer the public a new and exciting perspective on a familiar landscape. It is not uncommon for members of the public to assume the worst (i.e. clearing for houselots) and then to be greatly comforted by the knowledge that the site in question will remain forested and by the knowledge that there is a rational explanation of the silvicultural objectives.

Use of mowing, other cutting or fire, to maintenance of Early-Successional Conditions:

Practice purpose (how it helps create desired future condition: This practice sustains high-quality early-successional habitat overtime and sustains overall forest plant diversity by ensuring that conditions are provided for those plants that thrive in full sun, especially those that tend to resprout (such as oaks) or form clonal colonies (this includes sassafrass and many shrubs such as beaked hazel, winterberry, and some viburnums). Mowing, as used here, refers to a mulching process that can grind up trees as large as 8”-10” and sometimes more with little difficulty. This practice has the advantage that, if abandoned someday, the site may tend to quickly regrow into a forest dominated by oaks, which are greatly favored by this type of treatment. This practice is especially advantageous if the landowner wishes to continue to provide early-successional habitat over time without having to continue to carry out full overstory removals over significant areas mature forest.

Harvest Intensity (cf. Managing Forests for Trees and Birds in Massachusetts p. 18-22): High

Site Compatibility (which sites is this practice compatible with?): Well-suited and marginal

Habitat objective provided by forest structure: this practice promotes and sustains, over time, the *breeding bird habitat* for birds that prefer dense, young vegetation growing in full sun (i.e. early-successional forest conditions). Breeding bird habitat for early successional birds begins to decline rapidly after 7-10 years, once the understory is in full shade of a new closed-canopy forest. This practice "sets back the clock" and extends the early-successional habitat value for another 7-10 years. If a large enough area is included, mowing regimes can be staggered so that younger and later phases of early-successional habitat are continuously present. Mowing units should be > 3 acres.

Typical *breeding birds* that may benefit from this forest structure:

Eastern Towhee
Chestnut-sided Warbler
Ruffed Grouse
Northern Flicker
Mourning Warbler (assuming hemlock is present)

White throated sparrow
Prairie warbler
Common yellowthroat
Indigo bunting
Gray catbird

Economic perspective: in contrast to methods involving logging, this practice is an out-of-pocket cost to the landowner and may be seen as fairly expensive (cost-share programs may be available to assist with this). Main costs would be forestry costs to delineate the area and prepare any specs, permitting (if any), bidding, contracting and supervising, as well as the cost to have a mowing company move equipment to the site and carry out the mowing.

Contribution to forest resiliency: accentuate / perpetuate / enhance the diversity of tree species; diversify age structure; promote conditions for sustained future growth of forest products; diversify or maintain a diversity of habitat cover types; promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular; create sufficient amounts of regeneration with a special possibility of regenerating plants preferred and often overbrowsed by deer; not exacerbating the dominance of a very competitive native shrub (i.e witch hazel).

Trees to be removed & retained (types, conditions, sizes): Remove: most of the upright vegetation would be mowed or mulched to ground level, but some shrubs could be flagged for retention (e.g. highbush blueberry). Retain very few live trees but retain all snags. Large logs on the ground should not be mulched. Retain hemlocks through successive mowings except when these become large enough or so numerous as to interfere with early-successional function.

Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.): None.

Other special considerations: same as thinning.

Intentional creation of snags or small muti-snag openings to support development of late-successional conditions without Logging:

Practice purpose (how it helps create desired future condition: By promoting the growth of large trees to an advanced age, and by increasing the abundance of large snags, this practice simulates the small-scale, partial disturbances that drive the development of a forest structure typical of late-successional and old-growth forests. This practice is most useful when the process of logging would be too disruptive to the site or when the site is too difficult for logging operations or too unproductive. This practice is most suited to riparian areas in the broad sense, and in ledgy or steep areas, or in areas that cannot be readily accessed by logging operations due to skid distances or long stretches of wet ground. This practice is also suited as an enhancement of other silvicultural practices involving logging.

Site Compatibility (which sites is this practice compatible with?): all sites

Habitat objective provided by forest structure: this practice promotes *breeding bird habitat* for birds that prefer mature, closed canopy forest (forests with small, infrequent disturbance) by *enhancing and accelerating* the formation of large tree canopies, cavity trees, snags in various states of decay, and large downed logs.

Typical *breeding birds* that may benefit from this practice given a mature forest structure:

Black and white warbler
Black-throated blue warbler
Canada warbler
Eastern wood peewee
Wood thrush
Yellow-bellied sapsucker
Black-throated green warbler (if hemlocks are present)

Pine warbler (nesting on large white pine branches)
Scarlet tanager (nesting in large hardwood crowns)
Pileated woodpecker (nesting in large cavity trees or snags)
Downy and hairy Woodpecker (nesting in cavity trees or snags)

Economic perspective: this practice is an out-of-pocket cost to the landowner. As a stand-alone practice, the landowner will have to pay for the cost of this practice (cost-share programs may be available to assist with this). If done in conjunction with active logging,

the cost can sometimes be absorbed into the overall contract so that the landowner does not have to issue a payment. Main costs would be forestry costs to provide tree selection and marking, permitting (if any), bidding, contracting and supervising, as well as the cost to have an insured professional, suitable volunteers or town staff carry out the cutting or girdling.

Contribution to forest resiliency: accentuate/support the development of late-successional features; promote conditions for sustained future growth of forest products; promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular; minimizing, largely by avoidance or otherwise by mitigation, any impacts in riparian zones, as conceived in a broad, functional sense that could negatively affect water quality; support stable carbon storage; protecting existing trails and promoting a positive trail-use experience

Trees to be removed & retained (types, conditions, sizes): Remove: no trees are removed. Instead, trees are girdled and or felled and left on the ground. These will either be single trees or small groups of, typically, 2-10 trees. Strive to create several snags ≥12" per acre distributed singly or in small groups throughout the forest. Retain all trees. Selection of trees to be girdled or cut & left will follow similar guidelines as thinning, but it will be important that larger trees are treated as well so that large snags are formed. Do not cut or girdle hemlocks.

Special regeneration considerations (seed source, seed bed preparation, interfering vegetation, browse, etc.): None.

Other special considerations: same as thinning.

Set-aside / No Treatment during 10-year timeframe:

Practice purpose (how it helps create desired future condition: This practice does not actively attempt to modify or shape the forest, but relies instead on natural processes to operate. This is most appropriate in areas in which the forest is currently in a desirable state and/or there is no apparent way to improve or need to sustain its condition. Examples of this would be a stand in which significant management has recently been completed and is being allowed to take effect. Another example is a stand that has aesthetic qualities that would be harmed by other treatments, such as in areas with a high density of trails or in areas where it is feared that aesthetic or other non-quantifiable attributes maybe compromised (note: with proper planning and sensitivity, the presence of trails is not in itself an automatic limitation on logging). The timeframe of a Forest Stewardship Plan allows for re-evaluation of this approach every 10 years. A stand treated in this manner during a given 10-year period may not be treated in the same manner in a future 10-year period.

Site Compatibility (which sites is this practice compatible with?): all sites

Habitat objective provided by forest structure: this practice promotes *breeding bird habitat* for birds that prefer mature, closed canopy forest (forests with small, infrequent disturbance) by allowing the natural background rate of formation of large tree canopies, cavity trees, snags in various states of decay, and large downed logs to occur. The BBCF forest is in a phase in which the growth of the forest has been brought to a slowed rate by mutual competition and in which the formation of snags, especially large snags, is very slow (only 1 snag > 25" was observed during the entirety of the fieldwork for this plan).

Typical *breeding birds* that may benefit from this practice: This practice will provide a continuation of existing conditions.

Economic perspective: this practice has no cost other than opportunity cost, which can be evaluated in many ways and may be zero, negative or positive.

Contribution to forest resiliency: support the development of late-successional features; promote conditions for sustained future growth of forest products; promote / sustain the water quality functions of the forest at the forest-wide level in general and in riparian areas in particular; minimizing, largely by avoidance or otherwise by mitigation, any impacts in riparian zones, as conceived in a broad, functional sense that could negatively affect water quality; support stable carbon storage; protecting existing trails and promoting a positive trail-use experience.

Trees to be removed & retained (types, conditions, sizes): Remove: no trees are removed. Retain all trees.

BBCF Silvicultural Recommendations by Species

Species	Abundance (all products as cords per acre)	Cutting Recommendation/ Tendency
Oak RED	18.6	Include
Pine WHITE	12.3	Include
Maple red	8.4	Include
Hemlock	4.2	Avoid
Birch yellow	3.9	Avoid
Oak scarlet	3.3	Include
Birch black	2.5	Include
Maple sugar	0.9	Avoid
Birch paper	0.8	Avoid
Ash white	0.8	Avoid
Oak white	0.4	Avoid
Gum black	0.3	Avoid
Cherry black	0.2	Avoid
Hickory	0.1	Avoid
Total per acre	56.6	

Table XXX Treatment by Species. This table shows the recommended silviculture and treatment acreage for each of 14 tree species. Those species classified as "include" are those abundant or common species that would make up the bulk of the cutting volume. Those species classified as "avoid" are those species that are less abundant or which should be preserved at this time for a particular reason. Special discussion of some "avoid" species is provided below. The classification of "avoid" does not mean avoid at all costs, but as a general tendency.

Hemlock: Though abundant at BBCF, much of the hemlock at BBCF tends to occur in a clumped distribution. These pockets of hemlock have high habitat value and will be difficult to replace at this time, in part due to preferential moose browsing of young hemlocks. Regionwide, hemlock is in decline due to insect pests. The best chance to preserve hemlock into the future may be to preserve large trees that exist now. If these trees ultimately succumb to the insect pests, there will be habitat value and overall resiliency value in the snags and downed wood that results. It is possible that some of the cutting proposed will regenerate hemlock and if this seems to be occurring successfully, then the classification of "avoid" can be re-evaluated in the future.

Yellow birch: Yellow birch is considered an important tree for forest bird foraging of insects from leaves. Though abundant in terms of cords at BBCF, yellow birch generally

does not occur at BBCF as a large overstory tree. Over time, the development of large yellow birches should be promoted.

White ash: White ash is threatened by an insect pest. Most of the white ash occurs as tall trees of firewood or otherwise rough timber quality, in riparian areas. Recommendations about what to do with ash in general are still being formulated at the regional level, and there is discussion about cutting all large ash as a way of slowing the spread of the insect pest. If the white ash were located in upland settings at BBCF, this idea would be easier to contemplate. However, with the intention of avoiding logging in riparian areas, coupled with the fact that there is not a lot of timber value to be lost, it seems wisest to leave the ash as is and see what happens. If, as with hemlocks, the ash trees die, it will provide habitat value and overall resiliency value in the snags and downed wood that results.

Sugar maple: Though (thankfully) not threatened by any particular forest health issue *in Pelham*, (sugar maples are under threat in the Worcester area due to an insect pest), the sugar maples also tend to occur in riparian areas where the fertility is somewhat elevated. There are very few of these areas. In the interest of avoiding logging impacts to riparian areas, areas containing sugar maples will generally be excluded from harvesting.

Paper birch, black gum, and other minor species: These species are generally too incidental to factor into logging in an important way. Where large black gums or groups of small black gums are found, these should be preserved within small groves of trees. Likewise, paper birch should be left as a seed source and to form snags. Paper birch and black gum are likely to increase as a result of the early-successional cutting that is recommended; both species rely on heavy disturbance to become established, and while black gum can live a long time following such disturbances (such that their use of heavy disturbance to become establish becomes blurred by time), paper birch does not live as long as trees such as red maple and red oak. 100 years ago, paper birch was very likely quite abundant, but over time other trees prevail. Bigtooth poplar, not detected in the inventory, may also become established in early-successional cutting.

Overview of BBCF Management Practices 2017-2027

Mark Boundary and Access Points: locate and confirm, then clearly blaze and paint (or re- blaze and paint), as needed, the approximately 5.4 miles of external boundaries. Only those boundaries with non-town parcels would be marked. There are about 3.4 miles of boundary in the northern parcels and 2.0 miles for the southern parcels. Post signs along the boundary to identify ownership and permitted uses. At road frontage access points indicate permitted uses and any parking rules.

Riparian Forest Concept: Avoid Harvesting Activity in Areas that are only Marginally-Suited or Poorly-Suited as well as in Other Designated Areas**:** Avoid harvesting on about 51% of acreage.

Carry Out Silviculture/Harvesting in Suitable Areas: Carry out marked harvesting under CH 132 permits as appropriate in order to meet harvesting-related resiliency goals. See harvest silviculture table below. In carrying out harvesting, provide protection for Eastern Box turtle and plan to retain significant coarse woody material. Note: harvesting in Stand 6 would occur in 3 separate 5.33-acre units to be conducted at different times during the 10-year period in order to stagger habitat effects.

Maintain Early-Successional Habitat and Promote Late-Successional Habitat: In Stand 6, potentially carry out brush mowing as needed to *perpetuate* early-successional habitat. Mowing in Stand 6 might also follow the 5.33-acre arrangement created for silviculture practices. This practice is contingent upon future determinations of benefits and feasibility, and will be designed with greater specificity at such time. Brush mowing is recommended on about 16 acres beginning as late as 2027. Intentionally create snags on about 75 acres (see non-harvest silviculture below). See table below.

Control Non-native Invasive plants: combine within-property monitoring and control efforts with neighborhood-level outreach concerning the threat posed by non-native invasive plants to reduce existing populations and prevent non-native invasive plants from becoming established or spreading. Develop a practice of regularly monitoring the property to detect and control non-native invasive plants. Areas within 300’ of town roads (esp. Buffam and North Valley Roads) and within or near the power line ROW seem to be at the greatest risk of continued early infestation and should be addressed in the early phases of this effort. Monitor all areas subject to harvesting.

OBJECTIVE CODE: CH61 = Forest Products (for CH 61/61A); STEW = Non-harvest Stewardship Practices; STD = stand; Type = Forest Type; Mbf = 1000 board feet; cds = cords; BA = basal area; VOL = volume

Improve and Repair Vehicle Access: improve existing landing and truck access to the North area, ideally using Robinson Road. Fix drainage on Robinson Road (even if not used for logging) and on Old Stage Road. Note: success will depend on working successfully with immediate abutters as needed to gain permission and support or cooperation. Block ORV traffic as needed. See discussion in Stand Descriptions section.

Support Native Vegetation by Supporting Deer Hunting: At the very least ensure that BBCF remain open for hunting as legally permissible. Creation and operation of a hunting program is beyond the scope of this plan.

Hiking Trails**:** Protect existing hiking trails during any logging activity; this is best handled on a case by case basis. General principles include (1) avoiding using a hiking trail as a skid trail when possible (e.g. Gurvitch); (2) if trails need to be crossed during logging, try to do this at right angles (e.g. Hepler-Westhead or Olver South); (3) before marking trees to be cut, mark the trail in an extremely obvious manner so that tree marking can be done accordingly. In some cases, provisions to clean up trails post-logging may be necessary. When existing logging infrastructure is to be used as a trail (e.g. possibly on Olver South), try to maintain an awareness among the trail-using public that at some future time, it may be necessary to re-use the logging access (which by then may seem more like a hiking trail than logging access).

Design, creation and maintenance of new trails is beyond the scope of this plan, but is being undertaken separately.

Outreach, Education, Cooperation**:** Maintain the forest in a condition tht is suitable for ongoing educational and outreach uses. Developing these programs is beyond the scope of this plan.

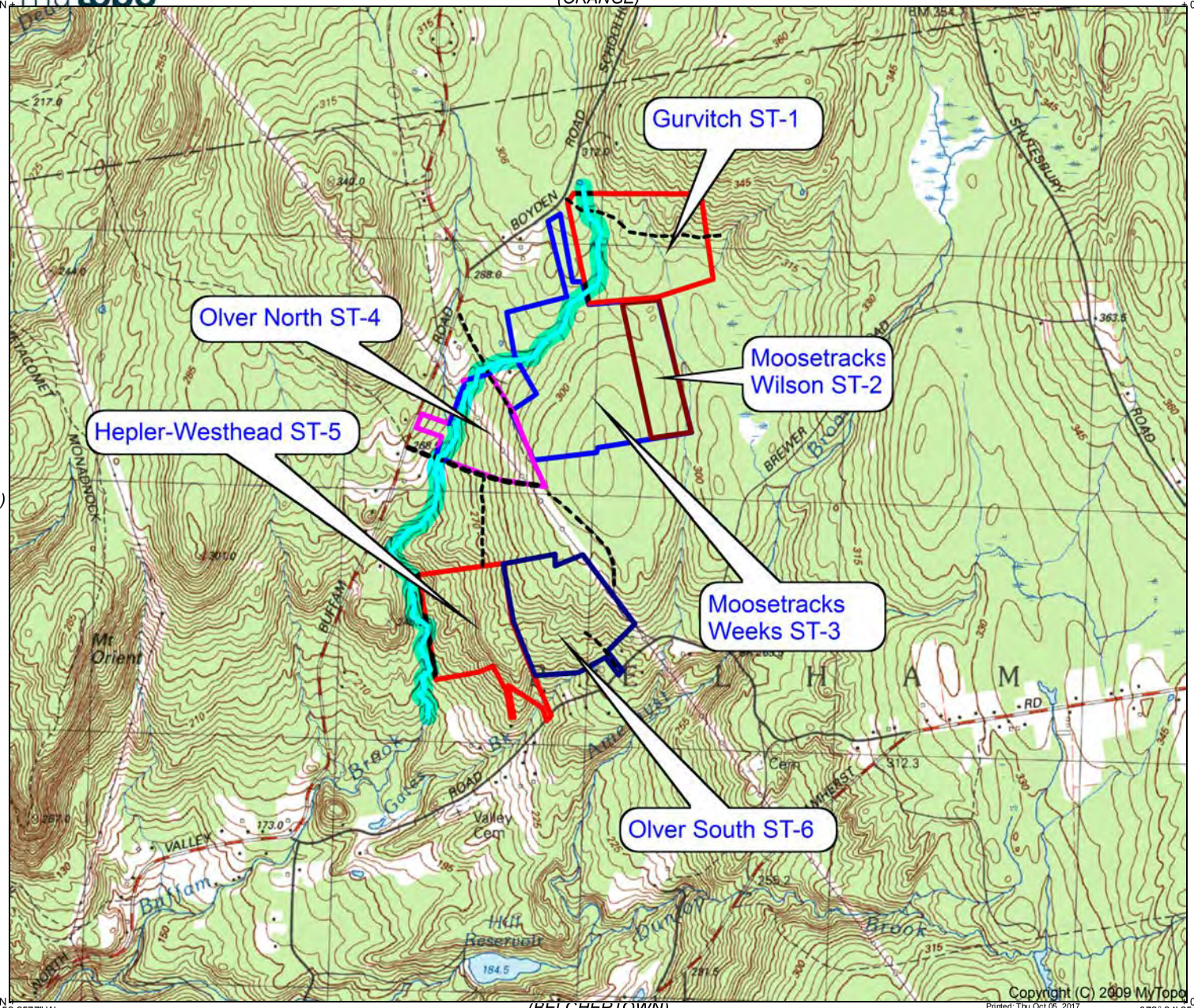
Table YY: Non-Harvest Silvicultural Practices

Stand	Type	Other Silviculture	Acres to Treat	Total Snags	Other Silviculture	Acres to Treat
1	OH	SNAG*	26.5	53		
2	WK	SNAG*	17.0	34		
3	WH	SNAG*	14.2	28		
4	BB	SNAG*	17.3	35		
5	WK		0.0	0		
6	WK		0.0	0	Mow Brush	16**
			75	150		29.8

*Create at least 2 snags ≥ 12" per acre
**Treatment potentially in 3 5.33-acre unit staggered over time – see discussion above.

Table YY shows other recommended silvicultural practices. Snag creation in Stands 1-4 would accentuate late-successional habitat conditions whereas mowing brush in Stand 6 would perpetuate early-successional conditions. Snags can be created at any time but ideally would be created early in the 10-year period. Snags creation should include red oaks but should not include uncommon trees such as white oak or black gum. Brush may not have to be mowed until the end of the 10-year period if harvesting can be designed to sufficiently cut small trees as well as product trees. At the time of mowing a staggered approach might be pursued (e.g. mowing 1/3 every 3 years or 50% every 5 years. Details of this approach can be worked out at the time in conjunction with monitoring of the site to evaluate actual conditions at that time.

Parcel	Stand	Type	Silviculture (harvesting)	Acres to Cut	BA / ac to Cut in Cut Area	Mbf to Cut	Cords to Cut (total includes upper stem cords)	Timing
Gurvitch	1	OH	Thinning	13.5	24	21	44	2018-2020
Moosetracks East (Wilson)	2	WK	No Cut	0.0	0	0	0	
Moosetracks Central & North (Weeks)	3	WH	No Cut	0.0	0	0	0	
Olver North	4	BB	Irreg. Shelterw.	8.7	48	16	52	2018-2020
Hepler-Westhead	5	WK	Irreg. Shelterw.	16.5	28	28	43	2018-2020
Olver South	6	WK	Overstory removal by logging in three 5.3-acre sections staggered over time	16.0	59	42	99	2018-2028
			Totals	55		106	239	
			Percent	22%		6%	7%	



SCALE 1:24000

Declination
MN GN
GN 1.72° E
MN 14.12° W

0 1 MILE
0 1000 2000 YARDS
0 1 2

CONTOUR INTERVAL 3 METERS
NATIONAL GEODETIC VERTICAL DATUM 1929

Produced by MyTopo Terrain Navigator
Topography based on USGS 1:24,000 Maps

North American 1983 Datum (NAD83)
Universal Transverse Mercator Projection

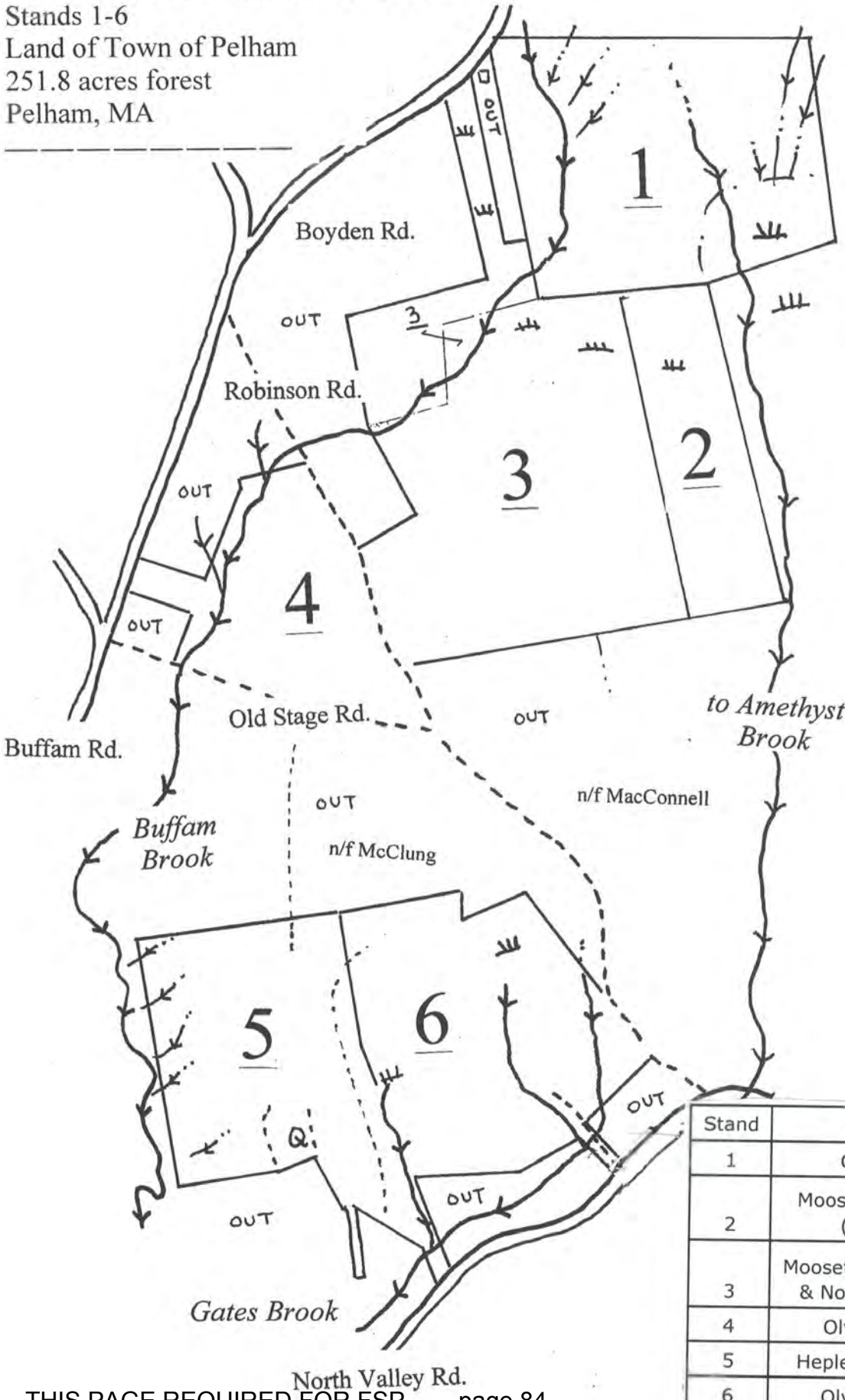
To place on the predicted North American 1927 move the projection lines 10M N and 38M E

LOCUS MAP: BUFFAM BROOK COMMUNITY FOREST & MOOSETRACKS, 252 ACRES, PELHAM, MA
MAP BY M.M. 10/2017

THIS PAGE REQUIRED FOR FSP

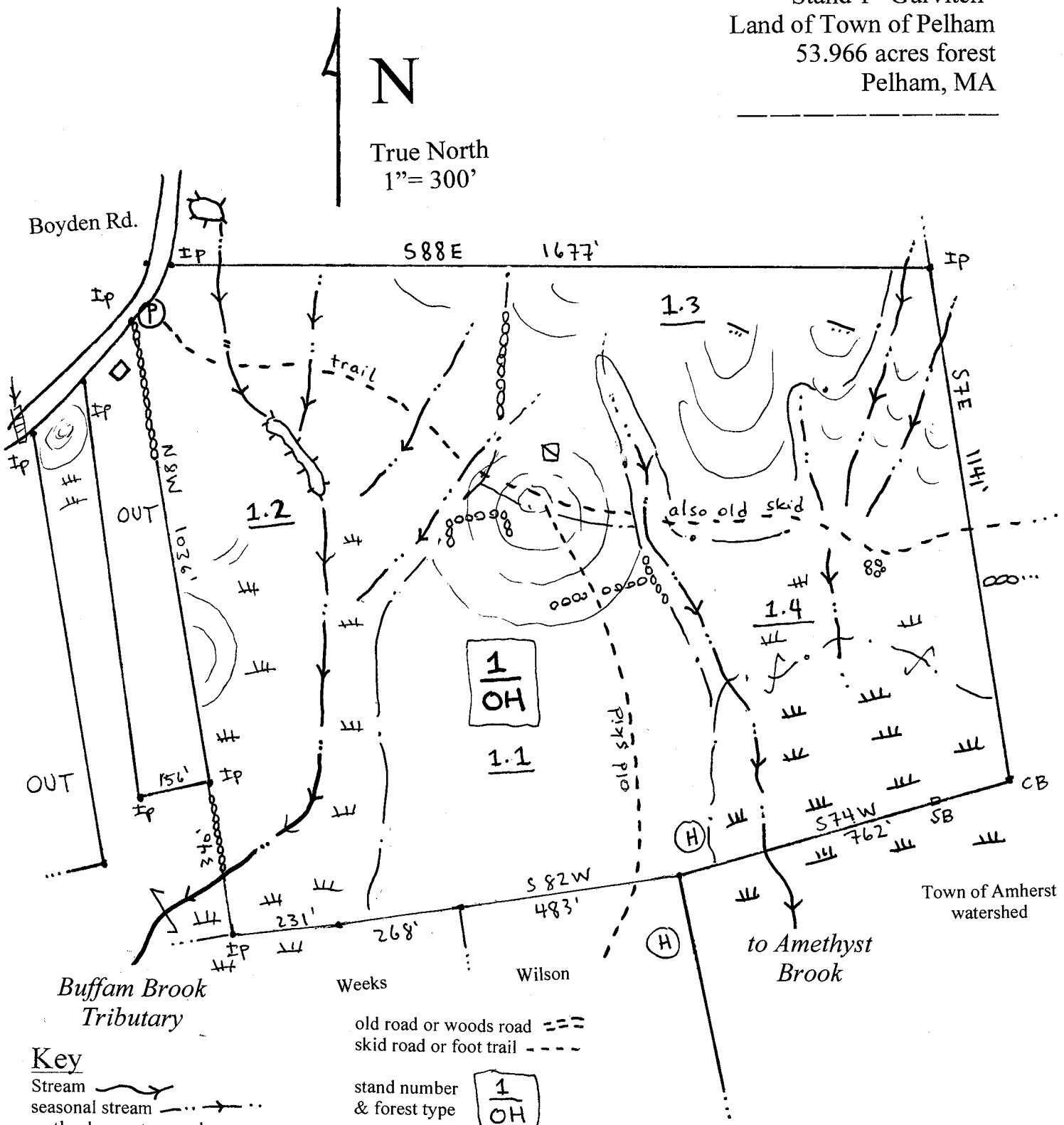
Forest-Wide Parcel & Stand Locator Map:
Buffam Brook Community Forest

Stands 1-6
Land of Town of Pelham
251.8 acres forest
Pelham, MA



Stand	Parcel	Acres
1	Gurvitch	53.966
2	Moosetracks East (Wilson)	17.000
3	Moosetracks Central & North (Weeks)	69.884
4	Olver North	26.000
5	Hepler-Westhead	41.086
6	Olver South	43.846
	Total	251.782

Forest Map: Buffam Brook Community Forest
Stand 1 "Gurvitch"
Land of Town of Pelham
53.966 acres forest
Pelham, MA



Key

Stream
seasonal stream
wetland or wet ground
vernal pool
culvert
bridge
stones
steep land
knoll
old quarry
old borrow pit
stone wall
wire fence

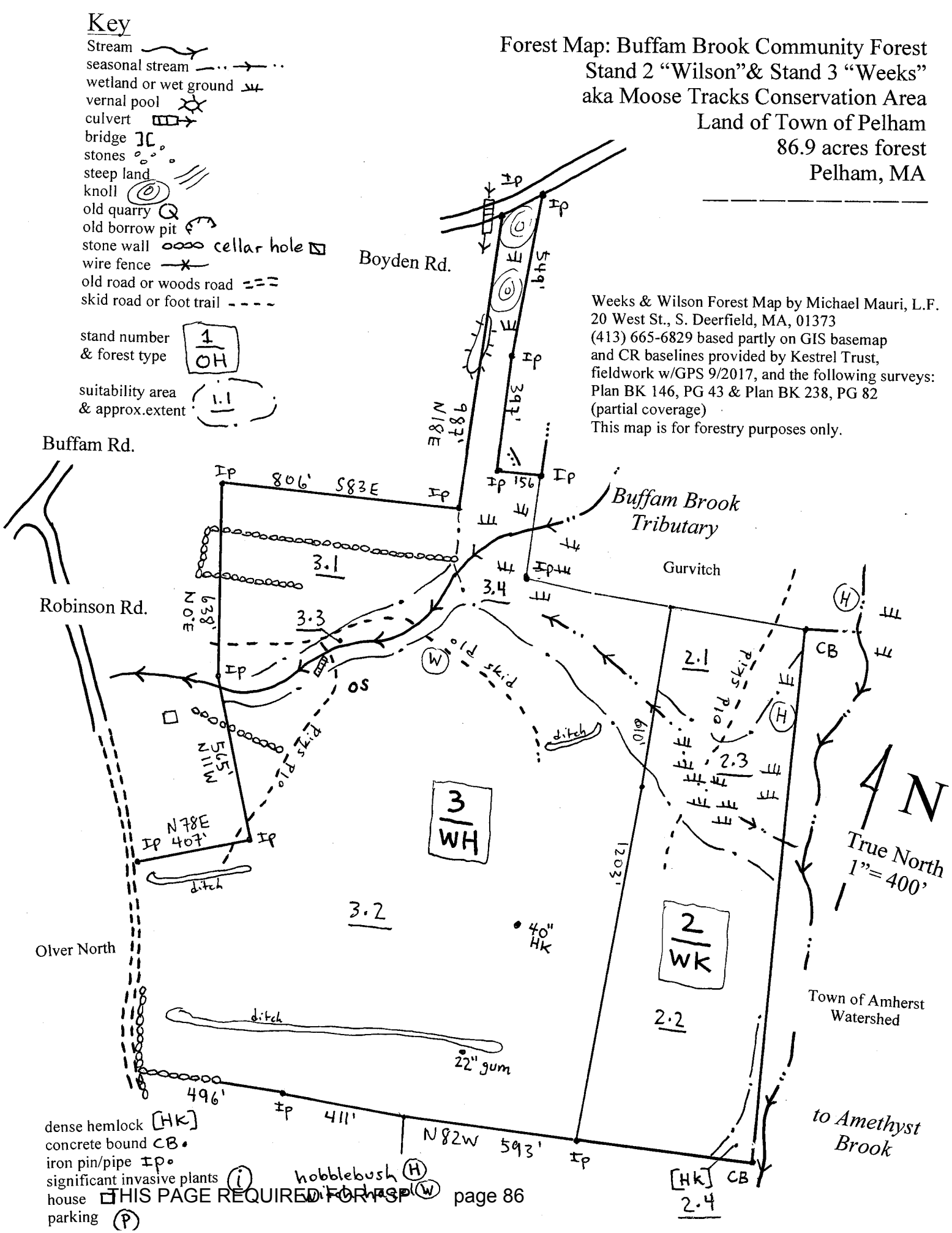
old road or woods road
skid road or foot trail

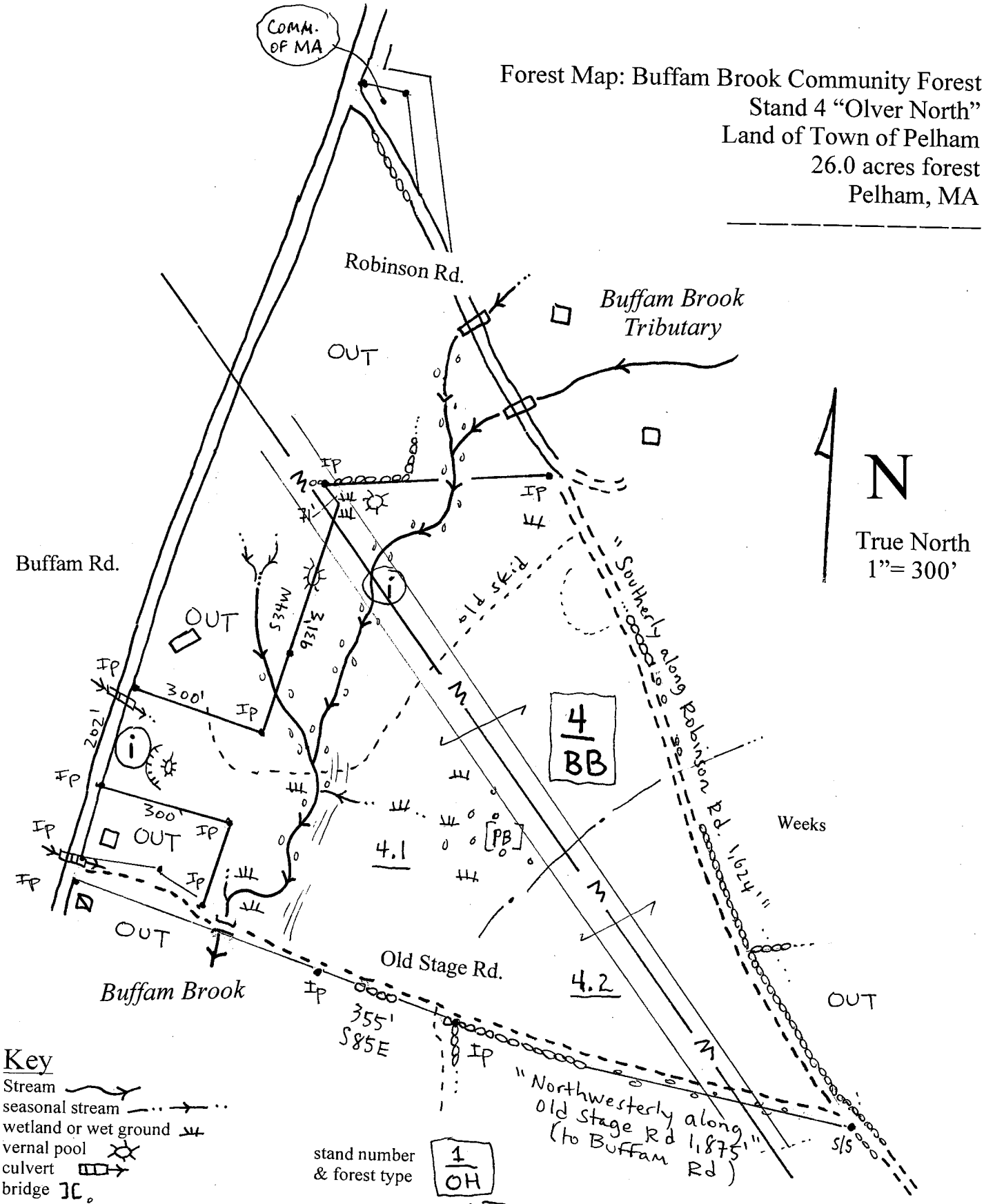
stand number & forest type (e.g. 1 / OH)

suitability area & approx.extent (e.g. 1.1)

dense hemlock [HK]
concrete bound CB
iron pin/pipe IP
significant invasive plants (i)
house
parking (P)

Gurvitch Forest Map by Michael Mauri, L.F.
20 West St., S. Deerfield, MA, 01373
(413) 665-6829 based partly on GIS basemap and CR baselines provided by Kestrel Trust, fieldwork w/GPS 9/2017, and the following surveys:
Plan BK 238, PG 82
This map is for forestry purposes only.


Key
Stream
seasonal stream
wetland or wet ground
vernal pool
culvert
bridge
stones
steep land
knoll
old quarry
old borrow pit
stone wall
cellar hole
wire fence
old road or woods road
skid road or foot trail
stand number & forest type
1 OH
suitability area & approx.extent
1.1
Forest Map: Buffam Brook Community Forest
Stand 2 "Wilson"& Stand 3 "Weeks"
aka Moose Tracks Conservation Area
Land of Town of Pelham
86.9 acres forest
Pelham, MA
Weeks & Wilson Forest Map by Michael Mauri, L.F.
20 West St., S. Deerfield, MA, 01373
(413) 665-6829 based partly on GIS basemap
and CR baselines provided by Kestrel Trust,
fieldwork w/GPS 9/2017, and the following surveys:
Plan BK 146, PG 43 & Plan BK 238, PG 82
(partial coverage)
This map is for forestry purposes only.
Boyden Rd.
Buffam Rd.
Robinson Rd.
Olver North
Gurvitch
Buffam Brook Tributary
Town of Amherst Watershed
to Amethyst Brook
True North
1"=400'
N
3.1
3.2
3.3
3.4
2.1
2.2
2.3
2.4
3 WH
2 WK
OS
ditch
skid
22" gum
40" HK
hobblebush
dense hemlock [HK]
concrete bound CB
iron pin/pipe IP
significant invasive plants (I)
house
parking (P)



Forest Map: Buffam Brook Community Forest
Stand 4 "Olver North"
Land of Town of Pelham
26.0 acres forest
Pelham, MA

Key

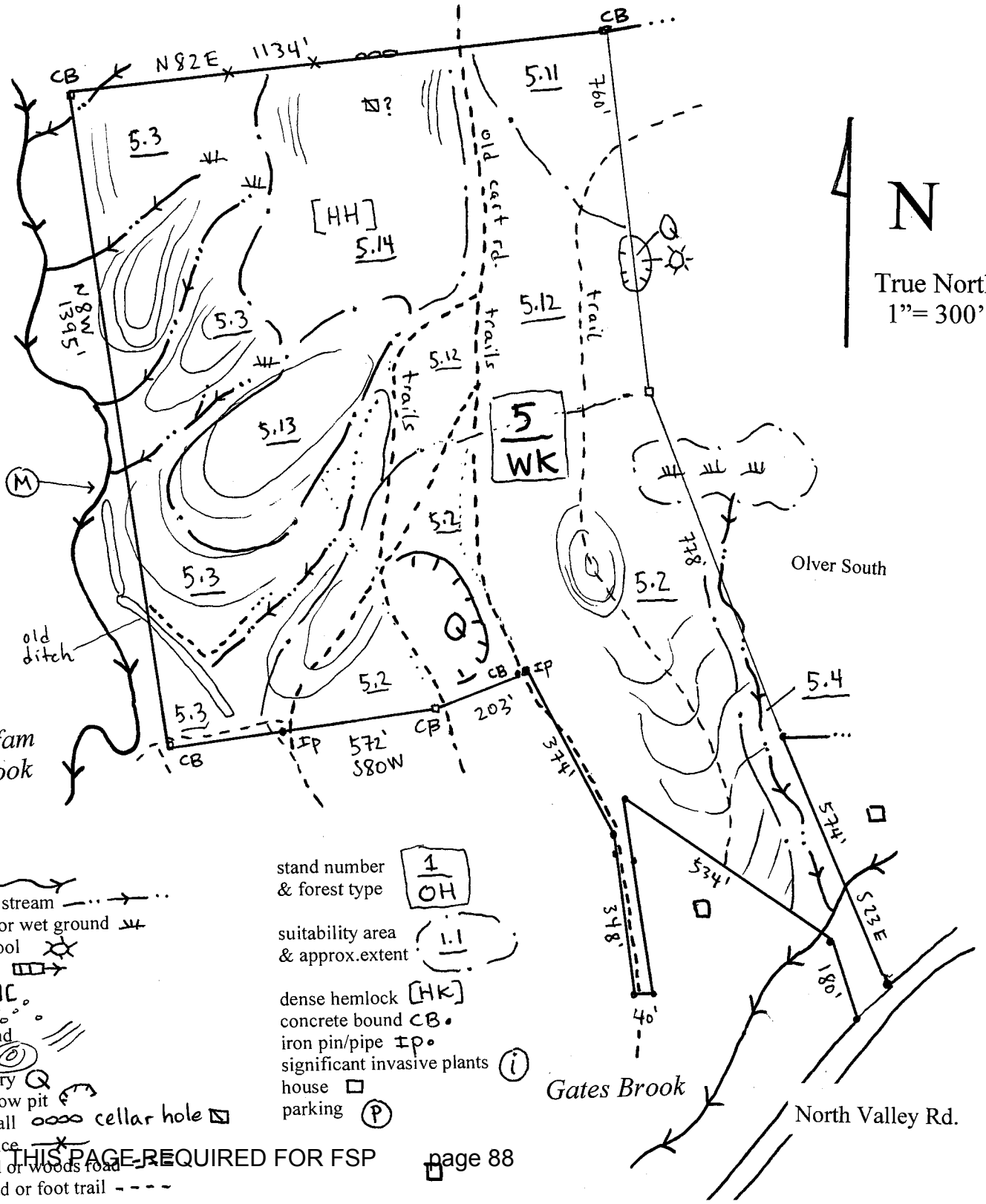
Stream
seasonal stream
wetland or wet ground
vernal pool
culvert
bridge
stones
steep land
knoll
old quarry Q
old borrow pit
stone wall
cellar hole
wire fence
old road or woods road
skid road or foot trail

stand number & forest type: 1 / OH
suitability area & approx.extent: 1.1
dense hemlock [HK]
concrete bound CB
iron pin/pipe IP
significant invasive plants (i)
house
parking (P)

Olver North Forest Map by Michael Mauri, L.F.
20 West St., S. Deerfield, MA, 01373
(413) 665-6829 based partly on GIS basemap and CR baselines provided by Kestrel Trust, fieldwork w/GPS 9/2017, and the following surveys:
Plan BK 142, PG 54 (partial coverage)
This map is for forestry purposes only.

Olver South Forest Map by Michael Mauri, L.F.
20 West St., S. Deerfield, MA, 01373
(413) 665-6829 based partly on GIS basemap
and CR baselines provided by Kestrel Trust,
fieldwork w/GPS 9/2017, and the following surveys:
Plan BK 238, PG 83
This map is for forestry purposes only.

Forest Map: Buffam Brook Community Forest
Stand 5 "Hepler-Westhead"
Land of Town of Pelham
41.086 acres forest
Pelham, MA



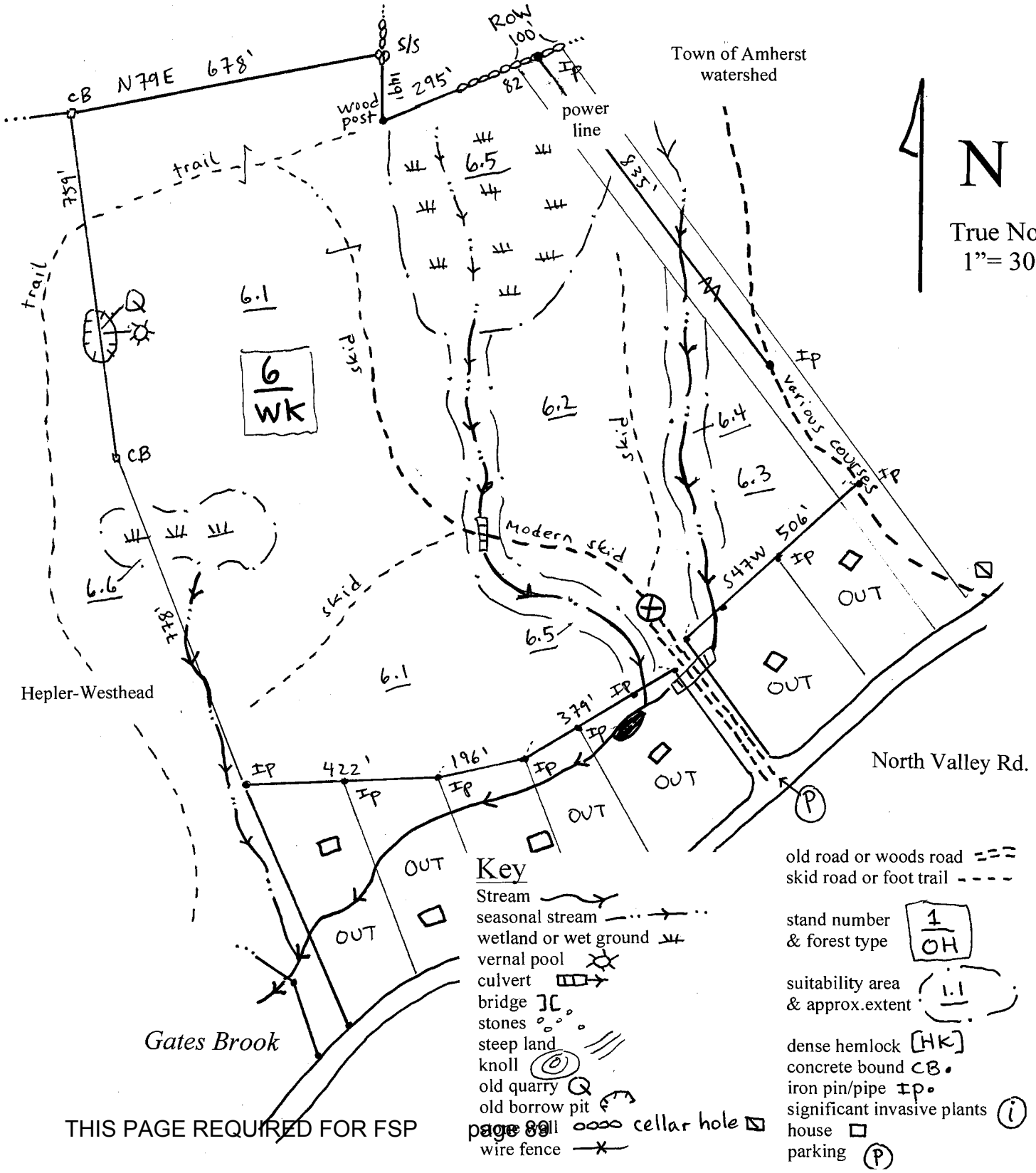
Key

Stream
seasonal stream
wetland or wet ground
vernal pool
culvert
bridge
stones
steep land
knoll
old quarry
old borrow pit
stone wall
cellar hole
wire fence
old road or woods road
skid road or foot trail

stand number & forest type: 1 / OH
suitability area & approx.extent: 1.1
dense hemlock [HK]
concrete bound CB
iron pin/pipe IP
significant invasive plants (i)
house
parking (P)

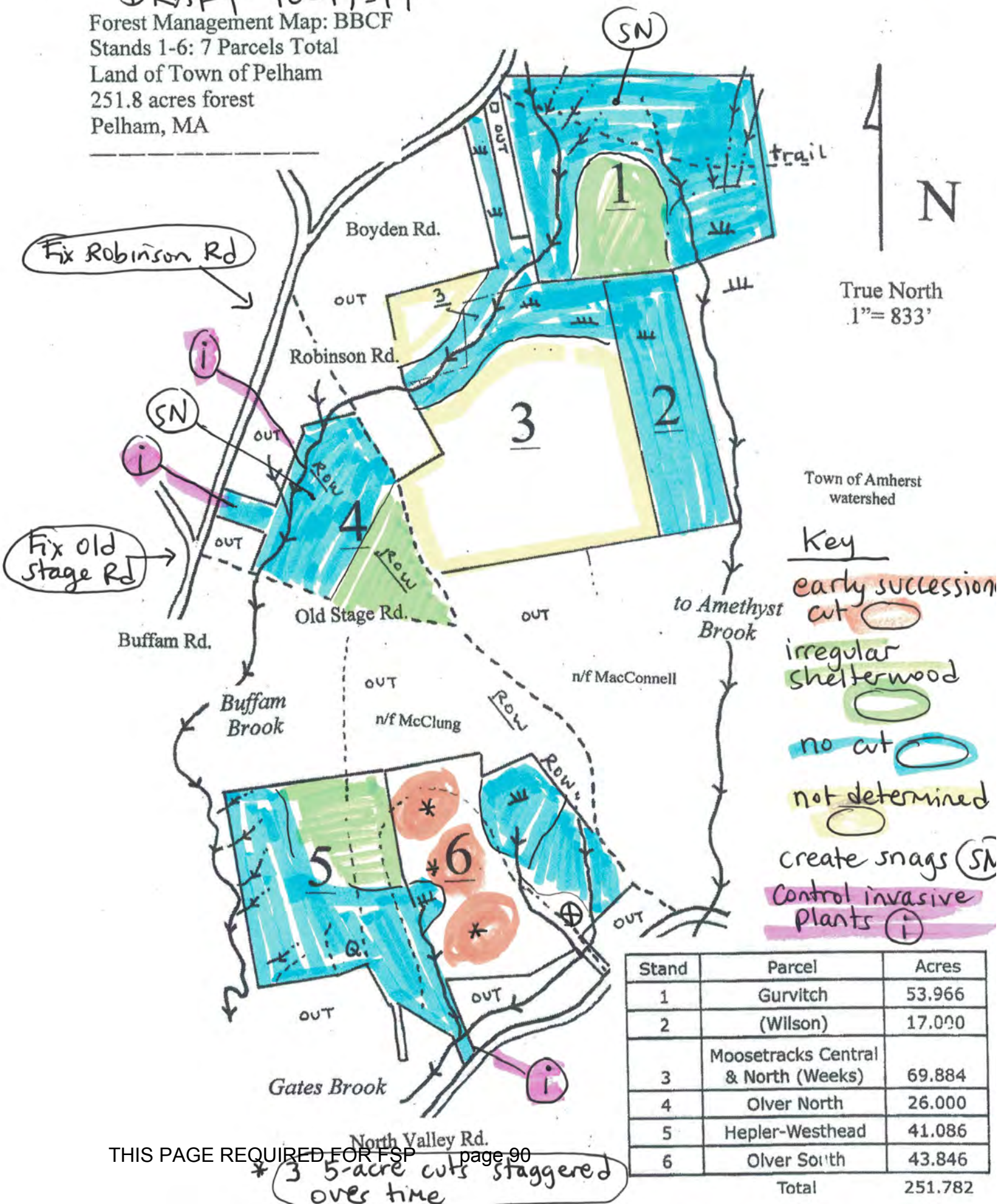
Hepler-Westhead Forest Map by Michael Mauri, L.F.
20 West St., S. Deerfield, MA, 01373
(413) 665-6829 based partly on GIS basemap
and CR baselines provided by Kestrel Trust,
fieldwork w/GPS 9/2017, and the following surveys:
Plan BK 238, PG 83
This map is for forestry purposes only.

Forest Map: Buffam Brook Community Forest
Stand 6 "Olver South"
Land of Town of Pelham
43.846 acres forest
Pelham, MA



Scenario B
DRAFT 10-19-17

Forest Management Map: BBCF
Stands 1-6: 7 Parcels Total
Land of Town of Pelham
251.8 acres forest
Pelham, MA



Stand	Parcel	Acres
1	Gurvitch	53.966
2	(Wilson)	17.000
3	Moosetracks Central & North (Weeks)	69.884
4	Olver North	26.000
5	Hepler-Westhead	41.086
6	Olver South	43.846
	Total	251.782

* 3 5-acre cuts staggered over time

Signature Page Please check each box that applies.

☐ **CH. 61/61A Management Plan** I attest that I am familiar with and will be bound by all applicable Federal, State, and Local environmental laws and /or rules and regulations of the Department of Conservation and Recreation. I further understand that 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.

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

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

Signed under the pains of perjury:

Owner(s)_____ Date 11-9-2017

Owner(s)_____ Date_____

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

Plan Preparer_____ Date 11-16-17

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

Approved, Service Forester_____ Date_____

Approved, Regional Supervisor_____ Date_____

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

Owner(s): Town of Pelham Town: Pelham

Step 1: DEFINE location, project, and time frames.

What are your management goals and objectives for the project area?

Project Area or Property:	Buffam Brook Community Forest
Location:	Pelham, MA

Ecosystem Type or Management Topic	Management Goals	Management Objectives	Time Frames
Entire property	Identify and pursue opportunities for a working forest providing a sustainable wood supply.		10 yr plan to support long-term stewardship
	Provide sufficient protection and habitat for the Eastern box turtle.		
	Provide desirable breeding habitat for forest-interior birds. This includes a full range of forest structures from mature/closed-canopy to partially-open/intermediate to early-successional habitat.		
	Provide adequate access for working utilization and stewardship of the forest.		
	Provide adequate access for sustainable forms of passive and active recreation and education including connectivity to other trails.		
	Provide forest-based source-water protection.		
	Identify forest-based educational opportunities including demonstration of forest stewardship.		

Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

What climate change impacts and vulnerabilties are are most imporant to this particular site?

Ecosystem Type or Management Topic (from Step #1)	Regional Climate Change Impacts and Vulnerabilities	Climate Change Impacts and Vulnerabilities for the Project Area or Property	Vulnerability Determination
Entire property	Intense precipitation events will continue to become more frequent in the Northeast.	Streams and roads and culverts could be at risk from increased precipitation or more extreme precipitation. There are different ages of infrastructure on the property, so some areas are more likely to be affected than others. Some historic roads are washing out and need to be stabilized.	Transition Hardwoods = Low (from: EVAS)
	Disturbances such as wildfire, flooding, and pest outbreaks are expected to increase in the future.	Large disturbances, particularly intense storms, are a concern. The forest tends to be even-aged, which may reduce its resilience to damage from extreme winds. Wind or ice storms could damage or kill larger white pine or other parts of the canopy. One factor that is more uncertain is the potential threat from invasive species following a large disturbance. There are relatively few invasives on the property, but a large storm that set back the forest to an earlier successional stage could provide invasives with a competative advantage. Damage from extreme storms would not be expected to negatively affect forest composition given the tree species diversity on the property.	
	Total precipitation is generally expected to increase during winter and spring, but summer and fall projections are more uncertain. Forest vegetation may face increased risk of moisture deficit and drought during the growing season.	Several vernal pools are present on the property, and the hydroperiods for this could be interupted by changes in precipitation and hydrology, especially where conditions become drier. This could negatively affect amphibians and other organisms that use these areas. Box turtles have historically been found on the property, and it is unclear how altered precipitation and hydrology would affect these species and their habitat. (Box turtles forage in a variety of forest and open vegetation types, including drier south and west facing slopes and small wetland depressions. They overwinter in upland forests.) The site is wetter than it seems in some areas, with wetter-site species like yellow birch and blackgum present. There was historic ditching on property to drain the site, which also points to it being a wetter site. The soils are mostly till with a restrictive layer, which creates higher seasonal groundwater levels. The forest is a transitional forest, so it's hard to imagine it being widely susceptible to moderate amounts of drought. It is presumed to have some ability to tolerate somewhat drier conditions. There are drier-site species like white and scarlet oak.	

Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

What climate change impacts and vulnerabilties are are most imporant to this particular site?

Ecosystem Type or Management Topic (from Step #1)	Regional Climate Change Impacts and Vulnerabilities	Climate Change Impacts and Vulnerabilities for the Project Area or Property	Vulnerability Determination
	High levels of diversity in transition hardwood forests may increase the ability of forests to adapt to climate change.	There's a wide range of tree species on the site, including species that tend to be found on either wetter or drier sites. There is not a lot of sugar maple on the property. There are some older sugar mapes in the riparian areas near Buffam Brook. Sugar maple tends to be limited in the riparian areas and could be the species most sensitive to drought (and perhaps serve as an indicator). Sugar maple is expected to be able to persist in these areas, but perhaps not regenerate under drier conditions.	
	Invasive species such as buckthorn, honeysuckle, and garlic mustard are expected to become more problematic under climate change.	There are very few occurrences of invasive plants on the property, especially compared to other areas locally. Invasives tend to be limited to areas like along the powerline and road. These areas have a mix of the most common invasives, including buckthorn, Asiatic bittersweet, garlic mustard, muti-flora rose, and winged eunonymous. There is a concern over large-scale disturbances (e.g. hurricanes, ice/wind damage) and risks for creating a turning point in invasives on the property from the removal of a large portion of the canopy.	
	Some of the common tree species in transition hardwood forests are projected to have similar or increased habitat, including black cherry and yellow-poplar.	Some species that are present on the site that might be suited to better conditions include: white oak, scarlet oak, shagbark hickory, sassafras, black cherry, black gum.	
	Species in fragmented landscapes will have less opportunity to migrate in response to climate change.	The properties are not very fragmented, except for the power line that is relatively narrow. The conservation work and community forest is putting tracts together (including adjacent Amherst water supply lands) and protecting a larger areas. The landscape is relatively well connected with good wetland and habitat corridors, even to a degree needed for large mammals. The biggest problem is parcelizaion along the road frontage. Busy car traffic is a threat to animals like turtles.	

Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

What climate change impacts and vulnerabilties are are most imporant to this particular site?

Ecosystem Type or Management Topic (from Step #1)	Regional Climate Change Impacts and Vulnerabilities	Climate Change Impacts and Vulnerabilities for the Project Area or Property	Vulnerability Determination
	Insect pests and forests diseases could become more problematic forests under a warmer climate.	There are several pests and pathogens that are potentially problematic. Emerald ash borer is know to be nearby (known in Winsor) and likely to be present on the property. Climate change is not a factor in its spread. Ash is limited except in riparian areas where it is important. Hemlock woolly adelgid and hemlock scale are present but there is not much mortality yet. Some trees are almost dead. Gypsy moth can be a problem. There was a big defoliation to the east and south the past two years, but it is receding. Gypsy moth causes defoliation but is not devastating like other pests. Chestnut blight historically killed all of the chestnuts. There are many needle and canker diseases affecting white pine, such as needle cast and *Caliciopsis* canker affecting white pine. Beech bark disease is present regionally, but there is very little beech on the property. Last year was bad for many forest health issues (due to a dry spring?) but this year wasn't as bad.	
	Winter temperatures are expected to continue increasing, leading to changes in snowfall, soil frost, and other winter processes.	The areas with wetter soils on the property might be more susceptible to changes in soil freezing. Winter harvest is recommended as a way to protect turtle habitat, with timber harvests occuring sometime between mid-December are mid-March to help protect soils and animals. Changes in frozen ground or snowpack could limit operations.	

Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

What management challenges and opportunities may occur as a result of climate change?

Management Objectives (from Step #1)	Challenges to Meeting Management Objective with Climate Change	Opportunities for Meeting Management Objective with Climate Change	Feasibility of Objectives under Current Management	Other Considerations
Affecting all goals and objectives	Invasive plant species are "#1 menace" for all the goals for the forest.	Invasive plants are not bad yet, so there's still time and possibility for preventing their establishment.		
Affecting all goals and objectives	Deer could also become a problem if future climate conditions or other changes allow populations to increase.	There is a reasonably substantial number of deer hunters in the area, which help keep deer populations from getting out of hand.		
Identify and pursue opportunities for a working forest providing a sustainable wood supply.		Multiple stands provide opportunties to do harvests and improve forest conditions over time. Win-win with other benefits like habitat improvements. Currently, stand is at appropriate successional stage without major impediments (invasives, deer) to encourage regeneration. There is evidence of recent regeneration success on one previously-harvested parcel. There are few challenges to regeneration. For example, the local hunter population helps keep herbivory pressure down.	High	Balance with carbon Social considerations
Provide sufficient protection and habitat for the Eastern box turtle.	There may be a potential for habitat degredation due to changes in climate like drier conditions, fluctuating water levels, or reduced winter snow pack. More information is needed!	There may be opportuntities to improve habitat during management, such as through retaining woody residues on site.	??	

Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

What management challenges and opportunities may occur as a result of climate change?

Management Objectives (from Step #1)	Challenges to Meeting Management Objective with Climate Change	Opportunities for Meeting Management Objective with Climate Change	Feasibility of Objectives under Current Management	Other Considerations
Provide desirable breeding habitat for forest-interior birds. This includes a full range of forest structures from mature/closed-canopy to partially-open/intermediate to early-successional habitat.		There are many opportunities to increase structure through management. This could also increase coarse woody debris to improve habitat.	High	
Provide adequate access for working utilization and stewardship of the forest.	There are a handful of culverts that are poorly designed, placed, or undersized and at risk to damage or failure. Do not currently have a schedule of maintenance for culverts. Any access is also access for invasives Winter conditions are always unknown. This is already challenging, and it's unclear whether it will become worse.	There are many opportunities to improve infrastucture, or remove unnecessary culverts.	High	
Provide adequate access for sustainable forms of passive and active recreation and education including connectivity to other trails.	Changing and extreme precipitation may increase the risk for erosion or periodic flooding of recreation trails.	There are opportunities to improve access and connectivity of the trail system. The existing trail is good. Other trails need to be developed yet, and potential impacts can be considerd as part of that process.	High	There are concerns about potential overuse by visitors.

Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

What management challenges and opportunities may occur as a result of climate change?

Management Objectives (from Step #1)	Challenges to Meeting Management Objective with Climate Change	Opportunities for Meeting Management Objective with Climate Change	Feasibility of Objectives under Current Management	Other Considerations
Provide forest-based source-water protection.	Buffam Brook is high-quality water, designated cold-water fishery. A riparian butter has already been designated. Riparian forests are most vulnerable to forest health issues, and declines would potentially affect water quality. Maintaining large trees in riparian areas is important for water control and also dead wood recruitment into streams. Management activities allowed inside of riparian buffer needs to identified.	Across property, management could be used to improve soil organic matter (retain woody residues) for infiltration.	High	
Identify forest-based educational opportunities including demonstration of forest stewardship.		The community has good connections through UMass-Amherst and other organizations to do demonstration and education. This could be broadly related to environmental education about forests (especially for K-12), but climate change might be a a component in some instances.	High	

Step 4: IDENTIFY adaptation approaches and tactics for implementation.

What actions can enhance the ability of the ecosystem to adapt to anticipated changes and meet management goals?

Ecosystem Type or Management Topic (from Step #1)	Adaptation Actions		Time Frames	Benefits	Drawbacks & Barriers	Practicability of Tactic	Recommend Tactic?
	Approach	Tactic					
Entire property	Prevent the introduction and establishment of invasive plant species and remove existing invasive species	Identify infestations of invasive plant species and determine whether treatment or monitoring is appropriate.					
		Create a monitoring plan for invasive plants in general and particularly following a timber harvest or other disturbance.					
		Treatment of any existing or new invasive plant populations.					
		Precautions during timber harvest to prevent new infestations (clean machinery, etc.).					
		Develop a community-level campaign/effort to prevent and control invasive plants.					
		other?					
Entire property	Reduce impacts to soils and nutrient cycling. Manage habitats over a range of sites and conditions.	Perform harvest operations in winter to protect box turtles as well as water and soil resources.					
		Other actions for turtles?					
Entire property	Manage herbivory to promote regeneration of desired species.	Continue to allow (and even encourage) deer hunting on property.					
Entire property	Maintain or improve the ability of forests to resist pests and pathogens.	Other actions for pests and diseases??					
Roads, culverts, and woods infrastructure	Reduce impacts to soils and nutrient cycling. Maintain or restore hydrology.	Evaluate roads, culverts, and other woods infrastructure to identify current and potential problems.					

Step 4: IDENTIFY adaptation approaches and tactics for implementation.

What actions can enhance the ability of the ecosystem to adapt to anticipated changes and meet management goals?

Ecosystem Type or Management Topic (from Step #1)	Adaptation Actions		Time Frames	Benefits	Drawbacks & Barriers	Practicability of Tactic	Recommend Tactic?
	Approach	Tactic					
		Remove infrastructure where it is no longer needed, such as my decommissioning roads or removing culverts.					
		Upgrade infrastructure that is old or underperforming. Replace undersized culverts with larger structures, such as open-bottom arches or timber bridges.		Increases resilience to extreme events. Improves aquatic organism passage.			
Upland forests	Reduce competition for moisture, nutrients, and light. Alter forest structure to reduce severity or extent of wind and ice damage. Maintain and enhance species and structural diversity. Favor or restore native species that are expected to be adapted to future conditions.	Harvest at least one area to provide wood products and improve bird habitat:					
		a) Re-cut area that is currently in an earlier-successional habitat to keep it in a younger seral stage		Good regeneration of oak and other species, so	Would be a good area to allow to grow		
		b) Create openings in areas with well-established understory to encourage regeneration and bird habitat					
	Promote diverse age classes.	Implement silvicultural practices to increase structural and age class diversity.					
	Reduce impacts to soils and nutrient cycling.	Implement silvicultural practices to increase down woody material, and retain harvest residues for increasing soil organic matter and infiltration capacity.					
	Maintain or restore hydrology.						
	Retain biological legacies.						
	Maintain and restore diversity of native species.	Implement silvicultural practices to maintain or increase species diversity, including mast species.					

Step 4: IDENTIFY adaptation approaches and tactics for implementation.

What actions can enhance the ability of the ecosystem to adapt to anticipated changes and meet management goals?

Ecosystem Type or Management Topic (from Step #1)	Adaptation Actions		Time Frames	Benefits	Drawbacks & Barriers	Practicability of Tactic	Recommend Tactic?
	Approach	Tactic					
	Promote diverse age classes. Maintain and enhance species and structural diversity.	No active management in some (most?) stands during the next 10 years.					
	Allow for areas of natural regeneration to test for future-adapted species.	In the event extreme storm damage, allow for natural processes and avoid salvage harvest as much as possible.					
Riparian forest/ Riparian areas	Maintain or restore riparian areas.	Establish riparian areas as a no-management buffer arounds the stream to encourage large trees and natural ecosystem processes.				yes	yes
	Reduce impacts to soils and nutrient cycling.	If necessary, girdling or thinning could occur in riparian areas to increase tree growing space and in-stream wood.					
	Reduce competition for moisture, nutrients, and light.	Perform by hand to avoid damage from logging equipment.				low	no
	Favor or restore native species that are expected to be adapted to future conditions.	Consider enrichment planting in the understory in the event of canopy declines (from pests or other causes).		Probably not necessary since natural seed sources are available.		low	no
Recreational trails	Reduce impacts to soils and nutrient cycling. Maintain or restore hydrology.	Designate and design new hiking trails to provide for natural drainage of trails and minimize damage in sensitive areas.					
		Avoid overuse of important recreation areas by keeping parking areas simple, minimal signage.					

Step 5: MONITOR and evaluate effectiveness of implemented actions.

What information can be used to evaluate whether the selected actions were effective and inform future management?

Ecosystem Type or Management Topic (from Step #1)	Adaptation Monitoring Variable	Criteria for Evaluation	Monitoring Implementation

Buffam Brook Community Forest Education Plan

Written by Colleen Kelley, Education Director, Hitchcock Center for the Environment
9/7/17- 10/25/17

Introduction:

"Place-based education challenges the meaning of education by asking seemingly simple questions: Where am I? What is the nature of this place? What sustains this community? It often employs a process of re-storying, whereby students are asked to respond creatively to stories of their homeground so that, in time, they are able to position themselves, imaginatively and actually, within the continuum of nature and culture in that place. They become part of the community, rather than a passive observer of it."

-Laurie Lane-Zucker (Executive Director of Orion Magazine)

The Buffam Brook community forest has a variety of healthy habitats supporting diverse plant and animal life. I walked the forest with a naturalist, forester, and land owner and used my lens as an environmental educator to evaluate what kinds of place-based education programming could be supported by this forest. The following is a list of a few suggested opportunities divided in to categories by Adult , Children and School programming . These are only a few of the many teachable opportunities that the forest lends. I chose to expand on the school programs in more detail with examples of a few descriptions and learning standards they would accomplish – so not to make this report too long!

Adult Education Programs: many of these programs are one to two hour programs that serve as an introductory experience. The Phenology, Sustainable Forestry and the Succession Studies are groups of adults that would meet for a year long study. Birding is also a series but people sign up and continue for years.

General throughout the forest:

- **Birding** would be supported by a variety of habitats- forest, field, clear cut-open forest canopy.
- **Tree ID** – the forest supports of a variety of healthy species both young and old.
- **Succession studies** – easily seen with areas that have been cut previously
- **Fern ID**
- **Phenology-** citizen science
- **Sustainable Forestry**- forest stewardship
- **Redback Salamander Plot studies**- citizen science
- **Mushrooms**
- *Specific to the Hepler's land:*
    - ***Geological History** – the quarry off of North Valley has Gneiss that was used as foundation for some of the Amherst College buildings!
    - ***Vernal Pool study**

Example Public Program offerings that could take place in this forest:

Birding By Ear
John will guide you on a listening walk through a variety of local habitats. He will point out the songs and calls of a variety of spring nesting songbirds. He will share strategies about how to distinguish some of the sound-a-like songs and will help you connect the visual image with the sound! He will explore several varied habitats and specify which species live in each so you can more easily determine who is singing!

Trees and Wildflowers
We'll hike some of the trails at the Buffam Brook Community Forest. We'll look for wildflowers and the variety of trees found on the site. And we'll look and listen for nesting woodland birds along the way. Bring your curiosity, binoculars and be prepared to take notes.

Children Education Programs – Many of these programs are full year contact with these children once a week. These programs have great impact on changing perspective and gaining connection to nature and the outdoors.

Focus Groups:

Girl scouts/Boy scouts - Vernal pool studies, Birds, Insects, Tracking, Geology, Soil Studies, Plant and Animal Identification

Homeschool Programs – Patterns in Nature, Biomimicry, Forest Systems, Vernal Pool study, Wetlands, Birds of the Forest, Amphibians and Reptiles

Nature Play (unstructured Free Play in the Forest) – Tree climbing, Stream walking, Mud play, Fairy house building, Shelter building**Girls in to the Wild**

(Afterschool girls nature club) – Forest stewardship and trail work, tree climbing, vernal pool investigation, seed collecting, natural dyes, plant weaving, flower pressing, insects, amphibians, reptiles, mammals, tracking , geology

Youth School Programs:

Field Trips to Buffam Brook Community Forest-the property is closest to Pelham Elementary School and Shutesbury Elementary school but can also serve the other elementary, middle school and high school in Amherst with a 10-15 minute bus ride

to the site. It also offers a great study site for the local colleges and schools from surrounding towns.
If the Forest was to become a focus study site for a school – curriculum could be developed by the Hitchcock Center that would be PreK-6 grade focus – and could have great impact on the students understanding of their local environment.

Animals in Winter Grade Levels: PreK–2 Program Description: The world is very much alive in winter. We can learn about that life by following the tracks and signs of the animals around us. We will explore animal homes, food, signs and various adaptations that animals use for surviving in the cold, snowy months. We will learn to recognize tracks and signs that tell a story about an animal's life during this challenging season.

Massachusetts Curriculum Standards: Pre-K: Life Science LS1. From Molecules to Organisms: Structures and Processes PreK-LS1-1(MA). Compare, using descriptions and drawings, the external body parts of animals (including humans) and plants and explain functions of some of the observable body parts. LS2. Ecosystems: Interactions, Energy, and Dynamics PreK-LS2-2(MA). Using evidence from the local environment, explain how familiar plants and animals meet their needs where they live. Kindergarten: Life Science LS1. From Molecules to Organisms: Structures and Processes K-LS1-1. Observe and communicate that animals (including humans) and plants need food, water, and air to survive. Animals get food from plants or other animals. Plants make their own food and need light to live and grow. K-LS1-2(MA). Recognize that all plants and animals grow and change over time. Grade 1: Life Science LS1. From Molecules to Organisms: Structures and Processes 1-LS1-1. Use evidence to explain that (a) different animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. LS3. Heredity: Inheritance and Variation of Traits 1-LS3-1. Use information from observations (first-hand and from media) to identify similarities and differences among individual plants or animals of the same kind. 845 West Street, Amherst, MA 01002 | hitchcockcenter.org | 413-256-6006 Grade 2: Life Science LS2. Ecosystems: Interactions, Energy, and Dynamics 2-LS2-3(MA). Develop and use models to compare how plants and animals depend on their surroundings and other living things to meet their needs in the places they live. LS4. Biological Evolution: Unity and Diversity 2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas.

Habitat Studies Grade Levels: 1–5 Program Description: Every living thing needs a home or a habitat to survive. Just as each neighborhood has its own needs and inhabitants, each habitat has its own animals, plants, and interactions. Our trip will take us through forest, field, wetland where we will focus on the components of each habitat and the adaptations of the animals and plants that live there.

Massachusetts Curriculum Standards: Grade 1: Life Science LS1. From Molecules to Organisms: Structures and Processes 1-LS1-1. Use evidence to explain that (a) different animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air, and (b) plants have roots, stems, leaves, flowers, and fruits that are used to take in water, air, and other nutrients, and produce food for the plant. LS3. Heredity: Inheritance and Variation of Traits 1-LS3-1. Use information from observations (first-hand and from media) to identify similarities and differences among individual plants or animals of the same kind. Grade 2: Life Science LS2. Ecosystems: Interactions, Energy, and Dynamics 2-LS2-3(MA). Develop and use models to compare how plants and animals depend on their surroundings and other living things to meet their needs in the places they live. LS4. Biological Evolution: Unity and Diversity 2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas. 845 West Street, Amherst, MA 01002 |

hitchcockcenter.org | 413-256-6006 Grade 3: Life Science LS1. From Molecules to Organisms: Structures and Processes 3-LS1-1. Use simple graphical representations to show that different types of organisms have unique and diverse life cycles. Describe that all organisms have birth, growth, reproduction, and death in common but there are a variety of ways in which these happen. LS3. Heredity: Inheritance and Variation of Traits 3-LS3-1. Provide evidence, including through the analysis of data, that plants and animals have traits inherited from parents and that variation of these traits exist in a group of similar organisms. LS4. Biological Evolution: Unity and Diversity 3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction. 3-LS4-3. Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive. Grade 4: Life Science LS1. From Molecules to Organisms: Structures and Processes 4-LS1-1. Construct an argument that animals and plants have internal and external structures that support their survival, growth, behavior, and reproduction. Grade 5: Life Science LS2. Ecosystems: Interactions, Energy, and Dynamics 5-LS2-1. Develop a model to describe the movement of matter among producers, consumers, decomposers, and the air, water, and soil in the environment to (a) show that plants produce sugars and plant materials, (b) show that animals can eat plants and/or other animals for food, and (c) show that some organisms, including fungi and bacteria, break down dead organisms and recycle some materials back to the air and soil.

Life of a Tree Grade Levels: PreK–2 Program Description: Trees are essential to forest ecosystems and the animals that live there. In this field trip, students will learn about tree anatomy and function while comparing trees to our own bodies. Students will have the opportunity to sharpen their observation skills as they explore life in and around a tree. Our forest exploration will reinforce tree life cycles, components of a forest ecosystem and seasonal changes.

Massachusetts Curriculum Standards: Pre-K: Earth and Space Sciences ESS2. Earth's Systems PreK-ESS2-1(MA). Raise questions and engage in discussions about how different types of local environments (including water) provide homes for different kinds of living things. Pre-K: Life Science LS1. From Molecules to Organisms: Structures and Processes PreK-LS1-1(MA). Compare, using descriptions and drawings, the external body parts of animals (including humans) and plants and explain functions of some of the observable body parts. PreK-LS1-3(MA). Use their five senses in their exploration and play to gather information. LS2. Ecosystems: Interactions, Energy, and Dynamics PreK-LS2-2(MA). Using evidence from the local environment, explain how familiar plants and animals meet their needs where they live. LS3. Variation of Traits PreK-LS3-1(MA). Use observations to explain that young plants and animals are like but not exactly like their parents. Kindergarten: Life Science LS1. From Molecules to Organisms: Structures and Processes K-LS1-1. Observe and communicate that animals (including humans) and plants need food, water, and air to survive. Animals get food from plants or other animals. Plants make their own food and need light to live and grow. K-LS1-2(MA). Recognize that all plants and animals grow and change over time. 845 West Street, Amherst, MA 01002 | hitchcockcenter.org | 413-256-6006 Grade 1: Life Science LS1. From Molecules to Organisms: Structures and Processes 1-LS1-1. Use evidence to explain that (a) different animals use their body parts and senses in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air, and (b) plants have roots, stems, leaves, flowers, and fruits that are used to take in water, air, and other nutrients, and produce food for the plant. LS3. Heredity: Inheritance and Variation of Traits 1-LS3-1. Use information from observations (first-hand and from media) to identify similarities and differences among individual plants or animals of the same kind. Grade 2: Life Science LS2. Ecosystems: Interactions, Energy, and Dynamics 2-LS2-3(MA). Develop and use models to compare how plants and animals depend on their surroundings and other living things to meet their needs in the places they live. LS4. Biological Evolution: Unity and Diversity 2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas

The Forest Ecosystem Grade Levels: 3–5 Program Description: The forest is a dynamic ecosystem and is also an ideal classroom. Through a variety of activities, students will learn about plant life cycles, and the energy transfer through the food web from producers to consumers to decomposers. Seasonal changes allow for variations in themes (e.g. foliage, buds, photosynthesis).

Massachusetts Curriculum Standards: Grade 3: Life Science LS1. From Molecules to Organisms: Structures and Processes 3-LS1-1. Use simple graphical representations to show that different types of organisms have unique and diverse life cycles. Describe that all organisms have birth, growth, reproduction, and death in common but there are a variety of ways in which these happen. LS3. Heredity: Inheritance and Variation of Traits 3-LS3-1. Provide evidence, including through the analysis of data, that plants and animals have traits inherited from parents and that variation of these traits exist in a group of similar organisms. LS4. Biological Evolution: Unity and Diversity 3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals within the same species may provide advantages to these individuals in their survival and reproduction. 3-LS4-3. Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive. Grade 4: Life Science LS1. From Molecules to Organisms: Structures and Processes 4-LS1-1. Construct an argument that animals and plants have internal and external structures that support their survival, growth, behavior, and reproduction. 845 West Street, Amherst, MA 01002 | hitchcockcenter.org | 413-256-6006 Grade 5: Life Science LS2. Ecosystems: Interactions, Energy, and Dynamics 5-LS2-1. Develop a model to describe the movement of matter among producers, consumers, decomposers, and the air, water, and soil in the environment to (a) show that plants produce sugars and plant materials, (b) show that animals can eat plants and/or other animals for food, and (c) show that some organisms, including fungi and bacteria, break down dead organisms and recycle some materials back to the air and soil.

School Special Project or Residency:

The Buffam Brook community forest also offers a great site for an ongoing school research study of phenology- *change over time.* This kind of long -term project can be supported by Massachusetts Cultural Council STARS grants that local schools can write in collaboration with a specialist.

Forest Service Grant- Every Kid in the Park – This program connects 4th grade children to public lands for learning experiences. The Buffam Brook Community Forest could be a site to connect children through digital ecology classes.

Higher-Education School Programs – The Buffam Brook Community Forest is in reasonable proximity to The University of Massachusetts – Amherst, with over 40,000 students of undergraduate and graduate level learning. Kestrel Land Trust has existing partnerships with this school, along with others in the Valley, which can be leveraged to bring living laboratory science and graduate research opportunities to make use of the Community Forest. Already Buffam Brook Community Forest has served as a service-learning opportunity for Forestry students in the Forest Measurements Class Fall 2016. And, in the Spring of 2017, plots were delineated for a salamander populations study through the SPARCnet collaborative. Additional partnerships to leverage are in discussion. One such partnership would utilize students with a service-learning requirement to have the opportunity to assist in building the new trails on the community forest land, learning valuable hands-on skills in stewardship.

Below is a picture of the 2016 UMass Forest Measurements Class presenting their Inventory Analyses to the previous landowners of the Community Forest.