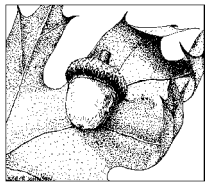
FOREST MANAGEMENT PLAN

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 ☐	Green Cert ☐		Plan Period		Topo Name	*Haverhill*
			Conservation Rest. ☐		Rare Spp. Hab.		River Basin	*Merrimac*
Plan Change: _____ to _____			CR Holder _____					

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) ***City of Haverhill, Haverhill Conservation Dept., c/o Robert E. Moore*** ***(Crystal Lake East)***
Mailing Address *City Hall Room 310, 4 Summer Street, Haverhill, MA 01830* Phone 978-420-3678

Property Location: Town(s) *Haverhill* Road(s) *Lake Street*

Plan Preparer ***Gary H. Gouldrup, New England Forestry Cons., Inc.*** Mass. Forester License # *81*
Mailing Address *72 Townsend Street, Pepperell, MA 01463* Phone *978-433-8780*

RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A/61B *Excluded* Acres	Ch61/61A/61B **Certified** Acres	Stewardship *Excluded Acres*	Stewardship Acres
*	*	*	*	95.32	NA	NA	1.09	94.23
			TOTALS	**95.32**	**NA**	**NA**	**1.09**	**94.23**

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

There are 1.09 acres to be excluded from forest stewardship classification. This area is part of a gas line right-of-way.

HISTORY Year acquired *Periodically since late 1800's* Year management began *2014*

Is subdivision plan on file with municipality? Yes ☐ No ☒

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

Have forest products been cut within past 2 years? Yes ☐ No ☒

What treatments have been prescribed, but not carried out (last 10 years if plan is a recert.)?
Stand no. *NA* Treatment *NA* Reason *NA*
(if additional space needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Value	Acres	Date
All	*NA*	*Trail Maintenance*	*NA*	*NA*	*NA*	*2013*

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

* *Please see Page #2 for Assessors Map & Lot information.*

RECORDS (continued)

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A/61B *Excluded* Acres	Ch61/61A/61B **Certified** Acres	Stewardship *Excluded Acres*	Stewardship Acres
15	10	30161	244	2.08	NA	NA	0.00	2.08
15	9	UK	UK	11.00	NA	NA	0.00	11.00
15	8	5394	733	16.00	NA	NA	0.00	16.00
15	7	UK	UK	30.20	NA	NA	0.00	30.20
15	6	UK	UK	PO Lot 7	NA	NA	1.09	PO Lot 7
15	5	16623	335	6.30	NA	NA	0.00	6.30
15	4	UK	UK	1.94	NA	NA	0.00	1.94
15	3	UK	UK	27.80	NA	NA	0.00	12.13
15	2	UK	UK	PO Lot 3	NA	NA	0.00	PO Lot 3
15	1	UK	UK	PO Lot 3	NA	NA	0.00	PO Lot 3
			TOTALS	**95.32**	**NA**	**NA**	**1.09**	**94.23**

EXCLUDED AREA DESCRIPTION (continued):

There are 1.09 acres to be excluded from forest classification. This area is a gas line right-of-way.

HISTORY (continued):

**Stand #*	*Acres*	*Mgt. Practice*	*Yield*	*Value*	*Year*

Management on the property has been primarily trail construction and maintenance.

This is the first Forest Management Plan for the Crystal Lake East Conservation Area.

Property Overview, Regional Significance, and Management Summary

The 95-acre Crystal Lake Conservation Area is located on the southeast side of Crystal Lake in a northwest section of Haverhill. The property is surrounded by private landowners in a semi-rural setting. Most of the surrounding open space areas are forest lands. The nearest property with long term protection is Haverhill's Crystal Gorge, Crystal Point, and Crystal Shore Conservation Area (134-acres) located on the northwest side of Crystal Lake. The property was acquired in the late 1800's. Up until the 1990's, Crystal Lake's water was purified at a small treatment facility along its south shore and distributed to nearby homes. Today, the water from Crystal Lake is pumped 6-miles across town to Kenoza Lake, where it is treated prior to distribution. The old water treatment building is still standing on the property.

The property lies in the Merrimack River Watershed. Water that passes through the property flows into Crystal Lake and Creek Brook on the southeast side of Crystal Lake. Water eventually enters the Merrimack River approximately 1-mile southeast of the property.

The forest stewardship land is comprised of mature upland woodlands (88%) and wetland resource areas which include red maple swamps and open marsh (11%). An open gas line right-of-way also exists (1%). White pine and red oak dominate the upland areas while red maple is the primary species in the wetland resource areas. Timber resource quality ranges from poor to high. A quarantine of white ash forest products in Essex County was recently imposed by the USDA due to the presence of the Emerald Ash Borer found in North Andover. The white ash trees will be monitored during this ten year management period for its presence. The forest is heavily stocked with timber resources with no signs of recent timber resource management conducted on the property in many years. Invasive and non-native vegetation on the property is not prevalent and consists of scattered Japanese barberry, buckthorn, bittersweet, Japanese bamboo, and honeysuckle. Target canker is deforming most of the black birch trees on the property.

Fishing is allowed in Crystal Lake by special permit only and boating is prohibited.

Forest soils on the property include well and moderately well drained fine sandy loam soils (Montauk-Woodbridge), poorly drained fine sandy loam (Ridgebury-Leicester-Whitman), and very poorly drained organic muck (Freetown). Approximately 89% of the forest soils are productive and capable of producing high quality timber resources.

Continued on Page 4 ……..

Property Overview, Regional Significance, and Management Summary

The Haverhill City Mayor, through the Conservation Department, established the Haverhill Forest Stewardship Committee in 2009. The Forest Stewardship Committee has developed the following goals for the Crystal Lake (East) Conservation Area:

Management will focus on promoting a healthy forest environment for the safety and enjoyment of the residents of Haverhill and others who will visit the property. The City would like to specifically accomplish the following on this property:

- Enhance both the quality and quantity of future timber products;
- Conduct a biomass operation to improve regeneration and aesthetics;
- Produce firewood that will be made available to residents;
- Enhance wildlife habitat by diversifying tree age and species
- Protect the water quality of Crystal Lake; and
- Create a self-guided stewardship trail for public education and enjoyment.

Timber resource management will be aimed at enhancing the quality of timber resources into the future while improving wildlife habitats and aesthetics throughout the property. Commercial sales of timber will require whole-tree chipping of low quality trees and portions of trees that do not have firewood or sawtimber products primarily for aesthetic and fire protection purposes. Removing low quality hardwoods for firewood will be done in order to generate a supply of firewood for the residents of Haverhill.

The primary management objective of the Crystal Lake (East) Conservation Area will be to preserve, maintain and improve water quality as a public water resource supply for the residents of Haverhill. The Haverhill Forest Stewardship Committee has reviewed the Quabbin Reservoir Watershed System Land Management Plan, 2007-2017. The Quabbin Forest Management Objectives can be found on page 144 of the Plan. The Forest Stewardship Committee would like to pursue management of the Crystal Lake Conservation Area as stated in the first paragraph under the "Primary Objectives" (5.2.3.1). *"The primary objective of forest management of the Quabbin* (Crystal Lake Conservation Area) *forest is to create and maintain a complex forest structure, which forms a protective forest cover and a biological filter on the watershed land. This watershed protection forest is designed to be vigorous, diverse in species and age, actively accumulating biomass, conserving ecological and economic values, actively regenerating, and most importantly maintaining a predictable flow of high quality water from the land".*

The Forest Stewardship Committee will use the Quabbin Plan as a guide when managing the Crystal Lake Conservation Area watershed lands.

Continued on Page 5 ……..

Management on the Crystal Lake Watershed will be approached by using the "*Subwatershed Administration of Forest Management*". The Quabbin Plan defines a subwatershed on page 145 (5.2.3.21). *"A subwatershed is defined in most cases as the land area that drains to a perennial tributary of the reservoir*." The Quabbin Plan defines this management theory on page 146 (5.2.3.2.2). "*The general theory behind the use of subwatershed-based planning is to control the proportion of a drainage area that is disturbed by management activities (e.g., logging or road work) during the management period in order to reduce the chances of water quality impacts. This approach is partly based on research on experimental watersheds throughout the eastern US that indicate that until approximately 25-30% of the watershed overstory stocking is harvested (assuming nearly 100% forest cover type), there is no detectable increase in water yield (Hornbeck and Kochenderfer, 2004: Hornbeck et al., 1993). As increases in transport of sediments and nutrients to tributaries and the reservoir are directly related to increases in water yield, it follows that the 25-30% threshold also applies to water quality changes (so long as Conservation Management Practices are in place, the greatest concern is with the movement of nutrients rather than sediments). The same research also demonstrated that water yield generally returns to pre-harvest conditions as the harvested area regenerates – usually within 3-10 years*."

Wildlife habitats will be enhanced through the timber harvesting practices. Creating multiple age classes within the forest will benefit a variety of wildlife species. Identifying large "Legacy Trees" will be done to promote "Old Growth" characteristics within the forest where these trees exist and where this practice is applicable. Wood duck nest boxes will be considered in the partially vegetated and open wetland resource areas.

All forest management activities will be sensitive to protecting water quality, soils, cultural resources, wildlife habitats, rare and endangered species and their habitats, aesthetics and recreational values. When harvesting timber resources on the property a Chapter 132 Cutting Plan will be filed with the Department of Conservation and Recreation. The Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) will make recommendations to protect any special vegetation or wildlife and their habitats should they exist on the property.

Trail maintenance and interpretive signage will be a priority on this forest for the safety and forest stewardship education of those using the property.

Timber resource management will be aimed at enhancing the quality of timber resources into the future while improving wildlife habitats and aesthetics throughout the property. Commercial sales of timber will require whole-tree chipping of low quality trees and portions of trees that do not have firewood or sawtimber products primarily for aesthetic and fire protection purposes. Removing low quality hardwoods for firewood will be done in order to generate a supply of firewood for the residents of Haverhill.

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			
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			
Maintain or Enhance Privacy (For Abutters)	X			
Improve Hunting			X	
Improve Fishing			X	
Preserve or Improve Scenic Beauty	X			
Protect Water Quality	X			
Protect Unique/Special/ Cultural Areas	X			
Other: Attain Green Certification				X
Other: Public Education & Outreach	X			

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

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

The City of Haverhill would like to improve and protect the forest resources on the Crystal Lake Conservation Areas for the benefit of the residents of Haverhill. Protecting the Crystal Lake Watershed is a high priority. These goals will be accomplished by periodically harvesting timber resources, discouraging the use of unauthorized motor vehicle use (ATV's), enhancing wildlife habitat, and educating the public on forest stewardship matters.

Stewardship Purpose

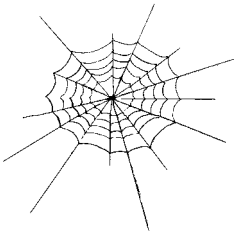
By enrolling in the Forest Stewardship Program and following a Stewardship Plan, I understand that I will be joining with many other landowners across the state in a program that promotes ecologically responsible resource management through the following actions and values:

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

Signature(s): _____ Date: _____

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.

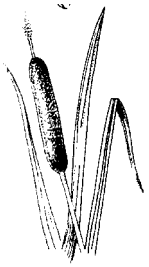
Another factor influencing biodiversity in Massachusetts concerns the amount and distribution of forest growth stages. Wildlife biologists have recommended that, for optimal wildlife habitat on a landscape scale, 5-15% of the forest should be in the seedling stage (less than 1" in diameter). Yet we currently 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.

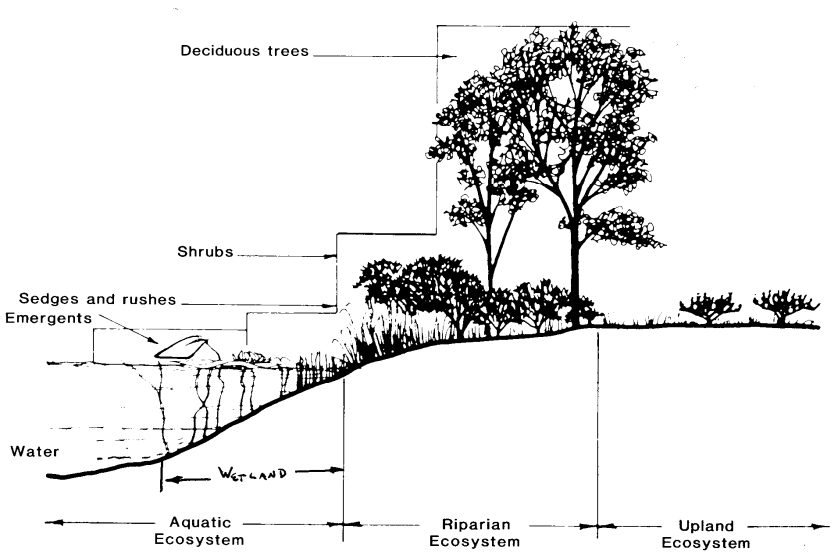


Figure 1: Example of a riparian zone.

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. DEM'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 DEM 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.

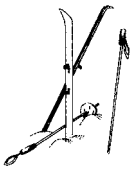
Cultural Resources: Cultural resources are the places containing evidence of people who once lived in the area. Whether a Native American village from 1,700 years ago, or the remains of a farmstead from the 1800's, these features all tell important and interesting stories about the landscape, and should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



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.

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.

STAND DESCRIPTIONS

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	1	RO	4.04	11.4" DBH Sawtimber-Pole	150 sqft	12,859 BF & 23.6 Cds	63 (RO)

Red oak is the dominate overstory species in this well stocked sawtimber sized stand. The red oak is primarily in the sawtimber class with a minor component in the pole class. The red oak stems are generally well formed and fair to high in timber quality. Scattered red maple, black birch, and white ash poles and sawtimber of poor to good form and timber quality can also be found. Forest regeneration is scattered and includes white pine and mixed hardwood saplings. No commercial timber harvesting has occurred in this stand in the past. The area is flat to gently sloped with moderately well drained fine sandy loam soils (Montauk). The soils are capable of producing high quality timber resources. Management will focus on timber resource management and recreation and aesthetic improvements. The desired future condition is a stand that is growing high quality timber resources in several size and age classes while providing wildlife habitat and recreational opportunities for the public while protecting water quality on the Crystal Lake watershed.

STEW	2	WO	20.11	16.3" DBH Sawtimber	130 sqft	18,481 BF & 17.0 Cds.	63 (WP)

White pine is the dominant overstory species in this overstocked sawtimber sized stand. The white pine stems are generally poor to fair in form and timber quality with a large quantity of black- knotted timber. Scattered mixed oaks, black birch, and red maple poles and sawtimber of poor to good form and timber quality can also be found. Forest regeneration is limited due to the dense overstory canopy, although mixed hardwood saplings are present. The area is gently to moderately sloped with moderately well to well drained soils fine sandy loam soils (Montauk) capable of producing high quality timber resources. Management will focus on timber resource management. The desired future condition is a stand that is growing high quality timber resources in several size and age classes while providing wildlife habitat and recreational opportunities for the public and protecting water quality on the Crystal Lake watershed.

STEW	3	OM	1.83	8.2" DBH Pole	40 sqft	397 BF. & 7.6 Cds.	63 (WP)

Mixed oak poles and infrequent sawtimber sized stems occupy this area that was disturbed and open at one time. Scattered white pine and red maple poles are present as well. The stems are generally poor to good in form and timber quality. White pine and mixed oak saplings are the primary source of regeneration. The area is gently sloped with well drained fine sandy loam soils (Montauk) capable of producing high quality timber resources. This area is a potential wood landing for future timber harvesting projects that may occur on other areas of the property. The desired future condition is a stand that is growing high quality timber resources as well as being a landing for timber resources.

STAND DESCRIPTIONS

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	4	MS	7.87	6.0" DBH Sapling-Pole	10 sqft	0.8 Cords	50 (RM)

This area is mostly an open marsh and wetland resource area. There are scattered saplings and pole sized red maple trees on the dry fringes of the area. Cattails, alder, winterberry, dogwood, buckthorn, barberry, ferns and grasses can all be found growing in and along the edges of the stand. The area is flat, hummocky, and tends to be wet most of the year. The soils are very poorly drained and organic (Freetown Muck). The area will be left to develop naturally. The desired future condition is a wetland resource area that provides habitat for wildlife.

STEW	5	OH	12.15	8.7" DBH Sawtimber-Pole	120 sqft	2,929 BF & 24.7 Cds.	63 (RO)

Black birch, red oak, and red maple poles and sawtimber sized stems dominate the overstory of this well stocked stand. The red oak stems are generally well formed and fair to high in timber quality. Target canker is deforming a majority of the black birch trees. Scattered elm, white birch, white ash, aspen and white pine poles and sawtimber are present as well. Forest regeneration is limited due to the dense overstory canopy, although mixed hardwood and white pine saplings are present. The area is flat with moderately well to poorly drained soils fine sandy loam soils (Ridgebury-Leicester) capable of producing high quality timber resources. Management will focus on timber resource management. The desired future condition is a stand that is growing high quality timber resources in several size and age classes while providing wildlife habitat and recreational opportunities for the public and protecting water quality on the Crystal Lake watershed.

STEW	6	RM	2.50	11.7" DBH Sawtimber-Pole	100 sqft	1,914 BF. & 23.6 Cds.	50 (RM)

Red maple is the dominant species in this adequately stocked pole and sawtimber sized stand situated in a wetland resource area. The stems are generally poor in form and timber quality. The understory consists of highbush blueberry, arrowwood, ferns, and other wetland plants and shrubs. The area is flat and hummocky with poorly drained fine sandy loam soils (Whitman) and capable of producing high quality timber resources. No management is recommended in this stand at this time. The desired future condition is a stand that is growing high quality timber resources while being a filter and protection of water quality.

STAND DESCRIPTIONS

OBJ	STD NO	TYPE	AC	MSD OR SIZE-CLASS	BA/AC	VOL/AC	SITE INDEX
STEW	7	WP	35.66	12.0" DBH Sawtimber	185 sqft	15,761 BF & 33.4 Cds.	63 (WP)

White pine is the dominant overstory species in this overstocked sawtimber sized stand. The white pine stems are generally poor to good in form and timber quality with a large quantity of black- knotted timber. Scattered mixed oaks, black birch, and red maple poles and sawtimber of poor to good form and timber quality can also be found. Forest regeneration is limited due to the dense overstory canopy, although mixed hardwood saplings are present. The area is gently to moderately sloped with moderately well to somewhat poorly drained soils (Montauk-Ridgebury-Leicester) capable of producing high quality timber resources. Management will focus on timber resource management. The desired future condition is a stand that is growing high quality timber resources in several size and age classes while providing wildlife habitat and recreational opportunities for the public and protecting water quality on the Crystal Lake watershed.

STEW	8	MH	10.07	10.8" DBH Sawtimber-Pole	110 sqft	3,418 BF & 23.6 Cds	63 (RO)

Red maple, black birch, red oak, and white ash sawtimber and pole sized stems dominate the overstory of this well stocked stand. Timber quality is mostly poor to fair although there are scattered stems of good form and high quality. Forest regeneration is scattered and includes white pine and mixed hardwood saplings. The seasonally wet areas have highbush blueberry in the understory. The area is flat to gently sloped with somewhat poorly fine sandy loam soils (Ridgebury-Leicester). The soils are capable of producing high quality timber resources. Management will focus on timber resource management and recreation and aesthetic improvements. The desired future condition is a stand that is growing high quality timber resources in several size and age classes while providing wildlife habitat and recreational opportunities for the public and protecting water quality on the Crystal Lake watershed.

MANAGEMENT PRACTICES
to be done within next 10 years

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	

Timber Management

STEW	1	RO	Selection Harvest Improvement Thin	4+/-	40 sqft	9 MBF & 8 Cords	2014-2023

Management will focus on improvement thinning by selection harvesting. The target is to harvest approximately 1/4 of the overstory volume. Management will focus on harvesting mature red oak and hardwood sawtimber sized stems (14" DBH+) in order to improve growing conditions within this overstocked stand. Suppressed and low quality stems of all sizes will also be harvested and utilized as firewood and wood chips. Thinning will release well-formed and high quality stems in order to improve their growth and canopy development. Advanced regeneration will be released and the site will be prepared for new production in the understory as a result of thinning. High value sawtimber will be sold as sawlogs, low quality hardwoods will be utilized as firewood, and tops of trees will be chipped and burned at wood burning facilities for generating electricity. Please see page 18 for details about the Haverhill Home Fuelwood Program. Chipping the tops of trees will be important for protecting and improving aesthetics and reducing the threat of forest fires.

STEW	2	WO	Selection Harvest Improvement Thin	18+/-	40 sqft	70 MBF & 720 Tons	2014-2023

Management will focus on individual and group selection harvesting techniques. The target is to harvest approximately 1/4 - 1/3 of the overstory volume. The emphasis will be to harvest mature white pine and mixed hardwood sawtimber (18" DBH+) in order to improve the growing conditions of the developing high quality white pine and mixed oak sawtimber sized stems. An emphasis will be to remove as much of the poor quality and black-knotted white pine sawtimber as possible. Poorly formed and low mixed hardwood stems of all sizes will also be harvested to improve the growing conditions within the stand. High value sawtimber will be sold as sawlogs, while the low quality softwood trees and portions of trees will be chipped and utilized at wood burning facilities that generate electricity. The low quality hardwoods that are harvested will be cut, skidded, and landed for the purpose of providing firewood to the citizens of Haverhill. Please see page 18 for details about the Haverhill Home Fuelwood Program. Whole-tree chipping the tops of trees will be important for protecting and improving aesthetics and reducing the threat of forest fires. Some of the largest trees within the stand (25" DBH+) will be selected as "Legacy Trees" and retained for biological diversity. This selection harvest will prepare the understory for establishing new regeneration.

Wood landing areas will be seeded to ensure stability and provide alternative wildlife habitat.

MANAGEMENT PRACTICES
to be done within next 10 years

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	5	OH	Improvement Thin Selection Harvest	10+/-	40 sqft	7 MBF & 50 Cords	2014-2023

Management will focus on improvement thinning and group selection harvesting. The target is to harvest approximately 1/3 of the overstory volume. Harvesting will focus on harvesting the very poor quality timber resources which will include the target canker deformed black birch stems of all sizes. Trees to be retained will be the mixed oaks, hardwoods, and white pine poles and small sawtimber sized stems (6-14" DBH) that are well formed and have the potential of producing high quality timber resources in the future. Harvesting will release advanced regeneration and prepare the site for new production in the understory. High value sawtimber will be sold as sawlogs, low quality hardwoods will be utilized as firewood, and tops of trees will be chipped and burned at wood burning facilities for generating electricity. Please see page 18 for details about the Haverhill Home Fuelwood Program. Chipping the tops of trees will be important for protecting and improving aesthetics and reducing the threat of forest fires.

STEW	7	WP	Shelterwood 1	30+/-	40 sqft	110 MBF & 1,200 Tons	2014-2023

Management will focus on harvesting through the shelterwood system. The target is to harvest approximately 30% of the overstory volume. The emphasis will be to harvest mature white pine sawtimber (18" DBH+) in order to improve the growing conditions of the developing high quality white pine sawtimber sized stems. Poorly formed and low quality white pine and mixed hardwood stems of all sizes will also be harvested to improve the growing conditions within the stand. High value sawtimber will be sold as sawlogs, while the low quality softwood trees and portions of trees will be chipped and utilized at wood burning facilities that generate electricity. The low quality hardwoods that are harvested will be cut, skidded, and landed for the purpose of providing firewood to the citizens of Haverhill. Please see page 18 for details about the Haverhill Home Fuelwood Program. Whole-tree chipping the tops of trees will be important for protecting and improving aesthetics and reducing the threat of forest fires. Some of the largest trees within the stand (25" DBH+) will be selected as "Legacy Trees" and retained for biological diversity. This shelterwood harvest will prepare the understory for establishing new regeneration. Aesthetic buffers will be defined prior to harvesting the timber for residents with homes close to the harvesting area.

STEW	8	OH	Improvement Thin Selection Harvest	10+/-	30 sqft	4 MBF & 45 Cords	2014-2023

Management will focus on improvement thinning and group selection harvesting. The target is to harvest approximately 1/4 - 1/3 of the overstory volume. Harvesting will focus on harvesting the very poor quality timber resources which includes red maple, black birch, white ash, mixed oaks, and white pine stems of all sizes. Trees to be retained will be the mixed oaks, hardwoods, and white pine poles and small sawtimber sized stems (6-14" DBH) that are well formed and have the potential of producing high quality timber resources in the future. Harvesting will release advanced regeneration and prepare the site for new production in the understory. High value sawtimber will be sold as sawlogs, low quality hardwoods will be utilized as firewood, and tops of trees will be chipped and burned at wood burning facilities for generating electricity. Harvesting will occur when ground conditions are dry, frozen, or otherwise stable. Please page 18 for details about the Haverhill Home Fuelwood Program. Chipping the tops of trees will be important for protecting and improving aesthetics and reducing the threat of forest fires.

OBJECTIVE CODE: CH61 = Forest Products (for Ch. 61/61A) STEW= Stewardship Program practices
STD= stand Type= Forest type AC= acre MBF= thousand board feet BA= basal area VOL= volume

Owner(s) Haverhill – Crystal Lake East Town(s) Haverhill

MANAGEMENT PRACTICES
to be done within next 10 years

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	

Home Fuelwood Program

The Forest Management Committee has developed the *Haverhill Home Fuelwood Program* as a means of making firewood available to the residents of Haverhill. The low quality hardwood stems that are harvested in the recommended timber sales within the Crystal Lake East Conservation property will be one of the sources of wood for this program. Hardwood stems that are cut on the property will be skidded to landings on the property used for the commercial timber harvesting project. The trees will be cut to a length of approximately 24 feet and then trucked to the Haverhill Highway Facility at 500 Primrose Street where the firewood will be stacked in one-cord piles. Haverhill residents will be allowed to bid on the one-cord piles at the completion of the commercial harvest. Successful bidders will be required to cut the trees into stove lengths and remove the firewood on their own. The successful bidders will be required to sign a liability waiver that does not hold the City of Haverhill liable for any accidents, injury or death as a result of cutting and removing the stacked firewood. The intent is to make the project revenue neutral and as safe as possible. There will be a cost of having the firewood trees cut, skidded, landed and trucked to the Haverhill highway facility at 500 Primrose Street of approximately $75-$80 per cord. Bids for the stacked firewood must at least cover this cost.

Biological Diversity

STEW	1-8	All	Invasive Species Control	95+/-	NA	NA	2014-2023

The Forest Stewardship Committee is interested in promoting biological diversity on the property. Eliminating invasive and non-native trees, plants and shrubs will be done where these species exist and when economically feasible and practical. Invasive species are scattered throughout the property but are not prolific on the Crystal Lake East Conservation property. Stands 1 & 4 contain the majority of the problem areas. Buckthorn, bittersweet, honeysuckle, and Japanese barberry are all present on the property. Cutting the stems of invasive species with saws, or with other mechanical means, will help reduce and control the spread of the invasive species. Controlling the invasive species through well timed timber management activities is another management tool. Encouraging vigorous growth of native tree species in the forest understory will be accomplished by scarifying the soil prior to seed dissemination. Another biodiversity issue is the distribution of forest growth stages. Trying to maintain multiple forest age and size classes on the property will also be pursued by the landowner on this property through periodic timber harvests and wildlife habitat management. Please see the Biological Diversity issues on page #7 for more details.

The Forest Stewardship Committee will seek council from the UMass Amherst Extension Center for Agriculture and the United States Forest Service with regard to controlling invasive species as part of a forest stewardship program to ensure active management activities do not result in proliferation of these species in any of the City's forest lands.

MANAGEMENT PRACTICES
to be done within next 10 years

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	

Recreation Management
Forest Stewardship Education

STEW	All	All	Trail Maintenance Forest Stewardship Education	95+/-	NA	NA	2014-2023

The existing trails on the Crystal Lake East Conservation Area will be periodically maintained for the safety, enjoyment and education of the residents of Haverhill. New trails may also be constructed. Trail maps, tags, interpretive signs, and potential picnic tables will all be variables associated with the management of the trails and the education of those who will be using the trails. Interpretive signs along the trails will help educate the property users about Forest Stewardship matters within the forest interior. Improving public access and parking on the forest will also be subject that the Forest Stewardship Committee will be considering in the near future.

Boundary Maintenance

STEW	All	All	Blaze & Paint	95+/-	NA	NA	2014-2023

The property lines are in need of identification, blazing and painting before forest management activities are conducted on the property. Stone walls define approximately 60% of the property lines. Abutting surveys will be used to identify the property lines in the future.

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

Signed under the pains of perjury:

Owner(s) _____ Date _____

_____ Date _____

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

Plan Preparer _____ Date _____

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

Approved, Service Forester _____ Date _____

Approved, Regional Supervisor _____ Date _____

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

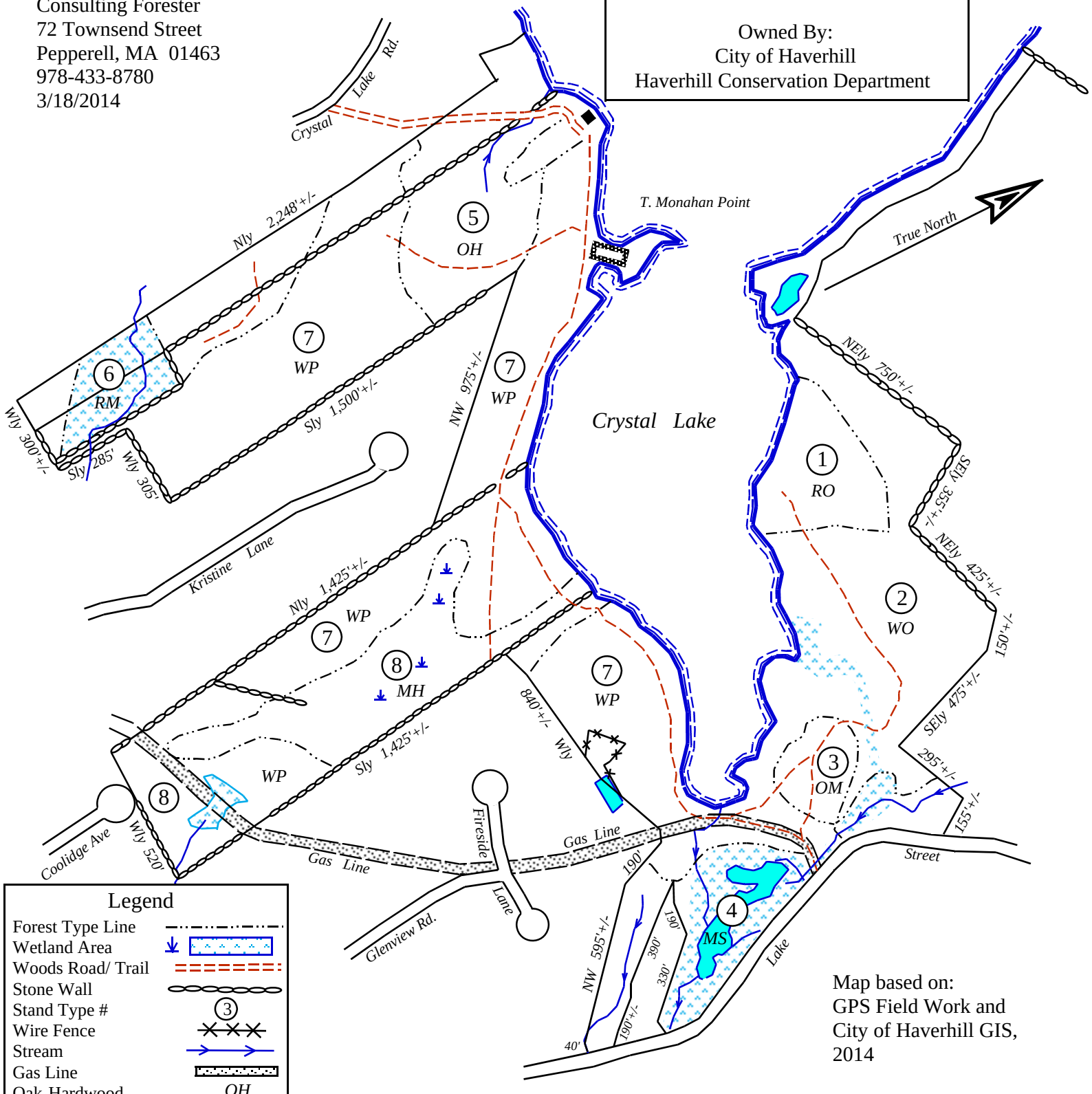
New England
Forestry Consultants, Inc.

Prepared By:
Gary H. Gouldrup
Consulting Forester
72 Townsend Street
Pepperell, MA 01463
978-433-8780
3/18/2014

BOUNDARY & STAND TYPE MAP

Land in Haverhill, MA
Crystal Lake East Conservation Area
Lake Street Lot

Owned By:
City of Haverhill
Haverhill Conservation Department



Legend

Forest Type Line	
Wetland Area	
Woods Road/ Trail	
Stone Wall	
Stand Type #	3
Wire Fence	
Stream	
Gas Line	
Oak-Hardwood	*OH*
White Pine-Hardwoods	*WH*
Mixed Hardwoods	*MH*
White Pine	*WP*
Marsh	*MS*
Mixed Oak	*OM*
Building	

Map based on:
GPS Field Work and
City of Haverhill GIS,
2014

graphic scale (in feet)
0 475 950

City of Haverhill
Crystal Lake East Conservation Area
Haverhill, MA
2013 Aerial Photo

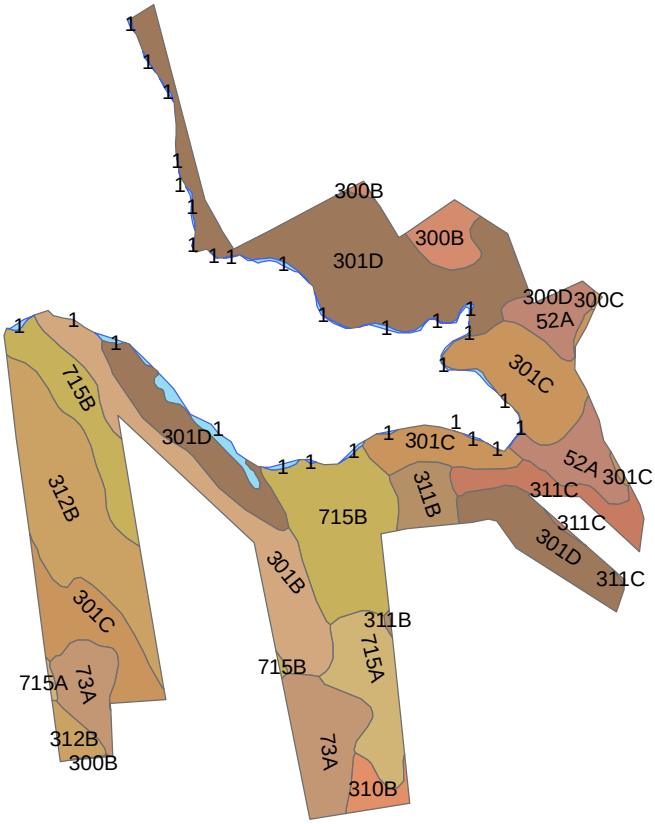
1,000 500 0 1,000 2,000 Feet

N
W E
S

Prepared by:
New England Forestry Consultants, Inc
Sherman R. Small, Consulting Forester
Maine License # LF655
New Hampshire License # 409
April 16, 2014

Sketch map for management and planning purposes only, NOT A LEGAL SURVEY
Data obtained from MASS GIS, & New England Forestry Consultants, Inc.

City of Haverhill
Crystal Lake East Conservation Area
Haverhill, MA
Soils Map



307B Soils Symbol

1,000 500 0 1,000 2,000 Feet

N
W E
S

Prepared by:
New England Forestry Consultants, Inc
Sherman R. Small, Consulting Forester
Maine License # LF655
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April 16, 2014

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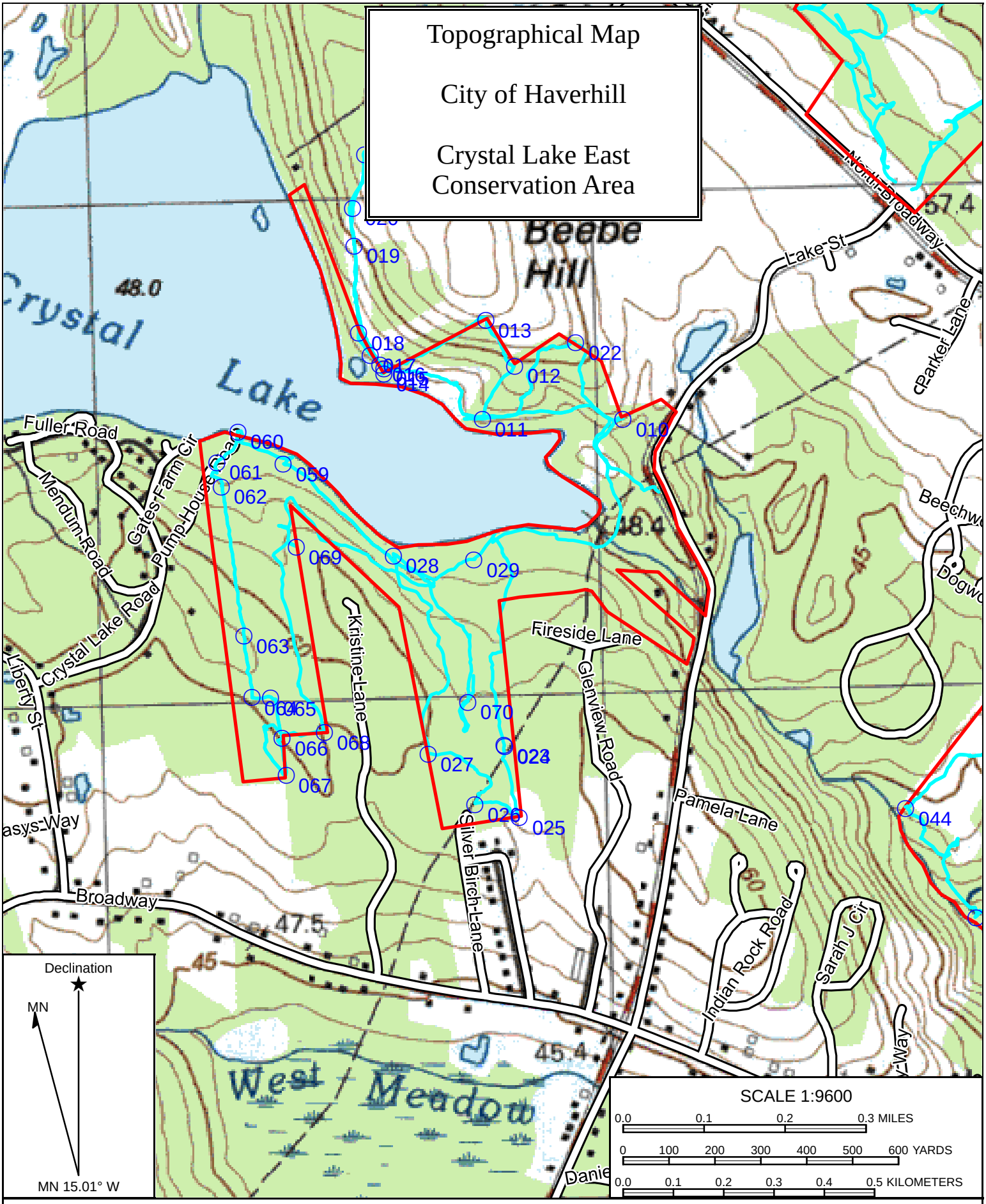

Name: HAVERHILL
Date: 04/28/14
Scale: 1 inch = 800 ft.

Location: 042° 47' 45.99" N 071° 08' 32.81" W
Caption: Crystal Lake East CA