

**FOREST STEWARDSHIP-GREEN CERTIFICATION MANAGEMENT PLAN FOR THE
PROPERTY OF CITY OF HOLYOKE WATER WORKS
THE HUNTINGTON LANDS
Located near Sampson Road, Huntington, Massachusetts
TOTAL FORESTED AREA 96.6 ACRES**



Adam Swamp in Relation to HWW Huntington Lands

Presented by Holyoke Water Works

Our Mission: "Providing High Quality Water to our Customers at Competitive Rates"

Manager David Conti, 20 Commercial Street, Holyoke, Massachusetts

**Prepared By: Wigmore Forest Resource Management, Mary K. Wigmore (MLF 250), John
W. LeBlanc (CA RPF 2324), and Technicians: Kurt P. Wigmore and Irina Scully**

1637 West Road

Williamsburg, MA 010196

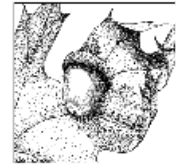
December 2016





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. <input type="checkbox"/>	cert. <input type="checkbox"/>	cert. <input type="checkbox"/>	cert. <input type="checkbox"/>	new <input checked="" type="checkbox"/>	EEA <input checked="" type="checkbox"/>	Owner ID	Add. Case No.	
recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	recert. <input type="checkbox"/>	renew <input type="checkbox"/>	Other <input type="checkbox"/>	Date Rec'd	Ecoregion	
amend <input type="checkbox"/>	amend <input type="checkbox"/>	amend <input type="checkbox"/>	amend <input type="checkbox"/>	Green Cert <input checked="" type="checkbox"/>		Plan Period	Topo Name	
Plan Change: _____ to _____				Conservation Rest. <input type="checkbox"/>		Rare Spp. Hab.	River Basin	
				CR Holder	DCR			

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s): City of Holyoke, Holyoke Water Works
 Mailing Address: 20 Commercial Street, Holyoke, MA 01040 Phone: 413.535.6048
 Email Address: _____

Property Location: Town(s): Huntington Road(s): near Sampson Road

Plan Preparer Mary K. Wigmore Mass. Forester License # 250
 Mailing Address 1637 west Road - Williamsburg, MA 01096 Phone 413.628.4594

RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A/61B Excluded Acres	Ch61/61A/61B Certified Acres	Stewshp Excluded Acres	Stewshp Acres
506	23	1299	78	96.6	0	0	0	96.6
TOTALS				96.6				96.6

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

HISTORY Year acquired 1975 Year management began 1959

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. NA treatment NA 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)

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	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	X			
Improve Hunting or Fishing			X	
Preserve or Improve Scenic Beauty	X			
Protect Water Quality	X			
Protect Unique/Special/ Cultural Areas	X			
Attain Green Certification	X			
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: **Provide high quality water through natural filtration by the forest itself.**

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: _____

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.)

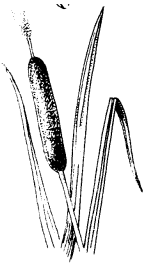


Rare Species: Rare species include those that are **threatened** (abundant in parts of its range but declining in total numbers), those of **special concern** (any species that has suffered a decline that could threaten the species if left unchecked), and **endangered** (at immediate risk of extinction 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 shows 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.

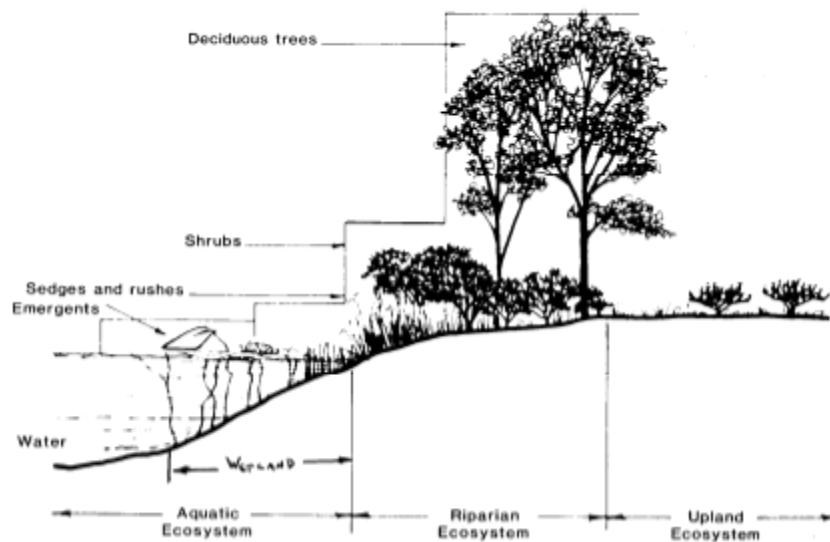


Figure 1: Example of a riparian zone.

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 keep our drinking water clean, 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 storm water, 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 (CH131), 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 ensure 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 than 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 (*Berberis 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.

Purpose of the Plan

The Holyoke Water Works (HWW) is charged with the delivery of clean, potable water to the City of Holyoke. One hundred percent of the drinking water for Holyoke comes from their watershed lands including this remote 96.6 acre Huntington parcel. This small property forms a living filter strip for the headwaters of Tucker Brook as it starts its journey down slope to the Tighe Carmody Reservoir. HWW operates under a waiver from The Massachusetts Department of Environmental Protection for the filtration requirements of the Surface Water Treatment Rules, which were established in 1986 in response to the Safe Drinking Water Act. Water quality protection is the highest priority with any activity across the entire watershed. HWW accepts the working hypothesis that healthy, resilient forests are the best natural filter for water.

The basic premise of this model is that with maintenance an ideal watershed forest ecosystem offers the least expensive natural filter for drinking water. The maintenance of a healthy forest requires its continual replacement through natural regeneration of its trees. This first section (The Overview) of this document explains the silvicultural techniques that HWW will apply to maintain and regenerate the watershed filtration forest upon the Huntington watershed lands. Silviculture requires the harvesting of trees from the watershed, and this document explains the strategies for the protection of water quality during the necessary silvicultural projects.

The City owns this 96.6-acre forest ecosystem that lies due west of the extensive Tighe Carmody watershed drainage system. HWW plans to certify these lands under the Forest Stewardship Council Green Certification Program. Management plans are necessary for all certified acreage. HWW plans to make the management plan available in the public libraries with the expectation that community members and citizens and water rate payers of Holyoke will appreciate the valuable resource these lands bring to the City of Holyoke. Education raises awareness, which can motivate stewardship of a community's natural resources. These lands are often used unofficially for walking, hiking, nature study, and other benign activities. No official access is permitted onto these lands in order to protect water quality.

The Holyoke Reservoir System

Established in 1872, the Holyoke Board of Water Commissioners had the vision and foresight to design, plan and build one of the most reliable water systems known today. This network of reservoirs located in Southampton, Westhampton, Montgomery, Huntington, and within the City of Holyoke impounds billions of gallons of water, ensuring the City's water supply needs are met under all operating conditions. The Holyoke Water Works Board of Commissioners purchased these lands in 1959 to add to their extensive holdings and to protect the Tucker Brook headwaters. An energy efficient gravity based system conveys water from the reservoirs to a centralized treatment facility to meet all State and Federal water quality regulations. Treated water is then distributed to a series of storage tanks and pumping stations that service the five individual pressure zones within the City.

Geology and Topography

Over 200 million years ago in the Triassic Period, the North American, Eurasian, and African plates drifted towards each other and eventually collided. The collision force shoved the northern Appalachian Mountains upwards forming the bedrock of the Berkshire Highlands. Metamorphic force folded the bedrock into the current formations across this area of Huntington (historically known as Norwich). Erosion wore the highlands down into the gentler hills of the terrain today. The bedrock is a portion of the Goshen Formation and it is composed of predominantly schist with quartz and mica.

Water effusing from a ground swell in a small cleft in the rocks about two miles north of the HWW lands carved its way through the bedrock of the Tucker Brook valley formation. The valley widens into the Adam Swamp before carving the bedrock of this parcel in its southward flow. Tucker Brook flows between the ridgelines of Breakneck Hill and three small-unnamed hilltops to the west of the brook valley. The eastern portion of the property lies on the lower flank of Breakneck Hill. The terrain gradually drops into the brook channel across this broad slope. A wide floodplain underlain with schist and gneiss bedrock spreads out on both sides of the brook. The floodplain rises onto three small hilltops across the western portion of the land. These three hilltops drop on their contiguous edges into a shallow, rocky depression, which fills with spring water.

History

Native peoples frequented the level alluvial terraces and floodplains of the Westfield River valley, as evidenced in fishing sites, flint tools found in the uplands made from basalt, and burial grounds strewn across the Indian Hallow district above the current Knightville dam. Many artifacts were unearthed during the building of the Knightville Dam in the “Forgotten Valley” site. The current forest structures, the blend of the mixed oak and northern hardwood forest with white pine and hemlock developed about 15,000 years ago as proven by tree pollen and seed. The Mohican and Woronoco peoples inhabited this area. The first settler of European descent (1750) married a native woman known for her healing skills with herbs.

Dense forests covered the area at that time, which were cleared and cultivated for corn, rye, oats, beef, mutton, flax, and maple sap. Three small settlements joined to form the present day Town of Huntington in 1855. Access to waterpower along the east branch of the Westfield River supported a thriving factory and mill economy. The first meetinghouse, church parish, and school house were in this section of Huntington along Searle Road. The rugged terrain of north and west Huntington supported maturing forests that provided the land base for lumber, charcoal, and firewood businesses.

History of Disturbance to the Forest

The history of disturbance on this property from the 1830’s is like that of the typical woodlot in Southern New England. The mid-19th century was the height of the forestland clearing for agriculture and pasturing. The availability of richer, more productive farmland in the Midwest resulted in farm abandonment and subsequent regrowth of the forests. Industrial patterns and modes of production also shifted with the advent of the 20th century, and the factories were abandoned.

The forestland reverted to the dense mixed oak, white pine, hemlock, chestnut, and mixed hardwood cover typical on old farmlands. These forests began the successional transition toward a more diverse species composition. Wood products industry surges in the early 20th century interrupted the development of these forests. This new upswing in land clearing for wood products and reversion to open land was cut short by the World War period. The forests have been maturing into their current condition since this time.

More recent natural disturbance to the forests have been the Chestnut Blight in 1900 to 1908, the hurricane of 1938, the Gypsy Moth outbreak of 1980 to 1982, and recent severe storm events driven by climate change, including the ice storm of 2008 and the October 2011 snow storm. Currently the hemlock wooly adelgid and emerald ash borer are changing the composition of these hilly forests.

Forest Soils

Time and weather eroded the uplifted Goshen formation into boulders, rock, and soils. The United States Department of Agriculture – Soil Conservation Service classified all of the soils within the Huntington -Tucker Brook watersheds into three main categories with minor inclusions of similar soils dependent upon their texture, depth, topography, and productivity. Measures of the soil’s susceptibility to erosion or detachment and the amount of run-off due to water infiltration rates are useful in the determination of highly erodible soils. All of the soils across this property have a Wind Erodibility Measure of 8 and moderate K factors with an average of .3. These metrics indicate highly erodible soils.

Protection measures are essential during any proposed watershed forest management work. Timing of silvicultural operations to periods that reduce surface disturbance and removal of the sponge like mulch of leaves will increase infiltration rates and decrease run-off and potential erosion. Installation of erosion control measures during and after any silviculture work also protects soil stability.

The Westminster-Millsite Soils Association are extremely stony, rocky shallow, well-drained upland sandy loams, which derived from glacial till. They are interspersed with pockets of deeper Hollis-Chatfield soils. Available water is low in these soils due to rapid permeability. These shallow, upland soils do not grow trees very well. These soils are found to the southwest of the Adam Swamp and Tucker brook.

The deep, muck Pillsbury-Peacham-Wonsqueak Soils Association (inclusions of Ridgebury) lie beneath the Tucker Brook valley, its floodplain and the Adam Swamp. These soils are nearly level, poorly drained, high in organic matter, and strewn with stones and boulders. The water table sits at or near the soil surface. The moisture often results in high seedling mortality. The sites above these soils are not suitable for silviculture of watershed forest management. A small sliver of the Montauk-Canton Soils Series sits on the southern property bound due east of Tucker Book. These extremely stony and rocky soils line floodplain areas in the hills. Trees grow slowly in these soils.

East of the Tucker Brook valley, the Ashfield-Shelburne Soils Association climb the gentle slopes to the property bound. These soils are deep, well-drained sandy loams with stones and boulders covering less than 15% of the soils surface. Some areas have a perched water table in spring and after heavy storm events. In the areas outside the large boulder deposit, trees grow very well. The following chart summarizes the soils basic characteristics and productive capacity for forest crop growth and management.

Table 1.: Soil Classifications and Descriptions for the HWW Huntington lands

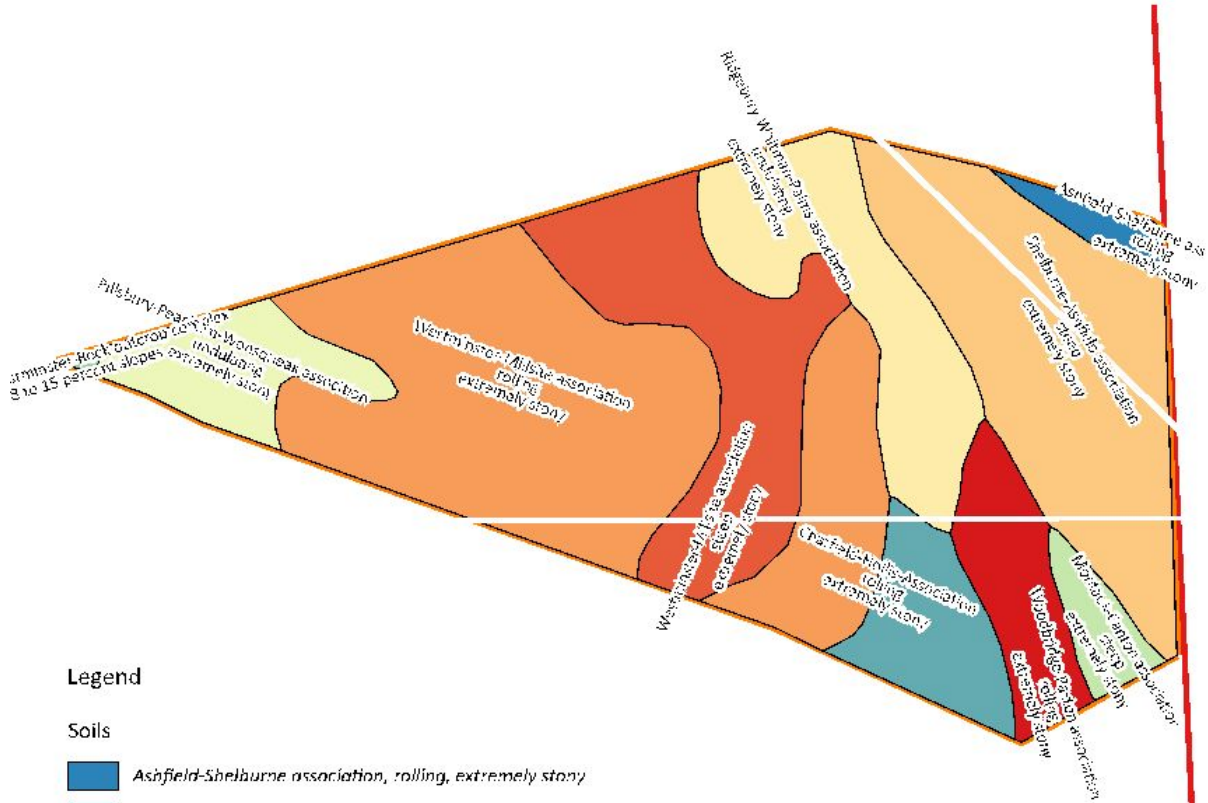
Terrain/ Topography	USDA Classification -Soil Name	Soil Description	Forest Productivity
Upper slopes, small hilltops, and the depression zone west of Tucker Brook	Westminster-Millsite Association	Coarse textured, shallow sandy loams in uplands formed in a thin layer of glacial. Extensive rock, stone, and boulder deposits across soils	Poor to Fair for productive tree growth.
Level and gentle slopes within the floodplain of the Tucker Brook valley	Pillsbury-Peacham-Pillsbury –Ridgebury and Montauk-Canton	Deep, poorly-drained organic matter and mucks. Extensive rocks, stones, and boulders.	Moderate potential for tree growth and

and the Adam Swamp area.	Association		productive for wetland plants.
Gentle lower slopes east of the Tucker brook valley.	Ashfield-Shelburne Association	Well-drained sandy loams with high moisture capacity and sections of boulder and rock fields.	Moderate to high productivity for oak and white pine.

Figure #2. Soil Classification Map for the Huntington HWW Lands- 96.6 acres












**USDA Soil Classifications
for the
Holyoke Water Works
Huntington Property
96.6 Acres**



Legend

Soils

-  *Ashfield-Shelburne association, rolling, extremely stony*
-  *Chatfield-Hollis-Association, rolling, extremely stony*
-  *Millsite-Westminster-Rock outcrop complex, 8 to 15 percent slopes*
-  *Montauk-Canton association, steep, extremely stony*
-  *Pillsbury-Peacham-Wonsqueak association, undulating, extremely stony*
-  *Ridgebury-Whitman-Palms association, undulating, extremely stony*
-  *Shelburne-Ashfield association, steep, extremely stony*
-  *Westminster-Millsite association, rolling, extremely stony*
-  *Westminster-Millsite association, steep, extremely stony*
-  *Woodbridge Paxton association, rolling, extremely stony*
-  *Boundary*
-  *Towns*



1:7,920

SOUTH

Prepared by Wigmore
Forest Resource
Management from MassGIS
and Field Sources
Not a Survey Map

Overview of Forest Ecosystem on the Huntington Watershed Lands

The forest is predominantly a maturing eastern hemlock and mixed hardwood grove. Dominant hardwood trees are red oak, black birch, sugar maple, yellow birch, red maple, white oak, paper birch, American beech, and cherry. The forest exists in a two-aged structure with the exception of a small grove of immature beech, birch, maple, and oak trees on an upland slope. This complex, vast forest ecosystem functions as an ideal natural filter. The maturing overstory oak, mixed hardwood, white pine and hemlock trees of the main canopy range in age from 100 to 140 years and the immature, mid-canopy layer range in age from 30 to 45 years of age. Natural decline opened gaps in the upper layers for the development of predominantly beech, hemlock, and red maple seedlings and saplings (less than 30 years). Sufficient reproductive stocking is lacking for the perpetuation of the natural forest filter across the large hemlock/hardwood groves. Scattered old farm relics (mostly sugar maple and white pine) and small groves of surviving hemlock may even be older than 200 years.

These forests are generally healthy, vigorous, and productive with the exception of the hemlock, white ash, and paper birch crops. The hemlock component is under attack by the elongated hemlock scale and the hemlock wooly adelgid. These pathogens are systematically destroying the genetically ancient *Tsuga* species east of the Appalachian Mountains. The full ramifications of their loss from the watershed forest ecosystem are not understood. White ash suffers environmental decline, and paper birch is a short-lived species, with many stems approaching their biological maturity across the watershed. The black birch crop suffers from infestation of the nectria bacteria.

Table #2: Forest Stand Summary By Number, Forest Type, and Area:

Reservoir Name	Stand #	Forest Type	Stand Description	Area
Huntington	1.01	HH	Dense groves of declining eastern hemlock mixed with maturing high value red oak and black birch, legacy sugar maple and immature black birch above well-formed, vigorous immature birch, maple, oak, and hemlock, which stretches across the entire property providing shade for Tucker Brook and numerous spring seep recharge sites..	75.6 acres
Huntington	1.02	OH	Small stand of maturing red oak above black birch, yellow birch, red maple, cherry, and prolific beech sapling and poles trees resting on the southern flank of steep knoll.	9 acres
Huntington	1.03	BM	Small grove of immature beech, black birch, pin cherry, gray birch, paper birch, red oak, and sugar maple, which filled an openings from a past harvest.	6 acres
Huntington	1.04	RZ-SM	Adam Swamp and a small water filled depression.	6 acres
Subtotals Stewardship and Green Certified Area				96.6 acres

Invasive Plant Communities and Their Management

Invasive plants threaten local biodiversity with their aggressive displacement of native species. They can significantly inhibit regeneration and the future productivity of a forest stand. Invasive plants have few natural enemies, and often have little to no wildlife value. In general, preventing

the spread of invasive plants is easier and less expensive than trying to control them. This plan often recommends treatment of existing invasive plants before any timber harvest work and the use of non-toxic practices to avoid their spread. Manual removal, stem cutting, application of vinegars and borax, brush cutting, and mowing in cycles reduce invasive plant stocking and prevent their spread. Retention of high crown closure uses shade as a deterrent of their spread. Scheduling and planning efforts for the treatment with natural correctives will be coordinated with income production. These plants are found in very low densities' as scattered individual stems in some areas. Manual removal of these stems will occur prior to any timber harvest removal work in order to prevent their spread onto the seedbed areas.

Wildlife

This is a rich undisturbed monaural area that provides excellent habitat for native populations. During the field inventory sign of use by bobcat, raccoon, black bear, white tailed deer, chipmunks, wild turkey, rabbit, and moose were noted. Native shrubs such as illex, maple leaved viburnum, and rubus produce palatable fruit each year. Red oak and beech trees mast is enjoyed by most native habitat. The dense hemlock, although in decline, still provides a wind and cold break for wintering deer and moose. The location of this property within the small depression and natural bowl offers refugia for animals moving across the landscape. Extensive patch openings carved into the MacDonald property to the south opened vast acreage of native browse. These openings also provide ideal nesting and breeding habitat for migratory songbirds.

Biodiversity:

The Massachusetts Division of Fish and Game (DFG) through its Natural Heritage and Endangered Species Program (NHESP) designates these lands as Priority Core Habitat, which is essential for the long-term health of native communities. The ecosystem provides high quality wetlands, vernal pools, habitat, and range for rare and vulnerable or uncommon animals, birds, reptiles, amphibians, invertebrates, and plants. The entire area is also designated as Critical Natural Landscape, which provides good habitat for wide ranging species, nurtures intact ecosystems, and protects habitat integrity. The protection of both Priority Core Habitat and Critical Natural Landscapes (especially their overlap zones) assures healthy ecosystem functioning and rich biodiversity. The continuous acreage provides connectivity for species to cross the landscape.

Biodiversity Protection:

All projects within Priority Habitats undergo a review by DFG NHESP. Most of the watershed area is designated as a sensitive resource not suitable for timber harvest or silviculture work. No access is encouraged to the vernal pool zones on the southern watershed. Holyoke Water Works supports the diligent use of Forest Conservation Management Practices (CMP). All CMPs published by the DFG NHESP will be followed during the one proposed timber harvest project within the white pine plantations.

Conservation Management Practices (CMPs) are specific, science-based guidelines for conservation of rare species during forest harvesting. CMPs are somewhat analogous to Forestry Best Management Practices (BMPs), except whereas BMPs focus mainly on protection of water resources, CMPs specialize in protection of rare wildlife. The primary objective of CMPs is to guide harvesting activities such that rare species listed under the Massachusetts Endangered Species Act (MESA) are not impacted in a way that jeopardizes long-term viability of local populations. CMPs first identify and describe potential impacts of forest harvesting to state-listed species, whether impacts may be direct (e.g., physical injury or death of individual animals) or

indirect (e.g., alteration of habitat in a way that reduces overall reproductive success of a local population). Then, CMPs provide specific guidelines to avoid or minimize impacts that would be considered negative or potentially detrimental to a local population. The guidelines are based on scientific knowledge of the habitat requirements, reproductive strategy, dispersal ability, survivorship, and other ecological factors that influence population dynamics of the species.

CMPs aim to maintain adequate opportunity for sustainable management of timber products in Massachusetts. To this end, CMPs tend to focus forest harvesting restrictions on the critical areas



Holyoke Water Works Huntington Parcel

Biomap 2

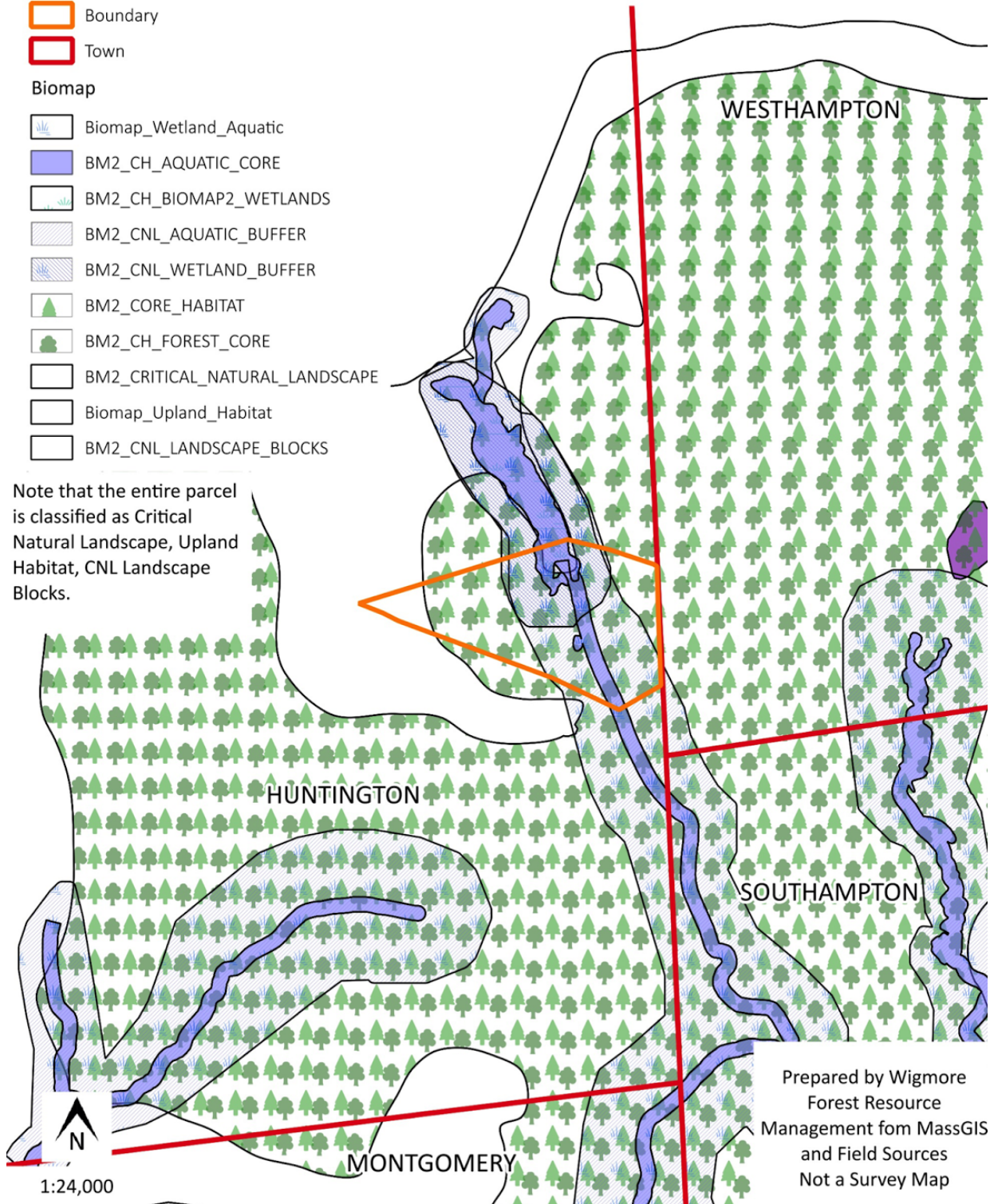
Legend

- Boundary
- Town

Biomap

- Biomap_Wetland_Aquatic
- BM2_CH_AQUATIC_CORE
- BM2_CH_BIOMAP2_WETLANDS
- BM2_CNL_AQUATIC_BUFFER
- BM2_CNL_WETLAND_BUFFER
- BM2_CORE_HABITAT
- BM2_CH_FOREST_CORE
- BM2_CRITICAL_NATURAL_LANDSCAPE
- Biomap_Upland_Habitat
- BM2_CNL_LANDSCAPE_BLOCKS

Note that the entire parcel is classified as Critical Natural Landscape, Upland Habitat, CNL Landscape Blocks.



Prepared by Wigmore Forest Resource Management from MassGIS and Field Sources
Not a Survey Map

Figure #4: Priority Core Habitat and natural Critical Landscape Map from the BioMap2

Project for the Holyoke Water Works Huntington watershed lands.

within known habitat of state-listed species, thereby allowing timber management to proceed with fewer restrictions over as large an area as possible. This strategy is based, in part, on the recognition that forest harvesting typically results in temporary habitat change or sometimes even habitat improvement rather than permanent habitat loss. Thus, the CMP strategy is designed to help maximize the protection of state-listed species and the ability of Massachusetts's landowners to manage their forests for timber and other wood products.

Principles Guiding Forest Watershed Management

The science of watershed management continues to evolve, although many basic principles are long established and are now widely accepted as the precedent for the stewardship of watershed lands. This section is presented as the scientific defense synopsis for the City of Holyoke's watershed forest management program. The focus is on water quality, which can be directly impacted by active silviculture work. Although water yield is important to watershed management, the proposed silvicultural program restricts harvest levels to a less than 20% threshold, which is not significant enough to impact yield.

Watershed Protection

- Forested watersheds generally yield higher water quality than non-forested cover types.
- Maintaining vigorously growing forests across a watershed provides the best regulation of nutrients in a watershed.
- Watershed management activities depend upon an adequate, well-designed, and well-maintained watershed road system.

Water Quality

- Surface water collected from fully forested watersheds with minimal exposed soils generally carries low turbidity.
- In actively managed forests, correctly designed and effectively applied Best Management Practices will protect water sources from sediment/nutrient losses otherwise associated with forest management work.
- The most common sources of water quality degradation by timber harvesting are intersections in harvesting roads and staging areas near water sources. Disconnecting roads/staging areas from water sources prevents this degradation.
- To prevent contamination of surface or ground waters, petroleum products on water supply watersheds must be tightly regulated.
- Maintaining a species and age/size diverse forest cover may increase the forest's resistance to natural disturbance. Active forest management can increase size and species diversity of forest cover.

The Water Protection Forest: A Working Hypothesis

- The ideal watershed protection forest has the capacity to recover from natural disturbances with or without active forest management.
- Healthy, well-distributed diverse age groups and size classes across the watershed increase the forest's ability to withstand environmental stress and disturbance.

- Research has shown that harvesting less than 25% of the forested watershed in any given ten year period can minimize the loss of nutrients or sediments.
- Separation of the roads and staging areas from water resources is the first rule to protecting these resources from any negative impact due to logging.
- Roads should be designed to minimize stream crossings, and storm water drainage structures need to be properly designed and managed.
- Staging areas must be remote from water resources.

Forest Management Objectives/Strategies:

- To maintain the ability of the forest to regenerate itself;
- To encourage the development of the ideal all-aged, species diverse natural filtration forest structure on the forest stand suitable for silviculture treatment;
- To continually regenerate these lands in order to maintain multi-age structure and diverse species composition;
- Strict adherence with Best Management Practices as stated the Department of Conservation and Recreation Best Management Practices Manual (2103) with compliance with both the mandatory and suggested practices;
- To limit harvesting to no more than 25% of the total stocking on any given forest stand over a 15 to 20 year cutting cycle; and
- Delineation and marking of the boundaries of the entire reservoir lands with documentation of all monumentation for archive purposes.

Water Quality Objectives/Strategies for 2016 to 2026

Silvicultural practices, as described in this management plan, are employed to bring about ideal filtration forest conditions. These practices require the cutting and removal of overstory trees to diversify structural and species compositions and to maintain the vigor of the residual overstory. The process of removing trees disturbs the forest and the watershed soils, which are essential to protecting water quality. The areas of greatest concern are the hauling roads for timber products and log landings. Proper location of these in relation to streams, rivers, reservoirs, ponds, vernal pools, springs, and vegetated wetlands is important to prevent soil loss.

- 1) Prevent the movement of sediments from the upper slopes into the Tucker Brook channel.
- 2) The compliance with the best BMP's (Explicitly described in the Massachusetts Forestry best Management Practices 2013 Manual) for harvest techniques in order to minimize the risks of sediment and nutrient loading into the water system. The timber harvest work would be conducted during frozen ground conditions.
- 3) Establish a program of public outreach to the local community users about erosion prevention and trail use.
- 4) Conduct a detailed survey of the trail and road system condition and record and document high erosion concern areas.

Biodiversity Objectives/Strategies for 2016 to 2026

- 1) Protect and encourage native plant communities through the study and control of the invasive plant infestations across the reservoir lands.

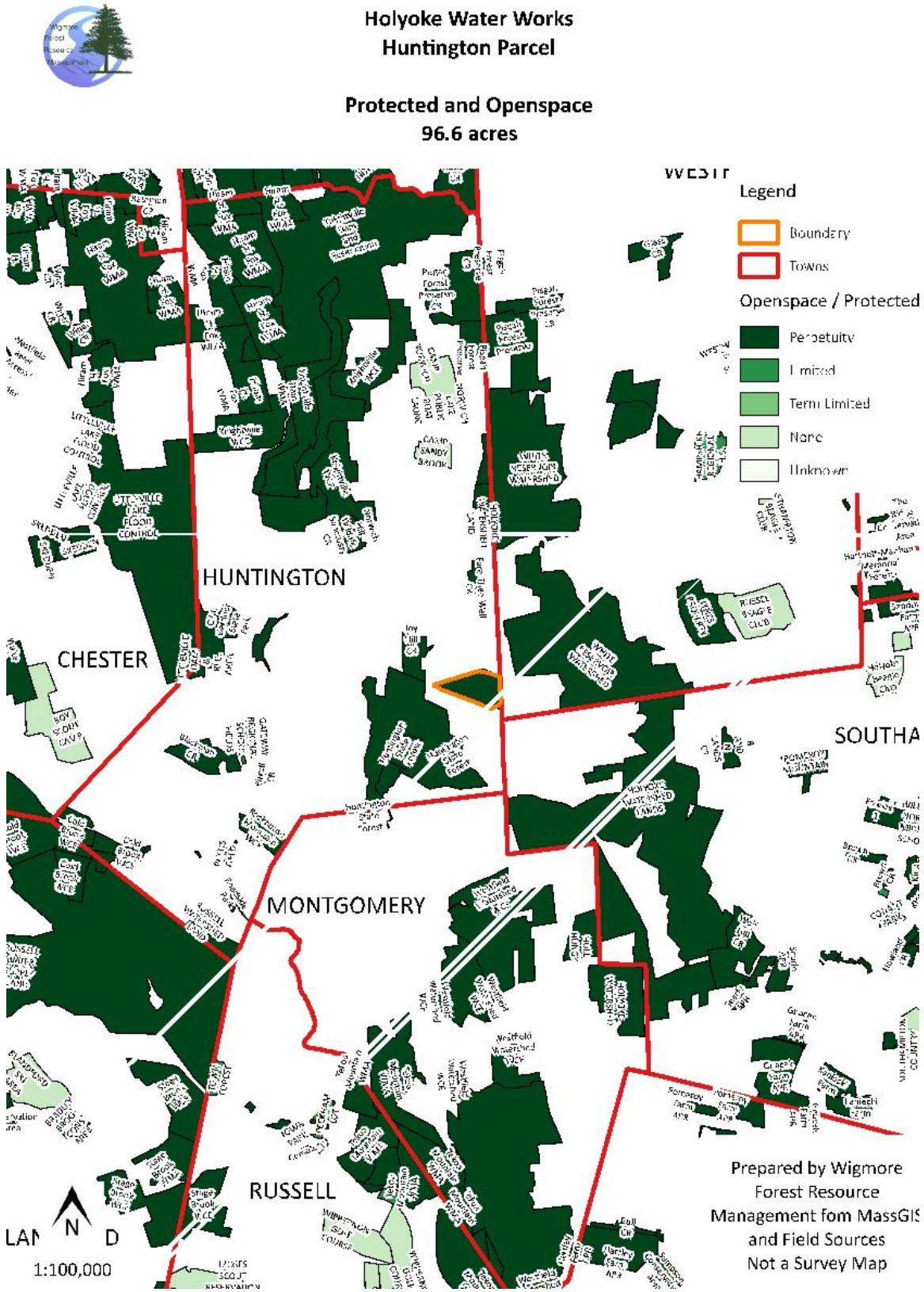
- 2) Seek grant funding for analysis and control measures against the invasive plants.
- 3) Establish non-disturbance preservation areas within each reservoir property for the conservation and development of intact natural communities and the diverse species within each area.
- 4) Monitoring for forest health, which poses a threat to biodiversity if a species is threatened by a pathogen.
- 5) Strict adherence to all CMP's as published by Massachusetts NHESP during any silviculture work.

The Role of the Forest in the Landscape and Local Economy

The Huntington watershed lands lies within an extensive wild lands corridor with a north-south orientation. Lands owned by Cows Lumber Company, Charles MacDonald, and the Commonwealth of Massachusetts surround this unique ecosystem. These lands provide a unifying corridor for a vast habitat and forest core, which covers over. Protected open space is important in the maintenance of individual populations, species richness, and biological diversity. Population viability of many wildlife species within a regional context is reported to be dependent on large tracts of contiguous habitat that are minimally isolated from similar habitats. Often, area-sensitive species are not present or do not breed successfully in isolated, small, or fragmented tracts of land. The landscape context in relation to a given habitat can have an important effect on wildlife reproductive success and population health. Diversity of habitats and microhabitats within an area influences wildlife species richness and presence/absence of individual species. The three-reservoir watershed increases the ecological resiliency and biodiversity of the regional landscape.

The active silvicultural program on this watershed area will produce moderate volumes of merchantable timber products over ten years. Local and regional forest products businesses will complete the physical management work on these lands. They rely on local small businesses for the necessary materials and tools for the production and processing of these timber products. The City of Holyoke relies on the timber revenues from their silvicultural program for the funding of special water related projects and maintenance needs. Their use of the forest as a natural filtration system saves the City millions of dollars in the costs of construction and maintenance of a water filtration plant.

Figure #5: Protected Open Space in and around the Holyoke water Works Huntington watershed lands.



The Role of Silviculture

Applying ecological principles to a forest stand to enhance growth of desirable species or native plant communities or to promote regeneration is termed silviculture. Silvicultural treatments are generally divided into procedures designed to reproduce forest stands, and intermediate treatments that maintain vigor and desired composition and stand structure. The tree species growing upon the Huntington watershed lands are biologically immature. The oak species might approach senescence near 275 years. However, some red oak can live for over 400 years, and some white pine have been recorded at well over 300 years. The average age range of trees across these properties is 110 to 145 years with some mature hemlock, oak, sugar maple, and black birch that exceed 225 years. Most of these trees are mid-way through their life cycles. If a tree is not under stress from a pathogen or environmental hardships, it is likely to continue growing. Although not yet biologically mature, the dying hemlock crops pose a threat to the continuity of this protection/filtration forest.

The forest stands on the property were assessed for their suitability for silviculture. Suitability depends upon the ability of a given forest stand to support the main objectives for water quality and biodiversity of this management plan. Therefore, forest stands upon steep slopes with a high erosion factor were not deemed suitable, nor were forest stands that function solely for the filtration, collection, or transfer of water (wetlands, swamps, or stream banks). Some areas were deemed not suitable for silviculture because of their support function for habitat and their important values for ecological resiliency, such as biodiversity or habitat value.

Only 65-acres of the hemlock hardwood grove are suitable for silviculture during the 2016 to 2026 period upon Huntington watershed forest. Regeneration of mixed hardwoods and possibly white pine of the site is the long-term goal of the silviculture work, with a hopeful full site occupation by over 2,000 seedlings per acre of all native hardwood species within five to ten years. The silvicultural systems appropriate for this objective are the Salvage Harvest System and the Selection System. Salvage Harvests remove trees that at risk of merchantable value loss within a short period, and Selection Harvests remove either individual or small groups of trees for the purposes of regeneration. The imminent loss of the hemlock crop mandates the successful establishment of reproductive stocking on the site. Monitoring of the natural seeding is recommended for the possible planting of the areas if natural means should fall short.

Invasive Plant Management:

Invasive plants, like Japanese barberry, Asiatic bittersweet, and multiflora rose can significantly inhibit regeneration and the future productivity of a forest stand. Usually escaped ornamentals, they have few natural enemies, and often have little to no wildlife value. In general, preventing the spread of invasive plants is easier and less expensive than trying to control them. This plan recommends treatment of existing invasive plants with natural correctives prior to the proposed timber harvest and after the work. Treatment will be necessary along the reservoir shoreline, along the Whiting Street Reservoir Road, and into the interior of the plantations. Throughout the rest of the forest ecosystem without any reduction in crown closure, shade should prevent the spread of these plants.

Annual monitoring inspections of the pine plantation conditions post harvest for detection of spread of the plants into the regeneration areas can motivate future control work. Some of the removal work can be done manually with the removal of the plants from the soils. Brush cutting and mowing along the Whiting Reservoir Road by the HWW will continue to reduce their spread. Toxic methods and the use of chemicals will not be permitted on the Whiting Street Reservoir lands. HWW's management philosophy subscribes to the opinion that invasive plants, although a threat to the native ecosystem, should not introduce a more dangerous threat to water quality in their treatment. Other natural corrections include propane torch application, stem cutting and vinegar and borax application, and direct plant removal by tool or hand.

Hazard Tree Removals

Whiting Street Reservoir Road is lined with stately, tall hardwoods and conifers. Due to their position and aesthetic quality, these trees should be retained. Severe storm events that damage trees can create hazardous circumstances for the public users. Though not initially slated for harvest, unanticipated changing conditions require adaptive management methods. Adaptive watershed management allows for new decision making new conditions or information. Amendments would be made to the management plan after review by all stakeholders, which would include the development of a prudent plan for hazard tree removal.

Adaptive Watershed Management

Adaptive resource management (ARM) is a structured, iterative process of robust decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring. In this way, decision making about the use and management of the forest resources on the Whiting Street Reservoir simultaneously meets one or more resource management objectives and, either passively or actively, accrues information needed to improve future management. Adaptive management is a tool that will be used not only to change the watershed management system, but also to learn about the system.

Because adaptive management is based on a learning process, it improves long-run management outcomes. The challenge in using the adaptive management approach lies in finding the correct balance between gaining knowledge to improve management in the future, and achieving the best short-term outcome based on current knowledge. The use of these lands as a primary biodiversity protection area is a new direction for HWW. The reproduction of the forest tree species is essential to the maintenance of the forest's filtration function. Diligent monitoring, documentation, and analysis will inform the watershed manager and all stakeholders about the effectiveness of this approach for the achievement of HWW stated Forest Stewardship and Green Certification Goals. This approach allows for the flexibility to evaluate the forest when a new

threat to forest health, ecosystem function, or habitat condition develops in the future, and to change direction when necessary.

Methodology

Inventory Methodology: A sampling system was devised that used probability parameters proportional to the size of the trees sampled and the relationship between basal area and volume. The “double point” sampling system relies on the measurement of the basal area in all trees with a 20 basal factor gauge and the measurement of the tree metrics (diameter, height, and condition class) of a sub-set of these trees with a 40 basal area factor gauge. Its core is the method known as variable plot sampling work, which assigns chance of measurement of trees on each sample plot based upon its relative size with larger trees, which have a greater chance of measurement. Fifty-five points were taken across the watershed on a systematic grid design that was executed with a GPS field system throughout all three compartments of the watershed. The placement on the plots on the grid was generated by a random plot function in QGIS. The DS Cruiser computer program calculated the stand volumes, basal areas, and stand structure metrics. The raw field data is stored in an electronic file, as well as the computed reports on each stand’s condition.

Site Index Methodology: Site index for each stand was estimated using data from Natural Resources Conservation Service, United States Department of Agriculture Web Soil Survey. This survey is available online at <http://websoilsurvey.nrcs.usda.gov/>. Site index by species was determined by weighted average based on the estimated percentage of the soil types within a stand.

Soils Methodology: Soils data were obtained from MassGIS, Office of Geographic Information, and Commonwealth of Massachusetts from the layer GISDATA_SOILS_POLY_SV_MUNAME. Stand maps were geo-referenced to the soils layer to delineate soil types.

Mapping Methodology: GIS data was obtained from MassGIS, Office of Geographic Information, and Commonwealth of Massachusetts. Layers included the following and the appropriate aerial imagery from the same source.

GISDATA_L3_TAXPAR_POLY_ASSESS

GISDATA_EOTROADS_ARC

GISDATA_HYDRO25K_ARC

GISDATA_HYDRO25K_POLY

GISDATA_SOILS_POLY_SV_MUNAME

Stand maps, developed from aerial imagery and further refined during field investigation using GPS were geo-referenced to a base layer that covered the watershed. Forest Stands were numbered as a decimal (.01 – .04) within a watershed so that they can be sorted correctly. For example, the Riparian Zone stand in the Manhan sub-watershed is numbered 1.04 – stand # 04 in watershed # 1.

Growth Rate Methodology: Growth rates were determined using the method by which the state determines Chapter 61 tax valuations, using an expected volume increase of 162 board feet per acre per year. This is calculated from state Forest Inventory Analysis (FIA) data. The total expected average volume increase was determined by multiplying the acreage of the stand by 162 board feet per acre.

Simple Regeneration Metric: Regeneration is described at different points in the inventory data and the management plan in the following manner using a simple metric.

A - High - very dense regeneration.

B - Moderate - intermediate level of stocking.

C - Low - low to negligible stocking.

Simple Invasive Plant Metric: The stocking level of invasive plants is described using a simple metric.

A – High – very dense stocking of invasive plants.

B – Moderate – intermediate level of stocking.

C – Low – low to negligible stocking.

Boundary Consideration:

A boundary research and delineation project is underway for these lands with an anticipated completion date of August 2017. Survey maps exist for the lands of Charles MacDonald and several neighbors that adjoin Sampson Road. A map of the lands of Cowls Lumber Company defines the bound to the north. Stone monuments were found at all property corners prior to the field inventory phase. The Forest Stand and Boundary map within this document accurately depicts the boundary locations.

Combination Forest Stand Descriptions and Management Practices for 2016 to 2026 by Stand

For the purposes of this report, a forest stand is an easily defined area that is relatively uniform in composition and structure. If a stand is suitable for silviculture, the management data was presented directly after the stand descriptions. Specific stand attributes that support the value of its habitat are mentioned in the stand description narratives.

Objective	Stand Number	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index	DCR/FIA Growth Rate (MBF/yr.)
Stewardship Green Cert.	1.01	HH	75.6	14.2	155	7.980 MBF 15 cords	WP:60 RO:60	16.662 MBF

Water Quality Concerns: The goal for water quality protection on these watershed lands is the prevention of the movement of sediment and nutrients from the upland forests through the soils and streams into the headwaters of Tucker brook and Adam Swamp or its further movement downstream into the watershed. Application of all BMP's for water quality protection and scheduling of the harvest during winter months with frozen ground minimizes the risk of sediment movement.

Silviculture Status: Suitable in some zones.

Terrain/Topography: This large stand stretches across the property from east to west. The terrain sweeps down slope gently across increasingly larger stones and boulders as it enters the Tucker Brook channel and its floodplain. The relief climbs a small knoll on the west side of Tucker Brook before a plunge into a bowl-shaped depression zone on the southern bound, which extends to the western tip of the property. It holds a classic watershed topography, which supports the movement and collection of stream, rain, and upward percolating ground waters.

Soils: East of Tucker brook, the deep, productive Shelburne-Ashfield Association soils are found, which support productive timber crops. The stony, boulder-strewn Chatfield-Hollis soils lie within a small zone due west and adjacent to Tucker Brook. These soils grow trees poorly. The remainder of the lands west of Tucker brook lie above the shallow, droughty Westminster-Millsite-Whitman Association. Productive capacity is variable, yet overall marginal on these shallow, dry sites.

Timber Harvesting: Access for timber harvesting work is difficult and dependent upon the neighbors to the south (Private lands of Charles MacDonald and Massachusetts State Forest lands). Boulders, stones, and interspersed low, moist depressions make road engineering difficult with only specific surface areas allowable for road building. Harvest work on the gentle terrain will not cause sediment loss. The coarse, loose structured loams tend to erode between the stones. Scheduling of the proposed harvest during the winter with frozen ground conditions and a snow cover protects soil integrity and the isolated wet depressions throughout the stand.

Overstory: Maturing hemlock and mixed hardwoods densely populate the upper canopy. The average stand age is 120 to 150 years of age. Hemlock contributes over 45% of the species composition with the following distribution through other species: sugar maple (2%), red maple (2%), white ash (1%), black cherry, (2%), yellow birch (11%), black birch (6%), beech (9%), and red oak (12%). The hardwood trees have good form and high value, particularly the maturing red oak crop. Some of the oak stems reach over 75 feet into the main canopy. Scattered pockets of statuesque mature white pine stems dot the upper canopy. The hemlock trees have fair to good quality with many branch defects on their lower boles.

Understory: Some harvesting amongst the stand over 35 years ago resulted in dense pockets of black birch, yellow birch, and red maple pole trees. With the exception of the poorly formed, inferior red maple, these young trees are vigorous and well formed. Shade tolerant beech saplings with an average height less than 25 inches cover any available growing space on the forest floor.

Regeneration: General reproductive stocking records a simple metric of a C to B- level with dominance by hemlock and beech seedlings. Overstory shade and laurel pockets prevent widespread and sufficient regeneration. Whenever an opening occurred in the canopy, black birch, red maple, sugar maple and hemlock seeded into the spots. These young trees are less than two inches in diameter and less than ten feet in height.

Forest Health: The marginal to poor growing site conditions tends to exacerbate any compromised health conditions across this stand. Infestations of hemlock woolly adelgid and elongated hemlock scale have compromised the health of the hemlock crop (all ages and all sizes). Most trees have over 65% needle dieback. Isolated black and yellow birch trees battle necrotic bacterium cankers on the main boles. Beech bark disease is causing fatality and defects in the beech crop. The disease results when bark, attacked and altered by the beech scale, *Cryptococcus fagisuga* Lind., is invaded and killed by fungi, primarily *Nectria coccinea* var. *faginata* Lohman, Watson, and Ayers, and sometimes *N. galligena* Bres. The white ash appears in serious decline across the stand.

Shrub and Herbaceous Cover: The dense hemlock cover restricts forest floor vegetation in large areas of the stand. Surprisingly some of the densest shrub and fern growth occurs where stones and boulders limit tree growth. Mountain laurel, witch hazel, striped maple, and ironwood were common. Polypody fern climbs over the large boulders along the spring seep and stream channels and within the low, bowl shaped depression. Lycopodium were prevalent in the upland areas on drier soils. Some other common plants were low bush blueberry, and maple leaved viburnum, hay scented fern, and partridgeberry.

Invasive Plants: Exotic invasive plants have not infiltrated this remote stand. Individual stems of Japanese barberry, Asiatic bittersweet, and winged euonymus were noted along the southern boundary with Charles MacDonald and The Commonwealth of Massachusetts and along the boundaries with connection to the old county road near the eastern edge.

Habitat: The small pockets of maturing white pine on the knolls provide perching and nesting sites for mammals and birds. They also provide ample seed for bird species such as red-breasted nuthatch, pine warbler, common grackle, and evening grosbeak. Porcupine use the rocky clefts amongst the hemlock groves. The decaying central core of the extensive dying hemlock crop attracts many members of the woodpecker family. The red oak and beech crops produce annual mast crops, which many birds and mammals depend for high nutrition food source. Despite its decline, the dense hemlock groves offer a warmer microclimate for white tailed deer in winter. Moose sign was common near Adam Swamp and along Tucker Brook. They also browsed across large sections of striped maple saplings in the upland zones.

Fire Protection: Access into the stand is difficult, but could be gained from the Macdonald parcel along Sampson Road with a with a four-wheel drive pumper truck for fire management. Water is readily available from the Tucker Brook and Adam Swamp. No fire events have occurred across this area for decades.

Desired Future Condition: The hemlock crop is dying quickly and would not survive another twenty-year cutting cycle in the management program on the Holyoke Water Works lands. Salvage of this extensive crop would remove 40% of the stand stocking and retain a well-stocked red oak and northern hardwood grove. This grove would be biased towards older age classes, but the openings would fill quickly with the youngest age class of hardwoods. This regeneration would encourage the development a resilient, species diverse natural filtration and protection forested watershed ecosystem.

Recommended Management Practices: 1. Initiation of a public outreach campaign within the local community to prepare the site users and stakeholders about the necessity of this harvest work amongst the dying hemlock for fire hazard reduction and mixed hardwood regeneration promotion. 2. Application of the Salvage Harvest System within the hemlock crop and declining white ash, yellow birch, black birch, and beech crops. The application of the Single Tree selection System within the maturing and high risk red oak crop.

Stand Number	Forest Type	Silviculture Practice	Stand Area (acres)	Basal Area Removal (sq.ft/acre)	Volume Removal (MBF)	Firewood Removal (Cords)	Pulpwood Removal (Cords)	Timing
1.01	HH	Salvage Harvest System	65	<=65	250,000	65	200	2017-2020

Management Practice Objective: The long-term objective for this stand is the conversion of the mixed hemlock and hardwood grove to an all-aged red oak and northern hardwood stand with a scattered overstory of mature white pine and clustered groups of hemlock. This forest structure provides the diverse, un-even aged forest ecosystem capable of resistance to pathogens, disease and climate change and natural water filtration and purification. Salvage harvests remove trees that are damaged and declining in vigor and health from natural events such as ice and storm crown damage or insect and pathogen infestation. Use of the Salvage Harvest System may be applied either through thinning, singletree selection or group selection.

Trees to be removed and retained: The hemlock salvage would remove over 75% of the hemlock stocking in the main interior zones of this stand. Hydrological sensitive areas such as of the areas outside stream and wetland filter strips. This includes trees that range in size from four inches to over twenty-four inches and larger. White ash timber trees grow scattered throughout the stand, and their salvage removal would mimic a singletree selection process whereby small pole stems and sawtimber crops would be targeted for harvest.

The salvage work amongst the birch and beech crop would remove the trees with extensive cankering along the main bole and the inability to survive another 20 years of forest growth. These trees range in size from five inches to nineteen inches inclusive of both fuelwood and timber products. Harvest of 25% of the red oak crop would remove oak stems with bacterial wet wood, extensive crown damage, and other bole defects. Their inclusion in the harvest also secures the economic viability of the project. Most of these trees are over 20 inches in diameter.

The residual stand structure includes maturing red oak seed and timber crop trees (diameter range 13 to >24 inches), healthy, well formed immature black birch, yellow birch, sugar maple, cherry, and red oak pole and small timber crops, mature, large sized white pine and hemlock overstory trees, and mature, cavity-riddled oak, beech, and black birch stems. Harvest engineering and workmanship will avoid damage to the scattered patches of immature birch, maple, oak, and cherry saplings throughout the stand.

Regeneration Concerns: The removal of high stocking levels of dying hemlock opens the forest canopy and creates diverse conditions supporting the establishment of many hardwood species. Immature beech seedlings and saplings and shrub growth may prevent adequate regeneration across the entire stands. It may be necessary to apply cleanings and weedings amongst this stocking. .

Soil Considerations: The shallow, stony soils easily slough off sediment if mineral soils are exposed. Winter harvesting with some snow cover would prevent extensive disturbance to the mineral soils. Snow cover would also protect harvest equipment from the stones and boulders common in the soils.

Habitat Considerations: The proposed harvest will increase the vertical stratification within this stand and enhance biodiversity. The legacy white pine trees will provide excellent perching and roosting opportunities in the upland zones. Retention of the dying and declining mature hemlock stems offers future cavity trees and abundant insect habitation for birds and small mammals. The silviculture practices will incorporate the guidelines of existing Conservation Management Practices from Massachusetts Division of Fish and Game NHESP publications when applicable. Retention of dense hemlock cover and the establishment of a non-disturbance zone around the extensive spring seep matrices across the stand protect the value of these unique habitat niches.

Harvest Engineering: Negotiation for a harvest access road and landing location must be negotiated with the southern neighbor, Charles MacDonald, and his forester. His property is certified under the Chapter 61 program, and the owner is open to this negotiation. The proposed timber harvest project will comply with the regulations within the Massachusetts Best Management Practices Manual 2014 for water quality protection. A bridge crossing of Tucker Brook is necessary for completion of the harvest. A good site lies close to the southern bound where the brook bottom is stony and gravelly.

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index	DCR/FIA Growth Rate (MBF/yr.)
Stewardship Green Cert.	1.02	OHK	9	14	144	4.250 MBF 9 cords	58:RO	1.98 MBF

Water Quality Concerns: The goal for water quality protection on these watershed lands is the prevention of the movement of sediment and nutrients from the upland forests through the soils and streams of the upper slopes into Adam Swamp and the Tucker Brook drainage system. Retention of full canopy cover protects the soil structure and precludes any sediment loss off the upper slopes.

Silviculture Status: Suitable but not relevant during the 2016 to 2026 operating period.

Terrain/Topography: This stand grows upon the steeply sloping southern flank of a small hill west of Adam Swamp. Stone, boulders, and exposed bedrock cover the soils surface. Narrow gully formations mark the eastern and southern edge of the stand.

Soils: The very stony, shallow Westminster-Millsite Soil Association lies beneath this knoll. Tree growth is poor to marginal upon these limited sites.

Timber Harvesting: Not applicable.

Overstory: The stand has a two-storied structure with an overstory of medium timber sized red oak trees (size range 13 to 18 inches) and large sized (≥ 19 inches) white pine and hemlock trees above a densely stocked sapling and pole layer with dominance here by beech and hemlock. The maturing red oak crop (average age 150 years) has excellent quality. The scattered white ash appear in serious decline on this hilltop. The oak crowns suffered damage from the recent storm events, yet the stand was in general healthy with the exception of declining paper birch and white ash trees. Most of the hemlock stems have lost over 50% of their needles due to the combination of hemlock elongated scale and wooly adelgid. Beech bark disease severely affects the entire beech crop.

Regeneration: Seedling stocking is low (Simple metric equals C) with predominantly beech and hemlock composition. A few red oak seedlings were noted between the stones and rocks.

Shrub and Herbaceous Cover: The forest floor cover was sparse on this slope but inclusive of many common xeric sites species such as lycopodium, maple leaved viburnum, Polypody fern on the rocks, and mountain laurel. One notable exception was some dense thickets of hobblebush near the crest of the knoll.

Invasive Plants: No invasive plants were noted across the forest floor in this stand.

Habitat: Small caves amongst the rocks provide denning and nesting opportunities for porcupine, and small mammals on this upper slope. Pileated woodpecker damage was noted in most of the white ash and dying hemlock trees. A large raptor or squirrel nest was cited in a towering white pine stems. Abundant fine and coarse woody material clutters the forest floor from the storm damage within the oak crowns. This material supports the lifecycle of invertebrates and fungi and provides burrowing and nesting sites form small mammals. The oldest red oak and sugar maple trees have plenty of cavities and holes for denning.

Fire Protection: This stand is not easily accessible from the south, but four-wheel drive pumper truck access is feasible from the interior woods road network on the Cows lands to the north. No evidence of a recent fire event was noted.

Desired Future Condition: The long-term objective for this stand is its development into a mature all-aged species diverse forest community. Seedlings will continue to establish themselves beneath the canopy shade. Since red oak crops live for a longtime, the regeneration of this stand will be addressed in the future.

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index	DCR/FIA Growth Rate (MBF/yr.)
Stewardship Green Cert.	1.03	BM	6	4.5 to 8	80	4 cords	60:WA	NA

Water Quality Concerns: The goal for water quality protection on these watershed lands is the prevention of the movement of sediment and nutrients from the upland forests through the soils and streams into the Whiting Street Reservoir. These sites are the last barrier for filtration of sediment and toxins in the upper slope run-off before it enters the small spring field to the west of Adam Swamp. Retention of full canopy and shrub cover will protect the forest soils from displacement.

Silviculture Status: Not suitable.

Terrain/Topography: This stand hugs a moderate slope with a southeast aspect due east of a major moist depression within Stand #1.

Soils: This stand grows upon the steeply sloping southern flank of a small hill west of Adam Swamp. Stone, boulders, and exposed bedrock cover the soils surface.

Timber Harvesting: Not applicable.

Overstory: The area was harvested heavily in a timber trespass operation about fifteen to twenty years ago. An immature hardwood stand with some pioneer species re-seeded the area. The composition of this young stand includes red maple, (50% of stocking), yellow birch, black birch, gray birch, pin cherry, black cherry, beech, red oak, and sugar maple. These trees have an average height of less than thirty-five feet. Scattered poor quality, severely diseased beech trees dot the overstory. The beech bark disease symptoms have begun their appearance even on this young crop. The quality of the sapling and pole red maple is poor, as they are from stump sprout origin. The gray birch trees began a decline and many stems are arcing over from ice and snow loads. The red oak and northern hardwood saplings and pole trees have good form and potential value.

Regeneration: Seedling stocking is very low due to the shade of the dense sapling layer. Some seedlings of all of the upper layer species were cited with dominance by beech.

Shrub and Herbaceous Cover: Cover was sparse on this slope with stocking of maple leaved viburnum, mountain laurel, lycopodium, partridgeberry, and New York fern.

Invasive Plants: No invasive plants were noted across the forest floor in this stand.

Habitat: Dense sapling stand offer ideal cover for songbird nesting and breeding. Moose rubbings on the immature red maple and beech were common in the small stand. Despite their obvious decline, the maturing beech trees produce ample mast each year. The cambium rot provides denning and nesting cavities for birds and mammals.

Fire Protection: This stand is accessible from the south with four-wheel drive pumper truck. Water could be pumped form Tucker Brook. No evidence of a recent fire event was noted.

Desired Future Condition: The long-term objective for this stand is its development into a species rich, healthy, resilient all-aged forest ecosystem capable of natural water filtration. In the broader landscape this small stand could be viewed as one grouping of the youngest age class. It will continue its natural development through the next few cutting cycles.

Objective	Stand #	Forest Type	Stand Area (acres)	MSD or Size Class (inches)	Basal Area (sq.ft./ac)	Volume Per Acre	Site Index	DCR/FIA Growth Rate (MBF/yr.)
Stewardship Green Cert.	1.04	RMZ	6	NA	NA	NA		

Narrative: Riparian areas are lands that occur along and within watercourses and water bodies. On this property they include the southern section of Adam Swamp, the Tucker Brook channel and banks, and various spring seep drainages. The largest delineated riparian zone is the small tip of Adam Swamp along the northern bound of the property. The terrain is level here, and the swamp site sits in a depression nestled between several small knolls. Adam Swamp is a classic riverine wetland with the headwaters of Tucker Brook flowing through its center core and following the gradient southward. Tucker Brook flow originates from the groundswell beneath Adam Swamp and the numerous spring seeps across the property. Another small wetland lies at the western tip of the property within a shallow depression that fills with run-off from the west and ground water.

These wetlands function as wildlife habitat, support for the food chain across this habitat, a surface water retention and detention site, a ground water recharge site, and nutrient transformation area. Swamps collect sediment and dissolved materials as water drains off the higher landscape. Adam Swamp serves a valuable filtering capability as it intercepts water running off from the upland sites. The headwaters of tucker brook pass through this area and dump any excess nutrients, pollutants, and sediments picked up. Furthermore, this area provides crucial atmospheric maintenance function as carbon is stored within wetland plants and the deep muck soils.

Common native wetland vegetation was recorded in the waters and on the shoreline. Plants cited include: speckled alder, shadblow, buttonbush, silky dogwood, witchazel, illex, sensitive fern, maiden hair fern, cinnamon fern, new York fern, sweetflag, bluestem, and aster. Sedges, reeds, cattails and pond lily remnants were present in the shallow waters of the swamp.

Invasive Plants: The invasive plant community is minimal along the Adam Swamp shoreline. Individual stems of Japanese Barberry and Winged Euyonomous were noted along the drier shoreline areas. These plants do not pose a threat to the native community at this point, and the overstory shade from the surrounding forest should prevent their spread into the interior forest. Their stocking rating is a C on a simple A to C metric indicative of very low density.

Habitat: Dense shrub cover provides forage and breeding sites for woodcock, ruffed grouse, and wetland songbirds such as the Canadian warbler. Sign of use of these areas by raccoon, white tailed deer, pileated woodpecker, and coyote were noted during the field inventory. All of the native shrubs produce palatable fruit crops each year. The dense hemlock groves along the shore

line provide ample perching sites for birds and shade on the water's edge and the Tucker brook channel.

Fire Protection: Water is readily available from the reservoir for protection in the event of a fire. No fire events have occurred across this area for decades, and the threat of fire hazard here are quite low.

Desired Future Condition: These sites function as core habitat and water filtration strips across the landscape. No disturbance is recommended in these sites.



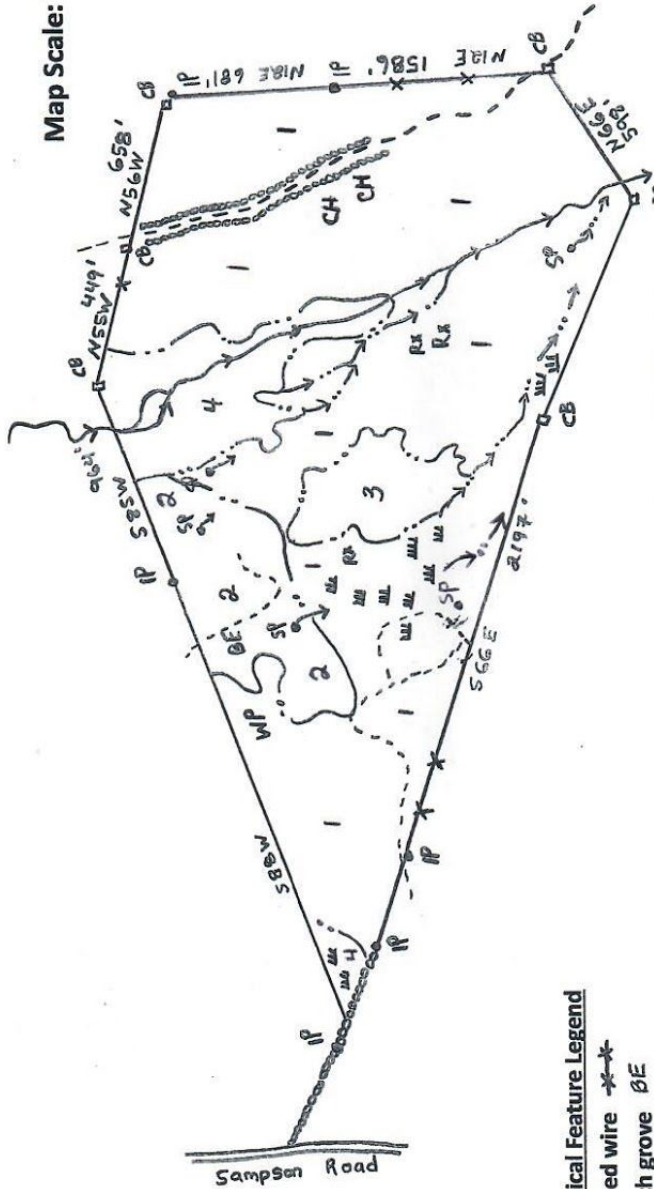
HOLYOKE WATER WORKS HUNTINGTON -2 PROPERTY

Located Near Sampson Road

Huntington, Massachusetts

Green Certified Forest Area: 96.6 acres

Magnetic North
Map Scale: 1 inch = 660 feet



Physical Feature Legend

- Barbed wire *-*
- Beech grove BE
- Cellar hole CH
- Cement bound □ CB
- Extensive rock outcrops RX
- Hydric soils/Swamp site
- Iron pipe IP
- Old town road
- Recreation trail
- Spring seep
- White pine grove WP

Forest Stand Legend- 96.6 Total Acres

- #1: HH: Hemlock and Hardwoods= 67 acres
- #2: OH: Red Oak and Hardwoods = 11.6 acres
- #3: BM: Beech, Birch, and maples = 7 acres
- #4: RZ: Riparian zone, swamps, and Marshes = 10 acres

Map prepared by Wigmore Forest Resource in November 2016 from tax maps, field GPS assessment, and abutter survey maps and Chapter 61 management plan maps. This is not a survey map.

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

Owner(s) 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