Wildlife Habitat Assessments
of Haverhill Conservation Area Forests

Summer 2013

Prepared by Liz Newlands

Mass Audubon Ecological Extension Service

Introduction

Ecologists from the Mass Audubon Ecological Extension Service conducted site visit to seven City of Haverhill conservation properties during late May and June in the spring of 2013:

Kenzoa Lake

Wheeler Woods

Dead Hill Reservoir

Crystal Lake (including Crystal Farms and Crystal Gorges)

Gale Hill Reservoir

Meadow Brook

East Meadow Brook

We first reviewed Forest Management Plans prepared for Kenzoa Lake and Upper East Meadow River, noting how forestry plans could affect habitat. We then conducted wildlife habitat assessments at all properties, making a point to visit stands delineated in management plans to the best of our ability. These assessments were done under a "rapid ecological assessment" (REA) model which allows for the identification of key features within a property, and calls attention to threats to those resources. An REA is particularly useful when limited time and resources are available, as was this case for this project.

During assessments, we navigated trails within the properties, noting various forest and aquatic communities present, as described by Swain and Kearsely (2001) in the *Natural Community Classification of Massachusetts.* We also noted the dominant understory shrubs, saplings and herbaceous plants in the forested understory and include a list of these observations in Appendix A of this report. We also recorded all observations of animals heard and seen during site visits and we provide a list of these animals, as well as a list of species that likely inhabit each property, in Appendix B. Important habitat features, including vegetation structure - such as groves of oak and hickory trees, understories with abundant fruiting plants, and standing dead trees - were noted and are also included in this report. We then provide recommendations to protect and enhance wildlife habitat, with specific comments forestry management plans as needed.

In Section I, we present a description of the forest and aquatic communities present at each property, and review the wildlife values inherent within these natural resource areas. We provide a brief description of the various structural elements and features inherent to these communities, and review how they contribute to wildlife habitat. These characteristics are introduced again in Section II, where we present information specific to each property, including a table indicating which of the various natural communities and habitat features were found within. Property descriptions also include a brief review of the important wildlife habitat features present, and conclude with specific management recommendations.

In general, management recommendations pay special attention to areas identified by the MA Natural Heritage and Endangered Species Program (MA NHESP) as *Priority Habitat* or *Estimated Habitat* for rare species, and to those delineated in *BioMap 2* as *Core Habitat* or *Critical Natural Landscape*. *Priority Habitat* demarcates the geographic extent of known habitat for state-listed rare species in Massachusetts: *Estimated Habitat* is a subset of *Priority Habitat* that is based on occurrences of rare wetland wildlife. Areas delineated in *BioMap2* are critical for ensuring the long-term persistence of rare and other native species and their habitats, exemplary natural communities, and a diversity of ecosystems. Activity within *Priority Habitat* or *Estimated Habitat* including forestry operations requires regulatory review, while those within *BioMap 2* areas to do not.

Overall, we recommend the City minimize forestry operations in all areas designated as *Priority Habitat, Estimated Habitat* and *BioMap2* areas in favor of natural forest succession. This will allow ecological processes to take place, and best protect rare and endangered species habitat, as well as a suite of other wildlife. However, in some instances more extensive forestry operations may help to enhance existing habitat and with that purpose in mind, forestry operations may be acceptable and even desirable. It is important to note that any forestry operations that take place in a *Priority* or *Estimated Habitat*, must be approved by the MA NHESP to protect endangered species habitat. We also recommend that the City of Haverhill exercise due diligence and contact the MA NHESP to discuss forestry operations planned in areas identified as vernal pool habitat as well as those delineated in *BioMap2* to best protect these ecologically significant areas and the important species they harbor.

In addition to the protection of important wildlife habitat, we also recommend that any forestry operations take into account the protection of aquatic resources. Many of the subject properties contain extensive marshes and swamps, riparian corridors, vast expanses of open water and woodland vernal pools. Each of these natural resources provide rich wildlife habitat and enhance forest biological diversity, and many hold additional value. Some of the properties contain aquatic resources that area a critical component of the city's public water supply system: from the reservoirs that hold water; to the streams feeding these reservoirs; to wetlands that purify groundwater. Therefore, we recommend that when working with foresters and logging operators, the City aim to develop and implement best management practices for the protection of aquatic resources.

Section I: Natural Community Descriptions

Description of Natural Communities and Habitat Features

Mixed Oak Forest – A broadly defined community with a mix of oak species and ericaceous understory situated on dry soils and exposed slopes. Provides abundant acorn mast and is important for White-tailed Deer, Black Bear, Gray Squirrels and other small mammals.

Oak-Hickory Forest – A variable forest type dominated by oaks with a mix of hickory species in lower densities.

Successional White Pine Forest – White Pine with scattered oaks and Red Maple. Shrub and herbaceous layers are variable. Blackburnian Warblers associated with dense pine forests. This forest type is also used by accipiters and forest generalist species such as Black-capped Chickadees and Blue Jays.

Early Successional Habitat – Young forest in transition. Characterized by thickets of shrubs or dense, young trees which are often shade intolerant. Pockets of this habitat type increase the biological diversity and provide wildlife habitat for a variety of species that rely on more open conditions that an older, more mature forest.

Hemlock Ravine – Dense hemlock canopy with little undergrowth. Can occur within a White Pine community. Hosts Acadian Flycatcher, Black-throated Green Warbler, and Winter Wren. Provides important cover for larger mammals during winters with deep snow. Many hemlock stands are in decline or have completely succumbed to the Hemlock Wooly Adelgid insect.

Successional Northern Hardwoods Forest – Broadly defined community often showing signs of disturbance. Aspen, birch, maple and cherry often dominate. Understory is often open. Wildlife varies with age/size of trees.

Red Maple Swamp – Deciduous swamp dominated by Red Maple with occasional Yellow Birch, Black Ash and sometimes conifers. Speckled Alder, Highbush Blueberry, Button Bush and Red Maple saplings are often dominant in the understory.

Shrub Swamp – Occur in basin depressions and in riparian zone where soils are wet soils from flooding. Species composition is highly variable though Speckled Alder, Highbush Blueberry, Button Bush and Red Maple are often dominant.

Marsh – Two types of marshes are classified: deep and shallow. Deep marshes tend to hold standing water 6-inches to 3-feet deep, while shallow marshes are less than 6-inches deep. Both communities are dominated by emergent grasses with scattered herbaceous plants and occasional shrubs and saplings.

Vernal Pool – Small shallow depressions that occur in a variety of settings, from woodlands, swamps, and wet meadows. These provide important habitat for a suite of amphibians which breed exclusively in vernal pools. Adjacent upland forests provide important year-round habitat.
Snag –Dead tree left standing that provides shelter, nests or perches for a wide variety of birds and small mammals. Except for where they threaten visitor safety, we recommend that snags remain in the forested landscape for their important structural value to wildlife.

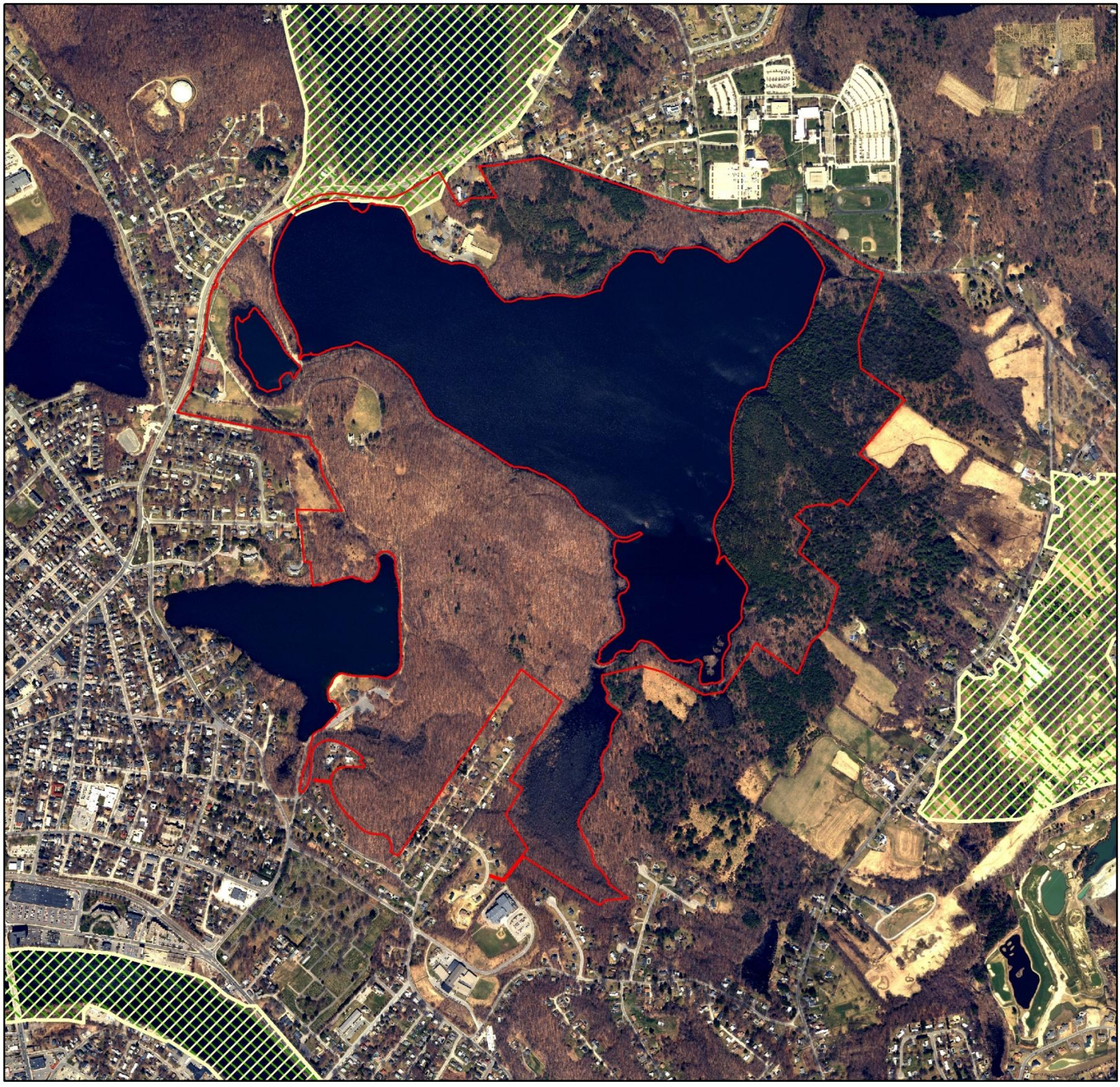
Den Site – Downed logs, tip-up mounds, snags, wolf trees, and rocky outcrops all provide opportunities for wildlife to construct dens or otherwise find shelter.
Nest Cavity –Important shelter for many species, including, raccoons, fisher, and a variety of birds. Cavities in trees located within interior forests as well as forest edges are important.

Mast –Seeds and fruits and produced by nut trees such as oak, beech and hickory. Production is cyclical, Mast provides important food for a variety of wildlife such as squirrels, Wild Turkey, White-tailed Deer, and Black Bear.

Legacy Tree – Large, fully mature tree that provide important wildlife habitat including shelter, nest cavities, and food production.

Nurse Log – A large, fallen tree decomposing in the forest which provides shade, nutritional support, water retention and disease protection to nearby seedlings.

Section II: Property Descriptions



Kenzoa Lake Conservation Area
Haverhill MA

0 500 1,000
Feet

1:16,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Kenzoa Lake

Priority/Estimated Habitat	Yes	**x**	No	
BioMap 2	Yes	**x**	No	

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	**x**	Open Water	**x**	Snags	**x**	Monitor and treat invasive species
x	Oak-Hickory Forest	**x**	Marsh	**x**	Den sites	**x**	Monitory/treat Wooly Adelgid
x	Successional White Pine Forest	**x**	Red Maple Swamp	**x**	Nest cavities	**x**	Protect rare species and core habitats
	Early-successional Shrublands		Shrub Swamp	**x**	Mast	**x**	Protect water supply
	Hemlock Ravine		Low-energy Riverbank		Blow downs		
	Successional Northern Hardwoods	**x**	Vernal Pool				

x **Other** (describe) Pockets of rich soils with lower acidity are indicated by the presence of towering White Ash canopy occurring with understory species such as Hop-hornbeam, Basswood, Doll's Eyes and Shinleaf. Many oak trees have wide, open branches indicative of a time when these were solitary trees in cleared woods, where their growth was not confined by neighboring trees.

Forest Characteristics

Kenzoa Lake features a large, centrally located reservoir situated among undulating hills to the south and east, and a relatively flatter area to the north. An extensive Oak-Hickory forest lies to the south-west of the pond, while a Successional White Pine forest lies to the east. As noted above, there are patches containing towering White Ash trees, Basswood trees, and an herbaceous layer which are all indicative of enriched soils. These areas are typically located on the steeper slopes within the Oak-Hickory forest community, where landform concentrates nutrients in depressions within the grade. There is also a pine plantation to north of Kenzoa Lake, with an open understory and carpeting of ferns and wild lily-of-the-valley.

The shrub/sapling and herbaceous layers tend to be sparse on steep slopes and under pines, and denser on gentler slopes. Several small wetlands located in the southern portion of the property are also depauperate. There are several openings in the forest canopy where large trees have fallen. These openings are lush with vegetation, including pioneer species such Raspberry and

Blackberry bushes, as well as seedlings of canopy trees that were released with the increased sunlight and lack of competition from other vegetation.

Important Wildlife Habitat Features

Kenzoa Lake, several smaller wetlands (which may function as vernal pools) – and marshes and swamps at the lake's margins - all enrich the biological diversity of the forests at this property. These water resources are valuable to upland as well as semi-aquatic wildlife. I witnessed a male and female Wood Duck high in the branches of an open-grown White Oak near the lake, calling to each other. Wood Ducks nest in large cavities and it likely the pair were raising their brood here before leading them to the safety of the water.

Management Recommendations

Many of the areas with rich soils areas have been identified for their potential to produce high-quality forest timber products. From an ecological standpoint, these soils support a rich diversity of flora atypical of the surrounding landscape. Therefore, we recommend maintaining these stands, especially legacy oak trees, and standing dead trees for their value as nesting, and denning sites as well as oak mast.

The stand of pine on the north shore is aesthetically pleasing. However, this community offers little in the way of wildlife habitat and floristic diversity. Furthermore, these stands are vulnerable to wind throw and disease due to their monotypic structure and diversity. We recommend thinning the plantation stand to allow the regeneration of suppressed canopy trees such as oaks and hickories, which are sparsely scattered throughout. The Successional White Pine forest to the east of the lake could also benefit from select thinning to promote a more diverse forest community with greater variety of habitat types, and overall an increased biological diversity.

Priority and *Estimated Habitat*, as well as *BioMap 2* areas, are confined to core wetlands in the extreme north and south of the property and do not apply to the majority of uplands in the Kenzoa Lake Conservation Area. Forestry operations conducted far from these areas are not likely to have an impact and will not require permitting by NHESP.

Wheeler Woods Conservation Area
Haverhill MA

0 500 1,000 Feet

1:8,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Wheeler Woods

Priority/Estimated Habitat	Yes	**x**		No
BioMap 2	Yes	**x**		No

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	x	Open Water		Snags		Monitor/treat invasives
	Oak-Hickory Forest		Marsh		Den sites		Monitor/treat Wooly Adelgid
x	Successional White Pine Forest	x	Red Maple Swamp	x	Nest cavities	x	Protect rare species and core habitats
	Early-successional Shrublands		Shrub Swamp	x	Mast		Protect water supply
x	Hemlock Ravine		Riparian Zone	x	Blow downs		
	Successional Northern Hardwoods		Vernal Pool				

x **Other** (describe) Species of conservation concern in adjacent pond: Eastern Pond Mussel, Tidewater Mucket and Least Bittern.

Forest Characteristics

Wheeler Woods is located in the northeast corner of Chadwick Pond. The woods are dominated by a Mixed Oak Forest which slopes gently toward a wetland complex located in a small inlet. Patches of High- and Low- bush Blueberry, as well as huckleberry, are scattered under stands of White and Red Oak American Beech, and White Pine. The understory is open, except at the wetland edge which is lush with Sweet Pepper-bush and Highbush Blueberry.

Important Wildlife Habitat Features

The point extending out into Chadwick Pond is located within *Priority* and *Estimated Habitat*, as well as *BioMap2* Critical Natural Landscape. This area provide important wildlife habitat rare and endangered species. Additionally, the extensive upland/wetland edge, or *ecotone*, along the water is an important wildlife feature, providing habitat for both upland and semi-aquatic species. Numerous cavities and snags here provide shelter and perches for wildlife.

Management Recommendations

Because of the important wildlife habitat identified on the point, we recommend minimizing forestry operations for timber production to allow natural forest succession to take place on the here. We also recommend that the city exclude car access to point. The road bisects important habitat which can be disruptive to wildlife, and it presents a potential hazard to water quality should there be problems with vehicles leaking fluids. Forestry operations in uplands on the eastern portion of the property should implement best management practices to protect the wetlands to the north, and to maintain mature beech, hickory and oak important value as mast.

Dead Hill Reservoir
Haverhill MA

0 500 1,000 Feet

1:12,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Dead Hill Reservoir

Priority/Estimated Habitat	Yes	No	**x**
BioMap 2	Yes	No	**x**

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities	Habitat Features		Management Recommendations	
x	Mixed Oak Forest	Open Water	**x**	Snags	**x**	Monitor/treat invasives
	Oak-Hickory Forest	Marsh		Den sites	**x**	Monitor/treat Wooly Adelgid
x	Successional White Pine Forest	Red Maple Swamp		Nest cavities		Protect rare species and core habitats
	Early-successional Shrublands	Shrub Swamp	**x**	Mast		Protect water supply
x	Hemlock Ravine	Riparian Zone		Blow downs		
	Successional Northern Hardwoods	Vernal Pool				

Other (describe)

Forest Characteristics

The Dead Hill Reservoir property lies on a south-east facing, moderately steep slope (a much steeper northern slope supports a small recreational ski facility which is located off the property). The majority of woodlands consist of Mixed Oak Forest and Successional White Pine Forest, the latter being confined mostly to a broad area near the base of the southern-most slope. A grove of Eastern Hemlock borders a small wetland flowing into Johnson's Pond at the base of this slope. The oak forest is young, with small trees and a dense understory dominated by American Beech, oaks and hickories, Wild Raisin, Sassafras, Black Cherry and White Pine. The herbaceous layer is variable with dense patches of Hay-scented Fern and Wild Lily-of-the-Valley, and a scattering of Partridgeberry, Virginia Creeper, and Jack-in-the-Pulpit.

Alien, invasive plant species are present throughout the property and are particularly abundant in areas adjacent to ski operations. In addition to invasive plants, the non-native Hemlock Wooly Adelgid, a non-native insect pest, has defoliated many of the hemlock trees in the grove to the south.

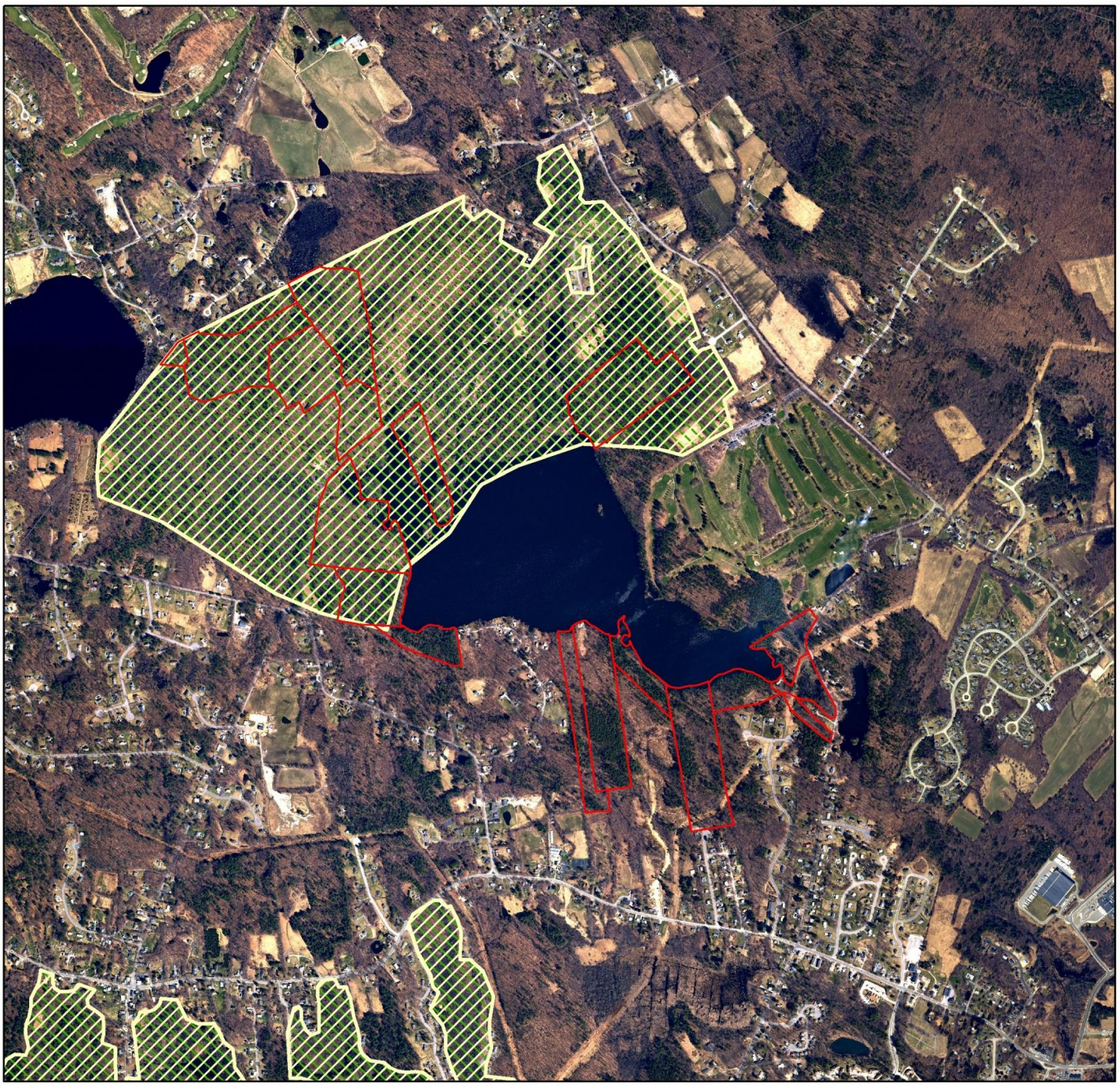
Important Wildlife Habitat Features

The property - with its mature, contiguous forest, close proximity to open water and hemlock grove - provides a wide range of habitat types contributing to forest biological diversity. The site also functions as a wildlife corridor, linking several large aquatic and upland areas in the landscape.

Management Recommendations

Forestry operations on the steeper slopes on this property should implement best management practices to minimize potential impacts to the site, especially erosion since forestry operations often create new openings along forest roads, landings, and the extraction area. Some pre-treatment of existing invasive plants may be required before extracting operations commence to minimize their spread.

The hemlock grove at the base of the southern slope provides important cover for wildlife, especially in winters with deep snow. We recommend maintaining these trees, and monitoring them for spread of the wooly adelgid.



Crystal Lake
Haverhill MA

0 500 1,000
Feet

1:20,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Crystal Lakes Conservation Area

Priority/Estimated Habitat	Yes	**x**	No
BioMap 2	Yes	**x**	No

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	**x**	Open Water	**x**	Snags		Monitor/treat invasives
x	Oak-Hickory Forest	**x**	Marsh	**x**	Den sites	**x**	Monitor/treat Wooly Adelgid
	Successional White Pine Forest	**x**	Red Maple Swamp	**x**	Nest cavities	**x**	Protect rare species and core habitats
	Early-successional Shrublands		Shrub Swamp	**x**	Mast	**x**	Protect water supply
x	Hemlock Ravine		Riparian Zone		Blow downs		
x	Successional Northern Hardwoods	**x**	Vernal Pool				

x **Other** (describe) Acidic rocky outcrops and hemlock ravines at Crystal Gorges – a stunning natural feature - which could provide denning sites for porcupine, bobcat, black bear, fox, coyote and other wildlife. Species of conservation concern: Blue-spotted Salamander in woodlands.

Forest Characteristics

The Crystal Lake Conservation Area consists of three discrete sections: Crystal Shores, Crystal Gorges and Crystal Lake East. Each has its own unique forest communities and wildlife values.

Crystal Shores lies on the northwest corner of Crystal Lake. It is predominantly low-lying with a small upland knob. Successional White Pine Forest and pine plantation dominates the forest community, tall oaks are scattered throughout. The understory is dense in low-lying eastern portions of the shores near smaller pools of open water that are rimmed with marsh vegetation. In the uplands, Wild Lily-of-the-Valley and ferns carpet the forest floor, with little vegetation in the shrub and sapling layer. A small Hemlock Ravine lies several hundred feet inland from the western shore of the lake: the understory here is all but barren due to low light conditions.

Crystal Gorges is a remarkable natural feature and as the name suggests, several ravines wind through the property. The tops of the ravines feature dry, acidic ridges scattered with small oak and hickory trees; intermittent streams in groves of hemlock lie at their feet.

The third section, Crystal Lake East, lies on the extreme south-east portion of Crystal Lake, sloping gently to the north toward the water. This section is dominated by Successional White Pine, pine plantations, and Mixed Oak Woodlands. The understory here tends to be sparse, due to the shade from pines. It is dominated by Hay-scented Fern, Partridge Berry, and Wild-Lily-of-the-Valley.

Important Wildlife Habitat Features

Wetlands rimming the northern margin of the pond, as well as the Crystal Gorges area, have been designated as *Priority*, *Estimated Habitat*, as well as *BioMap 2* habitat. The area contains numerous vernal pools which provide critical breeding habitat for the state-listed Blue-spotted Salamander in the spring. The adjacent uplands provide important year-round habitat for these salamanders. Furthermore, the extensive rocky outcrops throughout the property provide denning opportunities for small mammals such as Bobcat, Raccoon, and possibly Porcupine or Black Bear.

Management Recommendations

Overall, we recommend minimizing forestry operations for in all of Crystal Gorges, as well as areas designated as important habitat, to allow natural forest succession to take place. This will help to protect rare and endangered species and their habitats. Operations to enhance rare species habitat or to manage for invasive Wooly Adelgid could be conducted, but must done in consultation with certified foresters, state foresters and biologists from the MA NEHSP. We also recommend monitoring for Hemlock Wooly Adelgid and invasive plant species.

Stands of Successional White Pine forest in the Crystal Shores and Crystal Lake East areas would benefit from thinning to allow the release of suppressed species in the understory. This will increase the structural and compositional diversity of the forest by promoting the growth of different age and size classes, as well as species of trees. In time, the resulting forest will provide a wider range of habitats thereby promoting a biological diversity. A more complex and divers forest will also have a greater resiliency to periodic disturbance, such as fire and disease. It is important to note that some of the pine stands are near water, and best management practices should be implemented to protect water quality, aquatic habitat and public water supply.

Gale Hill Reservoir
Haverhill MA

0 500 1,000 Feet

1:10,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Gale Hill Reservoir

Priority/Estimated Habitat	Yes	No	**x**
BioMap 2	Yes	No	**x**

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	Open Water		Snags	**x**	Monitor/treat invasives	
x	Oak-Hickory Forest	Marsh		Den sites		Monitor/treat Wooly Adelgid	
	Successional White Pine Forest	Red Maple Swamp		Nest cavities		Protect rare species and core habitats	
	Early-successional Shrublands	Shrub Swamp	**x**	Mast		Protect water supply	
	Hemlock Ravine	Riparian Zone	x	Blow downs			
	Successional Northern Hardwoods	Vernal Pool					
	Other (describe)						

Forest Characteristics

This small conservation area straddles the peaks of Gale Hill and a nearby unnamed hill to the north. These hills are moderately to steeply sloped, and consist of thick layers of till. A small intermittent stream flows between the two, emptying into a wetland complex on the north side of Kenzoa Lake.

The site supports a Mixed Oak and Oak-Hickory forest with young and dense, with small diameter trees. Many aligned, downed trees seen on the eastern slope and these indicate wind disturbance. The understory is also dense with an accumulation of course, woody debris, tangles of shrubs and saplings released due to openings in the canopy. Some shrubs and saplings are dead and in decline, which detracts from an overall aesthetically pleasing experience found at other properties.

A water tower sites atop Gale Hill, and it appears there is also a composting operation here. This organic material may be the source of alien, invasive plants found along the open edge around the tower and scattered throughout the woods. Invasive species observed include Japanese Barberry, Oriental Bittersweet, shrub honeysuckle. The disturbed nature of the site

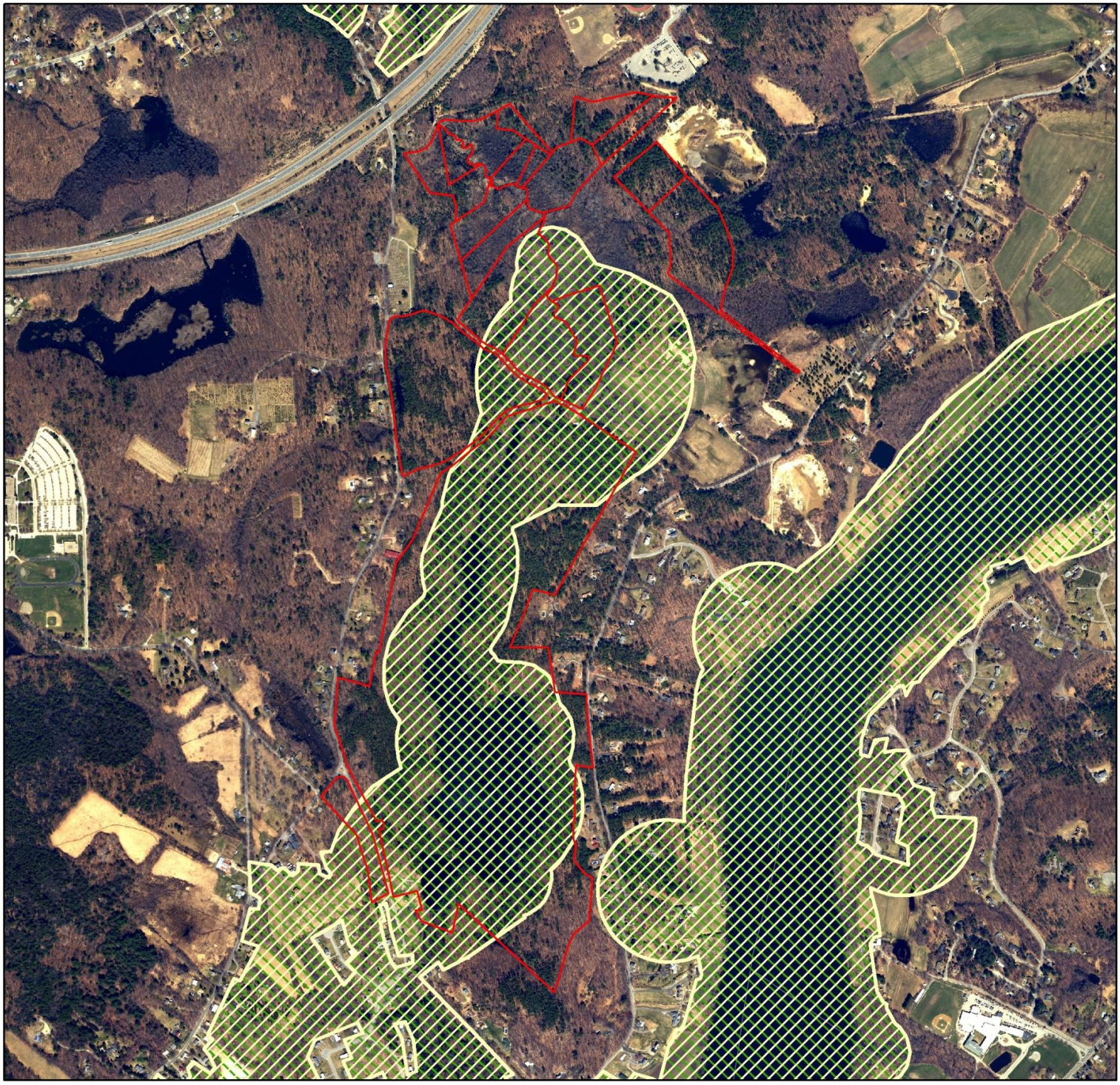
also likely contributes to the abundance of alien species present, since they often take root in areas where native plants have been uprooted or died back.

Important Wildlife Habitat Features

Because of its awkward shape, the surrounding residential development, and the presence of the water tower, the Gale Hill property provides marginal wildlife habitat. Forestry operations could improve the understory conditions of the site by thinning the abundance of course woody debris and releasing suppressed species. This would have the affect of allocating resources such as water and nutrients to select trees, thereby increasing their growth. This will help to bolster food and nesting resources on the property, and contribute to a more pleasing aesthetic.

Management Recommendations

We recommend treating invasive plant species as much as practicable. This may be particularly challenging due to the compost pile which likely harbors seeds that could be viable for many years to come.



Meadow Brook Conservation Area
Haverhill MA

0 500 1,000 Feet

1:15,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, priority and estimated habitats of rare species, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Meadow Brook Conservation Area

Priority/Estimated Habitat	Yes	**x**	No	
BioMap 2	Yes		No	**x**

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	**x**	Open Water	**x**	Snags		Monitor/treat invasives
x	Oak-Hickory Forest	**x**	Marsh		Den sites	**x**	Monitor/treat Wooly Adelgid
x	Successional White Pine Forest	**x**	Red Maple Swamp	**x**	Nest cavities	**x**	Protect rare species and core habitats
	Early-successional Shrublands	**x**	Shrub Swamp	**x**	Mast	**x**	Protect water supply
	Hemlock Ravine	**x**	Riparian Zone		Blow downs		
	Successional Northern Hardwoods	**x**	Vernal Pool				
	Other (describe)						

Forest Characteristics

The Meadow Brook Conservation Area features the Millvale Reservoir, created by the damming of the East Meadow River which flows in from the north. The reservoir is surrounded by stands of Successional White Pine Forest and a Mixed Oak Forest to the south. A large wetland complex lies in the northern portion of the property. It is dominated by forested swamp with a large marsh in the center and scattered patches of shrub swamp throughout. The understory varies and tends to be less dense in pine stands where Partridge Berry, Wild Lily-of-the-Valley, and Hay-scented Fern dominate.

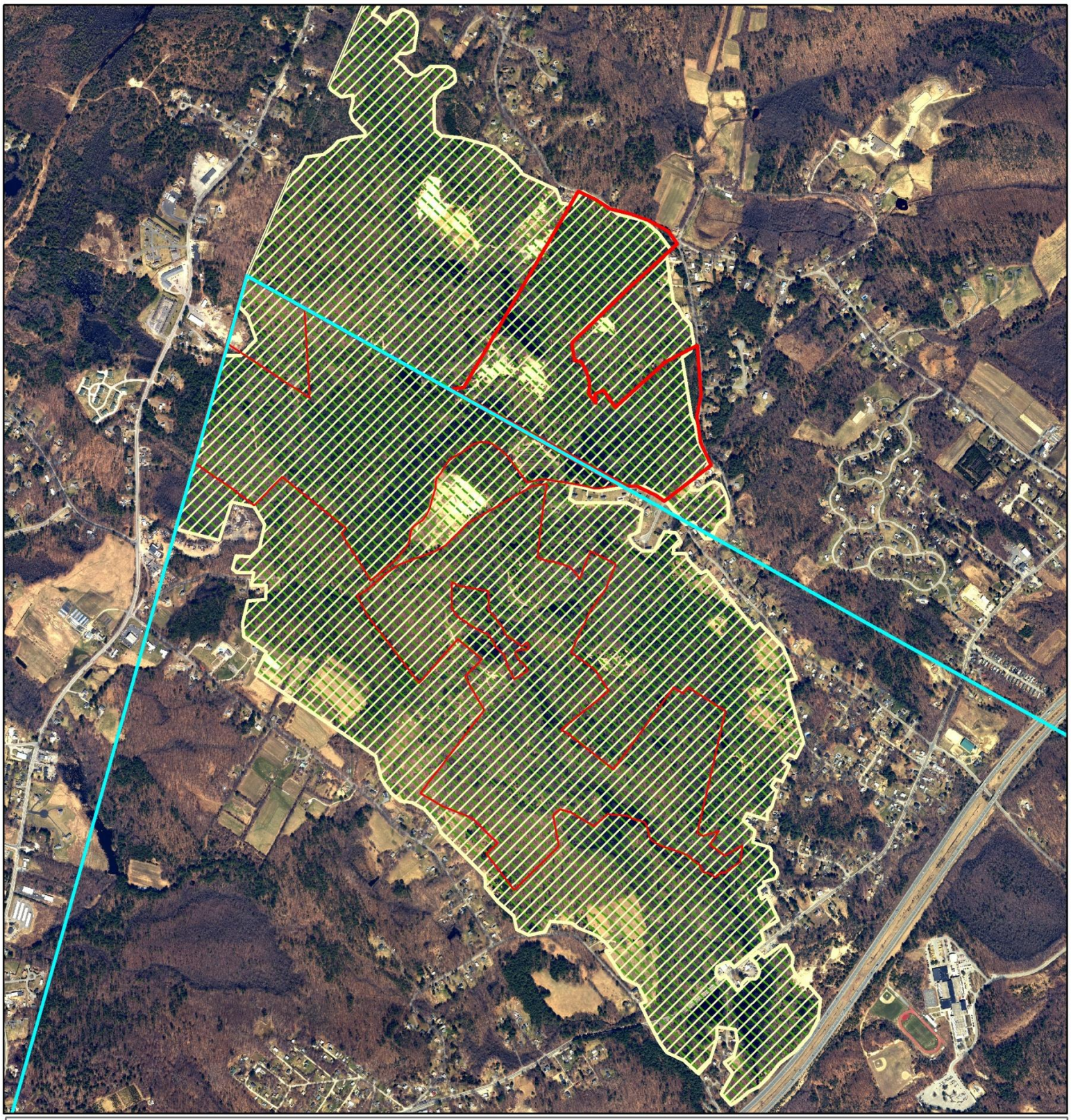
Important Wildlife Habitat Features

The open water and adjacent shores, including the large wetland complex to the north, are important habitat. These resource areas lie wholly within *Priority* and *Estimated Habitat*. The property also provides excellent landscape connectivity between the Upper East Meadow River property to the north and the Merrimac River to the east.

Management Recommendations

We recommend minimizing forestry operations and applying best management practices to protect important aquatic resources since they are used for public water supply . Any forestry done in *Priority* and *Estimated Habitat* must be done in consultation with biologists from the MA NHESP. Operations will likely need to take place during the winter months when the ground is frozen to minimize disturbance to wetland resources.

Stands of Successional White Pine forest would benefit from thinning to allow the release of suppressed species in the understory. This will increase the structural and compositional diversity of the forest by promoting the growth of different age and size classes, as well as species of trees. In time, the resulting forest will provide a wider range of habitats thereby promoting a biological diversity. The forest will also have a greater resiliency to periodic disturbances such as fire and disease. It is important to note that some of the pine stands are near water, and best management practices should be implemented here to protect water quality, aquatic habitat and public water supply.



Upper East Meadow River Conservation Area
Haverhill MA

0 500 1,000
Feet

1:18,000

Boundary

NHESP Priorty Habitats of Rare Species

NESHP Estimated Habitats of Rare Species

Data sources: 2008 ortho-photo, BioMap2, and boundary from Mass GIS.

Map produced by Mass Audubon Ecological Extension Service, Spring 2013

Site Upper East Meadow River

Priority/Estimated Habitat	Yes	**x**	No
BioMap 2	Yes	**x**	No

Overview of Wildlife Habitat

Upland Communities		Aquatic Communities		Habitat Features		Management Recommendations	
x	Mixed Oak Forest	**x**	Open Water	**x**	Snags		Monitor/treat invasives
x	Oak-Hickory Forest	**x**	Marsh	**x**	Den sites		Monitor/treat Wooly Adelgid
x	Successional White Pine Forest	**x**	Red Maple Swamp	**x**	Nest cavities	**x**	Protect rare species and core habitats
x	Early-successional Shrublands	**x**	Shrub Swamp	**x**	Mast	**x**	Protect water supply
	Hemlock Ravine	**x**	Riparian Zone		Blow downs		
x	Successional Northern Hardwoods	**x**	Vernal Pool				

x **Other** (describe) Abandoned gravel pits throughout the property provide nesting habitat for Blandings Turtle and important early successional habitat for a suite of migratory birds. Coniferous swamp as identified by Mass DEP.

Forest Characteristics

The Upper East Meadow River Conservation Area is in the northeast corner of Haverhill straddling the Merrimac town line. It is named for the river which flows through its center. Many wetland complexes lie adjacent to the river, including smaller streams, shrub and forested swamps, marshes, expanses of open water and small isolated vernal pools. Uplands are dominated by Mixed Oak and Oak Hickory forest with occasional stands of Successional White Pine Forest, the largest of which is located a parcel located in Merrimac. Areas dominated by oak and hickory have an abundance of High- and Low-bush Blueberries, as well as Huckleberries in the understory.

Abandoned gravel excavation operations are scattered throughout the property. Compared to the more mature forest in which they lie, these patches of young forest are open, with shorter, smaller diameter trees and a somewhat denser understory - particularly in the shrub and sapling layers. Here, Gray Birch and Trembling Aspen trees in the sapling layer are small and scattered, while Bracken Fern, Sweet Fern and seedling trees are scattered in the herbaceous layer.

Important Wildlife Habitat Features

This property is wholly within *Priority* and *Estimated Habitat*. It has also been identified as a core wetland area by *BioMap 2* for its wetland resource value, including numerous vernal pools and wildlife habitat. The site is known for Blandings Turtle, a state-listed threatened species, which requires a mix of marshes and swamps, as well as sandy openings and uplands, throughout its life cycle. In particular, early-successional habitat found in abandoned gravel pits provide excellent nesting habitat. This habitat is also important for other wildlife such as Indigo Bunting, Brown Thrasher, Blue-winged Warbler, and Chestnut-sided Warbler. As forests revert from farmland and reach a mature state, this habitat type is disappearing from the Massachusetts landscape and species that depend upon them are in decline throughout their range.

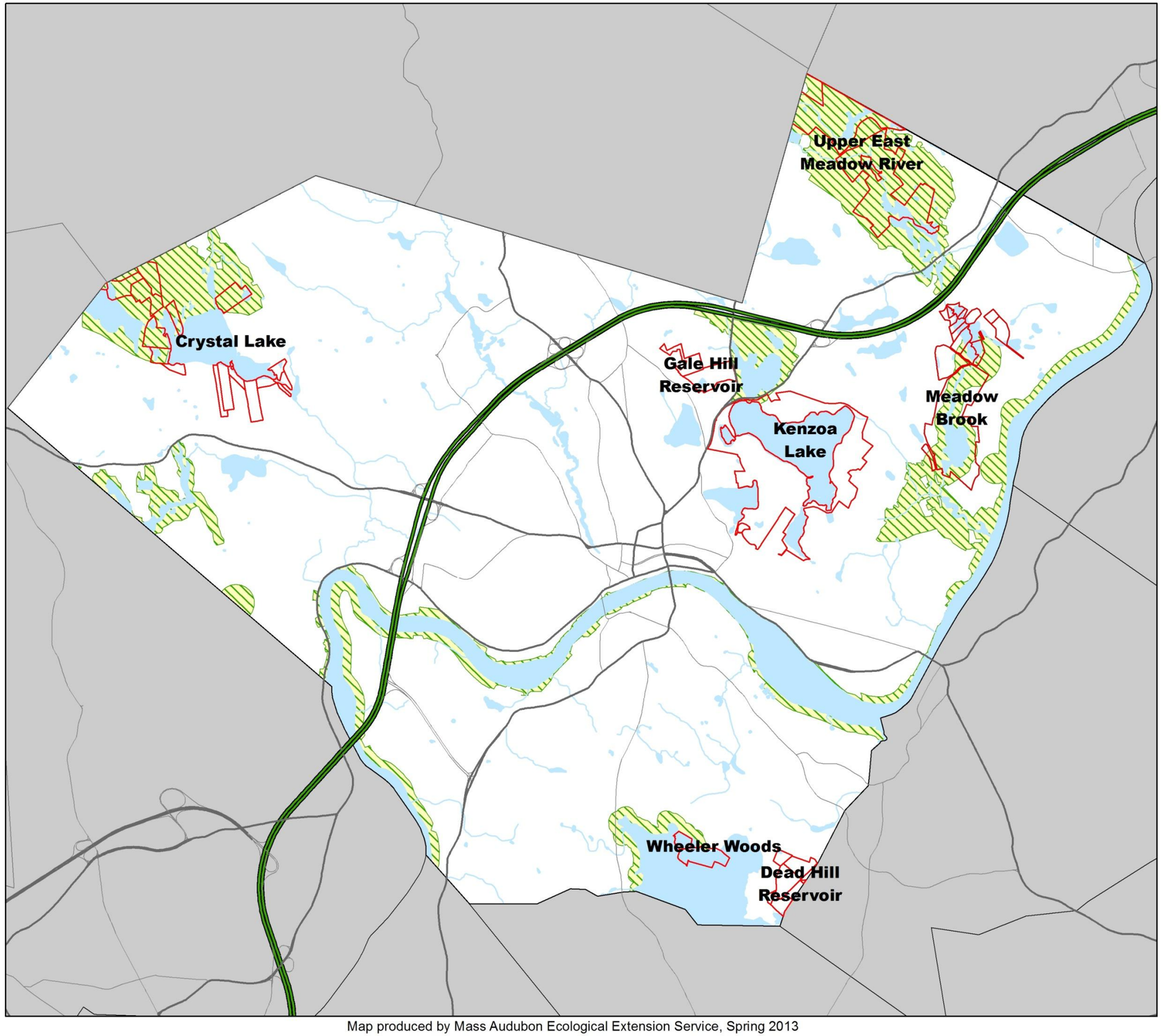
Management Recommendations

Managing the abandoned gravel excavation areas in a young forest condition is important to maintain early-successional habitat. This may require actions such as periodic thinning of the understory or removal of select canopy trees. It is also important to maintain patches of open sand associated with the gravel pits to provide important nesting habitat for the Blandings Turtle. The property lies within *Priority* and *Estimated Habitat*, and *BioMap 2* habitat: therefore all habitat management or enhancement, and all forestry operations, must be done in consultation with biologists from the MA NEHSP. These activities will likely need to be conducted during the late-fall through the early spring to minimize disruption to the Blandings Turtle. The potential disruption to vernal pools should also be considered when planning forestry operations.

Stands of Successional White Pine forest located throughout the property would benefit from thinning to allow the release of suppressed species in the understory. This will increase the structural and compositional diversity of the forest by promoting the growth of different age and size classes, as well as species of trees. In time, the resulting forest will provide a wider range of habitats thereby promoting a biological diversity: it will also have a greater resiliency to periodic disturbances such as fire and disease. It is important to note that some of the pine stands are near water, and best management practices should be implemented to protect water quality, aquatic habitat and public water supply.

NOTE: Due to extreme flooding during early and mid-June of 2013, field conditions at the time of the Upper East River Meadow survey were difficult. Many trails were flooded and access to portions of the property were somewhat compromised. We were only able to visit a small portion of the property south of

Brandy Brow Road. Remote sensing of aerial photographs, topographic maps, wetlands data layers, and NHESP data indicate patches of young forest described above occur in the southern portion of the property as well.



City of Haverhill MA
Subject Conservation Areas
Forest Management Recommendations

Property boundary

NHESP Priority Habitats of Rare Species

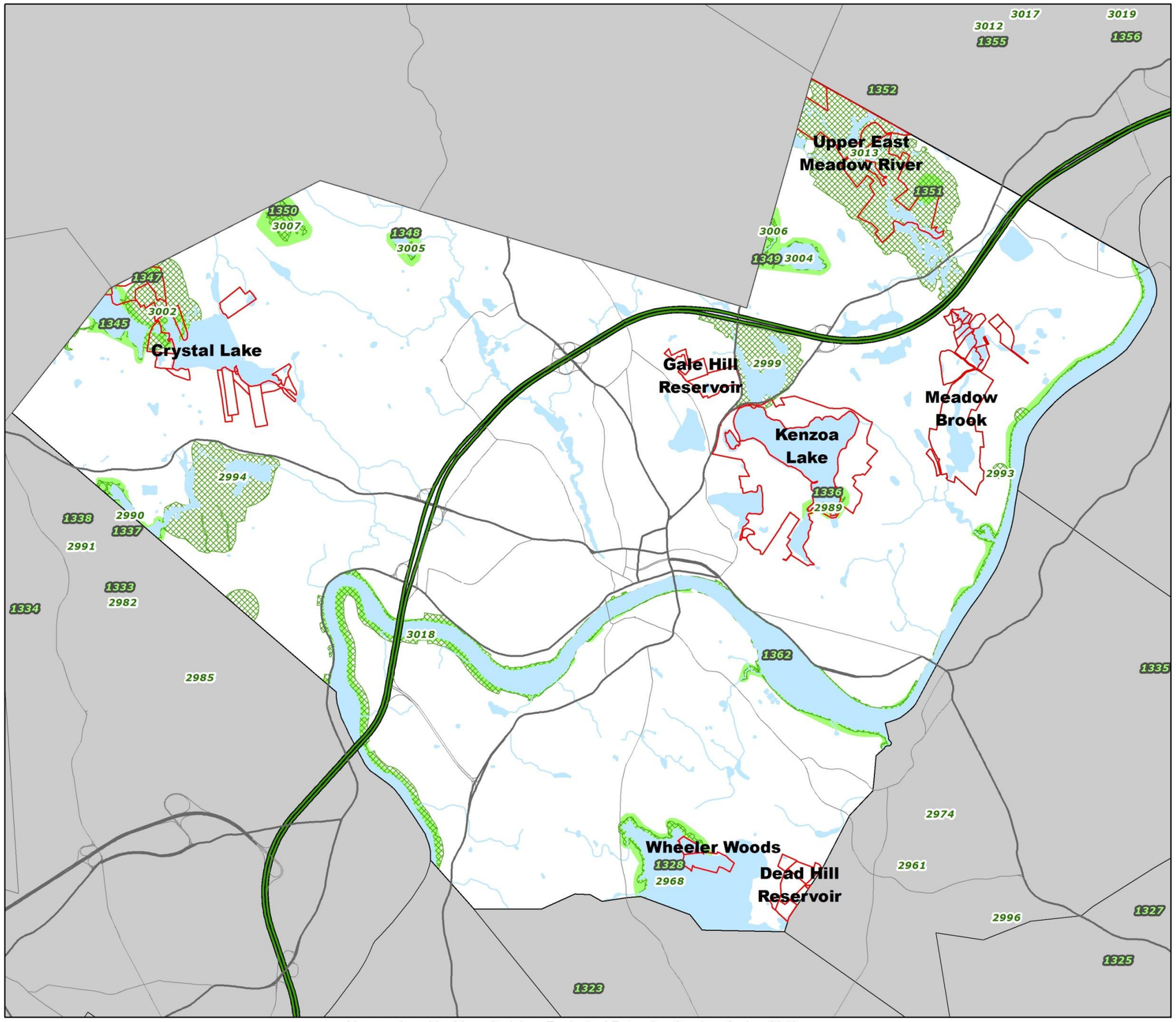
NHESP Estimated Habitats of Rare Species

Data sources: NHESP Priority and Estimated Habiat, and property boundary from Mass GIS.

1 Mile

1:50,000

Map produced by Mass Audubon Ecological Extension Service, Spring 2013



Map produced by Mass Audubon Ecological Extension Service, Spring 2013

City of Haverhill MA
Subject Conservation Areas
Forest Management Recommendations

Property boundary

BioMap2 Core Habitat

BioMap2 Critical Natural Landscape

Data sources: NHESP BioMap2,
and property boundary from Mass GIS.

1 Mile

1:50,000

b

Appendix B – Plants Observed

Native Species

Common Name	Scientific Name
Spotted Touch-me-not	*Impatiens capensis*
Lady Fern	*Athyriumfelix-femina*
Jack-in-the-pulpit	*Arisaema sp.*
Highbush Blueberry	*Vaccinium corymbosum*
Paper Birch	*Betula papyrifera*
Swamp Azalea	*Rhododendron viscosum*
Red Maple	*Acer rubrum*
Sweet Pepperbush	*Clethra alnifolia*
Arrowwood	*Viburnum dentatum*
Shagbark Hickory	*Carya ovata*
Catbriar	*Smilax sp.*
Goldenrod	*Solidago sp.*
Silver Maple	*Acer saccharinum*
Black Cherry	*Prunus serotina*
White Wood Aster	*Aster divaricatus*
American Beech	*Fagus grandifolia*
Black Oak	*Quercus velutina*
Cinnamon Fern	*Osmunda cinnamomea*
New York Fern	*Theylypteris novaboricensis*
Yellow Birch	*Betula allegheniensis*
Pignut Hickory	*Carya glabra*
White Ash	*Fraxinus americanus*
Raspberry	*Rhubus sp.*
Windflower	*Anemone pasqualle*
Wild Ginger	*Asarum canadense*
Hop-hornbeam	*Ostrya virginiana*
Round-leaf Pyrolla	*Pyrola americana*
Shin-leaf Pyrolla	*Pyrola elliptica*
Doll's Eyes	*Actaea pachyapoda*
Witchazel	*Hammamelis virginiana*
Interupted Fern	*Osmunda claytonianna*
Foam Flower	*Tiarella cordifolia*
Somon's Seal	*Polygonatum pubescens*
Canada Mayflower	*Maianthemum canadense*
Hay-scented Fern	*Dennstaedtia punctilobula*
Silky Dogwood	*Cornus amomum*
Chokeberry	*Prunus virginiana*

Common Name	Scientific Name
Flowering Dogwood	*Cornus florida*
Eastern Hemlock	*Tsuga canadense*
Sarsassparilla	*Aralia aucalis*
Oxalis	*Oxalis montana*
Senstive Fern	*Onoclea sensibilis*
Virginia Creeper	*Parthenocicus quinquefoilia*
Sassafrass	*Sassafrass albidum*
Wintergreen	*Gaultheria procumbens*
Indian Cucumber-root	*Medeola hispida*
Starflower	*Trientalis borealis*
Winterberry	*Ilex verticillata*
Princesspine	*Lycopodium*
Bristly Dew-berry	*Rhubus hispidus*
Striped Maple	*Acer pennsylvannica*
Trailing Arbutus	*Epigea repens*
Quaking Aspen	*Populus tremuloides*
White Pine	*Pinus strobus*
Dogbane	*Apocynum androsaefoluim*
Pink Lady's Slipper	*Cyprepedeum acaule*
Poison Ivy	*Toxicodendron radicans*
Wild Geranium	*Geranium maculatus*
White Oak	*Quercus alba*

Alien, Invasive Species	
Common Name	***Scientific Name***
Japanese Knotweed	*Polygonum cuspidatum*
shrub honeysuckle	*Lonicera morrowii (c.f.)*
Multiflora Rose	*Rosa multiflora*
Japanese Barberry	*Berberis thurnbergii*
Amur Cork Tree	*Phellodendron amurense*
Norway Maple	*Acer plantanoides*
Oriental Bittersweet	*Celastrus occidentalis*
Burning Bush	*Euonymus altatus*
Autumn Olive	*Eleagnus angustifolia*
Glossy Buckthorn	*Rhamnus frangula*
European Buckthorn	*Rhamnus cathartica*

Appendix B – Plants Observed

Wild Raisin	*Viburnum nudum*
Lowbush Blueberry	*Vaccinium angustifolium*

Garlic Mustard	Alliaria petiolata

Appendix B – Birds Observed

Common Name	*Scientific Name*	Crystal Shores	Upper East River Meadow	Kenzoa Lake	Wheeler Woods	Gale Hill Reservoir	Dead Hill Reservoir	Meadow Brook
American Crow	*Corvus brachyrhynchos*			x	x	x	x	x
American Goldfinch	*Spinus tristis*			x		x		
American Redstart	*Setophaga ruticilla*		x	x				
American Robin	*Turdus migratorius*		x	x		x	x	
Belted Kingfisher	*Megaceryle alcyon*	x						
Black-and-white Warbler	*Mniotilta varia*	x						
Black-billed Cuckoo	*Coccyzus erythropthalmus*			x				
Blue Jay	*Cyanocitta cristata*		x	x	x	x		
Brown Creeper	*Certhia americana*	x		x				
Brown-headed Cowbird	*Molothrus ater*		x		x		x	
Carolina Wren	*Thryothorus ludovicianus*			x				
Cedar Waxwing	*Bombycilla cedrorum*			x	x			
Chipping Sparrow	*Spizella passerina*		x					
Common Grackle	*Quiscalus quiscula*	x				x		x
Common Loon	*Gavia immer*	x						
Common Yellowthroat	*Geothlypis trichas*	x		x				
Downy Woodpecker	*Picoides pubescens*	x				x	x	x
Eastern Kingbird	*Tyrannus tyrannus*	x			x			
Eastern Bluebird	*Sialia sialis*				x			
Eastern Towhee	*Pipilo erythrophthalmus*		x					
Eastern Wood Peewee	*Contopus virens*			x	x		x	x
Gray Catbird	*Dumetella carolinensis*			x				
Great-crested Flycatcher	*Myiarchus crinitus*				x			
Indigo Bunting	*Passerina cyanea*		x					

Appendix B – Birds Observed

Mourning Dove	*Zenaida macroura*	x		x				x
Northern Cardinal	*Cardinalis cardinalis*	x						
Northern Flicker	*Colaptes auratus*		x	x				x
Northern Goshawk	*Accipiter gentilis*		x					
Baltimore Oriole	*Icterus galbula*	x		x				
Ovenbird	*Seiurus aurocapilla*	x		x	x			
Pileated Woodpecker	*Dryocopus pileatus*	x						
Pine Warbler	*Setophaga pinus*	x						
Red-bellied Woodpecker	*Melanerpes carolinus*			x	x		x	x
Red-breasted Nuthatch	*Sitta canadensis*	x					x	
Red-eyed Vireo	*Vireo olivaceus*	x		x	x	x	x	x
Red-tailed Hawk	*Buteo jamaicensis*		x					
Red-winged Blackbird	*Agelaius phoeniceus*				x			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				x			
Scarlet Tanager	*Piranga olivacea*	x			x		x	x
Tufted Titmouse	*Baeolophus bicolor*	x		x	x		x	
Veery	*Catharus fuscescens*	x						
Warbling Vireo	*Vireo gilvus*	x		x			x	
White-breasted Nuthatch	*Sitta carolinensis*			x		x		x
Wood Duck	*Aix sponsa*			x				
Wood Thrush	*Hylocichla mustelina*	x	x	x				x
Worm-eating Warbler	*Helmitheros vermivorum*				x			x

Appendix C – Wildlife Likely Present

	Crystal Shores	Upper East River Meadow	Kenzoa Lake	Wheeler Woods	Gale Hill Reservoir	Dead Hill Reservoir	Meadow Brook
Blue-Spotted Salamander		x					
Red-spotted Newt	x	x	x	x		x	x
Redback Salamander	x	x	x	x	x	x	x
Eastern American Toad	x	x	x	x	x	x	x
Fowler's Toad	x	x	x	x	x	x	x
Northern Spring Peeper	x	x	x	x			x
Gray Treefrog	x	x	x	x			x
Bullfrog	x	x	x	x			x
Green Frog	x	x	x	x			x
Wood Frog		x					
Northern Leopard Frog	x	x	x	x			x
Pickerel Frog	x	x	x	x			x
Common Snapping Turtle	x	x	x	x			x
Stinkpot	x	x	x	x			x
Spotted Turtle	x	x	x	x			x
Eastern Painted Turtle	x	x	x	x			x
Blandings Turtle		x					
Northern Water Snake	x	x	x	x			x
Northern Brown Snake	x	x	x	x	x	x	x
Northern Redbelly Snake	x	x	x	x	x	x	x
Eastern Garter Snake	x	x	x	x	x	x	x
Eastern Ribbon Snake	x	x	x	x	x	x	x
Northern Ringneck Snake	x	x	x	x	x	x	x
Eastern Milk Snake	x	x	x	x	x	x	x
Virginia Opossum	x	x	x	x	x	x	x
Short-tailed Shrew	x	x	x	x		x	x
Little Brown Bat	x	x	x	x	x	x	x
Big Brown Bat	x	x	x	x	x	x	x
Eastern Cottontail	x	x	x	x	x	x	x
Eastern Chipmunk	x	x	x	x	x	x	x
Woodchuck	x	x	x	x	x	x	x

d

Appendix C – Wildlife Likely Present

Gray Squirrel	x	x	x	x	x	x	x
Red Squirrel	x	x	x	x	x	x	x
Northern Flying Squirrel	x	x	x	x	x	x	x
Beaver	x	x	x	x			x
White-footed Mouse	x	x	x	x	x	x	x
Meadow Vole	x	x	x	x	x	x	x
Muskrat	x	x	x	x			x
Meadow Jumping Mouse	x	x	x	x	x	x	x
Coyote	x	x	x	x	x	x	x
Red Fox	x	x	x	x	x	x	x
Gray Fox	x	x	x	x	x	x	x
Raccoon	x	x	x	x	x	x	x
Fisher	x	x	x	x	x	x	x
Ermine	x	x	x	x			x
Long-tailed Weasel	x	x	x	x			x
Mink	x	x	x	x			x
Striped Skunk	x	x	x	x	x	x	x
River Otter	x	x	x	x			x
White-tailed Deer	x	x	x	x	x	x	x