



Figure 2.1: Dog walkers in the Beaver Brook Reservation, 2005 (Pressley Associates).

Chapter 2

Property Description and Existing Conditions

Introduction

The expanded Beaver Brook Reservation includes two properties, each with distinctive natural, cultural and recreational resources and characteristics, connected by the Beaver Brook watercourse: the 59-acre Beaver Brook Reservation and 245 acres of the former Metropolitan State Hospital – now Beaver Brook North Reservation. Adjacent to Beaver Brook North is 54 acres of the former hospital now owned by the City of Waltham on which DCR holds a conservation easement. These properties are located in the municipalities of Belmont, Lexington and Waltham. The RMP does not address the recent acquisition of Lot 1 at the northwest corner of Beaver Brook North Reservation.

This chapter presents a narrative description of existing features and characteristics of the expanded Beaver Brook Reservation, including natural and cultural resources, current site features and recreational resources, existing management, and adjacent land uses and open space. While this is an extensive chapter, it is by no means exhaustive; the information provided is derived from research, field investigation, and consultations by the DCR and its consultant team. The information contained in this chapter was prepared by the consultant team for the draft RMP during 2005-6. It has been minimally updated in 2009 to reflect

some changing site conditions since completion of the initial draft.

Natural Resources

LEC Environmental Consultants, Inc., (LEC) documented habitat types, plant community composition, invasive species, wildlife utilization, and potential endangered species habitat associated with the existing, 59-acre Beaver Brook Reservation and the recently acquired, 254-acre Beaver Brook North Reservation. This section describes the evaluation methodology, and provides initial findings and discussion based on data collected during a series of on-site field investigations conducted spring through fall in 2005. To date, no comprehensive natural resource inventory report has been completed for the entire expanded reservation, although there is some limited resource data for the Beaver Brook North Reservation as described below.

Relevant Documents

Several documents have been prepared that describe the wetland resources located within Beaver Brook North Reservation, including a *Water Withdrawal Feasibility Scope of Work* prepared in November of 1995 and a *Request for Determination of Applicability* (RDA) prepared in May of 1998 by

Cortell Associates. These documents focus on a proposed golf course within the southern portion of Beaver Brook North. A *Metropolitan State Hospital (MSH) Reuse Plan* prepared in June of 1994 by the Massachusetts Division of Capital Planning and Operations (DCPO now DCAM) contains a section describing the wetland areas and wildlife observations, but focuses instead on the use feasibility of the former Metropolitan State Hospital site. Documentation outlining or thoroughly describing the natural resource areas associated with Beaver Brook Reservation were not found.

Evaluation Methodology

LEC conducted several site evaluations in May, June, August, and November, 2005 in order to document habitat types, plant community composition, actual and potential wildlife utilization, potential endangered species habitat, and to evaluate potential management options for the site. LEC staff proficient in ecology, botany, soil science, and wildlife biology traversed the entire property during each site evaluation, utilizing binoculars, digital camera, soil auger, and botanical and wildlife field guides. Additionally, pertinent reference materials were also reviewed in conjunction with the site evaluations, including USGS Topographic Maps, FEMA Floodplain Maps, Interim Soil Survey for Middlesex County, Mass GIS Orthophotos, Natural Heritage and Endangered Species Program Estimated Habitat and Priority Habitat Maps, as well as additional reference materials and documents compiled to date for the site and portions thereof.

Habitat Types and Plant Community Composition

Habitat types were identified based on dominant cover types and hydrology. Surficial geology was evaluated through interpretation of the USGS topographic maps and the *Interim Soil Survey for Middlesex County* and through visual observation. Plant species comprising 5% or more of the vegetative cover were identified to the species level when morphologically possible. The relative pattern of plant distribution within each vegetative layer (canopy, sapling, shrub, lianas, and groundcover) was visually determined. Plant species within each layer were determined to occur as single plants, patches or clusters, entanglements, or as the dominant plant species. In addition, LEC observed the relative plant density between each vegetation layer, noting whether the sample layer is densely vegetated, contains moderately dense vegetation, is variably dense within the sample layer, or is sparsely vegetated. The presence and extent of invasive exotic species was also noted in accordance with *A Guide to Invasive Plants in Massachusetts*.¹

Actual and Potential Wildlife Utilization

During the site evaluations, LEC documented all observed and audible wildlife utilization with particular attention to avian species. Specifically, LEC documented all identifiable bird observations, vocalizations, as well as other wildlife signs, including tracks, scat, rubs, scrapes, nests, etc. In addition to observed and audible wildlife utilization, LEC evaluated the potential wildlife habitat utilization associated with the site, evaluating the extent and location of habitat types, habitat edges or ecotones, soil conditions, topography, hydrology, etc. LEC then compared these site conditions with the habitat requirements of wildlife species typical of similar landscapes and plant communities found throughout New England, as described in *New England Wildlife and Plants in Wetlands*.²

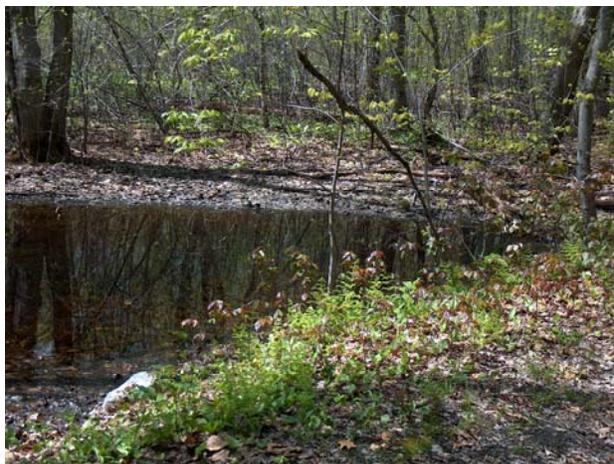


Figure 2.2: Vernal pool habitats in Beaver Brook North Reservation provide critical breeding and foraging sites for a variety of amphibians and reptiles, 2005 (LEC).

Endangered Species Habitat

In a letter dated June 6, 2005, the Natural Heritage and Endangered Species Program (NHESP) states that the then MESA listed Spotted Turtle (*Clemmys guttata*) have been observed within the vicinity of the site as recently as 1993. Several state-listed rare plants have also been observed within the vicinity of the property, including Violet Wood-sorrel (*Oxalis violacea*), Grooved Flax (*Linum sulcatum*), and Long-Leaved Bluet (*Houstonia longifolia* var. *longifolia*). Additionally, a network of vernal pools and potentially a portion of an expansive emergent marsh may also provide breeding habitat for Blue-Spotted Salamander (*Ambystoma laterale*) and Marbled Salamander (*Ambystoma opacum*). While species-specific studies have not been conducted on the site for these species, an evaluation of their potential utilization of the site was conducted based on a comparison of existing conditions and

species-specific habitat requirements described in the NHESP Fact Sheets, and other pertinent literature.

Findings and Discussion

Topography

Beaver Brook Reservation

The topography within the northerly parcel is largely controlled by the underlying bedrock, sloping moderately steeply toward the ponds and Beaver Brook, and descending southerly toward Trapelo Road. The relatively steep topography, exposed boulders, scattered rock outcroppings, and position in the surrounding topographic landscape indicate the area developed in the glacial landform known as a ground moraine. Soils within the northern part of the Beaver Brook Reservation parcel are predominantly comprised of Narragansett Hollis Rock Outcrop Complex, which formed in silt-mantled glacial till. These soils are typically comprised of friable fine sandy loam. Topography within the southern parcel of the Beaver Brook Reservation is less dramatic, with moderately steep slopes to the north becoming more level as the site extends southerly. The dominant soil type within the southern parcel is the Hinckley soil series. This soil series consists of stratified, gravelly and sandy soils typical of outwash terraces and plains.

Beaver Brook North Reservation

The topography varies significantly throughout Beaver Brook North Reservation. Three prominent drumlins occur within the northern and western portions of the site; the northern drumlin containing the former Metropolitan State Hospital campus, and the southwestern drumlin, known as Mackerel Hill, containing a water tank at its highest point. Portions of the third drumlin occur within the northwestern portion of Beaver Brook North. The drumlins' hillsides descend toward the surrounding ground moraine and glacial outwash landscape associated with Beaver Brook to the north. A variety of soil types occur within Beaver Brook North Reservation, including Montauk, Narragansett, Charlton-Hollis Urban Land Complex, Canton, and Swansea series. The first three soil series are typically associated with drumlins and formed in glacial till. Montauk friable sandy loam soils occur on Mackerel Hill, while Narragansett friable sandy loam soils occur on the northwestern drumlin. Charlton-Hollis Urban Land Complex occurs on the drumlin containing the former Metropolitan State Hospital. Canton soils are also comprised of friable sandy loam, but developed in ground moraine on the subject property, occurring between the glacial till drumlins and sandy outwash plain. Swansea soils are comprised of mucky, organics and are found within the flat, low-lying wetland areas associated with outwash plains. Swansea soils dominate the site's expansive emergent marsh. The MSH

Reuse Plan identified eskers on the property that provide views, dry upland areas, and also support diverse plant species³.

Habitat Types and Plant Community Composition

A diverse assemblage of habitat types including upland forest, successional shrub habitat, upland meadow, forested wetlands, emergent marsh, and wet meadow comprises the Beaver Brook Reservation and the newly acquired Beaver Brook North Reservation. Each habitat type varies in successional stage. Meadow and emergent marsh habitats are considered in primary succession, while successional shrub habitat is considered to be in secondary succession, and the forested areas are in tertiary succession. Each habitat type maintains its own unique plant community composition and character, and contributes to the overall habitat diversity and heterogeneity associated with the reservation. Plant species inventory lists for each habitat type are available in Appendix B. The MSH Reuse Plan also documented various flora species identified in Beaver Brook North Reservation.⁴



Figure 2.3: Pink Lady Slipper (*Cypripedium acaule*) is one of many forest-dwelling species contained within the northwestern portion of the former Metropolitan State Hospital land, now within the expanded reservation, 2005 (LEC).

Upland Forest

Several tracts of forested uplands occur throughout the site, typically occurring coincident with the drumlins and portions of the surrounding ground moraine and outwash terraces. Within the Beaver Brook Reservation, upland forest occurs along the glaciated upland landforms located along the eastern and western sides of Beaver Brook, the ponds and associated wetland habitats. Additional forested uplands are contained

within the western portion of the southern Beaver Brook parcel located south of Trapelo Road.

Forested uplands associated with the North Reservation occur within the prominent drumlins and portions of the surrounding ground moraine and outwash terraces. The upper part of the soil column within the upland areas exhibit a well-developed duff layer and organic-rich topsoil, while the subsoil horizon varies in depth and texture depending on the location within the landscape.

These upland areas appear to be the dominant habitat type within the expanded Beaver Brook Reservation, and are generally dominated by moderately dense canopies of either Sugar Maple (*Acer saccharum*) or Northern Red Oak (*Quercus rubra*). Included within these dominant species are clusters of Eastern White Pine (*Pinus strobus*), and individual White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), Black Cherry (*Prunus serotina*), Black Birch (*Betula lenta*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), and Hickory (*Carya* spp.). The shrub layers vary in density, and are typically vegetated with a preponderance of sapling canopy species, with clusters of sapling Norway Maple (*Acer platanoides*), sapling American Chestnut (*Castanea dentata*), Maple-Leaf Viburnum (*Viburnum acerifolium*), Tatarian Honeysuckle (*Lonicera tatarica*), Common Buckthorn (*Rhamnus cathartica*), European Buckthorn (*Rhamnus frangula*), Multiflora Rose (*Rosa multiflora*), and Japanese Barberry (*Berberis thunbergii*). Groundcover species also vary in density throughout the site, and include patches of Low-Bush Blueberry (*Vaccinium angustifolium*), Sarsaparilla (*Aralia nudicaulis*), False Solomon's Seal (*Smilacina racemosa*), Celandine Poppy (*Cheladonium majus*), Wood Anemone (*Anemone quinquefolia*), Lily-of-the-Valley (*Convallaria majalis*), Canada Mayflower (*Maianthemum canadensis*), Violets (*Viola* spp.), Garlic Mustard (*Alliaria officinalis*), Tree Clubmoss (*Lycopodium obscurum*), and Hay-scented Fern (*Dennstaedtia punctilobula*), with individual Trout Lily (*Erythronium americanum*), Star Flower (*Trientalis borealis*), Bracken Fern (*Pteridium aquilinum*), Wood Fern (*Dryopteris* sp.), and seedlings from the canopy and shrub layers.

Successional Shrub Habitat

This habitat type is typically associated with upland meadow habitats and meadow / forest edges that have not been maintained, and along the emergent marsh fringe. This habitat is characterized by the invasion of shrubs and sapling trees. Specifically, this habitat type occurs within the southern portion of the property, surrounding the former Metropolitan State Hospital building, and sparingly along the upland forest/upland meadow and wetland forest/emergent marsh interface

throughout the site. This habitat contains grasses and herbaceous plants, with clusters of shrubs and sapling tree species, particularly along the successional shrub habitat edge. Shrubs include clusters of Gray Dogwood (*Cornus racemosa*), Silky Dogwood (*Cornus amomum*), Tatarian Honeysuckle, Autumn Olive (*Elaeagnus umbellata*), Staghorn Sumac (*Rhus typhina*), and Meadowsweet (*Spirea latifolia*), with individual Flowering Dogwood (*Cornus florida*) and entanglements of Oriental Bittersweet (*Celastrus orbiculatus*) within upland areas; along with clusters of Speckled Alder (*Alnus rugosa*), Silky dogwood (*Cornus amomum*), and sapling Poplar (*Populus* spp.). Saplings include Honey Locust (*Gleditsia triacanthos*), Black Locust (*Robinia pseudoacacia*), Red Cedar (*Juniperus virginiana*), and those canopy species contained within the adjacent forest. The groundcover is dominated by grasses, but also includes scattered patches of Goldenrod (*Solidago* spp.), Polygonum (*Polygonum* sp.), Lance-Leaved Plantain (*Plantago lanceolata*), Common Plantain (*Plantago major*), Wild Carrot (*Daucus carota*), and Yellow Rocket (*Barbarea vulgaris*).



Figure 2.4: Considerable upland meadow habitat occurs within the former MSH area along Trapelo Road, 2005 (LEC).

Upland Meadow

A large upland meadow occurs adjacent to the western portion of Beaver Brook North in the City of Waltham land along Trapelo Road, on which DCR holds a conservation easement. Upland meadow habitat on the site is differentiated from lawn in that it is not regularly maintained. The upland meadow contains a diverse variety of grasses and wildflowers, with scattered mature Norway Spruce (*Picea abies*) measuring 60 to 80 feet high: a significant landscape feature within the site. The majority of this meadow is comprised of upland species, including Timothy Grass (*Phleum pratense*), Fescue Grass (*Festuca* sp.), Quackgrass (*Agropyron repens*), English and Common Plantain (*Plantago lanceolata* and *P. major*), St.

John's Wort (*Hypericum* spp.), Yarrow (*Achillea millefolium*), Milkweed (*Asclepias* spp.), Goat's Beard (*Tragopogon pratensis*), White Campion (*Silene latiflora*), and Oxeye Daisy (*Leucanthemum vulgare*).

Forested Wetlands

Secondary only to forested uplands in habitat dominance, the site's forested wetlands bordering on Beaver Brook and its tributaries comprise a major portion of the reservation landscape, on both Beaver Brook Reservation and Beaver Brook North Reservation. The forested wetlands on Beaver Brook Reservation occur within moderately narrow bands of forest on either side of Beaver Brook, Mill Pond, and Duck Pond.

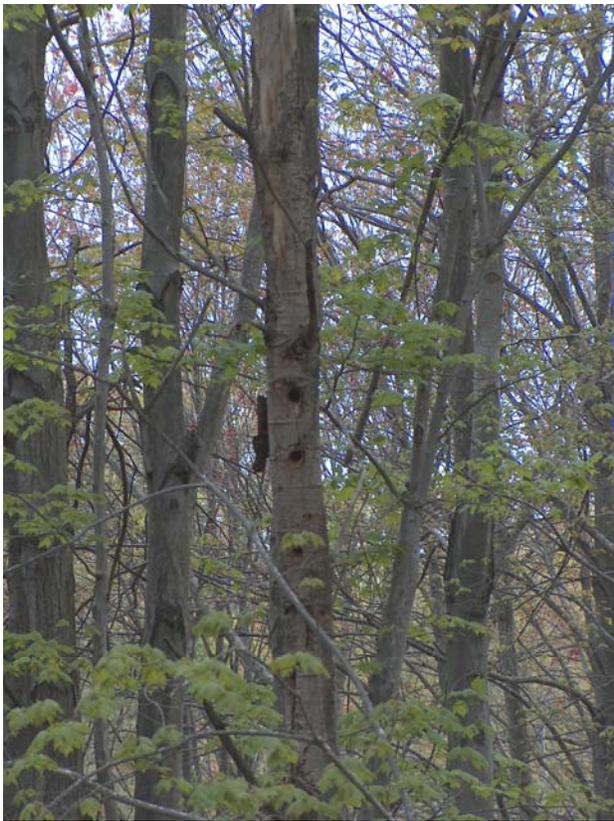


Figure 2.5: One of many habitat types, this forested wetland is dominated by Red Maple (*Acer rubrum*), and represents a dominate habitat type within Beaver Brook North Reservation, 2005 (LEC).

Within Beaver Brook North Reservation, forested wetlands occur north of Mackerel Hill, extending northerly and easterly around a large emergent marsh contained within the central portion of the site, and continuing further northerly and southerly along Beaver Brook and its tributaries. Scattered isolated pockets of forested wetlands also occur within the large upland forest. The site's forested wetland areas contain organic-laden

topsoil, underlain by sandy to loamy subsoil depending on the geologic landform in which the soils developed. These wetland forests are dominated by a canopy of Red Maple (*Acer rubrum*), with inclusions of American Elm (*Ulmus americana*) and Green Ash (*Fraxinus pennsylvanica*). The shrub layer contains thickets of Sweet Pepperbush (*Clethra alnifolia*), with clusters of European Buckthorn and Highbush Blueberry (*Vaccinium corymbosum*), and individual Silky Dogwood, Winterberry Holly (*Ilex verticillata*), Arrowwood (*Viburnum dentatum*), Spicebush (*Lindera benzoin*), and Swamp Azalea (*Rhododendron viscosum*). Groundcover species include patches of Skunk Cabbage (*Symplocarpus foetidus*), Poison Ivy (*Toxicodendron radicans*), Sensitive Fern (*Onoclea sensibilis*), Cinnamon Fern (*Osmunda cinnamomea*), Interrupted Fern (*Osmunda claytoniana*), Sedges (*Carex* spp.) and Rushes (*Juncus* spp.), with inclusions of Wild Geranium (*Geranium maculatum*), Jack-in-the-Pulpit (*Arisaema triphyllum*), and Sheep Laurel (*Kalmia angustifolia*).

Wetland Meadow

Three pockets of wetland meadow habitat occur within Beaver Brook North Reservation: immediately south of the upland meadow located along Trapelo Road; and along an intermittent stream channel that bifurcates the upland meadow; and immediately east of the former Metropolitan State Hospital infrastructure contained within the northern portion of the site. Patches of Reed Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), Sedges (*Carex* spp.), Rushes (*Juncus* spp.), and Cattail (*Typha latifolia*) dominate the wetland meadow, with patches of goldenrod located along the meadow edge.

Emergent Marsh

Two large emergent marsh habitats occur within the central portion and northern portion of Beaver Brook North, while segments of a third large emergent marsh located along Beaver Brook are located within the northernmost portion of the property. The emergent marsh habitats occur within the lowest elevations of the site, within the sandy, glacial outwash plains, although these sandy deposits have since been buried by accumulations of organic matter. The emergent marsh habitats are dominated by patches of Cattail and Purple Loosestrife, with patches of Reed Canary Grass, Sedges, Rushes, and Goldenrods.

Invasive Exotic Plant Species Evaluation

Invasive exotic species are generally defined as non-native plants that have aggressively invaded naturally occurring plant communities.⁵ Virtually every habitat within the Beaver Brook Reservation contains one or more invasive plant species, including Oriental Bittersweet (*Celastrus orbiculatus*), Black Locust (*Robinia pseudoacacia*), Norway Maple (*Acer platanoides*), European Buckthorn (*Rhamnus frangula*), Common Buckthorn (*Rhamnus cathartica*), Tartarian Honeysuckle (*Lonicera tartarica*), Multiflora Rose (*Rosa multiflora*), Russian Olive (*Elaeagnus umbellata*), Purple Loosestrife (*Lythrum salicaria*), Garlic Mustard (*Alliaria officinalis*) and Japanese Barberry (*Berberis thunbergii*). A description of each of these species and their location within the site is outlined below.

Oriental Bittersweet (Celastrus orbiculatus)

Oriental bittersweet is a deciduous invasive non-native woody vine that has a twining or trailing growth pattern. Native to eastern Asia, Japan, Korea and China, Oriental bittersweet was first introduced into the United States in the 1860s. Oriental bittersweet typically prefers roadsides, hedgerows and thickets, but its shade tolerance has allowed it to spread into forested areas. It reproduces by seeds, stolons, rhizomes and root suckers. Dense stands of vines can shade and suppress native vegetation.⁶ Tree and shrub stems are weakened and killed by the twining and climbing growth which twists around and eventually constricts solute flow. Trees with girdled stems and large amounts of vine biomass in their canopies are more susceptible to damage by wind, snow and ice storms.⁷

Black Locust (Robinia pseudoacacia)

Black locust is a rapidly growing, early successional, deciduous tree native to the southeastern United States. It is typically found on the lower slopes of the Appalachian Mountains as well as on slopes and forested edges of southern Illinois, Indiana, and Missouri. Outside of its historic North American range, black locust poses a serious threat to native vegetation in prairies, oak savannas and upland forest edges. It is commonly found in disturbed areas such as old fields, degraded woods and roadsides. Once introduced into an area, Black Locust expands rapidly, creating dense stands of clones which shade native ground vegetation. The large, fragrant blossoms of Black Locust compete with native plants for pollination by bees and other insects. Although abundant seeds are produced, few actually germinate.⁸ Black Locust is intolerant of shade and is not found in dense woods except as a dominant tree.⁹ Scattered Black Locusts were observed within the successional shrub habitat.

Norway Maple (Acer platanoides)

Acer platanoides is a fast-growing tree, highly tolerant to variations in environmental conditions, including soil type and moisture regime. It is often overlooked due to its resemblance to Sugar Maple (*Acer saccharum*). Its thick foliage tends to over-shade the understory and groundcover layers, stressing native shrubs and herbs. Areas with a complete Norway Maple canopy tend to be completely void of understory vegetation, with bare ground eroding to the roots. Native to continental Europe, this tree spread south from Norway, and was likely introduced to North America in the mid 1700's. Despite its aggressive nature, Norway Maple is still widely planted as a landscape tree, particularly in the urban and suburban landscape. Scattered sapling Norway Maple were observed on Mackerel Hill.

European Buckthorn (Rhamnus frangula)

European Buckthorn is an invasive, deciduous shrub native to Eurasia and first introduced into the United States prior to 1800 as a hedge planting. European Buckthorn is well established in New England and rapidly spreading westward. It is an aggressive invader of wet soils, capable of growing in both full sun and heavily shaded conditions. In addition, this species also grows well in a wide variety of upland habitats, including old fields and roadsides. European Buckthorn is a nuisance species growing mainly in thickets, hedgerows, pastures, abandoned fields, roadsides and rocky sites. It aggressively out-competes native flora, mainly on well-drained soils. Under full-sun conditions, individual plants can produce seed in only a few years. In heavily shaded habitats, seed production may be significantly delayed. The fruit of *R. frangula* is effectively dispersed by a variety of birds and mice. Seedling establishment is most successful where there is ample light and exposed or disturbed soil. Clusters of European Buckthorn were frequently observed within the forested wetland and forested upland habitats, with scattered clusters observed within the successional shrub habitat.

Common Buckthorn (Rhamnus cathartica)

Common Buckthorn and European Buckthorn share similar biology and introduction history; both were introduced from Europe as a hedge/landscape planting; both are prolific seed producers; both shade and out-compete native plants; and both tolerate a wide variety of soil and light conditions. Common Buckthorn however, is more often observed in drier, upland environments compared to European Buckthorn. While not as common at the site as European Buckthorn, scattered individuals and clusters of Common Buckthorn were observed throughout the forested portions of Beaver Brook North Reservation, particularly on Mackerel Hill.

Tatarian Honeysuckle (Lonicera tartarica)

L. tatarica is one of several, highly-invasive *Lonicera* species occurring throughout the United States. A deciduous shrub that can grow in dense thickets, *L. tatarica* displaces native shrubs and shades out native groundcover species. This shrub is largely resistant to insects and disease, and its seed is easily spread into new areas by birds that forage on the prolific fruit. Like many of the non-native Asian honeysuckles, *L. tatarica* was introduced in the late 1700s to early 1800s and was subsequently promoted to provide erosion control and wildlife cover. Dense patches of Tatarian Honeysuckle were observed throughout the forested uplands located within the eastern portion of Beaver Brook North Reservation, with scattered individuals observed within the successional shrub habitat.

Multiflora Rose (Rosa multiflora)

Rosa multiflora is a prolific shrub with thorny, arching stems known as canes. This shrub was introduced to the east coast of the United States from Japan for use as an ornamental landscape plant in the mid 1800s. *R. multiflora* tolerates a variety of soil and light conditions and spreads primarily through seeds consumed by birds (an individual plant may produce up to 1 million seeds per year which can remain dormant in the soil for up to 20 years), but can also root from the canes that contact the soil surface. Multiflora rose has historically been planted for a number of uses, including: wildlife cover for game birds; 'living fences' to confine livestock; and within highway median strips to reduce headlight glare. LEC observed multiflora rose within the successional shrub habitat, along forest edges, and intermittently within forested uplands.¹⁰

Autumn Olive (Elaeagnus umbellata)

Autumn Olive is a tall (4 to 5 meters), spreading shrub that was introduced to the United States from Asia in the 1830s. *Elaeagnus* is typically found in thickets along roadsides and within abandoned fields. This shrub produces seeds that are consumed and dispersed by birds and mammals. Autumn Olive was planted as natural screening, for wildlife, and to stabilize soils along roadsides, as it is salt tolerant and 'fixes' atmospheric nitrogen.¹¹ Scattered thickets of Autumn Olive are limited to the successional shrub habitat.

Purple Loosestrife (Lythrum salicaria)

L. salicaria is a perennial, herbaceous species native to much of the world, including Europe and Asia that was introduced to the northeastern United States and Canada in the 1800s for ornamental and medicinal purposes. This species aggressively out-competes and displaces native wetland vegetation, reducing biological diversity, and degrading the quality of wildlife habitats.¹² This species has quickly invaded much of North

America and has no natural predators or diseases that would normally limit its success in the northeast region.¹³ *L. salicaria* produces copious amounts of seeds, as many as a million seeds per plant annually, and possesses a strong taproot that continues to provide food to the plant when it is mowed, sprayed with herbicides, or damaged by insects. Purple Loosestrife is one of the dominant plants vegetating the emergent marsh habitat.

Garlic Mustard (Alliaria officinalis)

Native to Europe, this biennial wildflower (e.g. seeds over-winter prior to germination) tends to grow in woodlands and floodplains, where it out-competes native herbaceous plants. The plant can self-pollinate, and seed germination is prolific, starting earlier in Spring (late February/early March) than most native wildflowers. Plant growth may extend into the winter months provided temperatures are above freezing and there is no snow cover. Seeds often spread to new areas via stream flooding events, and tend to germinate in disturbed, open areas and forest edges. This plant was first reported on Long Island, NY in 1868, and may have been brought from Europe as food or for medicinal use (*A. officinalis* contains antiseptic properties and was often used to treat wounds). Scattered patches of Garlic Mustard were observed throughout the forested portions of the property.

Japanese Barberry (Berberis thunbergii)

Native to Japan, this species was introduced to North America as an ornamental landscape plant in 1864. *B. thunbergii* withstands variably wet and dry soil conditions and thrives well in both sun and shade. Seed-eating birds are likely responsible for this plant's migration from yards and gardens to successional forests and woodland edges. This shrub can form dense thickets that out-compete native shrub species. Scattered individual Japanese Barberry were observed throughout the forested portions of the reservation.

Habitat Diversity and Value

Three primary characteristics contribute to the site's ability to provide significant wildlife habitat both locally and regionally. These are: habitat diversity; the extent of edge habitat; and the site's size and location in landscape context. While each of these site features is important individually, their benefit to wildlife is compounded when occurring together.

Habitat Diversity

Compared to Beaver Brook Reservation, Beaver Brook North Reservation significantly contributes to the overall habitat diversity of the expanded reservation, with the addition of emergent marsh, successional shrub habitat, and meadow

habitats. This habitat heterogeneity, both between habitats and within each habitat enhances the reservation's ability to provide feeding, breeding, migratory, overwintering, and cover resources for many migratory and resident wildlife species. Habitat diversity is directly related to species diversity, and contributes to complex arrangements of species interactions and relationships, as well as community stability. For example, the diversity of herbaceous plants contained within the meadow provides a varied array of resources for a host of herbivorous insects, including butterflies and moths (Lepidoptera), grasshoppers (Orthoptera), beetles (Coleoptera), and ants, wasps, and bees (Hymenoptera). This variety of herbivorous insects provides a range of prey options for predatory insects, amphibians, reptiles, and birds. Species diversity at these lower trophic levels adds complexity to the food web, and gives rise to ecological stability both locally and regionally.



Figure 2.6: The interface between two habitat types, or "ecotone" is the preferred habitat for many avian species such as this male Rose-Breasted Grosbeak (*Pheucticus ludovicianus*), 2005 (LEC).

Edge Habitat

Biological interactions tend to concentrate along habitat edges, or "ecotones." While many species may prefer a specific habitat type, others have evolved to exploit the edges occurring along habitat boundaries. Two distinct ecotones associated with the site include upland/wetland edges and forest/meadow edges. While many ecotones occur along a two dimensional interface (e.g. upland to wetland, forest to field), the successional shrub habitat contained within the North Reservation provides extensive edge habitat over a large area, extending the wildlife benefits of the 'edge' to larger numbers of species. The forest / field interface is the preferred predatory habitat for many raptor species, including hawks (Accipitridae) and owls (Strigidae). The

maturing trees provide perching habitat for the raptors as they search for prey within the field below. During our May 17, 2005 site evaluation, LEC observed a red-tailed hawk (*Buteo jamaicensis*) soaring over the upland meadow contained within Beaver Brook North Reservation, and perching within the Norway Spruce and adjacent oak forest. LEC also observed numerous small mammal burrows and pathways within the upland meadow, affirming that the forest/field edge within the property provides habitat for this predator/prey interaction.

Landscape Context

The Beaver Brook Reservation and Beaver Brook North Reservation located in Waltham, Belmont, and Lexington, Massachusetts represent a significant tract of undeveloped land within the Route 128 loop, particularly within the area north of the Mass Pike. The diversity of wetlands, watercourses, upland forest and meadow provide important habitat similar to the open space system of the Blue Hills Reservation and Ponkapoag Bog located south of Boston, and the Middlesex Fells. Large tracts of undeveloped land are critical refuges for wildlife, particularly when encapsulated within urban and suburban environments. These areas provide critical stopover points for migrating birds, providing necessary food and cover resources. Furthermore, large tracts of specific habitat types such as forest, meadow, and emergent marsh provide critical interior spaces for reclusive wildlife species that do not thrive in smaller, fragmented habitats. Significant areas of maturing forest also provide dimensional structure for biological interactions to occur, adding to the 2-dimensional 'area' of land we often consider.

Observed and Potential Wildlife Habitat

The property contains significant areas of undisturbed land relative to the surrounding, predominantly developed landscape, providing an oasis of natural resources, including areas for foraging, breeding, nesting, overwintering, and/or migration stopover for a variety of mammals, birds, reptiles, amphibians, and insects. The species utilizing these resources inherently propagate complex food webs and inter-species relationships that are as connected to the ecosystem as the landscape's vegetative structure, and fluctuate with the changing seasons and over time.

The predominantly forested site offers a maturing canopy of several deciduous cover types described above. These multiple plant communities offer varying food, cover, and nesting sites and substrate for boreal and semi-boreal mammals as well as avian species. The leaves, fruit, mast, seeds, and tree boles on the forest floor make available these resources to fossorial and semi-fossorial mammals, amphibians, reptiles and invertebrates.

Burrows within the loamy and sandy soil material and the suitable den habitat associated with rock outcroppings provide nesting and cover habitat and/or hibernacula for fossorial and semi-fossorial mammals and amphibian and reptile species, including mice, voles, salamanders, newts, turtles, and *colubrid* snakes. White-tailed Deer (*Odocoileus virginianus*) may also utilize the site for food and cover.

Given the abundant cover habitat for small fossorial and semi fossorial mammals, the site likely contains a significant food source for carnivorous mammals such as Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), Gray Fox (*Urocyon cinereoargenteus*), Fisher (*Martes pennanti*), and predatory birds, including hawks and owls. MSH Reuse Plan records additional fauna sited in Beaver Brook North Reservation (Appendix G in Volume 2).



Figure 2.7: Red-Tailed Hawk (*Buteo jamaicensis*) perched in a Norway Spruce (*Picea abies*) tree high above an open meadow, 2005 (LEC).

Wildlife Habitat Potential

Of the two areas considered in LEC's evaluation, Beaver Brook North Reservation clearly boasts a more unique and comparatively large area of undisturbed land that provides significant wildlife habitat surrounded by a predominantly suburban landscape. Despite the infrastructure associated with the former MSH and proposed residential development, its proximity and connectivity to Beaver Brook Reservation land offers the potential for increased habitat utilization (a natural forested corridor along Beaver Brook connects Beaver Brook Reservation with Beaver Brook North Reservation). The topographically varied landscape, edaphic, and geologic features also add value, providing suitable burrowing substrate, den habitat in rocky areas for a host of small mammals,

amphibians, and reptiles. Pollinating insects also likely exploit the diverse floral communities.

Island Biogeography

Initially developed to explain the similarities and differences in species assemblages on island chains, the theory of island biogeography addresses how the characteristics of isolated pockets of habitat affect the species composition within a given habitat.¹⁴ In light of this assessment, Beaver Brook Reservation and Beaver Brook North Reservation represent two such islands or habitat fragments, separated from contiguous tracts of forested habitat elsewhere in the state and region. Current ecological studies within the northeast region have shown that this paradigm plays a significant role in how the reservation is utilized by wildlife. The surrounding developed areas contain a gradient of habitat suitability ranging from lawn and landscaped residential areas to roadways and semi-urban areas that separate the Beaver Brook Reservation from other pockets of useful habitat. Therefore, species that can effectively migrate between preferred habitat fragments are more likely to thrive within the reservation than those species with limited mobility or ability to exploit alternative resources. These tolerance-limited species would be largely confined to the reservation and afforded limited ability to take advantage of the resources contained within the nearby habitats. Therefore, this particular habitat fragment has variable, species-specific value based on accessibility, habitat size requirements, and a given species ability (or need) to migrate between fragments. Regardless of these specific considerations, the reservation (Beaver Brook North Reservation in particular) contains abundant evidence of, and potential for wildlife utilization, as explained in detail below.

Specific Wildlife Use

The diverse plant communities found throughout the site offer specific, preferred habitat for different species. The available habitat within each cover type, as well as an analysis of the species potentially utilizing each cover type are outlined below. Species documented to utilize the site by LEC via direct observation, other evidence of occurrence (e.g. audible means or sign) have an asterisk following the common name. Additionally, wildlife species lists for each habitat type are included in Appendix B.

Forested Uplands

The site's forested uplands contain various habitat features that provide suitable habitat for a host of birds and mammals. Both resident and migratory birds will utilize the upland forest for foraging, cover, mating, nest building, and rearing young. The variety of habitat niches, vegetation, insects, and small mammals contained within the forested uplands provides the

base from which these ecological relationships flourish. Small fossorial mammals including White-Footed Mouse (*Peromyscus leucopus*), Chipmunk* (*Tamias striatus*), Hairy-Tailed Mole (*Parascalops breweri*) provide a food source for Great Horned Owl (*Bubo virginianus*) and raptors including Cooper's Hawk (*Accipiter cooperii*) and Northern Goshawk (*Accipiter gentilis*).

Forested upland areas provide year-round habitat for resident avian species such as Blue Jay* (*Cyanocitta cristata*), Northern Cardinal* (*Cardinalis cardinalis*), Tufted Titmouse* (*Parus bicolor*), Black-Capped Chickadee* (*Parus atricapillus*), White-Breasted Nuthatch* (*Sitta corolinensis*), Crow* (*Corvus* spp.), Downy Woodpecker* (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Northern Flicker* (*Colaptes auratus*), Dark-Eyed Junco (*Junco hyemalis*), and Wild Turkey (*Meleagris gallopavo*); and seasonal habitat for migratory species including American Robin* (*Turdus migratorius*), Least Flycatcher (*Empidonax minimus*), Red-Eyed Vireo* (*Vireo olivaceus*), American Woodcock (*Scolopax minor*), Ovenbird* (*Seiurus aurocapillus*), Rose-Breasted Grosbeak* (*Pheucticus ludovicianus*), Eastern Wood Pewee* (*Contopus virens*), Eastern Towhee (*Pipilo erythrophthalmus*) and a host of warblers, including Canada Warbler (*Wilsonia canadensis*) and Black and White Warbler* (*Mniotilta varia*). The tall, more mature maple and oak-dominated areas are the preferred habitat of Hermit Thrush* (*Catharus guttatus*), Wood Thrush* (*Hylocichla mustelina*), Scarlet Tanager (*Piranga olivacea*) and Great-Crested Flycatcher* (*Myiarchus crinitus*).

In addition to White-Tailed Deer* (*Odocoileus virginianus*), Gray Fox (*Urocyon cinereoargenteus*), and Coyote (*Canis latrans*), the site's forested uplands may provide food, cover, nesting, and/or overwintering habitat for Weasel (*Mustela* spp.) and boreal mammals such as Porcupine (*Erethizon dorsatum*), Gray Squirrel* (*Sciurus carolinensis*) and Red Squirrel (*Tamiasciurus hudsonicus*). Forested uplands also provide habitat for Big Brown Bat (*Eptesicus fuscus*), Eastern Red Bat (*Lasiurus borealis*), and perhaps Fisher (*Martes pennanti*) as populations extend toward eastern Massachusetts.

While amphibians and reptiles are more typically associated with wetland environments (discussed below), surrounding upland forested areas may provide aestivation and overwintering habitat for Eastern Ribbon Snake (*Thamnophis sauritus*), Northern Ring-Neck Snake (*Diadophis punctatus*), Spotted Salamander (*Ambystoma maculatum*), Blue-Spotted Salamander (*Ambystoma laterale*), and Marbled Salamander (*Ambystoma opacum*), and may also provide migration routes for Spotted Turtle (*Clemmys guttata*). However, according to the MNHESP, the Blue-Spotted and Marbled Salamanders have not

been documented in the area and are therefore not likely to occur.

Forested Wetlands

While many forest-dwelling species utilize both upland and wetland habitats, certain species prefer the forested wetland environment. Forested wetland habitats dominated by Red Maple and flowering shrubs tend to support a preponderance of pollinating insects including butterflies, moths, and bees, as well as mosquitoes which provide a valuable food source for a variety of avian species. In addition to providing feeding, nesting, and cover habitat, the canopy coupled with a moist soil stratum provide shading and cooling during the warmest of summer months. Owls and raptors including Eastern Screech Owl (*Otus asio*), Barred Owl (*Strix varia*), Red-Shouldered Hawk (*Buteo lineatus*), and Broad-Winged Hawk (*Buteo platypterus*) will feed on wetland forest-dwelling mammals such as Short-Tailed Shrew (*Blarina brevicauda*), Star-Nosed Mole (*Condylura cristata*), and Weasel (*Mustela* spp.). Avian species preferring the forested wetland environment include Ruby-Throated Hummingbird* (*Archilochus colubris*), Least Flycatcher, Eastern Phoebe* (*Sayornis phoebe*), Carolina Wren* (*Thyothorus ludovicianus*), Winter Wren (*Troglodytes troglodytes*), Blue-Gray Gnatcatcher (*Polioptila caerulea*), Veery* (*Catharus fuscescens*), Catbird* (*Dumetella carolinensis*), Northern Parula (*Parula americana*), Northern Waterthrush* (*Seiurus noveboracensis*), Common Yellowthroat (*Geothlypis trichas*), Black-Crowned Night Heron (*Nycticorax nycticoax*) and Green Heron (*Butorides virescens*). Fossorial and semi-fossorial mammals, including Woodland Jumping Mouse (*Napaeozapus insignis*) also prefer cool, moist woodlands. Eastern Ribbon Snake and Northern Ring-Neck Snake are likely to be observed within the mesic conditions provided by this habitat.

There is a strong potential for a host of amphibians and turtles to utilize the wetland areas contained within the site, particularly due to the presence of scattered Vernal Pools that provide reproductive habitat for these species, including Wood Frog* (*Rana sylvatica*), Green Frog (*Rana clamitans*), Pickerel Frog (*Rana palustris*), Spring Peeper (*Hyla crucifer*), Spotted Salamander, Blue-Spotted Salamander, and Marbled Salamander, although the last two salamanders have not been documented in the area. Spotted Turtle may also utilize these Vernal Pools for breeding and foraging habitat.

Mill Pond and Duck Pond

While Mill Pond and Duck Pond are situated in a recreational setting compared to a more natural environment where reclusive species may be observed, these ponds offer potential for habitat utilization amongst more commonly observed, adaptable species. The majority of fauna utilizing Beaver Brook

Reservation as opposed to Beaver Brook North Reservation likely rely on these ponds and Beaver Brook as a perennial water source, while the interface of the open pond and adjacent forested areas provides perching habitat for avian species such as Belted Kingfisher (*Ceryle alcyon*) that may feed on the ponds' fish. The ponds also provide habitat for fish and semi-aquatic reptiles and amphibians, including Snapping Turtle (*Chelydra serpentina*), Painted Turtle (*Chrysemys picta*), Green Frog, Bull Frog (*Rana catesbeiana*), and Red-Spotted Newt (*Notophthalmus viridescens*).

Mill Pond and Duck Pond serve as the preferred habitat for the more commonly observed waterfowl species, including Mallard* (*Anas platyrhynchos*), Black Duck* (*Anas rubripes*), and Canada Goose* (*Branta canadensis*). However, additional, less common species may also benefit from this open water habitat, including Snow Goose* (*Chen caerulescens*), Teal (*Anas* spp.), Wood Duck* (*Aix sponsa*), and Hooded Merganser (*Lophodytes cucullatus*). Duckweed and other aquatic vegetation observed at the pond's edge provide food for waterfowl, while the adjacent forested areas provide perching sites for Eastern Phoebe*, Blue-Gray Gnatcatcher (*Polioptila caerulea*), Warbling Vireo (*Vireo gilvus*), and Northern Parula. Populations of insects, including Mosquitoes* and Odonates*, provide a significant food source for many insectivorous birds and bats, including Big Brown Bat, Silver-Haired Bat (*Lasionycteris noctivagans*), Eastern Red Bat (*Lasiurus borealis*), and Hoary Bat (*Lasiurus cinereus*). Adequate bat roosting habitat is available in the surrounding snags and/or nearby dwellings (roof rafters/attics) to support such bat populations.

Successional Shrub and Meadow Habitats

The successional shrub and meadow habitats contained within the Beaver Brook North Reservation maintain a habitat interface along the adjacent forested areas. This edge habitat, or ecotone, provides habitat species preferring both field and forest to interact. In addition to the predator / prey relationships encountered with the Red-Tailed Hawk and small mammals within the meadow (discussed above), significant numbers of Baltimore Orioles* (*Icterus galbula*) were observed within the open habitats and along the woodland edges during our May 17, 2005 site evaluation. This observation likely represents a 'migration fallout' event, where migrating populations of this species utilize the Beaver Brook Reservation as a 'stopover point' during seasonal migration.

These similar habitats also provide habitat for Coyote and Red Fox (*Vulpes vulpes*), which may also prey on small mammals, including Woodchuck (*Marmota monax*), Meadow Vole (*Microtus pennsylvanicus*), Meadow Jumping Mouse (*Zapus hudsonius*), Striped Skunk (*Mephitis mephitis*), Weasel (*Mustela*

spp.), and Eastern Cottontail (*Sylvilagus floridanus*). The successional shrub and meadow areas provide hunting, perching, and/or nesting habitat for additional Raptors that may feed on small mammals, including American Kestrel (*Falco sparverius*), Northern Harrier (*Circus cyaneus*), and Turkey Vulture (*Cathartes aura*).



Figure 2.8: Numerous Red-winged Blackbirds (*Agelaius phoeniceus*) were observed in flight displays over the site's expansive emergent marsh, 2005 (LEC).

American Toad* (*Bufo americanus*) may be found in the upland meadow, along with Black Racer (*Coluber constrictor*), Milk Snake (*Lampropeltis triangulum*), Smooth Green Snake (*Ophedryx vernalis*), and Common Garter Snake (*Thamnophis sirtalis*), while wetland meadow habitats may contain many species of frogs and newts.

A myriad of other avian species also utilize this habitat, including Mourning Dove* (*Zenaidura macroura*), Black-Billed Cuckoo (*Coccyzus erythrophthalmus*), Common Nighthawk (*Chordeiles minor*), Whip-Poor-Will (*Caprimulgus vociferus*), Chimney Swift (*Chaetura pelagica*), Ruby-Throated Hummingbird, Eastern Kingbird (*Tyrannus tyrannus*), Carolina Wren*, Eastern Bluebird (*Sialia sialis*), American Robin*, Northern Mockingbird* (*Mimus polyglottos*), Catbird*, Brown Thrasher* (*Toxostoma rufum*), Cedar Waxwing (*Bombycilla cedrorum*), Northern Shrike (*Lanius excubitor*), Rose-Breasted Grosbeak*, Indigo Bunting (*Passerina cyanea*), American Goldfinch* (*Carduelis tristis*), numerous sparrows, including Winter Sparrow (*Spizella arborea*), Chipping Sparrow (*S. passerina*), Savannah Sparrow (*Passerculus sandwichensis*), and a variety of blackbirds, including Red-Winged Blackbird*, Common Grackle (*Quiscalus quiscula*), Brown-Headed Cowbird (*Molothrus ater*), and Baltimore Oriole*.

Emergent Marsh Habitat

A significant area of emergent marsh habitat is contained within the interior of Beaver Brook North Reservation. Surrounded by expansive forest, the emergent marsh is well protected from human activity associated with nearby residential development and/or recreational use and maintains considerable edge habitat. The emergent marsh generally contains deeper standing water for a longer duration throughout the year compared to wetland meadow habitat associated with the site. Large numbers of Red-Winged Blackbirds* (*Agelaius phoeniceus*), and several nesting sites for this species were observed during our May 17, 2005 site evaluation. The emergent marsh also provides breeding, feeding, cover, and hydration habitat for a host of turtles, including Spotted Turtle, Painted Turtle, and Musk Turtle (*Stemnothaerus odoratus*); snakes including Brown Snake (*Storeria dekayi*), Northern Water Snake (*Nerodia sipedon*), and Eastern Ribbon Snake (*Thamnophis sauritus*); and amphibians including Pickerel Frog, Green Frog, Bull Frog, and Spring Peeper (*Hyla crucifer*). Snakes and amphibians provide a food resource for Great Blue Heron (*Ardea herodias*), Green Heron (*Butorides virescens*), Black-Crowned Night Heron (*Nycticorax nycticorax*), Great Egret (*Ardea alba*) and Snowy Egret (*Egretta thula*). This habitat is also preferred by other avian species, including Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Common Snipe (*Gallinago gallinago*), Northern Waterthrush*, Tree Swallow* (*Tachycineta bicolor*), Marsh Wren (*Cistothorus palustris*), Common Yellowthroat* (*Geothlypis trichas*), Song Sparrow (*Melospiza melodia*), and Swamp Sparrow (*M. georgiana*). Mammals utilizing the marsh may include Meadow Vole (*Microtus pennsylvanicus*), Meadow Jumping Mouse (*Zapus hudsonius*), Muskrat (*Ondatra zibethicus*), and Raccoon (*Procyon lotor*). There is also the potential for the Common Moorhen (*Gallinula chloropus*) although according to the MNHESP, this species has not been recorded in the area.



Figure 2.9: A Red-winged Blackbird nest woven of grass and mud within the emergent marsh habitat, 2005 (LEC).

Overall Assessment of Wildlife Habitat

The 254-acre Beaver Brook North Reservation provides a significant addition to Beaver Brook Reservation. The relative size, physical attributes, and vegetative diversity of the expanded Beaver Brook Reservation provides locally significant habitat for a variety of resident and transient wildlife species despite the limitations of its suburban/residential geography. The variable, three-dimensional landscape and diverse plant communities provide assorted habitat niches for a variety of species, including potential habitat for species listed by NHESP as Endangered, Threatened, and/or Special Concern. Of particular importance is the site's potential suitability for state-listed salamanders, spotted turtle, and rare flora as well as charismatic species such as deer, coyote, fox, and wild turkey.

The predominance of Red Maple, and other prolific flowering species in the wetland areas supports a host of pollinating insects, while Mill Pond, Duck Pond, the emergent marsh and scattered vernal pools likely provide a productive breeding area for mosquitoes and odonates (dragonflies and damselflies). These insects provide a substantial, primary food source for frogs, toads, bats, and many species of birds. Fruit and mast-producing plants provide an invaluable, perennial food resource to many types of small mammals and birds. Small mammals are also afforded abundant cover and overwintering habitat in the form of friable soil material. Large populations of small mammals, in turn, provide a significant food resource for snakes, owls, raptors, and larger carnivorous mammals. The existence of such rich habitat resources at this site supports an equally diverse faunal community.

Potential Habitat for Endangered Species

The area encompassing the expanded Beaver Brook Reservation includes areas identified as both the Estimated Habitat and Priority Habitat according to the Natural Heritage and Endangered Species Program's (NHESP) database. In 2005, the property contained Estimated/Priority Habitat for Spotted Turtle (*Clemmys guttata*). With the delisting of the Spotted Turtle in 2006, this habitat will not be included in future NHESP regulated areas. However, the species continues to need protection on conservation land and the following site analysis would assist in protecting the species. Additionally, the site's vernal pools offer potential breeding habitat for Blue-Spotted Salamander. In addition, several plant species and Marbled Salamanders were known from the area historically. Based on the existing site conditions and pertinent reference material, LEC has conducted a habitat suitability analysis for each of these species.

Preliminary Spotted Turtle (*Clemmys guttata*) Habitat Analysis

The on-site emergent marsh/aquatic wetland system, numerous vernal pools, forested wetlands, and nearby field areas provide ideal habitat characteristics for *C. guttata* overwintering, feeding/breeding, nesting, and aestivation.

Over-wintering Habitat

Semi-aquatic turtle species of the family Emydidae, including the *Clemmys guttata*, utilize thermally protected areas for overwintering (brumation) sites, typically under water, below the depth of ice formation, thus avoiding exposure to sub-freezing conditions.¹⁵ While, Ernst noted *C. guttata* individuals utilizing muskrat burrows for brumation sites, Graham documented winter hibernation in Red Maple-Sphagnum swamps within underwater passageways among masses of inundated sphagnum and roots of the Red Maple.¹⁶ Through past and ongoing radio telemetry studies of Spotted Turtle (*C. guttata*), LEC personnel have observed a predominance of over-wintering within emergent marsh habitat and minimally within forested Red Maple swamps.

Appropriate *C. guttata* over-wintering habitat occurs throughout the expansive emergent marshes located northwest and southeast of the former Metropolitan State Hospital. The various hummocks within the interior of these wetland systems likely provide the most ideal hibernacula for *C. guttata* individuals or aggregations.

Feeding/Breeding Habitat

Once individuals have emerged from over-wintering sites, ephemeral (vernal) pools may be sought out for feeding/breeding habitat or individuals may remain within the confines of the emergent marsh/aquatic system if capable of supporting feeding/breeding habitat. Spring migration, typically occurring in March, but influenced by a late or short winter, to vernal pools is apparently timed to take advantage of seasonally abundant foods located there.¹⁷ Adult *C. guttata* feed on a variety of aquatic plants, algae, adult and larval insects, crustaceans, snails, tadpoles, salamander eggs and larvae, and carrion.¹⁸ Hatchlings are primarily carnivorous, feeding on a variety of insects, worms, and snails.¹⁹ Feeding and breeding habitat must possess an adequate water column and readily available food sources.

Potential feeding/breeding habitat is located throughout the emergent marsh habitats, forested wetlands, and vernal pools located throughout and adjacent to the project site. These wetland systems and vernal pools possess ideal habitat to

support *C. guttata* prey species, including macro invertebrates, amphibian egg masses, and tadpoles/larvae.

Nesting Habitat

C. guttata nesting activity in Massachusetts may extend from late May through June, depending on seasonal weather conditions. Preferred nesting habitat includes sunny, well-drained soil in open meadows, fields, or along roadsides.²⁰ Nesting has been observed to take place in "open, non-forested habitat", as well as within hummocks of emergent vegetation within wetlands.²¹

LEC observed only limited open, field habitats in close proximity to prime aquatic habitat for *C. guttata*, primarily restricted to areas currently under construction/demolition or along pedestrian pathways. However, the level of disturbance and shading canopy vegetation impacting nest incubation are limiting factors. On-site viable nesting habitat may be limited to hummocks of emergent vegetation within the marsh's interior.

Aestivation Habitat

Aestivation occurs within forms, which are shallow excavations made in the earth beneath accumulated organic debris, for varying periods of time in late summer, roughly 2 days to 10 weeks.²² Overland migration for aestivation may be triggered by decreasing water levels and increasing temperatures within vernal pools and correspondingly a diminishing food supply and oxygen content within the water. Aestivation sites vary between upland fields and forests, woodland leaf litter, paludal (swampy) forests, dried wetland edges, muskrat burrows, and soft bottoms of shallow streams.²³ Furthermore, Perillo noted upland aestivation occurred between 3 and 165 meters away from the wetlands for all turtles.²⁴

Preferred aestivation habitat typically occurs within close proximity to preferred feeding/breeding habitat. The dried wetland edges and hummocks associated with the emergent marsh and forested wetland areas provide suitable aestivation habitat. Furthermore, the forested upland areas on the project site may also function as potential aestivation habitat.

Preliminary Blue-spotted Salamander (*Ambystoma laterale*) and Marbled Salamander (*A. opacum*) Habitat Analysis

The site's scattered network of vernal pools potentially provides breeding habitat for Blue-Spotted and Marbled Salamanders. Additionally, partially shaded portions of the expansive emergent marsh may also provide breeding habitat for Blue-Spotted Salamander. Both species require seasonal inundation of these ephemeral pools of water to complete their breeding

cycle, but each typically uses the Vernal Pools during separate times of year.

The breeding period for Blue-spotted Salamander (*A. laterale*) typically commences during early Spring when temperatures are above freezing during evening precipitation and continues through later Spring.²⁵ Female Blue-spotted Salamanders tend to lay their eggs underwater on the substratum of vernal pools, roadside drainage ditches, temporary pasture ponds, and/or kettle holes. Eggs are usually attached to litter or twigs within the water column and/or bottom detritus of these water bodies.²⁶ The larval period typically extends from late June to mid-August, when Blue-Spotted Salamander adults emerge as fully-grown, air-breathing adults. This species tends to feed on arthropods, annelids, and centipedes.²⁷

The breeding cycle for *A. opacum* occurs toward the end of the growing season. In late summer when vernal pools are typically dry, adult Marbled Salamanders migrate from surrounding upland areas to the dry pools where females deposit fertilized eggs beneath leaf litter and detritus. As autumnal precipitation fills the pools, the eggs are inundated with water and the female remains with the eggs until they hatch. Larval *A. opacum* actively grow beneath the ice over the winter months, emerging as adults the following spring.

Both *A. laterale* and *A. opacum* utilize upland environments surrounding the vernal pools as non-breeding habitat. Typically, these salamanders remain relatively inactive beneath leaf litter and logs, or underground. Salamanders will utilize surrounding upland areas as far as 1,600 meters from the pool's edge.²⁸

Preliminary Rare Plant Habitat Analysis

According to the June 6th, 2005 letter from NHESP, three rare plants are documented in historical records within the subject parcel. These plants include Violet Wood-sorrel (*Oxalis violacea*), Grooved Flax (*Linum sulcatum*), and Long-Leaved Bluet (*Houstonia longifolia* var. *longifolia*). In August, 2005, LEC traversed the entire site noting plant communities, specific species, and characterizing habitat types in a preliminary effort to identify particularly suitable habitat for each of these species and to note the presence of these or commonly co-occurring species. During these site visits, LEC defined four major habitat types, including Upland Forest, Successional Shrub Habitat (including dry meadow and wet meadow habitats), Forested Wetland, and Emergent Marsh. Overall, some of the broadly defined habitat requirements for each of the species do occur at the site. However, no evidence of the species themselves, or commonly co-occurring species, was identified to date. Further observations during the specific periods of anthesis will be required to fully determine the presence of these species at the

site. However, a summary of the specific characteristics and habitat requirements of these plants, including a discussion of existing site characteristics is provided below.

Violet Wood-sorrel (*Oxalis violacea*)

A member of the Wood-sorrel Family (Oxalidaceae), *O. violacea* occurs within a range from Massachusetts to Michigan and North Dakota, south to Florida and Texas. This species is classified as "Threatened" in Massachusetts. Similar species in Massachusetts include Common Wood-sorrel (*O. montana*) which is similar in height (4-8" and 2-6", respectively) but has white flowers prominently veined with pink rather than the solidly pink to purple flowers of *O. violacea* which bloom in late May through early June. It is easily differentiated from more common species of *Oxalis* such as Yellow Wood-sorrel (*O. europaea*) and Great Wood-sorrel (*O. grandis*), which grow considerably taller and have bold yellow flowers.



Figure 2.10: Violet Wood-sorrel (LEC).

The habitat in Massachusetts for *O. violacea* is broadly defined as a plant of upland woods, shaded slopes and prairies. Despite this, specific habitats associated with confirmed observations of this species in the state include dry and mesic habitats, including a dry, calcareous, semi-open, oak-conifer forest habitat, a damp rich woods habitat, a wooded rocky slope near an intermittent stream and several other habitats. These observations suggest that little is known about the specific habitat requirement of this species, though the plant has only been observed in the state partial canopy/partial shade habitats. Therefore, closed canopy habitats and/or open field, full sun habitats are not likely locations to find this species. Upland forest is the one habitat type present on the site that may contain requisite parameters to support *O. violacea*. As a significant habitat at the site, upland forest accounts for roughly 51% of the total area of the expanded reservation, ranging from

moderate to dense canopy coverage. Due to a moderate to sparse shrub layer throughout much of these forested habitats, observations of low herbaceous cover were easily performed. During two days of field reconnaissance, no evidence of *O. violacea* was observed although *O. europaea* and *O. grandis* were observed in flower.

Grooved Flax (*Linum sulcatum*)

Grooved flax (*L. sulcatum*) is a yellow-flowered member of the Flax Family (Linaceae), classified as rare in Massachusetts based on historical records (observations prior to 1978), although no current observations have been recorded. This annual can grow up to 18" but in New England would be much shorter, typically occurring in dry prairies and calcareous rocks and sand. The geographic range of *L. sulcatum* extends from eastern Massachusetts (historic) to Manitoba, south to Georgia, Arkansas, and Texas. Similar species in Massachusetts include wild yellow flax (*L. virginianum*) and sandplain flax (*L. intercursum*), which have more branched stems and common or domestic flax (*L. usitatissimum*) that is notably similar in appearance, except it has blue flowers.

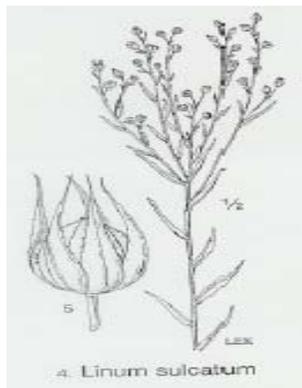


Figure 2.11: Grooved Flax (LEC)

Requiring open, prairie or meadow habitat, *L. sulcatum* would be limited to the relatively few open areas on the site. Three defined upland meadow habitats exist on the site, two located near the roadway access of Trapelo Road, and the third occurs southwest of the water tower in a transition zone from forested upland. Comparable habitats occur on forested area margins scattered throughout the site but are limited in size. During LEC observations at the site, this species was not identified, although common flax (*L. usitatissimum*) and blue toadflax (*Linaria canadensis*), which appear similar after flowering, were observed along sunny forest edge margins.

Long-Leaved Bluet (*Houstonia longifolia* var. *longifolia*)

A member of the Madder or Coffee Family (Rubiaceae), Long-leaved bluets (*H. longifolia* var. *longifolia*) are low perennial herbs that are classified as "Threatened" in Massachusetts. Globally, the species *H. longifolia* is abundant and may be easily missed as populations are typically small, isolated, and low growing (10-20 cm). Unlike similar species common in Massachusetts such as Common Bluets (*H. caerulea*) that have blue flowers with a yellow center, *H. longifolia* has a uniform white to pale blue flower. Additionally, *H. longifolia* occupies a markedly different habitat, growing in small cracks or depressions along river shore ledges or rocky substrates, while *H. caerulea* occurs in dry open fields and lawns. The range of *H. longifolia* extends from Maine to Saskatchewan, south to Georgia and Oklahoma. This species flowers from June through September.

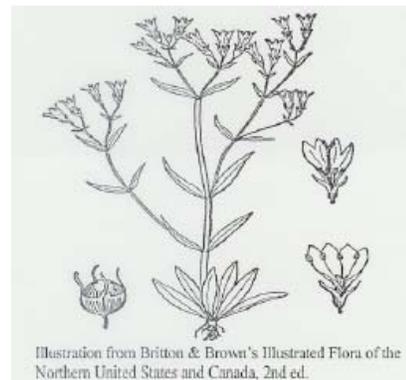


Figure 2.12: Long-leaved Bluet (LEC)

Based on LEC's observations of habitat types at the site, the characteristic river shore, rocky ledge habitats typically associated with *H. longifolia* do not occur within the project site. However, intermittent and perennial stream habitats may be marginally suitable given that rocky or ledge-dominated soils exist. While it is not expected that this species would occur on the site, a comprehensive plant survey should be conducted along existing waterways to confirm if suitable habitat or the species itself exists on the site.

Summary

The 254-acre Beaver Brook North Reservation is considerably larger than Beaver Brook Reservation and contains greater habitat diversity, representing a significant ecological addition to Beaver Brook Reservation. Both sites contain a diverse selection of habitat types, including forested uplands, forested wetlands, successional shrub habitat, upland and wetland meadows, ponds, and emergent marsh. This heterogeneity is compounded by the diverse plant communities contained within each habitat.

Despite the impressive plant species diversity contained within each habitat type, several species of invasive exotic plants, including Oriental Bittersweet (*Celastrus orbiculatus*), Black Locust (*Robinia pseudoacacia*), Norway Maple (*Acer platanoides*), European Buckthorn (*Rhamnus frangula*), Common Buckthorn (*Rhamnus cathartica*), Tartarian Honeysuckle (*Lonicera tartarica*), Multiflora Rose (*Rosa multiflora*), Autumn Olive (*Elaeagnus umbellata*), Purple Loosestrife (*Lythrum salicaria*), Garlic Mustard (*Alliaria officinalis*), and Japanese Barberry (*Berberis thunbergii*) have invaded each habitat type, threatening the longevity of the plant diversity within the site.

Each plant community provides important wildlife habitat for a variety of mammals, birds, reptiles, amphibians, and insects. Feeding, cover, breeding, nesting, and/or overwintering habitat is available for a host of resident and migratory species. Additionally, the site may contain actual habitat for a number of rare plants, amphibians, and/or reptiles listed by NHESP, including Wood-sorrel (*Oxalis violacea*), Grooved Flax (*Linum sulcatum*), Long-leaved Bluet (*Houstonia longifolia* var. *longifolia*), Blue-spotted Salamander (*Ambystoma laterale*), and Marbled Salamander (*Ambystoma opacum*). Additional study will be required to determine whether these species are actually utilizing the site.



Figure 2.13: Watercourse in Beaver Brook North Reservation (Pressley Associates, 2009).

**INSERT NATURAL RESOURCE MAP
BEAVER BROOK RESERVATION**

**INSERT NATURAL RESOURCE MAP
BEAVER BROOK NORTH**

Cultural Resources

This section documents the cultural resources within the expanded Beaver Brook Reservation. Based on a review of primary and secondary sources, it covers the history of both properties and documents cultural resources that include significant buildings and structures, constructed water features, stone walls, archaeological sites and other elements of the designed and vernacular landscape. Given their different histories, the cultural resources of the two properties (Beaver Brook Reservation and the former Metropolitan State Hospital property – now Beaver Brook North Reservation) are discussed separately.

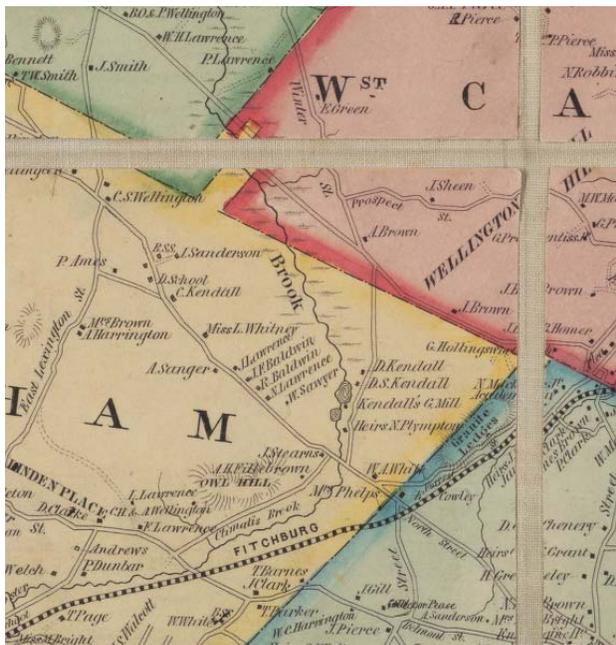


Figure 2.14. Detail of an 1853 map of the Boston area by James C. Sidney showing the two mill ponds and the newly-established Fitchburg railroad (Harvard Map Collection).

Beaver Brook Reservation

Prehistoric Cultural Resources

A 1989 archaeological survey²⁹ noted the potential existence of numerous Native American sites in and around Beaver Brook Reservation, including two recorded prehistoric sites (LXGT-6a and LXGT-6b) that had previously been identified in the southern Waverley Oaks part of the reservation, at the toe of the esker north and west of Beaver Brook. Both were identified by lithic artifacts (prehistoric stone tools) found during the 1890s and recorded in a 1968 archaeological survey of the Boston Basin. In addition, the 1989 survey noted that several Native

American trails probably passed through the area, intersecting at the Waverley Oaks. Trapelo Road probably follows the east-west route of one such trail, and a north-south one may have followed the Beaver Brook watercourse and what is now Mill Street. There may also have been small, temporary campsites near the falls in the northern section of the reservation and in the lower, wet areas to the south, which were used for fishing or hunting expeditions. The 1989 survey concluded that there were likely to be undisturbed prehistoric deposits within the reservation, although no additional information regarding the possible sites was found during field investigations at that time.

History

There is little information on the early impact on this area of the arrival of the European settlers, although it is believed that the brook was named by Governor Winthrop and his party in 1632 because "the beavers had shorn down divers great trees there and had made divers dams across the brook."³⁰ It was too far from the centers of Watertown (settled in 1630), West Cambridge (1630) and Waltham (1634) to be used for domestic dwellings. Instead, the land to the south contained several farms and so was used primarily for grazing or agriculture. To the northeast, the area known as Wellington Hill, which is now the site of McLean Hospital, was common pasture land. The settlers seem to have used two existing Native American trails through the reservation: the Watertown-Concord Highway ran north-south, following the route of what is now Mill Street, and a second route ran east-west, along what is now Trapelo Road. As well as these trails, the settlers built stone walls to mark the property boundaries and to delineate pastures.

By the middle of the seventeenth century, the settlers were also using Beaver Brook for industrial purposes. In 1662, Thomas Agar bought a ¾-acre parcel of land and water, probably located around a small natural cascade falling some ten feet, and established a fulling mill (where cloth was prepared by being beaten and cleaned). The mill and its associated parcel of land passed through several owners over the next few years. By 1690, it seems that Thomas Rider had set up a second mill for grinding corn, located north of Agar's mill adjacent to a more substantial natural cascade that fell some 40 feet or so over a series of ledges.³¹ Both mills would almost certainly have required that the Brook be dammed, creating the two mill ponds at this time.

An 1853 map of Boston (Figure 2.14) shows that the land remained in use for mainly agricultural and grazing purposes into the nineteenth century, with the two dammed millponds on Beaver Brook definitely in operation. A gristmill (for grinding grain) on the upper pond was owned at this time by Mr. Kendall. In records of the time, it is usually referred to as Kendall's mill or

Ruggles' mill. Two later reports suggested that there was also a boarding house where the workmen lived, somewhere near Kendall's mill, but no details or sources for this information were given.³²



Figure 2.15. Copeland House, photo by Nathaniel L. Stebbins, 1896 (DCR Archives). See Figure 7 for a contemporary image of this structure.

A man called Plympton had been running a satin cloth factory or mill on the lower pond, but it apparently burned down in 1848, leaving behind just the millwheel and a portion of the foundations as rather picturesque ruins.³³ There was also a house, owned by Plympton's heirs (see Figure 2.14), shown on the 1853 map to the southeast of the lower pond, as well as some houses and other structures along Mill Street, Trapelo Road and other streets just outside the reservation. These include a building, probably a house, just to the east of Trapelo Road, owned by J. Stearns. In 1845, the Fitchburg Railroad had been extended through this area: the map shows it running immediately south of what was to become the Beaver Brook Reservation. Its Wellington Hill depot, just to the northeast, became Belmont town center, with a second depot in what is now Waverley Square, and a third on Beaver Street, south of Clematis Brook. The arrival of the railroad meant this area became more accessible, both for people wishing to live nearby and travel into Boston; and for those living in Boston who wished to visit the attractive landscape at Beaver Brook.

The house owned by Plympton's heirs had been built probably in the 1830s by Samuel Brook. Plympton had acquired it in the 1840s and built his satin factory nearby. When that burnt, he sold the house and land to Robert W. Parker in 1853, and it was subsequently owned by its most famous occupant, Robert Morris Copeland, between 1857 and 1862 (Figure 2.14).

Copeland was a landscape architect who, among other projects, worked on Boston's Back Bay and who published *Country Life: A Handbook of Agriculture, Horticulture, and Landscape Gardening* in 1859. The book included illustrations of the Beaver Brook landscape and used the property as a model for its readers. The house passed through other hands in the second half of the century before being purchased by the new Metropolitan Park Commission in 1893 (see below). A 1989 inventory and evaluation of the house³⁴ provides extensive details of its history, original structure and later additions and repairs. Briefly, it was a simple Greek Revival cottage with center entry and a sharply-pitched gable roof. A one and a half story mansard block was added, probably after Copeland's time, and further additions and alterations were made by the MDC (the 1919 successor to the MPC) in the twentieth century.



Figure 2.16. Stearns Barn and shed in Beaver Brook Reservation, 1942 (DCR Archives).

An 1875 map of Belmont shows the Copeland house, now owned by R.W. Handyside, but the gristmill on the upper pond no longer appears, suggesting it had been removed or allowed to fall into ruins. A map of Waltham of the same date shows the Stearns house still on the east side of Trapelo Road. Probably sometime after 1852 a barn was added to the southeast of the Stearns house (see Figure 2.16) and therefore just within the boundaries of what is now Beaver Brook Reservation. It was a simple three-by-two bay structure, clad in wood shingles with a gabled roof. There was an Italianate roundhead window in the gable end. At some point a small shed was also added northeast of the barn.³⁵

In the late nineteenth century, the millponds became a source of ice for the vast natural ice industry. The Howard brothers of Watertown were cutting ice there in the early 1890s, blasting a large rock from the center of one of the ponds to increase the surface area, so that more ice could form. They built at least one

large ice house at the lower pond, and used an engine to move the harvested blocks of ice into the house to store before sale. There was also an "ice run" from the upper pond, a channel designed to move the blocks of ice down to where they could be stored.³⁶ A stone wall running alongside the Brook between the two ponds may be the remains of the run.



Figure 2.17: Cascade in Beaver Brook Reservation, c.1896 (DCR Archives).

In the second half of the nineteenth century, and despite the industrial activity described above, the area gained a reputation as a place of great beauty and interest. The picturesque ruined mill at the lower pond became the subject of much literary and artistic endeavor, appearing in many drawings and early photographs. It was so popular that the Boston Art Club pressed for its preservation specifically as a place for artists to sketch. As well as being the frontispiece in Copeland's *Country Life*, the mill at Beaver Brook was featured, for instance, in Ballou's *Pictorial and Drawing Room Companion* in 1859, and as an 1881 image in *Harper's New Monthly Magazine* (see Figure 2.19). Some nineteenth-century drawings (including the one in Copeland's *Country Life*) show planks of wood laid across the Brook just south of the ruins, to act as makeshift bridges for visitors. The poet and Cambridge resident James Russell Lowell captured something of the perceived romance and mystery of the site in his 1850s poem, "Beaver Brook:"

Hushed with broad sunlight lies the hill,
And, minuting the long day's loss,
The cedar's shadow, slow and still,
Creeps o'er its dial of gray moss.

Warm noon brims full the valley's cup,
The aspen's leaves are scarce astir;
Only the little mill sends up
Its busy, never-ceasing burr.

Climbing the loose-piled wall that hems
The road along the mill-pond's brink,
From 'neath the arching barberry-stems,
My footstep scares the shy chewink.

Beneath a bony buttonwood
The mill's red door lets forth the din;
The whitened miller, dust-imbued,
Flits past the square of dark within.

No mountain torrent's strength is here;
Sweet Beaver, child of forest still,
Heaps its small pitcher to the ear,
And gently waits the miller's will.

Swift slips Undine along the race
Unheard, and then, with flashing bound,
And, laughing, hunts the loath drudge round.
Floods the dull wheel with light and grace,

The miller dreams not at what cost
The quivering millstones hum and whirl,
Nor how for every turn are tost
Armfuls of diamond and of pearl.

But Summer cleared my happier eyes
With drops of some celestial juice,
To see how Beauty underlies
Forevermore each form of use.

And more; methought I saw that flood,
Which now so dull and darkling steals,
Thick, here and there, with human blood,
To turn the world's laborious wheels.

No more than doth the miller there,
Shut in our several cells, do we
Know with what waste of beauty rare
Moves every day's machinery.

Surely the wiser time shall come
When this fine overplus of might,
No longer sullen, slow, and dumb,
Shall leap to music and to light.

In that new childhood of the Earth
Life of itself shall dance and play,
Fresh blood in Time's shrunk veins make mirth,
And labor meet delight halfway.³⁷

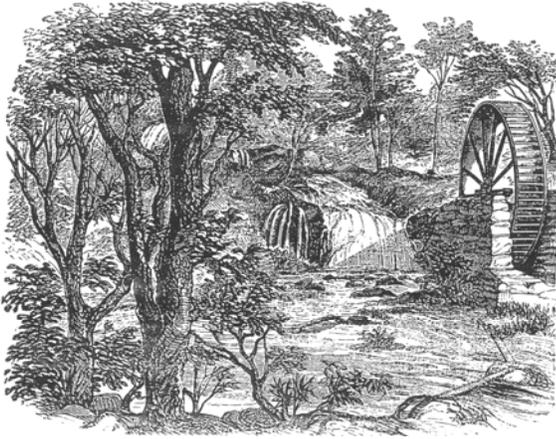


Figure 2.18: Lower Mill remains and the falls at Beaver Brook, 1859 (Ballou's *Pictorial*).

The area also became famous as the site of a stand of huge trees just south of Trapelo Road, which were known as the "Waverley Oaks."³⁸ They were reportedly "regarded by the best authorities as the finest group of those trees in New England"³⁹ and said to be two hundred or more years old. Their first appearance in print was probably in a sentence in an 1864 article about the impact of the ice age on America, by when they were clearly already celebrated: "The Waverley Oaks, so well known to all lovers of fine trees in our community, stand on an ancient moraine."⁴⁰ They appear in more detail in an article in *Harper's New Monthly Magazine* in 1881, about the poet Lowell. This mentioned seven or eight large oaks on a pasture below the ruined mill, and described them as:

...the well-known Waverley Oaks, the only group of aboriginal trees, probably, standing on the Massachusetts coast. If a bull be permitted, the largest of the oaks is an elm, now unhappily dying at the roots. This tree has a straight-out spread of one hundred and twenty feet—sixty feet from the giant trunk each way. The oaks are ... like as so many stout brothers, planted on sloping dunes west of the Brook. They have a human, resolute air. ... Elms have their graceful ways, willows their pensive attitudes, firs their loneliness, but the aboriginal oaks express the strength and the rugged endurance of nature.⁴¹

Later they were described in several articles as consisting of twenty-three oaks and one elm, and located on a glacial kame or ridge that ran through the southern part of the reservation. One report suggested that other venerable specimens were located throughout the reservation, with "one particular giant at the edge of Mill Pond ... reportedly over 600 years old."⁴²

By 1890, the trees were apparently under threat from rapid surrounding development, and the Massachusetts Horticultural Society and others were working to bring the endangered beauty of Beaver Brook and its famous Waverley Oaks to the public's attention. An editorial in the publication *Garden and Forest* in February 1890 issued a plea for their preservation: "The age which these trees have attained and the vicissitudes they have survived entitle them to respect, and the people of Massachusetts might wisely secure their preservation through the purchase and dedication to public use of the land on which they stand."⁴³ It classified them as twenty-two White Oaks, one Swamp Oak and an Elm, and estimated them to be several hundred years old. The largest one was apparently measured at seventeen feet three inches [in diameter] at breast height.



Figure 2.19: A drawing of the Waverley Oaks, 1881 (Harper's *New Monthly Magazine*).

Boston landscape architect Charles Eliot responded immediately to this editorial. Eliot was the son of Harvard president Charles W. Eliot and had worked briefly with Frederick Law Olmsted before traveling in Europe to further his understanding of the designed landscape. He now proposed a scheme by which "not the scene at Waverley only, but others of the finest bits of natural scenery near Boston, might perhaps be saved to delight many future generations."⁴⁴ His proposal led to the creation in 1891 of the Trustees of Public Reservations, which could hold in trust land throughout Massachusetts for the use and enjoyment of the public. While it was an important step, Eliot realized that such an organization could only protect land that was willingly donated.

In the mid to late nineteenth century, Sylvester Baxter, a resident of Malden, published a series of newspaper articles proposing the creation of a metropolitan park system. Many of these articles were widely circulated and appeared in the *Boston*

Daily Advertiser. In 1891 he published a refinement of his writings in a book titled *Greater Boston: A Study for a Federalized Metropolis Comprising the City of Boston and the Surrounding Cities and Towns*.⁴⁵ In 1892, the state legislature established a temporary Metropolitan Park Commission. The temporary commission engaged Charles Eliot as landscape architect and Sylvester Baxter as secretary to complete a comprehensive study with recommendations. The temporary commission's report, dated January 1893, listed a number of potential reservations throughout the metropolitan area that they believed should be preserved or created. Included in his report was Beaver Brook, which was described:

...issues from the highlands through a miniature gorge, and then flows among some glacial ridges upon which stand the largest surviving Oak-trees of our district. The waterfall in the little gorge and this famous grove of Oaks should certainly be preserved; but this cannot be accomplished under any statutes now in force, because the brook is the dividing line between Belmont and Waltham.⁴⁶

Indeed, the two towns had been described as "belligerent provinces ... [involved in a] border war"⁴⁷ who were hardly likely to invest in the preservation, maintenance and mutual enjoyment of jointly-owned parkland.

In 1893, the Metropolitan Park Commission was created by the state legislature with the power to acquire and develop public open spaces, largely thanks to the efforts of Charles Eliot and Sylvester Baxter. Its creation meant that for the first time parcels of land could be acquired and managed even if they crossed city or town boundaries. The creation of the Metropolitan Park Commission was thus critical in ensuring the acquisition and protection of Beaver Brook Reservation.

Frederick Law Olmsted, who was approaching the end of his extraordinary career, understood the importance of what his young protégé was doing, writing to his partners in the firm:

Nothing else compares in importance to us with the Boston work, meaning the Metropolitan quite equally with the city work. The two together will be the most important work in our profession now in hand anywhere in the world...In your probable life-time, Muddy River, Blue Hills, the Fells, Waverley Oaks, Charles River, the Beaches will be points to date from in the history of American Landscape Architecture, as much as Central Park. They will be the opening of new chapters in the art.⁴⁸

Others have subsequently recognized the significance of the creation of the Metropolitan Park Commission. It was a pioneering effort that provided a model for park systems across America and Europe: "the first of its kind, a source of inspiration and encouragement to other metropolitan communities everywhere."⁴⁹



Figure 2.20. Hand colored slide of Beaver Brook Oaks, photo by Nathaniel L. Stebbins, 1896 (DCR Archives).



Figure 2.21. Oaks and Red Cedars in Beaver Brook Oaks, photo by Nathaniel L. Stebbins, 1896 (DCR Archives).

Beaver Brook was a landscape with a rich agricultural, industrial, artistic and recreational history at the time it became the Metropolitan Park Commission's first acquisition. The recent archaeological survey cited earlier⁵⁰ identified a number of

cultural resources, pre-dating the creation of the reservation, for which there are known or potential extant remains. These include the eighteenth or nineteenth-century grist mill at the upper pond, the two mill dams, the nineteenth-century satinet factory and mill at the lower pond, the nineteenth-century barn and the former location of the shed, the nineteenth-century Robert Morris Copeland House, used as DCR staff housing, and the late nineteenth-century ice-harvesting operation (consisting of an ice house probably on the lower pond and an ice run between the two ponds). Boston University's 1989 survey also identified a number of stone walls and paths, which had been built and repaired at various points in the site's history, many of which were shown clearly on the 1894 Olmsted, Olmsted and Eliot plan of the land to be taken to form the reservation (Figure 2.23).

Acquisition and Development of the Reservation

The 59-acre Beaver Brook Reservation, created in 1893, was the first acquisition by the newly-formed Metropolitan Park Commission. Its boundaries were formed largely by existing transportation routes: Mill Road to the east, Waverley Oaks Road to the west and the railroad to the south (Figure 2.21). The main aim of the acquisition was to protect and preserve the famous Waverley Oaks. The MPC decided however not just to acquire the ten acres or so of land in Waltham that contained the oaks (only the ancient elm was in Belmont). The Commission chose also to include the brook itself and surrounding land for its historical and literary associations, and because it was believed that the glacial deposits in the water had nourished the trees and helped them attain their great size and age.

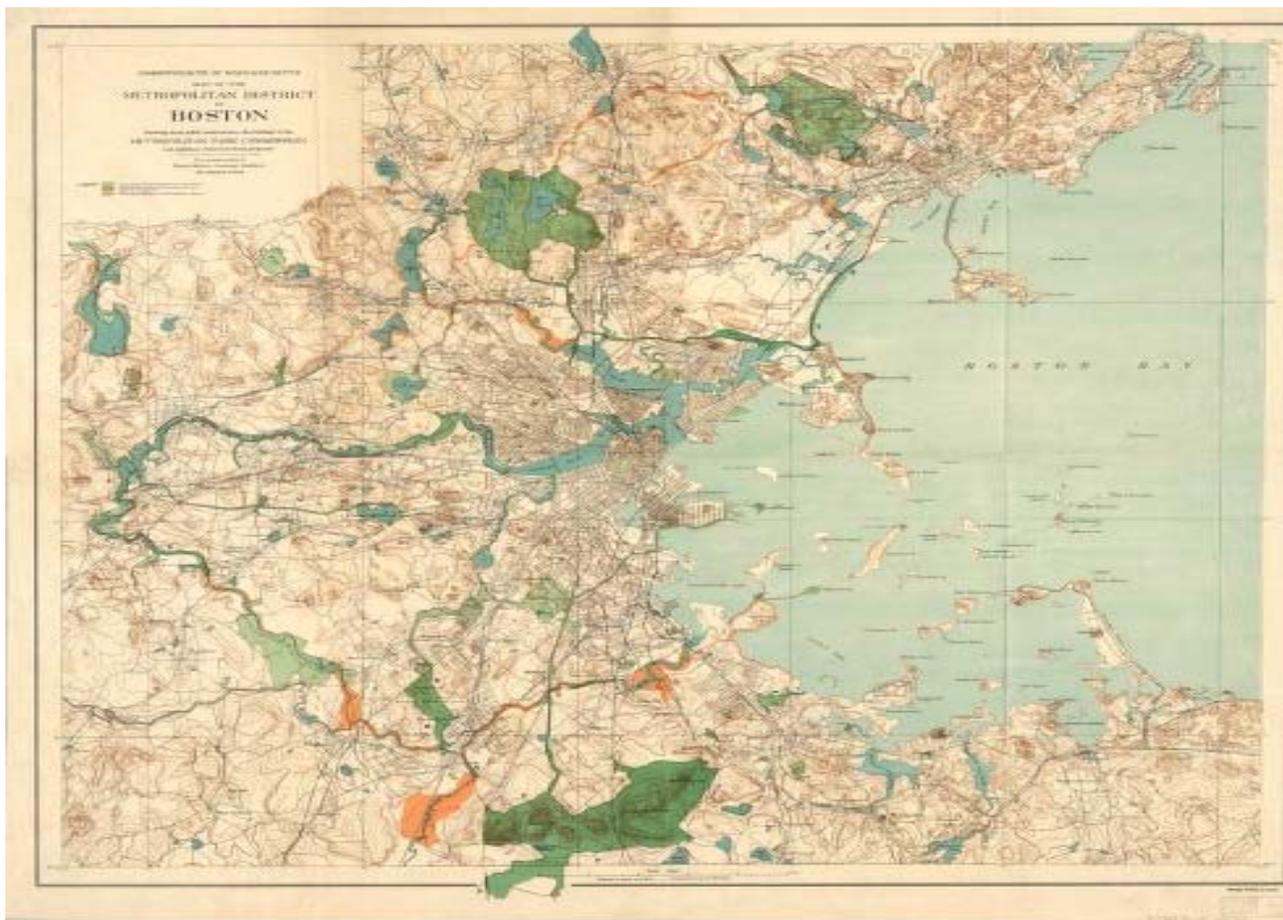


Figure 2.22: Map of the Metropolitan District of Boston, 1898 showing Beaver Brook as one of the original holdings of the Metropolitan Park Commission (Harvard Map Collection).

Some 59 acres was acquired by eminent domain, with the financial compensation to the previous seven owners being paid in part by the MPC and in part by a donation of \$12,500 from Belmont residents Mr. Edwin F. Atkins and his widowed mother, Mrs. Elisha Atkins, who were part of the wealthy Atkins family that had made its money through the sugar trade.⁵¹ In 1894, Atkins was the Chairman of the Belmont Park Commission.⁵² Once the reservation was created, Eliot described the charm of Beaver Brook as springing "chiefly from what lies at hand within the bounds, - the ponds, the cascade, the rushing brook, the open pasture, and the veteran Oaks."⁵³

Articles continued to appear that similarly praised the natural beauty of the new reservation, although they also began to express concern about the impact on the landscape of the increasing number of visitors. One lengthy piece published in *The New England Magazine* in 1896⁵⁴ poetically described the brook, ponds and springs, and listed the flora and fauna that could be seen within the reservation's boundaries, from fox, mink and weasel, to a vast array of game birds, raptors, and songbirds, fish, tortoises and snakes.

In addition to the Oaks, there were Walnuts, Willows, Red Maples, White and Red Ash, White and scrub (Pitch) Pines, plus one very large Red Cedar (measured at twenty inches in diameter) and at least one vast Tupelo. The writer, however, also described with regret how some of the wildlife was disappearing (he believed as a result of increasing human intrusion), from the trout in the brook to the deer among the trees. Many of the pines had been cut down for the saw mill that operated for a time on one of the ponds, and the wild flowers, the gentian in particular, had been all but eradicated by the

"ruthless pillaging of visitors from the city."⁵⁵ The article included an important set of ten photographs that captured the appearance of the landscape shortly after it had been acquired by the MPC and as work was just beginning to manage it as a reservation (Figure 2.23). The famous oaks are prominent in many of images, set in an undulating landscape, with red cedars beginning to colonize the former pasture land. The most obvious sign of human intervention is around the water, with a rustic stone bridge across the brook and large stones marking the edges of the ponds.

The firm of Olmsted, Olmsted and Eliot was appointed landscape architects to the new Commission. The renowned 'natural beauty' of the Beaver Brook landscape and the distinctive Waverley Oaks had made Eliot and others wish to preserve the land. As a result, the firm did not advise an extensive redesign. Instead, they apparently proposed "chiefly to erase the scars on the grounds caused by man's occupation, and to preserve the oaks, whose vitality already begins to show signs of declining, while [leaving] the natural beauties of the place untouched."⁵⁶

In its 1894 report, the firm outlined "two special pieces of safeguarding" that had been carried out at Beaver Brook. One was an extensive program of treatment for the old oaks, supervised by horticultural expert Warren Manning, which included widespread pruning, tarring the resulting cuts, and cementing the largest cavities. The work took six men six weeks. It was intended to extend the lives of the trees, although ironically even the Olmsted firm felt that it removed much of their picturesque appearance.

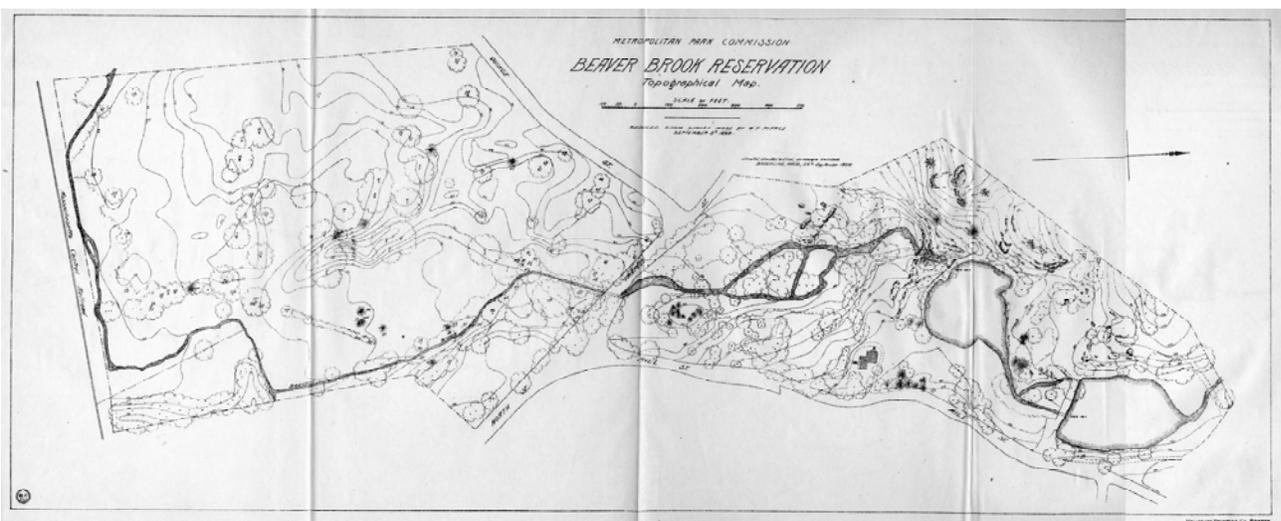


Figure 2.23: Olmsted, Olmsted & Eliot 1894 plan of Beaver Brook Reservation (Metropolitan Parks Commission Report, 1895).



Figure 2.24: Beaver Brook Reservation (*The New England Magazine*, April 1896).

Despite the careful attention of the Olmsted firm and park superintendents, the distinctive trees all succumbed to disease, weather, and old age within thirty years or so of the creation of the reservation. Three died and were removed by the MPC in 1910, one was destroyed in the 1921 ice storm and many more were felled in the 1920s. Although a postcard was issued in the 1930s showing “The Oaks, Waverley,” even the largest tree in the photograph does not appear to be particularly old. A local newspaper reported that the final large oak blew down in 1954, but the report states that it was probably not one of the original trees that had been so celebrated in the 1890s.⁵⁷



Figure 2.25: Mill Pond in Beaver Brook Reservation, photo by Nathaniel L. Stebbins, 1896 (DCR Archives).

The second piece of immediate preservation work at Beaver Brook was to repair the two old mill dams, and thus safeguard the mill ponds that had become “charming features of the local scenery.”⁵⁸ Further repairs were reported at various points by the MPC, and its successor the Metropolitan District Commission, over the forthcoming years.

Obvious evidence of the remains of the mill buildings themselves had largely disappeared by the time that the MPC acquired them. On the upper pond, the mill was reported “entirely gone” by 1896 and just one of the two stone runs used for grinding corn was visible, lying on the rocks below the dam.⁵⁹ The 1989 archaeological survey, however, suggested that a “substantial portion” of the building’s foundation may remain below ground.⁶⁰ On the lower pond, the celebrated ruin of the mill wheel had fallen by 1876⁶¹ and again little obviously remained, although one of the abutments was apparently still visible in the middle of the twentieth century.⁶² The 1989 archaeological survey identified stone remains that probably belonged to the mill wheel foundation, the tailrace (the watercourse that carried water away from the mill wheel) and some of the foundation walls for the mill building. The millstones themselves remained at the ponds and in 1968 were relocated to sit on top of the two dams.



Figure 2.26: Picnic shelter in Beaver Brook Reservation, 1942 (DCR Archives).

In addition to maintaining features that pre-dated the creation of the reservation, the MPC and later the MDC also added a number of buildings and structures to enhance the public’s use of the area as a park. The Olmsted firm designed a formal system of paths and trails in the 1890s, as well as at least two footbridges across the Brook (although the current bridges probably date to the 1960s).⁶³ The paths were laid out “not to

confine but rather to guide the public so that the rural character of the reservation may not be trampled out.⁶⁴ The roads surrounding the reservation were altered too. Mill Street to the east was widened in 1897 and Trapelo Road, which bisects the reservation, was widened to 49½ feet in 1902. As a result, the course of part of the Brook was rerouted and a new retaining wall built.

By 1900, the MPC estimated that over 100,000 people were visiting the reservation each year.⁶⁵ In 1902, sanitary facilities were added and by the following year picnic activities were supported in the southern part of the park, when a “portable house used as a lunch stand was placed in the lower part of the reservation, and the privilege let to a tenant.”⁶⁶ The MPC constructed a bandstand in 1908, with further sanitary and shelter buildings added in 1909. The MDC installed electric lights around the bandstand and sanitary area in 1937. Picnic tables, park benches and water fountains have also been added later in the northern portion of the park as well. The park was originally reached largely by carriage, train or streetcar. MDC added parking provisions with the rise of the automobile era.

For more active recreation, the MDC installed sports fields, including a baseball diamond sometime before 1939, a playground and at least two toboggan runs, one in the southern portion of the park in 1938 and one, later, in the northern section. Other park features are less well documented. At some point, now unknown, a duck pen (elsewhere labeled as an ‘animal shelter’) was built just to the southeast of the lower pond. There are also the remains of a twentieth-century earthen platform, possibly a garden, east of the lower mill, with a trash dump to the south, behind the shed of the superintendent’s house.⁶⁷

Current Historic Status

Beaver Brook Reservation is not yet listed on the State or National Registers of Historic Places. However, it is significant for its association with the Metropolitan Park Commission’s pioneering park acquisition and landscape architect Charles Eliot’s preservation strategies. In 1991, the MDC (now DCR) prepared an extensive draft multiple property nomination for the entire Metropolitan Park System including the Beaver Brook Reservation, which subsequently led to a more focused submittal addressing MDC (DCR) parkways and park roads within the urban parks system. As a result of this effort, the Massachusetts Historical Commission determined that the entire Metropolitan System was eligible for listing on the National Register, “fulfilling NR Criteria A and C on the local, state, and possibly national levels.”⁶⁸ Under Criterion A, a property is associated with events that have made a significant contribution to the broad patterns of our history; under Criterion C, a property

has distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic value. The period of significance for the entire system was defined as c. 1893 to 1941. The period of significance was limited to 1941 because the draft nomination was completed fifty years later. A property that has achieved significance within the past fifty years must be of exceptional importance and requires special justification under NR Criteria Consideration G. The end date may be updated when a final nomination is completed. The MHC also noted:

The park system is generally recognized as the most significant accomplishment of landscape architect Charles Eliot; the scheme was continued after Eliot’s death by members of the Olmsted firm, specifically John Charles Olmsted and Frederick Law Olmsted, Jr. The system is the earliest and most notable scheme of comprehensive metropolitan park planning in the United States.⁶⁹

Subsequently, the DCR pursued nomination of the metropolitan parkways, which were officially listed on the National Register in 2003.



Figure 2.27: Restroom in Beaver Brook Reservation, 1911 (DCR Archives).

It is likely that the primary period of significance for Beaver Brook Reservation is 1893-1938, which includes acquisition of the property by the Metropolitan Park Commission, development of a scenic reservation according to the vision of Charles Eliot, the design of paths and trails by the Olmsted firm, the addition of buildings and structures by MPC and MDC to enhance it as a public park between 1893-1910, and installation of recreational facilities to enhance public recreation in 1938. Further work is needed to determine the relative significance of the earlier historic periods, but the recorded history of Beaver Brook

extends back to 1662 when Thomas Agar purchased the property. Records from 1853 show agricultural and industrial development on the land. Thus, a secondary period of significance may be associated with prior land uses from 1830-1892, which includes Robert Morris Copeland's purchase and occupancy of the Samuel Brook house, a Greek Revival style cottage on the property.

Analysis of Integrity and Significance

The Beaver Brook Reservation possesses integrity of location, design, setting, materials, workmanship, feeling, and association

and meets National Register Criterion C as a representative example of a late nineteenth century scenic reservation developed by landscape architect Charles Eliot and the Olmsted firm. It may also meet National Register Criterion A for its role in the establishment of the Metropolitan Park System in Massachusetts. The Copeland House, Stearns Barn, mill ponds, recreational facilities such as the baseball diamond, trail system, oak trees, and prehistoric and historic archaeological sites all contribute to the property's significance. Areas of significance likely include architecture, landscape architecture, community planning and design, industry, recreation, and social history.

Table 2.1: Summary of Integrity for Beaver Brook Reservation

| Aspects of Integrity | Primary Period of Significance 1857-1938 |
|----------------------|--|
| Location | Retains location. |
| Design | Retains most elements of design reflected at the end of the period of significance; new recreation features diminishes design integrity. |
| Setting | Retains setting as a reservation for public recreation. |
| Materials | Retains most landscape materials and specimen tree collection. Some loss of plant materials diminishes landscape materials. |
| Workmanship | Retains most workmanship in structures. |
| Feeling | Retains feeling; many parts of the reservation are recognizable. |
| Association | Retains association with the original Metropolitan Park System (DCR). |

Table 2.2: List of Contributing and Non-contributing Resources in Beaver Brook Reservation *

1. Primary Period of Significance (1893-1938)

| Date | Feature | Preliminary Evaluation |
|---|--|---|
| | Mill Pond and surrounding area | Contributing site |
| Earliest c. 1690, c. 1898 improvements | Mill Pond dam | Contributing structure with alterations to present |
| Original probably c. 1662, c. 1898 improvements | Duck Pond dam | Contributing structure with alterations to present |
| 1893 | Boundary of the current reservation | Extant, contributing site (cultural landscape) |
| c. 1898 | Cascade and Overlook | Contributing structure |
| | MDC Duckpen/Duck Pond | Contributing site |
| 1890s | Ice house and ice run | Not extant |
| 1890s | Olmsted footbridges & paths and trails | Requires further evaluation to determine location and condition |
| 1890s | Retaining wall along Trapelo Road | Extant: contributing structure |
| c. 1898 | Stone walls & paths as shown on Olmsted 'takings' plan | Likely contributing structures |

| Date | Feature | Preliminary Evaluation |
|---------|--|---|
| c. 1900 | Earthen platform, possibly early 20 th century garden | Site remains only |
| Unknown | MDC Shed | Not extant; likely archaeological site |
| c. 1870 | Waverley Oaks | Contributing site |
| 1902 | Sanitary facilities at lower part of pond | Not extant; likely archaeological site |
| 1907 | Bandstand | Not extant; likely archaeological site |
| 1909 | Sanitary building near the bandstand | Extant: contributing building |
| 1909 | Shelter building near the bandstand | Extant: contributing structure |
| c. 1938 | Ball field | Contributing site |
| c. 1938 | Playground | Contributing site, existing equipment is not historic |

2. Additional Resources Associated with the Secondary Period of Significance

| Date | Feature | Preliminary Evaluation |
|---|---|---|
| 18 th century | Grist mill on upper pond and two stone runs | Archeological remains only |
| 17 th -18 th century (lost 1848) | Satinet factory & fulling mill on lower pond | Not extant; archaeological remains only |
| 1835 | Robert Morris Copeland House (Samuel Brook House) | Contributing building |
| c.1852 | Stearns Barn | Contributing building |

*Note that in the absence of a full NR evaluation or cultural landscape report, this list is preliminary and may be modified in the future following additional primary research.

Beaver Brook North Reservation

Prehistoric Cultural Resources

No prehistoric sites have yet been recorded within the boundaries of the North Reservation. However, the existence of several Native American sites in close proximity, described above, and the nature of the land itself make it is very likely that such sites are present. The land consists of well-drained soil, eskers, and hills with gently slopes leading to glacial ponds, wooded areas, and undisturbed wetlands. As such, it is very likely to have been used for prehistoric settlements and subsistence activities. There is, in addition, anecdotal evidence that Native American artifacts were found on the hospital grounds.⁷⁰

History

The area of the former hospital property was for many years used principally as farmland. There are the remains of the foundation of an agricultural stone barn in the southwestern corner, as well as possible other building foundations, and evidence of stone walls and carriage roads that pre-date the hospital. As with the Native American sites, the largely

undisturbed nature of much of the ground makes it likely that the site supports historic archaeological remains.

Significantly, when the hospital site was purchased by the Commonwealth, it included the eighteenth century home and estate of General Nathaniel Bridges, a friend of George Washington. The house was demolished to make way for the hospital superintendent's house, but some of its paneling was saved and used in Kline Hall.

Acquisition and Development of the Commonwealth Hospital⁷¹

In 1900, the Commonwealth of Massachusetts took on full responsibility for the care of its mentally ill citizens. Insane and aged senile patients were thus transferred from local to state facilities and the State Board of Insanity began a major system-wide review to plan for their current and future care. As it quickly became clear that the system was overcrowded, especially in metropolitan Boston, there was much debate over how best to increase capacity. The trustees of the largest existing facility, the Boston State Hospital, pressed for the increased need to be met by expansion of that hospital. Others urged the construction of a second facility, and the legislature duly appropriated

\$100,000 for the purchase of a new site in 1913. The Board of Insanity identified and acquired a parcel of approximately 300 acres on the Waltham, Belmont, and Lexington borders and produced preliminary site plans, but Boston State Hospital's continued lobbying for expansion, and the entry of the United States into the First World War, delayed any further progress until the 1920s.

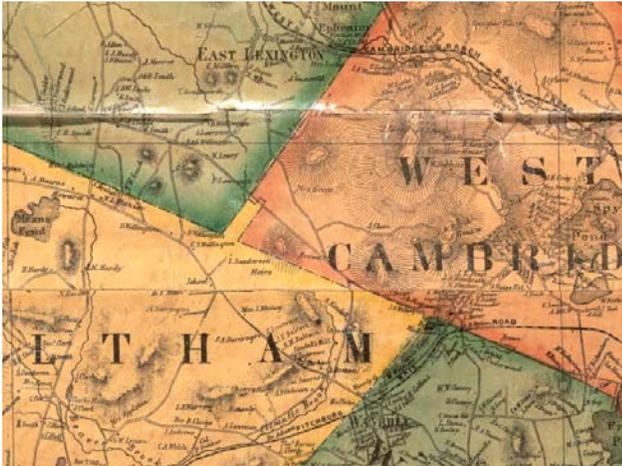


Figure 2.28: The future site of the Metropolitan State Hospital, shown on the 1856 Walling Map of Middlesex County (detail) (Harvard Map Collection).

In 1926, the Department of Mental Diseases (the 1919 successor to the Board of Insanity) advised against expanding Boston State Hospital, as its very size might then preclude individual care and treatment. Instead it recommended the establishment of a new second hospital, with room for no more than 2,000 patients. The cost of the new facility was a major issue, as care for the mentally ill was already consuming about one sixth of the state budget. The preliminary site plans, produced in 1915, which had proposed small, cottage-style units dispersed over the site, were now considered too expensive. The Department therefore conducted a major study of hospital facilities and consulted experts throughout the United States, in an attempt to find the best design for the new facility. With an appropriation of \$1,500,000 from the legislature, the Board then appointed Boston architect Gordon Robb to produce a plan that combined the best of the patient-focused cottage-style system with the efficiency and relative economy of the older congregate (single large building) approach. Robb's brief was also to produce standard buildings that could serve as models for other state hospitals in the future.

Work started in December 1927 and the Metropolitan State Hospital duly opened on the Waltham/Belmont/Lexington site in October 1930. The Colonial Revival style buildings were located on high ground on the northwestern portion of the site, arranged along two axes. Laid out along one was staff residential

accommodation, the superintendent's house and the main administration facilities; on the second axis were the buildings designed for patient care. These included the main wards (arranged around a large, enclosed courtyard), medical facilities, a food service building and chapel (see the 1934 site plan in Figure 2.29). Given the nature of their planning and construction, the buildings displayed a sense of cohesiveness and architectural unity that was unique among the Commonwealth's hospital campuses.

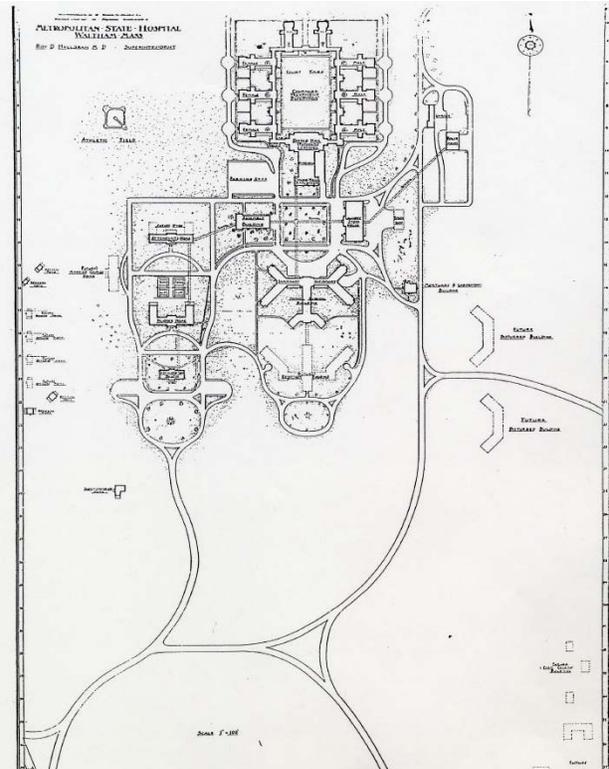


Figure 2.29: Original 1934 plan for Metropolitan State Hospital (National Register of Historic Places).

Metropolitan State Hospital proved to be the last of the great institutional facilities that the state created to care for its mentally ill. The size of the new hospital reflected the growing requirements imposed on the state by the ever-increasing number of mentally disabled patients, but the separate wards were an attempt to continue to provide patient-focused rehabilitation and care. Costs were kept down by the use of simple red brick as the main construction material and the removal of planned decorative elements from the ward buildings. Innovative features included tunnels and corridors that were carefully designed to provide suitable circulation routes for both staff and patients, while new windows were installed that did not require bars, and cells were treated to deaden sound. Radios and microphones were installed to allow broadcasts and talks to be heard by everyone.



Figure 2.30: The simple cinder blocks used as grave markers in the hospital's cemetery, the number signifying the patient, with a 'C' for Catholics and a 'P' for Protestants (The National Empowerment Center).

R. Loring Haywood served as landscape engineer for the hospital and his work represents an example of professional design on a state school or hospital campuses. The northwestern portion of the landscape was designed with manicured lawns, wooded groves and planting beds in a naturalistic style. The buildings, not visible from Trapelo Road, were gradually revealed to visitors as the curving approach road passed through the undulating grounds to reach a circular drive landscaped with lawns and trees in front of the former MSH Administration Building (see Figure 2.31). The road continued north and east as the link between the main campus buildings. The eastern half of the site was left as largely undisturbed wetland or swamp, with some wooded areas that sloped down to the adjoining Beaver Brook. There was a small farm at the southeastern corner of the campus where the male patients could work, which at one point may have included dairy barns and dormitories.



Figure 2.31: The MSH Administration Building, probably from the 1930s (Metropolitanstatehospital.com).

Patients and staff were transferred from other state hospitals, beginning in December 1930. Within the year, there were over a thousand patients at the new facility. By 1945, the campus had increased to 490 acres, with 80 acres under cultivation, including a large poultry plant. Much of the rest of the grounds were wetland or rock ledge. There were by now 1,995 patients, 410 over the nominal capacity of the hospital, including three children, whose presence may have led to the construction of the separate facility for children on Mackerel Hill to the south of the site.

The campus included over three dozen buildings and other structures constructed between 1927 and 1980. The main buildings, landscaping, circulation routes, patient cemetery, and ancillary structures were all in place by about 1935. The cemetery was located far south of the building complex. A small second wave of buildings, including the new children's center (Gaebler Center) on Mackerel Hill, was constructed in the 1950s and early 1960s, also in red brick but with simpler modern lines. There was one final addition in 1980.

Proposed Reuse of the Hospital Site

In the early 1990s the campus was vacated by the Department of Mental Health and subsequently declared surplus by the state. In its seemingly abandoned state, it became the subject of a number of photographic studies (see, for instance, Figure 2.32) and an award-winning short film, *Met State*, by Bryan Papciak, as well as the setting for part of the 1999 movie *A Civil Action* starring John Travolta.

The Massachusetts Division of Capital Planning and Operations (DCPO) managed the site's disposition for new uses. In 1994, it was listed on the National Register of Historic Places as part of the Massachusetts State Hospitals and State Schools Multiple Property Submission. In the same year, a Reuse Plan⁷² for its development was produced by the DCPO, MDC, Massachusetts Department of Mental Health, and the communities of Belmont, Lexington, and Waltham.

The plan recommended three main uses for the site:

- Public open space, run by the state as a metropolitan reservation; this would preserve the site's key natural features, including its extensive system of wetlands, its major plant communities and abundant fauna, fourteen vernal pools, a pond and three brooks, Mackerel Hill and several eskers (glacial ridges), as well as its system of footpaths and unpaved cinder roads;
- Redevelopment of portions of the site already largely occupied by buildings or parking with low to moderate-density housing aimed principally at senior citizens (reusing existing buildings wherever possible), or institutional use, or both; and
- Public nine-hole golf course on 49 acres of land lying within the town of Waltham, which included Haywood's front lawn and Trapelo Road frontage on Mackerel Hill.

The Reuse Plan categorized the main buildings and landscape into three geographical groups:

- Main Campus Hilltop (formed by the patient care axis with its seven brick buildings);
- Main Campus Flatlands (the staff axis with three brick buildings); and
- Gaebler Center site on Mackerel Hill.

The Massachusetts Historical Commission assessed the historic value of the resources on each of these sites and ranked as most important the Main Hospital Wards, the front section of the Medical Building and the surrounding mature landscape, with its tree-lined roadways and scenic hilltops providing spectacular views.

The 1994 Reuse Plan was enacted by legislation in 1996, incorporating a revised map produced in September 1995. A further amendment was made in May 2002, with the addition of a buffer zone on Porter Road. Judith Nitsch Engineering, Inc prepared a 2002 Definitive Subdivision Plan for the Massachusetts Division of Capital Asset Management (DCAM, the 1998 successor to the DCPO). DCAM duly transferred a portion of the site to the then MDC as a reservation site and Metropolitan Parkway. In January 2003, it released two lots of land to the City of Waltham for the development of the golf course, for consideration of the sum of \$600,000. The City of Waltham and the MDC were to share the use of the former MSH Administration Building as a Clubhouse and Visitors' Center respectively.

In August 2002, DCAM issued a Request for Proposals for the development of the Main Campus site and, the following year, the publicly-owned real estate investment trust AvalonBay Communities, Inc. was chosen as the designated developer. Its plans (see Figure 2.33) provided some 387 units of rental housing within the existing campus layout and landscape. Important buildings, including the Clock Tower, Kline Hall, and most of the Main Hospital Wards, were rehabilitated as part of the development. Twenty-five percent of the units were to be affordable housing, of which ten percent would be available to clients of the Department of Mental Health. Some units will also be reserved for people over 55.



Figure 2.32: Courtyard, Portico, Vines, part of a photographic study of the Hospital site called 'Detritus', 2004 (Opacity.us).



Figure 2.33: A model of AvalonBay Communities' redevelopment of the Main Campus (Mass.gov).

DCAM also commissioned debris removal in the reservation in winter 2005-06. At that time, damage was also observed to MetFern Cemetery; DCR consequently prepared a Preservation and Maintenance Plan and implemented stabilization work on the cemetery.

In 2009, the Metropolitan Parkway is complete, but without the DCR/Waltham parking area, and plans for the City of Waltham golf course have not yet progressed.

Current Historic Status

The former Metropolitan Hospital property is part of a historic district listed in the National Register of Historic Places since 1994. In 1993, Massachusetts Historical Commission determined that the MSH was eligible for listing on the NR as a historic district. It was deemed eligible under Criteria A and C with architecture, health/medicine, and social history as the areas of significance. The period of significance was identified as 1927 to 1940. Out of the 31 resources on the property, the MHC identified 17 contributing and 4 non-contributing buildings, 5 contributing sites, and 9 contributing and 1 non-contributing structures.

Integrity and Significance

The former Metropolitan State Hospital possesses integrity of location, design, setting, materials, workmanship, and feeling with diminished association. It was last of the institutions built by the Commonwealth for the care of mentally ill citizens and represented a mature and cohesive expression of the state's goals to reflect the rehabilitative ideals of the health care system. With a dominant late nineteenth-early twentieth century Colonial Revival architectural style set on pastoral grounds, the hospital represented an evolution from the congregate Kirkbride model to dispersed colony plan campus responding to increases in resident populations and constraints of a publicly funded budget without compromising on provisions for pertinent accommodations and treatment programs. It also reflected the impact of the automobile age.⁷³

Table 2.3: Summary of Integrity for the Former Metropolitan Hospital Property

| Aspects of Integrity | Period of Significance 1927-1940 |
|----------------------|---|
| Location | Retains location. |
| Design | Retains most elements of design as reflected at the end of the period of significance (1940). |
| Setting | Retains setting as an institutional campus. |
| Materials | Retains most landscape materials, particularly roads and specimen tree collection. Some loss of plant materials and lack of maintenance diminishes landscape materials. |
| Workmanship | Retains most workmanship in structures only. |
| Feeling | Diminished feeling; many parts of the campus are recognizable, although the overall feel of the manicured campus is reduced. |
| Association | Compromised association as it no longer functions as a health care institution and is currently being rehabilitated for new uses including housing and state reservation. |

The table below lists by location all the contributing resources included in the MSH National Register nomination located within the North Reservation and on City of Waltham land on which the DCR holds a conservation easement.

The City of Waltham has also taken title to the Gaebler Children's School, designed in 1950 by Gordon Robb, but considered non-contributing. Other historic resources on the former MSH land, now privately owned, include the 1927 Main

Hospital Wards (Continued Treatment Group), post 1935 St. Nicholas Chapel, 1930 Kline Hall, the 1929 Food Service Building, 1930 Laundry/Maintenance Building, the 1934 Medical/Surgical Building, and three houses all of which were designed by Gordon Robb and contribute to the NR nomination. The c.1928 quadrangle, Administration Lawn, and the primary and secondary circulation systems designed by R. Loring Haywood are also contributing features.

Table 2.4: List of Contributing and Non-contributing Resources on former MSH Property

1. Resources within the DCR Beaver Brook North Reservation

| Date | Name of resource | Condition and description | Architect | NR status ⁷⁴ |
|--------------|-----------------------|--|-------------|-------------------------|
| c. 1930 | MetFern Cemetery | Cemetery for patients of both Metropolitan State Hospital and the Fernald Center. Located on a terrace east of the main drive. Gravestones were simple cast stone blocks, marked often with a number rather than a name (Figure 2.30). Vernacular stone wall runs along rear and sides, with terrace in the SW corner. Site was damaged in 2006, but stabilized by DCR thereafter, including a new stone wall along the carriage road. | | C |
| 1928 | Power Plant | Contained 4 large boilers. 2-story building with massive round arched windows and red-brick smokestack. This building was demolished by DCAM in 2005. | Gordon Robb | C |
| 1930s | Incinerator | Demolished by DCAM in 2005. | | C |
| 1934 (or 36) | Mortuary / Laboratory | Center for studying causes and treatment for mental disease. Small, 5 by 6 bay building, 1 – 2 stories, with slate hip roof. Demolished by DCAM in 2005 | Gordon Robb | C |
| 1930 | Main Garage | Demolished by DCAM in 2005. | Gordon Robb | C |
| 1930 | Water Tower | Located at the top of Mackerel Hill. Lead-lined water tower with attached cell antennae. | | C |

2. Historic Structures and Features on City of Waltham [proposed golf course] land

| Date | Name of resource | Condition and description | Architect | NR status ⁷⁵ |
|--------|---------------------------------|--|-------------------|-------------------------|
| 1927 | Administration Building | Contained a lobby & information desk, staff offices, storage, medical library and records. First structure visible on approach from Trapelo Road. Rectangular, 11 by 4 bay, two-story building with slate hip roof and cupola. Tuscan portico and columns on south entrance. Extant. | Gordon Robb | C |
| 1934 | Superintendent's house & garage | Fine, two-story building with gabled slate roof with 3 dormers, exterior chimney and one-story sun porch. Attached 2-car garage. Built on site of earlier Bridges House. Demolished. | Gordon Robb | C |
| c.1935 | Superintendent's garden | Large garden enclosed by dry-laid stone wall. Not extant. | R. Loring Hayward | C |
| c.1928 | Front lawn | Adjacent to the Administration Building; currently a staging area for construction materials. Deteriorated – overgrown. | R. Loring Haywood | C |
| 1927 | Female Dormitory | Housing for 125 nurses. Three-story, U-shaped building with slate hipped roof. Center-entry pavilion in 21-bay south façade. Demolished. | Gordon Robb | C |

**INSERT CULTURAL RESOURCES
BEAVER BROOK RESERVATION**

INSERT CULTURAL RESOURCES NORTH RESERVATION

Current Site Conditions

Pressley Associates conducted an inventory and analysis of the existing conditions of both properties to inform the resource management plan proposed for the reservation. A series of field surveys conducted spring through fall of 2005 and interpretation of aerial photographs facilitated the documentation of the reservation properties. This section integrates the condition and function of various physical components of the reservation as described under the following categories:

- Location
- Site Description
- Site Access and Circulation
- Structures
- Site Features and Furnishings
- Recreational Uses

Location

Beaver Brook Reservation

The Beaver Brook Reservation is located in Belmont and Waltham with Beaver Brook defining the boundary between the municipalities. It consists of two properties divided by Trapelo Road. The northern property lies along Mill Street opposite Hospital and its associated residential development and open space property. The southern property, along to Waverley Oaks Road is located close to Waverley Center in Belmont and is bordered by MBTA commuter rail tracks in the south.

Beaver Brook North Reservation

This property is located northwest of Beaver Brook Reservation in Belmont, Lexington, and Waltham. Adjacent to Rock Meadow in Belmont, this property is sandwiched between Trapelo Road and Concord Avenue on a portion of the former Met State Hospital grounds.

Site Description

Beaver Brook Reservation

The northern part of the Beaver Brook Reservation has a naturalistic character with two ponds and thick woodland vegetation. The ponds cover almost 3 acres of the 26.76 acre property. The site elevation drops from the eastern and western boundaries to the ponds in the middle and further south. The site has abundant habitat value with trees and shrubs. The historic Copeland House functions as the DCR staff residence. The ponds, wooden bridges, remnants of the dam structures, and copious flora and fauna render a woodland experience on the lightly maintained trails in this property.



Figure 2.34: Lowell Path in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.35: View of wetlands along Metropolitan Parkway in the North Reservation, 2005 (Pressley Associates).

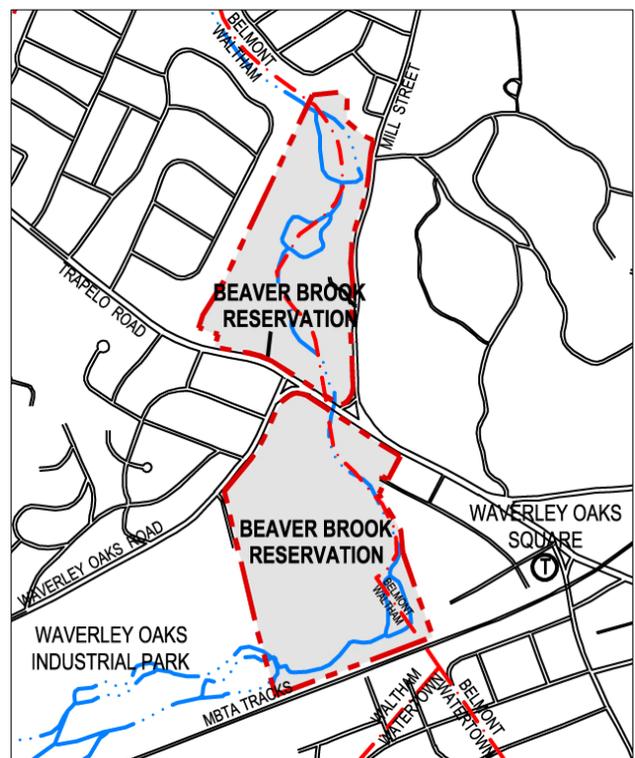


Figure 2.36: Location of the Beaver Brook Reservation (Pressley Associates).

The southern part of the Beaver Brook Reservation has a park character with active sports area, play area and picnic areas. This 36.96 acre property utilizes vegetation to screen the various activities. The site slopes down gradually from the western edge to the stream on the eastern side with interesting topography in the central region. The active sports facilities consisting of tennis courts and a ball field are located on the western side and other recreation facilities such as the picnic area and children's play area are located to the eastern side of the property. Both the existing ball field and the playground are considered historically significant.



Figure 2.37: View of wetlands and woodlands along the Metropolitan Parkway (Pressley Associates, 2005).

Beaver Brook North Reservation

Beaver Brook North Reservation consists of over 50 acres north and 200 acres south of the new Metropolitan Parkway. Wetland parcels concentrated in the 50-acre northern part of the property form an important habitat described in the natural resources section of this chapter. The 200-acre property south of the parkway is densely vegetated with trees except for the two open wetlands in the central region. Mackerel Hill dominates the southern part of the property and Beaver Brook flows along the eastern side of the reservation. The interesting variety in the landscape enhances the naturalistic character of the property. The demolition and rehabilitation of the former hospital buildings have disturbed the natural environment of the reservation in some locations.

Site Access and Circulation

Beaver Brook Reservation

The northern property is reached from Mill Street with a parking area of 10 spaces located at one of the three access points. The footpath along Mill Street provides pedestrian access from the southern property. The paths are approximately two to four feet wide with either gravel or dirt surface, except for the path near Duck Pond dam structure, which is bituminous. The bituminous

paths are in better condition than the existing dirt paths, largely because the paved paths follow a designed alignment traversing the slope and allow for sufficient drainage. In contrast, the desire line paths are the result of repeated foot traffic and as a result, they often follow the shortest route down the slope resulting in substantial erosion to both the path and the adjacent landscape. Three bridges cross over the stream adjacent to the ponds, two of which are part of the dam structure.

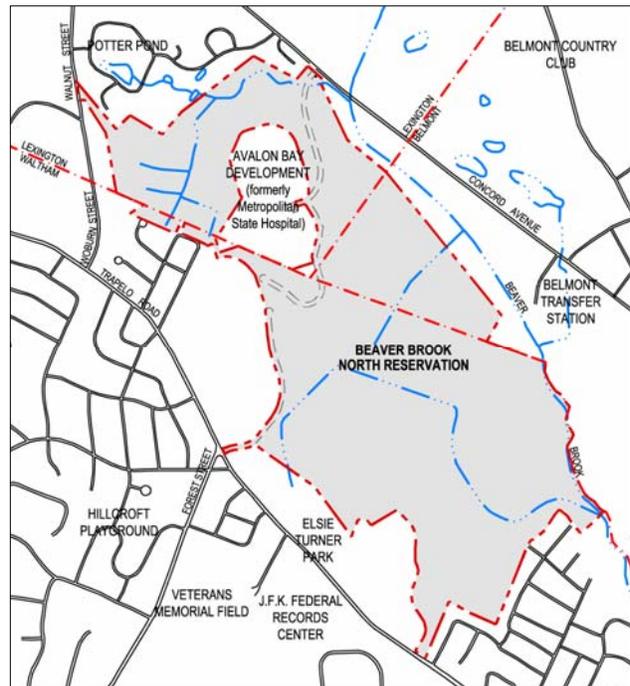


Figure 2.38: Location of Beaver Brook North Reservation (Pressley Associates).



Figure 2.39: Duck Pond in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.40: Entrance along Waverley Oaks Road in Beaver Brook Reservation, 2005 (Pressley Associates).

The southern part of the Beaver Brook Reservation is well developed in terms of both accessibility and circulation. The property can be accessed from Trapelo Road with two entrances at Waverley Oaks Road and Wilson Road respectively. Two parking areas with bituminous paving are located on the property, one with 40 parking spaces along Trapelo Road and another with 22 spaces along Wilson Road. The sidewalks bordering Trapelo Road and Waverley Oaks Road provide pedestrian access to the property. Part of the sidewalk along Waverley Road west of the entrance on this road is located inside the stone wall of the property. A well defined approximately 10 feet wide bituminous path with bridges across the stream connects all the access points. An approximately 3 feet wide gravel path leads to the wetlands located in the south with a bridge across the stream. Various desired line paths approximately two to three feet wide diverge from the bituminous path. Some of them are located in wetland areas creating muddy patches and a few others cutting across steep elevation suffer from erosion. Overgrown vegetation chokes the Two Bridge Trail and Brookside Trail whereas Tobogan Run, Plympton Path, and Kendall Path have an unobstructed route.

Beaver Brook North Reservation

The Metropolitan Parkway provides vehicular access from Trapelo Road and Concord Avenue, although access from Trapelo Road is envisioned to be the primary access road leading to the proposed DCR parking area near the former MSH Administration Building. Elsie Turner Park (City of Waltham) provides informal parking and access to the North Reservation; however, DCR is not responsible for this property, its maintenance, nor the public's use of it. Pedestrian and mountain bicycle access is also possible from Belmont's Rock Meadow conservation land.



Figure 2.41: Bituminous Lowell Path in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.42: Metropolitan Parkway under construction through the former MSH property, 2005 (Pressley Associates).



Figure 2.43: Gravel path in former MSH property, 2005 (Pressley Associates).

The property north of the parkway, dominated by wetlands, has well-defined paths allowing passage through the marsh. In the southern property some of the gravel paths, former woodland carriage roads approximately eight to twelve feet wide provide pedestrian, mountain bicycle and limited vehicular access to the former debris sites and MetFern Cemetery. As of the completion of this final draft RMP, vehicular access to the carriage road in the interior of the North Reservation has been altered due to the demolition of several buildings and construction of the parkway so that it is currently not feasible to enter the interior of the reservation by vehicle due to the curb and the steep grade of the dirt road as it enters the site from the north parkway segment near Concord Avenue.

Some of the gravel paths through the wetlands are deteriorated with muddy patches. One such path provides access to Rock Meadow Reservation with a bridge across Beaver Brook. The paths along the steep slopes of Mackerel Hill suffer from severe erosion, largely due to the straight alignment of the path heading straight down the fall line of the slope. This causes water to flow down the path exacerbating the erosion problem.

Structures

Beaver Brook Reservation

The Copeland House along Mill Street and the Stearns Barn at the entrance from Trapelo Road are the only buildings in the reservation property north of Trapelo Road. Both bridges over the dams have structures associated with the dams. The Duck Pond and Mill Pond dams are currently listed in the DCR Dam Safety database as being in poor condition. The five wooden bridges are in fair condition. The ten stone steps at the eastern edge of Two Bridge Trail provide access to the open area south of the historic Copeland House. The stone overlook with metal railing adjacent to Duck Pond offers a close view of the cascade, and when clear of vegetation, the wheel box and portions of the Plympton satinet remains are readily visible. The historic picnic shelter and the historic restroom (sanitary) building are located south of Trapelo Road in the Waverley Oaks parcel. The wooden bridges in both the north and south parcels of the reservation blend with the natural surrounding. The metal bridge near the play area has wooden handrails. The stone entrance wall with four pillars at the parking area on Waverley Oaks Road projects a rustic quality in conjunction with the stone boundary wall along that road.



Figure 2.44: Stone wall and park sign post located at the entrance of Beaver Brook Reservation along Mill Street, 2005 (Pressley Associates).



Figure 2.45: Stone overlook near Duck Pond in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.46: Park sign on a boulder in Beaver Brook Reservation, 2005 (Pressley Associates).

Beaver Brook North Reservation

In the DCR reservation property, the buildings associated with the former Metropolitan State Hospital were demolished in 2005. They include the garage, power plant/boiler room, incinerator, and mortuary/laboratory. The water tower atop Mackerel Hill dominates the highest elevation of the property and is visible from both Trapelo Road and Concord Avenue. The water tower has been evaluated by DCAM as part of the reuse process, who determined that it could be taken out of service. It currently has a leased cell tower. The wooden bridge connecting the site with Rock Meadow has no handrails making its use precarious.

Site Features and Furnishings

Beaver Brook Reservation

A two feet high stone wall borders Mill Street between the entrance to the park office and the northern gate on the property north of Trapelo Road. Chain link fence runs along the western edge of this property and a guide rail extends along Trapelo Road boundary.

Two metal swing gates are located at the entrances north of the parking area along Mill Street and another one at the entrance from Trapelo Road. Four wooden picnic tables are located near Duck Pond at the entrance from the parking area and another one on the other side of the pond at the end of a dirt path from Plympton Path. Two wooden benches, one located near the northern most entrance along Mill Street and the other near the bridge over Duck Pond, are in poor condition. One information board is located at the entrance near the parking area along Mill Street with information about the trails and park use. A wooden park sign post located adjacent to the parking area. Two traffic light boxes are located at the corner of Trapelo Road and Mill Street and a dumpster is located near the shed at the entrance from Trapelo Road.

A two feet high stone wall borders Trapelo Road and Waverley Oaks Road on the property south of Trapelo Road. Chain link fence encloses the two tennis courts and the back stop of the ball field. Single rail timber fence runs around the two parking areas and along Wilson Road boundary between Waverley Oaks Road and entrance from Wilson Road. The ramp at the southern entrance along Trapelo Road has pipe hand railing. Two metal swing gates are located near both parking areas and metal bollards exist at both entrances along Trapelo Road. The ball field has three wooden picnic tables, with three others along the bituminous path from the parking area along Waverley Oaks Road, six along Beaver Brook, two near the northern entrance along Trapelo Road, and another one at the center of the open space adjacent to the stream. Curved wooden seats are fixed

on granite boulders around the spray pool. The picnic pavilion has fixed seats around its edge and six picnic tables. A curved granite seat is located at the southern corner on Lowell Path.



Figure 2.47: Curved seating on boulders around the spray pool in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.48: Information boards at the entrance to Beaver Brook Reservation, 2005 (Pressley Associates).

A drinking water fountain is located near the play area and another one exists near the ball field. A wooden information board stands near the parking area along Waverley Oaks Road and another one is near the northern entrance along Trapelo Road. A wooden park sign post is located at the corner of Waverley Oaks Road and Wilson Road. The park name is also carved onto a granite boulder located along the bituminous path north of the open space adjacent to the stream. A granite plaque is located on the ground in the open space west of the parking area along Waverley Oaks Road.



Figure 2.49: Non-functioning electric posts bordering the cemetery in the North Reservation, 2005, subsequently removed by DCR (Pressley Associates).

Beaver Brook North Reservation

Compared to the Beaver Brook Reservation this property has limited features and furnishings due to its natural character and prior land use. Remnants of stone walls are scattered along the parkway, along the northern property boundary, and near the cemetery. The cell phone equipment located near the water tower is enclosed within chain link fence. A few non-functional electric poles are still visible in wooded areas. The cemetery partially built on a terrace features gravestones with patient numbers and the base of a decorative sculpture. In 2009, a dry-laid stone wall separates the cemetery from the adjacent carriage road. A wooden bench is located near the bridge that connects the property with Rock Meadow Reservation.

Recreational Uses

Beaver Brook Reservation

The northern property offers many passive recreational opportunities. The population of wild ducks attracts residents to that area for bird watching. The picnic tables are mostly used by single families. The scenic ambiance makes it very popular with trail users and the trails are well used for walking. A letter box is located off of Plympton Path near Mill Pond, part of Letterboxing North America, combining navigational skills and rubber stamp artistry in a "treasure hunt" style outdoor quest. Another similar letter box is located in Rock Meadow.

The southern property provides a wide range of recreational facilities featuring recreation fields, tennis courts, hiking and biking trails, fishing, nature programs, and the play area. The play area offers variety with a combination of swings, climbing structures, sand play areas and spray pool.

Beaver Brook playground is composed of separate play areas for infants and toddlers, each with its own play structure and swing set. The climbing structure, which stretches the width of the play area, has challenges for kids of all ages with towers, bridges, and slides. A sunken sand pit is located left of the playground entrance. The combined play area, spray pool and picnic area described below are very heavily used in the summer.



Figure 2.50: Wooden bridge connecting the North Reservation with Rock Meadow, 2005 (Pressley Associates).



Figure 2.51: Play area in Beaver Brook Reservation, 2005 (Pressley Associates).



Figure 2.52: Spray pool in Beaver Brook Reservation, 2006 (Pressley Associates).



Figure 2.53: Picnic shelter in Beaver Brook Reservation, 2006 (Pressley Associates).

A row of picnic tables along the creek accommodates group picnics. The picnic pavilion is used for individual and group events. Picnic tables near the stream create another picnic area that is more scenic and quiet than the picnic shelter near the play area and a large turf area for softball and volleyball games. The bituminous path is shared for walking, jogging, bicycling, and dog walking. Dog walking is very popular on the trails in the north parcel and on the athletic fields in south parcel. Dog stations are located along Lowell Path in the southern parcel near the parking areas. Other facilities include restrooms, drinking fountain, first aid, and public information. DCR issues special use permits to conduct community events in the Beaver Brook Reservation.

Beaver Brook North Reservation

The ongoing parkway construction and demolition of selected buildings, which are part of Beaver Brook North Reservation restricts official public access to the property. However avid hikers and mountain bikers can reach the DCR land through the trail from the City of Waltham's Elsie Turner Field, utilizing the associated parking area or from Belmont through Rock Meadow. The trails are mostly used for walking, jogging, dog walking, and mountain biking. Several miles of woodland carriage roads loop through a variety of habitats in the southern section whereas the large quaking bog in the northern section is bisected with paths, enabling hikers to walk across. A developed system of narrow [single track] track trails follow the ridge lines of many of the eskers in the northern part of the property. These trails appear to be in good condition. During the RMP process, motorized trail bike use was evident, particularly in the vicinity of the former debris pile.



Figure 2.54: Dog walking (off leash) in Beaver Brook Reservation, 2006 (Pressley Associates).



Figure 2.55: Narrow single track trail in the North Reservation, 2005 (Pressley Associates).

INSERT SITE FEATURES BEAVER BROOK RESERVATION

**INSERT SITE FEATURES
NORTH RESERVATION**

Relationship to Adjacent Open Space

The expanded Beaver Brook Reservation is part of the Western Greenway, conceived by open space advocates such as Waltham Land Trust, Citizens for Lexington Conservation, Massachusetts Audubon Society, and the Massachusetts Coalition for Healthy Communities to connect existing conservation, park, and institutional open spaces that provide wildlife corridors and extended hiking trails. This greenway supports 6 miles of trails through more than 1,000 acres of undeveloped land in Waltham, Lexington and Belmont. The expanded Beaver Brook Reservation forms the largest component in the Western Greenway network, but lacks necessary physical connection between the Beaver Brook Reservation and the Beaver Brook North Reservation.

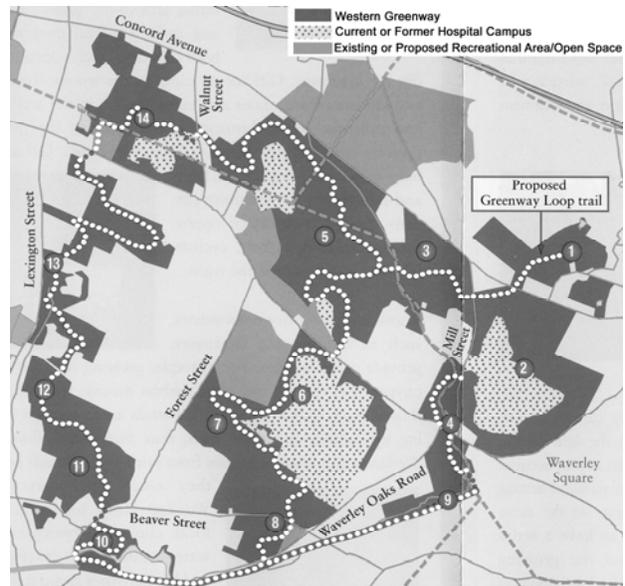


Figure 2.56: Beaver Brook separating the North Reservation and Rock Meadow, 2005 (Pressley Associates).

The Western Greenway passes through several existing open space properties including the Habitat Sanctuary and Highland Farm (Massachusetts Audubon Society), the expanded Beaver Brook Reservation (DCR), McLean Hospital conservation land (Town of Belmont and McLean Hospital), Rock Meadow (Town of Belmont), the Waltham Field Station (UMass), Lyman Estate (Historic New England), Robert Treat Paine Estate (City of Waltham), Storer Conservation Land (City of Waltham), Chester Brook Woods (City of Waltham), Waltham High School, YMCA (private), Our Lady's Church (private), North Eastern School (City of Waltham), Lexington Road Woods (City of Waltham), Falzone Park (City of Waltham), Fernald School Wood (Commonwealth of Massachusetts), Forest Street Park (City of Waltham), Cedar Hill (Gils Scouts of America) and the former Middlesex County Hospital property in Lexington. An important aspect of this trail and open space network is that it provides

public access to miles of hiking trails, readily accessible from public transportation in Belmont's Waverley Square.

Belmont's conservation land, Rock Meadow, is located physically adjacent to Beaver Brook North Reservation across Beaver Brook. There is clear view of Mackerel Hill from this conservation land. Rock Meadow provides crucial habitat for many species that are rapidly disappearing as development encroaches on former farm land. Conservation lands of Belmont and Lexington buffer Beaver Brook North Reservation from Concord Avenue with the privately owned Belmont Country Club located to the north across Concord Avenue. Over 100 acres of McLean Hospital property has been deeded to the Town of Belmont as conservation land east of Rock Meadow, with a conservation restriction held by the Trustees of Reservations. Adjacent to this McLean conservation land across Concord Avenue is the 87-acre Mass Audubon Habitat Sanctuary, part of which is the Highland Farm. McLean Hospital open space connects with the Beaver Brook Reservation across Mill Street and Trapelo Road.



Key

- 1 – Mass Audubon Habitat Sanctuary; 2 – Mclean Hospital Conservation Land; 3 – Rock Meadow; 4 – Expanded Beaver Brook Reservation (historic reservation); 5 - Expanded Beaver Brook Reservation (former MSH property); 6 – Fernald Center; 7 – Forest Street Park; 8 – Cedar Hill Girls' Scout Camp; 9 – Beaver Brook Wetlands; 10 – Lyman Estate Grounds; 11 – Robert Treat Paine Estate; 12 – Storer Conservation Land; 13 – Chester Brook Corridor; 14 – Former Middlesex County Hospital Property

Figure 2.57: The Western Greenway trail network (Waltham Land Trust).



Figure 2.58: Belmont Country Club across Concord Avenue, 2005 (Pressley Associates).

As part of the Reuse Plan for Metropolitan State Hospital (MSH), the City of Waltham received 54 acres of open space for a proposed municipal golf course. This property is adjacent to Elsie Turner Field. Fernald Center is located south of Mackerel Hill across Trapelo Road in the City of Waltham and along its western border is a wooded area with trails. The open space at the Fernald Center is crucial in linking the greenway to the Beaver Street properties. As of this writing, the Fernald Center is still in active use by the Massachusetts Department of Mental Retardation, but with a reduced number of clients. This property includes Owl Hill, a 250-foot landform between Trapelo Road and Waverley Oaks Road. The hill is largely undeveloped on its north and south slopes, and is used for sledding. There are several streams running through the 180 acres of the Fernald Center, and they eventually flow into the Lawrence Meadows within the University of Massachusetts Field Station wetlands. This wetlands area, deeded to the University of Massachusetts by Cornelia Warren, performs an essential function in retaining flood waters. With streams from Cedar Hill and Owl Hill draining into it, the cattail marsh and bog provide a habitat for many species. Clematis Brook crosses under Waverley Oaks Road here and merges with Beaver Brook.



Figure 2.59: City of Waltham land (proposed golf course site), formerly MSH, with a DCR conservation easement, 2005. (Pressley Associates).



Figure 2.60: Elsie Turner Field, 2005 (Pressley Associates).

At the southwest corner of the Fernald Center is the City of Waltham Forest Street Park, originally part of a larger parcel deeded to the City by the estate of Cornelia Warren. This 11-acre parcel is located along Forest Street between the former Army Corps of Engineers site and Cedar Hill Girl Scouts' Camp. The new Veteran's Memorial Field with six playing fields located on the former Army Corps of Engineers site in the City of Waltham is nearing completion. Cedar Hill Girl Scouts' Camp is fenced for the safety of the children camping there, but the reservation also acts as a wildlife corridor within the greenway. The 75-acre camp includes Clematis Brook, a spring-fed pond, diverse plant and tree species, and the 1730 Isaac Mixer House. Situated on the western side of the Girl Scout camp is another Cornelia Warren estate gift, the 15-acre Waltham Woods, the peak of Cedar Hill offering views to the south.

Across Beaver Street from the Cedar Hill Reservation is Cornelia Warren Playground, deeded to the City of Waltham and used as a softball field. Adjacent to Cornelia Warren Field is the University of Massachusetts Field Station. Until a few years ago, the Extension Service of the Agricultural School was located along Beaver Street. The farm land is still used by a variety of non-profit groups as community farms offering educational programs about farming. Chester Brook, a perennial stream runs parallel to Beaver Street, which historically supported mills such as Thomas Rider's 1680 grist mill and Moses Mead's 1790 mill manufacturing wooden farm tools, along its path in the past. Beginning at Hardy Pond, the brook runs south along Lexington Street, turns east and runs along Beaver Street, and merges with Beaver Brook near Linden Street, an area prone to severe flooding.

Following Chester Brook west past Bentley College is the location of the Lyman house, designed by Samuel McIntyre in 1793, and owned by Historic New England (formerly the Society for the Preservation of New England Antiquities). Located at the rotary at Beaver Street and Lyman Street, the 37-acre estate includes the oldest operating greenhouse (c. 1803) in the

country and is open to the public. The nineteenth century English naturalist-style grounds with beautiful specimen trees and gardens are also open to the public. There were mills and small ponds located at the Lyman estate.

The 134-acre historic Robert Treat Paine estate, owned by the City of Waltham is located across Beaver Street and open to the public. The house was designed by H.H. Richardson and the landscape by Frederick Law Olmsted has many mature specimen trees and universally-accessible trails. Adjacent to the Paine estate is the landlocked Chester Brook Woods, formerly known as the Coleman/Stanton property, acquired by the City of Waltham in 2001. With no way to access the site by road, this land has remained undisturbed. With wetlands draining into Chester Brook, the wooded property adds significantly to the size and value of the Paine estate grounds, and provides a vital link to the Chester Brook corridor.

Beginning at Hardy Pond, west of Lexington Street, Chester Brook and its associated wetlands run parallel to and under Lexington Street. The brook runs along the west side of Lexington Street, passes through a culvert at the Wal-Lex shopping center and emerges from the culvert on the east side of Lexington Street at Lake Street. The corridor properties east of Lexington Street include Waltham High School Woods, the YMCA property, and Housing Authority Woods. A 26-acre varied terrain of woods and wetlands, owned by Our Lady's and once known as "Sam Stearns' woodlot," is located north of the brook. Connecting to the woods around Northeast Public School, this church property contains mature woodland with hiking paths and a cascading stream that runs into Chester Brook.

Forest Grove Park with woods and wetlands and Falzone Memorial Park are situated between the church and former Middlesex County hospital property. The former Middlesex County Hospital property with meadows, wetlands and mature woodland connects to the Lexington conservation lands and Beaver Brook North Reservation across Walnut Street. The parcel, known as "Lot 1," was created in 1996 when Middlesex County Hospital land was declared surplus. DCR has acquired Lot 1 is so it is now an integral part of the Western Greenway, linking it to the northwestern end of Beaver Brook North Reservation.

Analysis of Adjacent Land Uses

The expanded Beaver Brook Reservation forms one of the largest protected open spaces accessible to the neighborhood communities of Belmont, Lexington, and Waltham. Surrounding land uses affect the form and function of the reservation. The management of adjacent properties such as Gaebler School, proposed Waltham golf course, the AvalonBay development,

former Middlesex County Hospital, and McLean Hospital may influence the sensitive balance of the reservation ecosystem.



Figure 2.61: View of water tower atop Mackerel Hill, 2005 (Pressley Associates).

Beaver Brook Reservation

The Beaver Brook Reservation property, set in close proximity to developed residential neighborhoods and the urban transportation system of Waverley Oaks Square, is managed as a neighborhood park with active and passive recreational facilities in the southern parcel and as a nature preserve with passive recreational opportunities in the northern parcel.

Beaver Brook Wetlands

Beaver Brook flows through the historic property and drains into the privately owned wetlands along the MBTA rail tracks. Ecological preservation of these wetlands is crucial to the health of Beaver Brook.

Waverley Oaks Industrial Park

The parking area of the industrial park borders the western side of the southern parcel south of Wilson Road. The buffer between the two properties lacks natural buffers that could improve privacy and boundary definition.

McLean Hospital Property

McLean Hospital property complex in Belmont was recently rezoned as the McLean District, which includes Town conservation land, private conservation land, and a new cemetery in addition to the core hospital campus and areas slated for new development. The private open space adjacent to the northern parcel across Mill Street connects the Beaver Brook Reservation with the contiguous Belmont conservation land, Rock Meadow conservation land and Highland Farm, part of Mass Audubon Society's Habitat Sanctuary.



Figure 2.62: View of McLean Hospital Property (McLean Hospital Reuse Plan, Pressley Associates).

Beaver Brook North Reservation

Based on the 1994 Metropolitan State Hospital Reuse Plan and the 2002 conservation easement between the City of Waltham and the Commonwealth of Massachusetts, the former Metropolitan State Hospital land is subdivided into multiple parcels with varying land uses. The 254-acre Beaver Brook North Reservation is directly affected by the adjacent land uses such as the Metropolitan Parkway, residential development by AvalonBay Communities, Inc. and future development of the proposed Waltham golf course and Gaebler School.

AvalonBay Communities, Inc.

The Reuse Plan proposed development of 387 units to accommodate multi/family, townhouse/condominium, and elderly housing options. As much emphasis is placed on the natural resources of the reservation property, management of the boundary bordering the residential development demands acute attention. Existing trail connections to the circumferential road may need to be addressed as the residential development is occupied.

Gaebler School

The City of Waltham purchased Gaebler School property in 2005. The Reuse Plan records the communities' preference in locating institutional uses on Gaebler site. The site offers vehicular access to Mackerel Hill for maintenance of the water tower and cell tower.



Figure 2.63: Gaebler School, 2005 (Pressley Associates).

Waltham Golf Course

Under the provisions of the MHS Reuse Plan and conservation easement, the City of Waltham can develop a nine-hole public golf course or other recreational uses on the land adjacent to Beaver Brook North Reservation. This property, consisting of three parcels, buffers the reservation from Trapelo Road and is ecologically connected to the reservation property through the wetlands.

Former Middlesex County Hospital Property

This 54-acre property, known as Lot 1 in Waltham and Lexington has been transferred to DCR. In addition to being prime conservation land supporting meadows, wetlands, vernal pools, and specimen tree stands, this property links the Beaver Brook North Reservation to the Western Greenway system of open spaces and provides an additional essential link in the greenway trail network.

Rock Meadow and other conservation lands

The conservation lands of Belmont and Lexington buffer the North Reservation from Concord Avenue. Collectively, these properties form a desirable natural riparian corridor for Beaver Brook.

Analysis of Community Recreational Needs

DCR does not yet have a comprehensive, state-wide analysis of recreational needs nor user studies of the expanded reservation that could be used to inform the RMP. Information received through the public review process indicated that both Beaver Brook and Beaver Brook North Reservations are popular and well-loved recreational and open space destinations. For example, despite its formerly "abandoned" condition, the Metropolitan State Hospital property, now Beaver Brook North

Reservation, has an established constituency of recreational users who came out in support of continued mountain bike and pedestrian access and who opposed motorized vehicle use. During the summer, when the spray pool is operational, the Waverley Oaks parcel of Beaver Brook Reservation is packed with visitors and both parking lots are often full, resulting in reservation parking in the surrounding neighborhood.

In the absence of recreational or user data, the RMP team collected open space and recreational information that was readily available from the three municipalities to project the degree to which these communities are currently meeting their own open space needs based on a level of service analysis that assumes an ideal of 1 acre open space/1000 residents, plus target standards for recreational facilities.⁷⁶ Note that the information provided below is derived from 2006 data readily available from the municipal web sites, rather than a detailed park and open space inventory.

Belmont

The Town of Belmont lists a current population of 25,349 residing within the 2979-acre municipal boundary. Town-owned open space includes the 70-acre Rock Meadow conservation land; Pequotette, Payson Park, and Grove Street Parks, and town fields and school grounds. Acreage figures for the Town's parks and school fields available on the Belmont Department of Recreation's website lists a total of 118 acres of municipally-owned park and open space land, including turf fields, ball fields, playgrounds, pools, tennis courts, and an indoor ice rink. The McLean conservation land protected 90 acres of open space. Additional privately-owned open space includes Massachusetts Audubon's Habitat Sanctuary (87 acres), Belmont Hill School (29 acres) and the Belmont Country Club (180 acres). Of these, only Habitat is publicly accessible. Based on this cursory inventory, it appears Belmont lacks as much as 45 acres of public open space, necessary to meet the target of 253 acres for its current population. DCR land accounts for approximately 47 acres in Belmont, which means that the expanded Beaver Brook Reservation plays a significant role in meeting the open space needs of this community. Belmont also has a recreational deficit of turf fields.

Lexington

The Town of Lexington lists a current population of 30,355 with a total of 10,650 acres in the town. According to the DPW, Lexington maintains 630 acres of Town-owned land, including 9 parks, 9 playgrounds, 28 conservation areas, 41 athletic fields, 12 school grounds, 4 tennis facilities, 3 historical sites, the pool and reservoir complexes, and the Town's bicycle, fitness, and conservation trails, which means that relative to its current

population, Lexington has exceeded its open space needs. The DCR reservation land in Lexington consists of 59 acres of the Beaver Brook North Reservation, which adds to the town's significant open space system. Now that the AvalonBay development has been implemented on the former MSH campus, it is likely that, despite Lexington's substantial open space system, the proximity of the new housing to Beaver Brook North will generate increased recreational demands on the reservation.

Waltham

With a total population of 60,087, the City of Waltham maintains 387 acres of open space, excluding the 54 acres transferred to the City as part of the MSH Reuse Plan. Waltham's park and open space system supports turf fields, ball fields, playgrounds, trails, pools, tennis courts, and basketball courts. According to this 2006 analysis, Waltham has a deficit of approximately 168 acres of open space. The DCR reservation land in Waltham consists of 207 acres, so that as in the case of Belmont, Beaver Brook plays a significant role in meeting the open space needs of this municipality. Furthermore, Waltham appears to have a deficit of turf fields, ball fields, and playgrounds, which could affect the future planning, and recreational needs and pressures on the City-owned former MSH land on which DCR holds a conservation easement.



Figure 2.64: Highland Farm, Habitat Sanctuary, Massachusetts Audubon Society (MAS).

INSERT OPEN SPACE MAP

Operations and Maintenance

DCR Management Structure and Staffing

The Department of Conservation and Recreation manages state parks, forests, reservations, parkways, recreation facilities that fall under the Division of State Parks and Recreation (formerly DEM) and the Division of Urban Parks and Recreation (formerly MDC) Each division has smaller management units such as regions and districts. The expanded Beaver Brook Reservation is located in the Division of Urban Parks North Region, Fells District. This is a large and complex district with over 4,000 acres of parkland including the Breakheart Reservation (Saugus), Middlesex Fells (Malden, Medford, Stoneham, Melrose, and Winchester), Alewife Brook Reservation (Cambridge, Arlington, Somerville), Mystic River Reservation (Medford, Somerville and Everett) and the Rumney Marsh (Saugus and Revere) as well as rinks, pools, and parkways such as the Alewife Brook Parkway and the Mystic Brook Parkway (Figure 2.65). The management for this district is based out of the District Office located at Middlesex Fells Reservation.

The assignment of staff and allocation of resources (such as operations funding, materials, equipment, etc.) is based on regional management priorities. With the current levels of regional staffing and associated operations funding far below adequate levels, management decisions for all of the DCR facilities within the North Region are often based on levels of use, types of recreation facilities, and public safety. The Beaver Brook Reservation is a relatively small park compared to the larger reservations in the region. As a result, Beaver Brook Reservation does not have any permanently assigned year-round staff and instead is managed and maintained by three operations personnel who are primarily responsible for the Alewife Brook and Mystic Lakes Reservations and their associated parkways. This means that health and safety issues such as plowing or roadway maintenance associated with the parkways always takes precedence over the routine maintenance needs for Beaver Brook Reservation. Lifeguards borrowed from Sandy Beach at the Mystic Lakes Reservation supervise the spray pool in Beaver Brook Reservation during the peak summer season. The Copeland House provides DCR operations staff housing. No interpretive or education programs are available at present due to lack of funding.

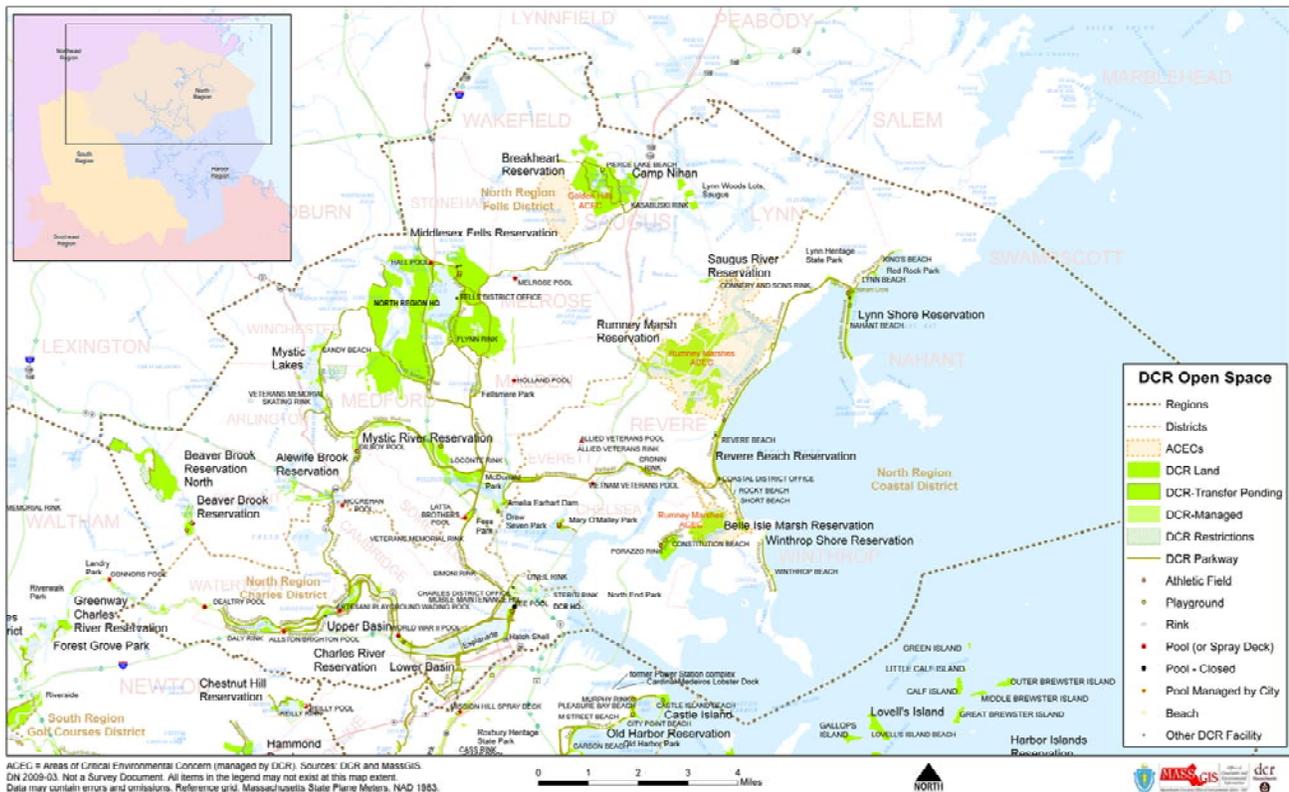


Figure 2.65: DCR Division of Urban Parks and Recreation - North Region (DCR).

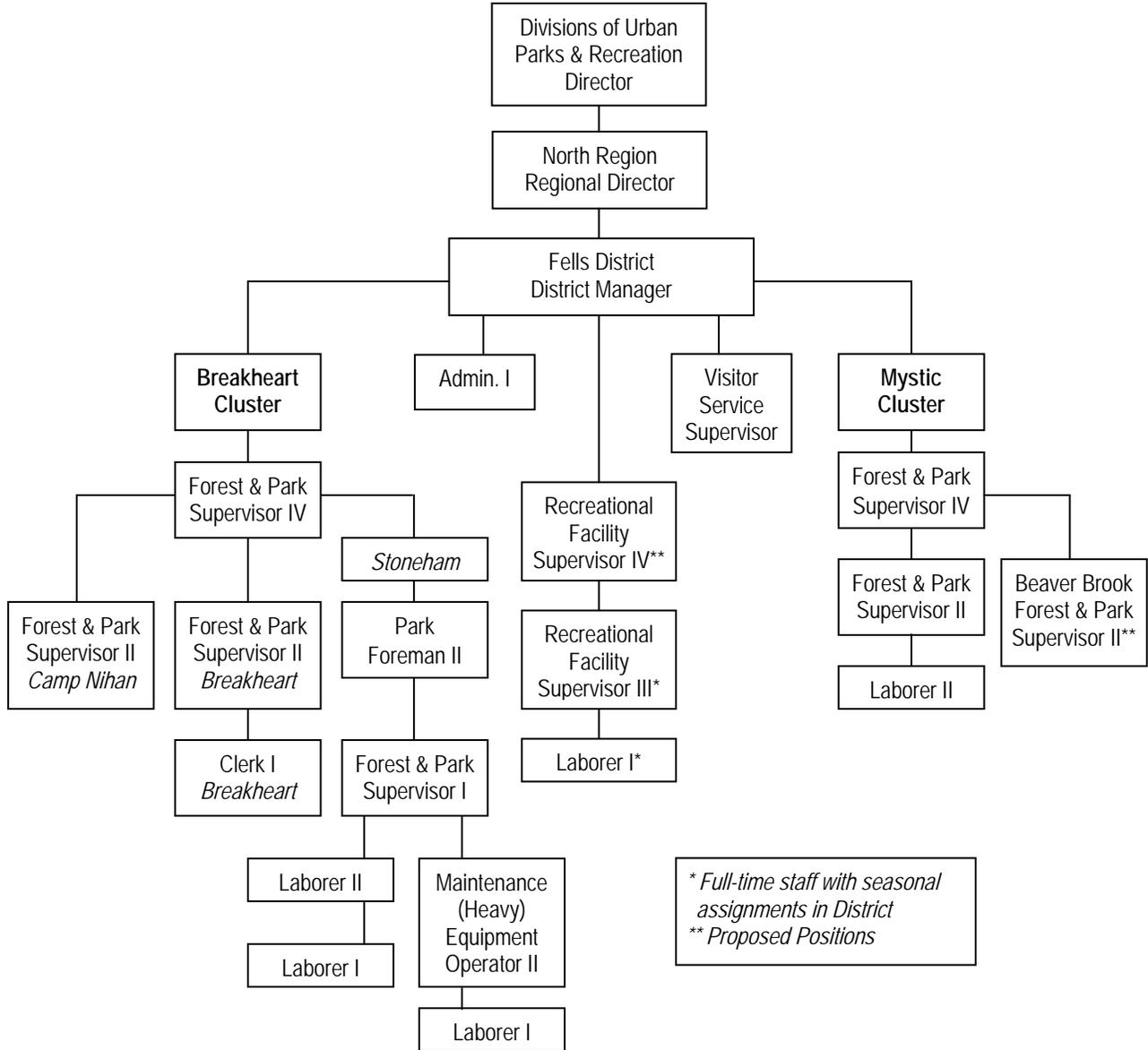


Figure 2.66: Fells District DCR management structure (DCR)

Spring 2009 work plan for the original Beaver Brook Reservation is shown on Table 2.5. The 254 acres of Beaver Brook North Reservation is a new acquisition and has not yet been funded with reservation staff or an operational budget.

Proposed management levels and staffing resources are described in Chapter 6.

Table 2.5: Spring 2009 Maintenance Work Plan for Beaver Brook Reservation

| Site/Facility | Trash | Litter Removal | Playground | Mow / Trim | Weed Grassy/Non-paved areas | Weed Paved Area | Ball Field | Graffiti Removal | Bathroom | Sweep | Catch Basin/ Drain |
|--------------------------|-------|----------------|------------|------------|-----------------------------|-----------------|------------|------------------|----------|-------|--------------------|
| Beaver Brook Reservation | E 3 | E 2 | E 7 | E 14 | E 14 | E 14 | E 10 | E 30 | | E 60 | A |
| Beaver Brook Spray Pool | E 1* | E 2* | E 7 | E 14 | E 14 | E 14 | | E 30 | E 1* | | |
| Beaver Brook Field | | | | E 14 | E 14 | E 14 | E 10 | | | | |

KEY:

- A Annually
- E X Every "X" Days
- * During pool season

Planned cycle of maintenance for the spring (May-June) 2009 pending staff and equipment availability. Source: DCR DUPR

Existing Regulations

Beaver Brook Reservation is open to the public year around, dawn to dusk. Dogs are allowed on leash and all dog waste must be picked up and disposed of properly.

Special Use Permits and Interpretive Programs

Events at Beaver Brook Reservation are allowed by permit through DCR's permit office. Permitted activities could include organized walks and sporting events or cultural performances. Groups planning an event at the reservation should obtain a permit from DCR, which is reviewed by DCR staff to ensure that the proposed event does not conflict with DCR management activities, public use, or resource protection. Thirty nine special use permits were issued in 2005, primarily for group picnics and gatherings from May thru August at Beaver Brook Reservation. Interpretive programs that spanned three consecutive weeks were last documented in 2003, which included one hour discovery hours on subjects titled Terrific Turtles, Bat in your Backyard, and Wildlife Mysteries.

Endnotes

- ¹ Massachusetts Biodiversity Initiative, 1998.
- ² DeGraff, 2001 and Redington 1994.
- ³ Massachusetts Department of Capital Planning and Operations. "Metropolitan State Hospital Reuse Plan," p. 11.
- ⁴ Massachusetts Department of Capital Planning and Operations. "Metropolitan State Hospital Reuse Plan," p. 8.
- ⁵ MA Division of Fish and Wildlife 1990.
- ⁶ IPC 2001.
- ⁷ Dreyer 2001.
- ⁸ PCA 2001
- ⁹ Converse 2001
- ¹⁰ Dirr 1990
- ¹¹ Dirr 1990
- ¹² Rawinski 1982, Thompson et. al. 1987, Malecki et al. 1993
- ¹³ Blossey, 2001
- ¹⁴ Primack, 1993 and Ricklefs, 1997.

- ¹⁵ Ultsch, 1989; Crawford, 1991
- ¹⁶ Ernst 1976 and 1982; Graham 1995
- ¹⁷ Graham 1995
- ¹⁸ Ernst 1976
- ¹⁹ NHESP Fact Sheet
- ²⁰ NHESP Fact Sheet
- ²¹ Ernst, 1970, Joyal 1996, Litzgus and Brooks 1998; Milam, 1997
- ²² Graham 1995; personal observations; Perillo 1997
- ²³ Personal observations, Ernst 1976; Ernst 1982; Ward et. al., 1976; Graham 1995; Milam 1997, Perillo 1997
- ²⁴ Perillo 1997
- ²⁵ Lazell, 1968
- ²⁶ Stille, 1954; Uzzell, 1976b: 48.1
- ²⁷ DeGraff 2001
- ²⁸ NHESP Fact Sheet
- ²⁹ Donald G. Jones, Office of Public Archaeology, Boston University, "Results of an Archeological Reconnaissance Survey of Beaver Brook Reservation in Belmont and Waltham, Massachusetts" (August 1989).
- ³⁰ Charles A. Nelson, *Waltham, Past and Present and Its Industries* (Cambridge, MA: John Ford & Son, 1879), 16, quoted in Arley Levee, "Beaver Brook Reservation", unpublished paper, November 1981.
- ³¹ Jones, "Survey."
- ³² See, for instance, Belmont Citizen, 22 January 1965, quoted in Jones, "Survey."
- ³³ Jones, "Survey."
- ³⁴ Peter Stott, "Cultural Resource Inventory, Evaluation of Significance: Copeland House, Beaver Brook Reservation," 1989.
- ³⁵ Jones, "Survey."
- ³⁶ Belmont Historical Society Newsletter 1971, quoted in Jones, "Survey."
- ³⁷ James Russell Lowell, "Beaver Brook," <http://www.gutenberg.org/dirs/1/3/3/1/13310/13310.txt>, 2005.
- ³⁸ The spelling of the name varies in different sources: particularly in the nineteenth century, it was sometimes spelled "Waverly."
- ³⁹ Commonwealth of Massachusetts, Board of Metropolitan Park Commissioners, *Annual Report of the Metropolitan Parks Commission* (1893), 45.
- ⁴⁰ Louis Agassiz, "Ice-Period in America," *The Atlantic Monthly*, Vol. 14, July 1864, 89.
- ⁴¹ F. H. Underwood, "James Russell Lowell," *Harper's New Monthly Magazine*, January 1881, 262.
- ⁴² MPC Report (1895).
- ⁴³ "The Waverley Oaks," *Garden and Forest*, Vol. 3, Issue 104, Feb. 19, 1890, 85.
- ⁴⁴ Charles W. Eliot, *Charles Eliot, Landscape Architect* (Boston, MA: Houghton Mifflin, 1902), 316.
- ⁴⁵ Cynthia Zaitzevsky, Frederick Law Olmsted and the Boston Park System (Cambridge, MA: The Belknap Press of Harvard University Press, 1982), 123.
- ⁴⁶ *Ibid.*, 399.
- ⁴⁷ Phineas Lawrence, "Trapelo Past and Present – I", *The Waltham Sentinel* (October 8, 1858), 2, quoted in Levee, "Beaver Brook Reservation."
- ⁴⁸ Frederick Law Olmsted, letter to his partners, 28 October 1893, quoted in Keith Morgan, "The Man Behind the Monograph," Introduction to Charles W. Eliot, *Charles Eliot, Landscape Architect* (Amherst, MA: University of Massachusetts Press, 1999), xxviii.
- ⁴⁹ Norman T. Newton, *Design on the Land: the Development of Landscape Architecture*, (Cambridge, MA: Harvard University Press, 1971), 330-1, quoted in Virginia H. Adams et al, "National Register of Historic Places Multiple Property Documentation Form for the Metropolitan Park System of Greater Boston: Parkways," 2002.
- ⁵⁰ Jones, "Survey."
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- ⁵³ Eliot, *Charles Eliot*, 497.
- ⁵⁴ Joshua Kendall, "Round About the Waverley Oaks," *The New England Magazine*, Vol.20, Issue 2, April 1896, 227-238.
- ⁵⁵ Kendall, "Round About the Waverley Oaks," 236.
- ⁵⁶ Kendall, "Round About the Waverley Oaks," 233.
- ⁵⁷ Belmont Citizen, 12 June 1959, quoted in Jones, "Survey."
- ⁵⁸ Eliot, *Charles Eliot*, 500f.
- ⁵⁹ Kendall, "Round About the Waverley Oaks," 230.

⁶⁰ Jones, "Survey."

⁶¹ Underwood, "Lowell."

⁶² Arthur Shurcliff, letter, May 29, 1946, quoted in Jones, "Survey."

⁶³ Jones, "Survey."

⁶⁴ MPC Report (1900).

⁶⁵ MPC Report (1900).

⁶⁶ MPC Report (1903).

⁶⁷ Jones, "Survey."

⁶⁸ Betsy Friedberg, MHC to Julia O'Brien, MDC, June 20, 1991.

⁶⁹ Ibid.

⁷⁰ Candace Jenkins, "National Register of Historic Places Nomination for Metropolitan State Hospital," 1993. Listed 1994.

⁷¹ Unless otherwise indicated, the information in this section is derived from Jenkins, "National Register Nomination for Metropolitan State Hospital."

⁷² Commonwealth of Massachusetts, Division of Capital Planning and Operations (DCPO) and David Dixon/Goody Clancy, "Metropolitan State Hospital Reuse Plan," 1994. Unless otherwise indicated, the information for this section is derived from the Reuse Plan.

⁷³ Refer the copy of the NR nomination form in Appendix G, Volume 2 for details.

⁷⁴ This column indicates whether the building was considered as contributing (C) or not contributing (NC) historical significance to the property in Jenkins, "National Register Nomination for Metropolitan State Hospital."

⁷⁵ This column indicates whether the building was considered as contributing (C) or not contributing (NC) historical significance to the property in Jenkins, "National Register Nomination for Metropolitan State Hospital."

⁷⁶ Based on level of service standards developed for the Town of Brookline, "Strategic Master Plan for Parks, Open Space and Recreation" by Pressley Associates, Inc. and Greenplay LLC, 2006.