Massachusetts Department of Conservation and Recreation
Bureau of Planning and Resource Protection
Resource Management Planning Program

RESOURCE MANAGEMENT PLAN

DCR's Beaver Brook Reservation

Historic Beaver Brook Reservation and Beaver Brook North Reservation
Belmont, Lexington and Waltham, Massachusetts

March 2010

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2010

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Jack Murray, Deputy Commissioner for Parks Operations

The Massachusetts Department of Conservation and Recreation (DCR), an agency of the Executive Office of Energy and Environmental Affairs, oversees 450,000 acres of parks and forests, beaches, bike trails, watersheds, dams, and parkways. Led by Commissioner Richard K. Sullivan Jr., the agency's mission is to protect, promote, and enhance our common wealth of natural, cultural, and recreational resources.

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RESOURCE MANAGEMENT PLAN

Expanded Beaver Brook Reservation

Belmont, Lexington and Waltham, Massachusetts

Contents

List of Tables

Figure 1: Carriage road and MetFern Cemetery in the Beaver Brook North Reservation, 2009 (Pressley Associates).

Executive Summary

Introduction

Resource Management Plans (RMPs) are "working" documents that develop short and long-term management goals and objectives for the properties under the stewardship of the Commonwealth of Massachusetts, Department of Conservation and Recreation (DCR). They include an inventory and assessment of environmental, cultural, and recreational resources and identify unique characteristics and values associated with a forest, park, or reservation. They are intended as working documents, used to set priorities, establish capital and operational budgets, allocate resources, and enhance communication and cooperation between park visitors and the surrounding communities.

The Massachusetts Department of Conservation and Recreation (DCR) was established in 2003 as a merger of the former Metropolitan District Commission (MDC) and the Department of Environmental Management (DEM). DCR manages of one of the largest state parks systems in the country. Its 450,000 acres is made up of forests, parks, greenways, historic sites and landscapes, seashores, lakes, ponds, reservoirs and watersheds, constituting 10% of the state's landmass and including 29 campgrounds, 67 beaches, 39 pools, 2 golf courses, 60 playgrounds, and 55 ball fields. The agency also manages 650 lane miles of parkways, 278 bridges, and 338 dams, and oversees watershed and forestry management across the state.

The mission of the DCR is to exercise care and oversight for the natural, cultural, and historic resources of the Commonwealth and to provide quality public outdoor recreational opportunities that are environmentally sustainable, affordable, and accessible to all citizens. To carry out its mission, DCR investigates, analyzes, plans, and provides stewardship of the Commonwealth's resources.

DCR is guided by a legislative mandate (M.G.L. Chapter 21, Section 2F) to prepare management plans for "all reservations, parks, and forests under the management of the department." Although the mandate does not specify the format or content of these management plans, it does require the following:

> "Said management plans shall include guidelines for the operation and land stewardship of the aforementioned reservations, parks and forests, shall provide for the protection and stewardship of natural and cultural resources and shall ensure consistency between recreation, resource protection, and sustainable forest management."

In addition, this legislation also requires that the DCR Commissioner "shall seek and consider public input in the

development of management plans, and shall make draft plans available for public review and comment period through notice in the *Environmental Monitor*." These management plans must be reviewed and adopted by the Stewardship Council; within thirty (30) days of adoption, the Commissioner must file a copy with the Secretary and the Joint Committee on the Environment, Natural Resources and Agriculture. Resource Management Plans meet and exceed the basic requirements defined by all legislative mandates.

Beaver Brook RMP

DCR initiated this Resource Management Plan (RMP) for the Expanded Beaver Brook Reservation in response to the transfer of 254 acres of the former Metropolitan State Hospital from the Department of Capital Asset Management (DCAM) to the DCR. The Metropolitan State Hospital was declared surplus in 1992 and in 1994, the Massachusetts Office of Capital Planning and Operations (DCPO, now DCAM) completed a Reuse Plan for the property in collaboration with a Tri-Community Task Force, the MDC (now DCR), and others. This Reuse Plan and its subsequent amendments and disposition documents sets forth guidelines and parameters for the redevelopment of the hospital grounds, including a significant new state reservation to be managed by the DCR. The Reuse Plan also established 54 acres of land to be acquired by the City of Waltham on which DCR holds a conservation easement.

The project area for this RMP includes the original Beaver Brook Reservation (59 acres) and the portions of the former Metropolitan State Hospital land, now under the care and control of the DCR (254 acres), including the new Metropolitan Parkway. For the purposes of this document, the original 59-acre property is referred to as Beaver Brook Reservation, and the former hospital land as Beaver Brook North Reservation. The RMP Appendix E also includes an evaluation of the City of Waltham's proposed 9-hole golf course with respect to environmental alterations and the potential effects on the adjacent reservation.

This RMP for the Expanded Beaver Brook Reservation is intended to provide a framework for future management and capital investment, while also defining a common vision for property managers, stakeholders, and community representatives. The Plan presents an inventory and evaluation of current site features and conditions, and recommends both capital improvements and increased staffing.

Planning Process

In spring 2005, DCR prepared a scope of services and hired the consultant team of Pressley Associates, Inc. and LEC Environmental to prepare the RMP for the Expanded Beaver Brook Reservation. The process of developing the RMP included reviewing previous studies for both the original reservation and Beaver Brook North Reservations, conducting site inventory and evaluations, completing additional research, public review process, and preparation of draft and final reports.

Public Participation

A public meeting to present preliminary findings and solicit input on issues and topics to be addressed in the RMP was held in March 2006. Approximately thirty individuals representing the communities of Belmont, Lexington, and Waltham and organizations such as the Waltham Land Trust, Massachusetts Audubon Society, and the New England Mountain Bike Association attended. On May 10, 2006, the public review draft was posted on the DCR RMP website and a public notice published in the MEPA *Environmental Monitor*.

The second public meeting held on May 23, 2006 presented the findings and recommendations of the draft RMP and solicited input and comments from the participants. Approximately twenty (20) individuals from the three communities and several stakeholder organizations attended the second public meeting. Consistent with RMP legislation, Chapter 26 Acts of 2003, the draft was available for public comment for a 30-day period ending on June 9, 2006. Thirty-eight (38) written comments were received, primarily by email. DCR and the consultant team evaluated all comments, and revised the draft plan and submitted it to DCR on June 30, 2006. In order to finalize the plan and prepare if for its presentation to the DCR Stewardship Council, DCR initiated a second phase of planning work in December 2008.

A summary of public comments, DCR's response to those comments, and a summary of substantive changes to the public review draft RMP are included in Appendix D.

Distinctive Characteristics of the Expanded Reservation

The 254-acre Beaver Brook North Reservation and the 59-acre Beaver Brook Reservation are important components of the DCR's Urban Park (DUPR) System, each with different and distinctive characteristics. As the first reservation in the Metropolitan Park System, Beaver Brook Reservation is a significant cultural landscape, with features that include mill ponds and dams, stone walls, open lawns, specimen trees, woodlands, trails, historic buildings and structures, and intensive recreation facilities. Relative to other parks, reservations, and facilities in the DUPR North Region, Beaver Brook Reservation is small in size, but it never the less holds a unique place in the

history of the Metropolitan Park System, and deserves increased recognition.

The former Metropolitan State Hospital, a portion of which is now Beaver Brook North Reservation, contains a diverse assemblage of natural communities resulting in part from minimal human intrusion or alteration over many decades. Cultural artifacts remaining from the former hospital such as the MetFern Cemetery and the carriage roads enhance the property and make it readily accessible for passive recreational use. Beaver Brook North is also much smaller in size than other urban reservations such as the Middlesex Fells or Great Blue Hill, but it contains a particularly diverse ecological system with important and extensive wetlands that have high habitat value.

Finally, the entire expanded reservation is part of an important regional open space system, called the Western Greenway, which presents opportunities for continued habitat and trail connectivity with adjacent open spaces managed by the Commonwealth, municipalities, and private conservation organizations. Thus, the expanded reservation, including both Beaver Brook and Beaver Brook North Reservations is an extraordinary asset for the citizens of the Commonwealth, particularly in the dense western suburbs of Boston.

Priority Findings

This RMP builds on a substantial body of work completed by the Tri-Community Task Force, Beaver Brook Watershed Coalition, the DCR and many others as part of the surplus process for the former Metropolitan State Hospital property. Early in the reuse process, Met State was identified by the Task Forces' consultants as a "fragile and valuable natural environments including wetlands, wildlife habitats;" historic preservation advocates expressed a strong interest in the possibility of reusing existing buildings and landscapes on the site.[1] The quality of existing habitats and natural systems is confirmed in this RMP, particularly given the urban location of the property. The former hospital is also listed on the National Register of Historic Places and the North Reservation contains the MetFern Cemetery, a non-active patient cemetery for both Metropolitan State Hospital and the Fernald Center.

However, interest in the former hospital property should not overshadow the importance of the original Beaver Brook Reservation, which was the first public reservation in the Metropolitan Park System. The reservation contains the Beaver Brook watercourse, mill ponds and dams, the location of the original Waverley Oaks, upland woodlands and wetlands, and popular recreation facilities including a spray pool, play area, tennis courts and turf fields.

Figure 2: "Beaver Brook Reservation," (Metropolitan Park Commission Report, 1898).

Beaver Brook Reservation

Established in 1893, the original Beaver Brook Reservation was the first reservation in the Metropolitan Park System, which has been determined eligible for listing on the National Register of Historic Places by the MHC.[2] Early accounts by Charles Eliot, Frederick Law Olmsted, and Sylvester Baxter, proponents of the Metropolitan Park System, emphasized the importance of preserving distinctive natural scenery near Boston. In recommending the preservation of land around Beaver Brook, including the famous Waverley Oaks, Eliot argued that the land in two municipalities (Waltham and Belmont) required protection under new state statutes, leading to the creation of the Metropolitan Park Commission, later the MDC (now DCR).

Today, Beaver Brook Reservation includes two parcels separated by Trapelo Road. The north or Mill Street parcel contains two mill ponds with associated dams, the historic Copeland House and Stearns barn, as well as stone walls, trails, open grass areas, and woodlands. This parcel is used primarily for passive recreation including hiking, dog-walking, and bird watching; duck feeding is also popular. The Copeland House is currently used as DCR staff housing on the second floor and the first floor could serve as a park staff office and visitor center as it once did.

The southern, Waverley Oaks parcel contains popular active recreation facilities including children's spray pool and play area, tennis courts, and turf fields. The existing restroom and picnic pavilion are associated with the early development of the reservation and are therefore historic structures. As the brook continues south through this parcel, it supports wetlands and a potential vernal pool.

Beaver Brook North Reservation

The Beaver Brook North Reservation includes a substantial portion of the former Metropolitan State Hospital grounds. In 2009, the construction of the Metropolitan Parkway north and south segments are complete, with a temporary connector road constructed to link the two segments. The parkway provides public access to the new AvalonBay residential development located in the former hospital buildings. Public access into the reservation is currently limited pending completion of a DCR/City of Waltham parking area in the vicinity of the former Administration Building. Plans for a proposed 9-hole golf course to be developed by the City of Waltham are currently on hold.

DCAM has demolished the hospital buildings in the DCR land, and has cleaned up the former debris site. Former carriage roads provide an existing trail system, and link the reservation to the adjacent Rock Meadow conservation land in Belmont. The historic MetFern Cemetery contains the remains of patients from both the Metropolitan State Hospital and the Fernald Center.

Beaver Brook North supports a diverse assemblage of natural communities including upland forest, successional shrub habitat, upland meadow, forested wetlands, emergent marsh, and wet meadow including both certified and potential vernal pools. The importance of the wetland habitats in Beaver Brook North has been documented since the disposition process began in the early 1990s, and is confirmed by the findings of this RMP.

Figure 3: Land owned by the City of Waltham on which DCR holds a conservation easement, 2005 (Pressley Associates).

Proposed Waltham Golf Course

The RMP also evaluated the natural communities found on land currently owned by the City of Waltham on which DCR holds a conservation easement, and considered environmental issues associated with the proposed 9-hole golf course, which is included as Appendix E. Construction of the golf course would require substantial alteration of the vegetation and topography of the site, largely because of the limited size of the property, and its sloping terrain and wetland system. The evaluation did not consider other potential uses of the property other than conservation land, which is consistent with the DCR easement.

Figure 4: Metropolitan Parkway and adjacent bike path, 2006 (Pressley Associates).

Planning Issues

It should be noted that several important resource and operational issues complicate the current management of the expanded reservation and the ultimate implementation of the Resource Management Plan. While the Metropolitan Parkway is largely complete, with a temporary connector linking the north and south segments, there is no formal public access at this time to the Beaver Brook North Reservation. Local residents informally access the reservation from adjacent public lands owned by Waltham and Belmont. The construction of the residential development complex and the potential for a Waltham golf course adjacent to Beaver Brook North will likely affect future site conditions and increase public use of the new reservation. Work still remains to be done to finish the reuse of the former hospital grounds, including determining a viable new use for the Administration Building and site restoration. This work requires inter-agency coordination between DCR, DCAM and the City of Waltham. Beaver Brook and Beaver Brook North are not contiguous properties (although they are linked ecologically by the Beaver Brook watercourse). Finally, no permanent, year-round DCR staff members are assigned to manage the expanded reservation; management of the current Beaver Brook Reservation is shared with other park, parkway and recreational facilities in the North Region Fells District.

Recommendations

The RMP provides a wide range of recommendations that address proposed capital improvements, public use, maintenance and management, and the protection and enhancement of the reservation's significant natural and cultural resources, which are summarized below. The underlying theme of these recommendations is balancing resource conservation and public use, and engaging in maintenance and management practices that improve and sustain the condition of cultural, historic, and recreational resources and infrastructure without altering the character and health of the natural communities or the integrity and significance of the cultural resources (see also Chapter 4 of the RMP and the two Recommended Improvements plans.)

Natural Resource Recommendations

The natural resources, including plant communities, wildlife, and habitats are an important characteristic of the expanded Beaver Brook Reservation and should be managed with a light hand to protect sensitive resources, perpetuate habitat diversity, and to monitor the health and condition of the ecosystems. Natural resource recommendations include public recreational use, management of invasive or nuisance species, habitat enhancements, and public education, as summarized below:

- In sensitive habitat areas, focus recreational uses on the existing primary and secondary trail systems, with passive uses (e.g. walking and bicycling) allowed and other inappropriate activities (e.g. motorized vehicle usage) prohibited.

- Provide public education materials in the form of brochures, signage, web-based information or other methods to describe the fundamentals and importance of habitats, ecosystems, vernal pools, avian migration, food webs, and seasonal changes and to identify species found in the reservation.

- Sustain the health of the existing natural habitat areas by managing invasive plants through physical, chemical, biological, or an integrated combination to insure effective, species-specific, invasive species elimination and control.

- Manage Canada Geese through a combination of vegetation management, halting public feeding of waterfowl, and public education.

- Enhance the distribution of natural habitats in Beaver Brook North Reservation by re-vegetating disturbed areas resulting from construction activities, building demolition, debris removal and motorized vehicle use. This will deter the colonization of these sites by invasive plant species. The former debris site may also provide an opportunity to establish a new wetland.

- Sustain habitat heterogeneity in field and successional shrub habitats, which require routine maintenance in the form of mowing and brush-cutting in the absence of natural herbivore grazing or fire.

- Enhance the emergent marsh, successional shrub habitat, and interior forest (upland and wetland) habitats by introducing wildlife nesting and roosting boxes.

- Monitor and evaluate both certified and potential vernal pools.

- Provide educational opportunities for local school groups and college and university students. Study topics may range from simple biological principals such as habitat diversity, food webs, vernal pool studies, to reservation management, and invasive species control.

Cultural Resource Recommendations

Both the former Met State Hospital and the original Beaver Brook Reservation are historic properties with important resources and features including archaeological sites, cultural landscapes, and historic buildings and structures. These features are integral to the importance of the reservation and will be treated according to the *Secretary of the Interior's Standards for the Treatment of Historic Properties.* Cultural resource recommendations are summarized below:

Beaver Brook Reservation

- Preserve historic character by retaining the cultural landscape features, materials, and spaces that contribute to its significance as the first reservation in the Metropolitan Park System.

- Undertake a detailed structural assessment of the two dams to determine specific repairs needed as well as code requirements and routine and cyclic maintenance needs.

- Retain existing specimen oak trees and develop a long-term program for replacement as the Waverley Oaks are a significant character-defining feature of the original reservation.

- Retain and maintain the historic restroom and picnic pavilion and ensure that future repair or improvements meet the *Secretary's Standards*.

- Retain and maintain the historic Copeland house; DCR staff residence is a compatible use and provides additional security for the reservation.

- Conduct a building condition assessment of Stearns Barn and undertake necessary emergency stabilization work and repairs.

- Preserve the two prehistoric sites in the Waverley Oaks parcel and the two historic mill sites in the northern section of the reservation.

- Repair the stone walls surrounding the reservation.

Beaver Brook North

- Continue ongoing maintenance of the MetFern Cemetery, consistent with the DCR Preservation and Maintenance Plan.

- Retain, preserve, and re-establish the character of the historic carriage roads with a rural character that reflects the low-intensity passive use recommended for the property. Reduce the width of the carriage road in the vicinity of the debris removal sites by replanting the shoulder.

Summary of Site and Recreation Recommendations

These recommendations address recreational facilities, public use, and other site features:

Beaver Brook Reservation

- Maintain active or intensive recreation facilities in selected areas of the Waverley Oaks parcel; retain the Mill Street parcel for passive recreation only.

- Perform regular trails maintenance to decrease loss of paths to invasive woody vegetation and reduce soil compaction and erosion.

- Maintain consistent site furnishings compatible with the historic character of the reservation.

- Provide improved site interpretation to enhance passive recreation and public education; clearly display the dog policy, designated trails, and allowable uses in the northern and southern parcels.

- Continue coordination with Belmont on the development and implementation of the Waverley Oaks Trail.

- Undertake selective clearing to reveal views from the dams and around the cascade to improve the visual quality of the reservation.

- Restrict access to the natural area along the MBTA tracks in the south parcel to protect the existing wetlands and to avoid unsafe access to the tracks.

- Perform periodic vegetation management in and around the two historic mill sites in the northern section of the reservation.

Beaver Brook North

- Create curb cut on the north parkway, re-grade carriage entrance, and install gate to allow DCR maintenance vehicles and emergency access to the reservation.

- Create new DCR public parking area near the former MSH Administration Building, accessible from the Metropolitan Parkway.

- Remove all existing non-functional utility poles with minimum site disturbance. This is a high priority for the reservation given their hazardous condition.

- Assess costs and feasibility of removing the water tower; evaluate alternatives for removal vs. retention for expanded cell tower use.

- Delineate a shared-use trail system that utilizes the existing carriage road system and rustic secondary [single track] trails, connecting to Rock Meadow and accessible to the new parkway bikeway at both Trapelo Road and Concord Avenue. Monitor trail conditions for potential new volunteer trails, damage to wetlands, and unauthorized motorized vehicle use. Seasonally close secondary trails if needed for wildlife protection and habitat management (see also management recommendations below).

- Realign the Mackerel Hill trails where necessary to address erosion, including installing water bars or other drainage features. Prohibit access to the water tower for safety reasons.

- Perform regular maintenance of the Metropolitan Parkway, including sweeping, plowing and snow removal, maintenance of the drainage system, and maintenance of the new street trees and lighting system.

- Create new visitor facility with restrooms, drinking water, interpretive exhibits, public program space, and user information in the former MSH Administration Building.

- Evaluate alternatives for a wetland boardwalk that provides pedestrian access to Walnut Street and Dawes Street through the open wetlands located north of the parkway and residential development.

- Prohibit motorized uses on the property consistent with DCR reservation regulations. Create public awareness and community watch programs to implement the recreation policies.

Summary of Management Recommendations

These recommendations address additional partnerships, collaborative programs, monitoring and staffing that achieve the goals of this RMP:

- Recognize the state and regional significance of both the Beaver Brook Reservation and the Beaver Brook North Reservation and advocate for increased staffing and funding resources to meet the maintenance and management needs of the expanded reservation (see management and operations alternatives below).

- Provide environmental programs and stewardship activities within the expanded reservation. Develop collaborative approach or partnerships with nearby environmental organizations (such as Mass Audubon) and institutions (such as Bentley College) related to environmental monitoring, inventory, and programs. This could provide an ongoing database of resource information and public programs that supports the mission of DCR and its partners.

- Clearly communicate and post current and future public access/use policies, particularly at Beaver Brook North, including allowable uses, trail system, entrances, and rules and regulations.

- Continue to work collaboratively with the City of Waltham and DCAM related to the use and physical improvements (including site restoration) to City of Waltham land (DCR conservation easement), former MSH Administration Building, the proposed DCR and golf course parking areas, the demolition of the former MSH Female Dormitory, former entrance road (Lot 4B), and the redevelopment of the Gaebler School to achieve the City's and the DCR mutual goals related to conservation, historic preservation, and recreation for the Beaver Brook North Reservation.

- Monitor ongoing construction and maintenance activities associated with the AvalonBay residential development site, particularly with respect to use of the parkway, equipment and materials storage, tree protection, and protection of the adjacent DCR reservation land.

- Work with established recreational associations to create a comprehensive trail assessment that includes a survey of all existing trails, describes current recreational values and deficiencies and proposes recommendations for enhancements or remediation.

- Coordinate with the Friends of the Western Greenway on the designation of a continuous greenway trail through the North Reservation.[3]

- Monitor Beaver Brook North on a regular basis related to potential inappropriate uses, such as dumping and motorized vehicle use, and take immediate action if such uses are observed.

- Actively participate in long term planning related to traffic safety along the Trapelo Road, Concord Avenue, and Mill Street corridors. Work specifically with the City of Waltham on a safety evaluation of the Trapelo Road/Metropolitan Parkway South intersection.

- Survey and mark the boundary of the reservation surrounding the AvalonBay Communities, Inc. development and monitor annually.

- Work with collaboratively park users to develop and post a policy for dog walkers and specify off-leash hours.

Capital Improvements

Following an analysis of site conditions, management requirements, DCR resources, and with additional public input, the RMP proposes capital improvements to achieve basic vs. enhanced level of service for both Beaver Brook and Beaver Brook North Reservation. Basic level services represent the most fundamental needs for maintaining the expanded reservation, which if left neglected, would lead to a permanent loss of an important cultural or natural resource, adversely affect public safety, or result in further decline of the property's infrastructure. Enhanced level services represent increased management to improve the condition of existing resources, enhance programming and public access, and which achieve cosmetic improvements that are not urgently related to public safety or resource protection.

Reservation-wide

Enhanced Level Services

- Continue voluntary program to acquire conservation easements along Beaver Brook.

Beaver Brook Reservation

Basic Level Services

- Conduct structural and rehabilitation evaluation of the Mill Pond and Duck Pond dams;
- Conduct structural and rehabilitation evaluation of the Stearns Barn;
- Inspect and repair deteriorated stone boundary wall along Waverley Oaks Road and Mill Street;
- Evaluate and restore trails and improve site conditions near the two ponds and along Beaver Brook;
- Improve/repair trail leading to the cascade and overlook;
- Implement a universally-accessible trail from the Mill Street parking area to the Duck Pond;
- Remove vegetation from the two archaeological mill sites;
- Undertake vegetation management and additional planting where necessary;
- Restore designated trails lost to volunteer/invasive vegetation growth;
- Develop riparian buffer planting along Beaver Brook.

Enhanced Level Services

- Implement structural and safety improvements at Mill Pond and Duck Pond dams;
- Implement emergency stabilization at Stearns Barn;
- Rehabilitate the baseball and turf fields
- Develop interpretive/education information related to the history of the reservation.

Beaver Brook North Reservation

Basic Level Services

- Preserve and maintain MetFern Cemetery following the Cemetery Preservation and Maintenance Plan;
- Install curb cut and gate, and re-grade the entrance to the carriage road from the north parkway for maintenance and emergency access;
- Locate and remove remaining non-functional utility poles;
- Survey DCR reservation property line surrounding AvalonBay development and monitor yearly.
- Replant areas cleared from the demolition of historic buildings and ensure that trail connections are re-established;
- Re-vegetate areas damaged by motorized vehicle use in the vicinity of the debris removal areas;
- Implement trail connection to Lot 1;
- Establish other critical trail connections
- Evaluate Mackerel Hill trails and implement erosion control and re-route trail where necessary;
- Design and construct DCR parking area with orientation sign accessible from the parkway east of the former MSH Administration Building (future visitor center);
- Implement site orientation/kiosk at new parking area;
- Implement native species planting along Metropolitan Parkway and in exposed slope area south of AvalonBay development;

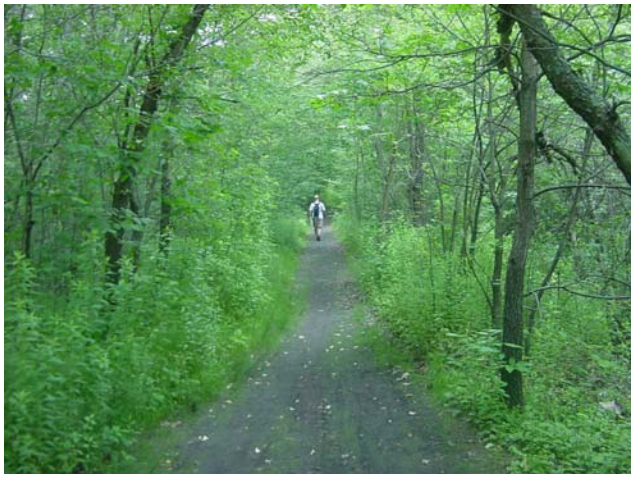


Figure 5: Existing path in Beaver Brook North Reservation, 2005 (Pressley Associates).

Enhanced Level Services

- Work with City of Waltham on the stabilization and re-use of Administration Building; design and construct new DCR visitor center;
- Assess cost and feasibility of removing the water tower on Mackerel Hill; if feasible, remove water tower;
- Design and implement compatible boundary fence and interpretive signage at MetFern Cemetery;
- Re-vegetate areas associated with construction activity and debris removal, including establishing a new wetland;
- Develop a shared-use trail system on the existing carriage roads and secondary rustic [single track] trails; implement priority trail connections across the brook along the south parkway and through the meadow from the north parkway.

Figure 6: Former MSH Administration Building, 2006 (Pressley Associates).

Land Stewardship Zoning Guidelines

The 2003 legislation that created the Department of Conservation and Recreation (DCR) directs the agency to prepare management plans that include guidelines for operation and land stewardship. These guidelines address natural and cultural resources, and ensure consistency between recreation, resource protection, and sustainable forest management. Land Stewardship Zoning Guidelines provide a foundation for recommendations for resource stewardship and facility management, and are intended to cover both existing DCR property conditions as well as future conditions of the reservation. Three zones can be supplemented with specific resource overlays that identify designated or recognized resource features.

Zone 1

Vernal pools possess rare species habitat with a sensitive ecological balance. Zone 1 covers a cluster of five certified and five potential vernal pools, including associated 100-foot buffer areas, and the historic MetFern Cemetery, all located in the Beaver Brook North Reservation. There is no area designated as Zone 1 in Beaver Brook Reservation.

Zone 2

All non-developed areas with cultural and natural resources that can tolerate visitor use and recreational activities at a sustainable level are classified under Zone 2. In the original Beaver Brook Reservation, Zone 2 includes most of the park, with the exception of the intensively used and maintained recreation areas – the parking lots, tennis courts, ball field, and area around the spray pool, picnic pavilion, and restroom. In the Beaver Brook North Reservation, Zone 2 covers all of the property excluding areas under Zones 1 and 3, which includes the aforementioned vernal pools and cemetery (Zone 1), and the Metropolitan Parkway, paved bike path, and proposed DCR parking area (Zone 3). Areas affected by building demolition, debris removal or parkway construction for which site restoration and re-vegetation is recommended will be managed under Zone 2.

Zone 3

All areas developed for intensive recreation and vehicular transportation that require higher levels of monitoring and maintenance are categorized as Zone 3. In Beaver Brook Reservation, Zone 3 includes the parking areas, tennis courts, ball field, and the spray pool and playground in the southern parcel. In the Beaver Brook North Reservation, Zone 3 is limited to the Metropolitan Parkway, the adjacent paved bike path, and the proposed DCR parking area.

Figure 7: Copeland House in Beaver Brook Reservation, 2006 (Pressley Associates). See Figure 2.15 for a historic image of the Copeland House.

Significant Feature Overlays

The three land stewardship zones can be supplemented with significant feature overlays identified through the RMP inventory process and research. The purpose of these overlays is to provide more precise management guidance for identified resources and to recognize, maintain, protect, or preserve unique and significant resource values, regardless of the zone in which they occur. The Cultural Resource Overlay covers the entire Beaver Brook Reservation, including the cultural landscape, archaeological sites, and historic buildings and structures that should be evaluated further and listed on the National Register of Historic Places. The MetFern Cemetery in the North Reservation is also covered by the overlay.

The Natural Resource Overlay includes additional potential vernal pool areas in both Beaver Brook and Beaver Brook North Reservations, which require additional field research to determine their ecological function and condition.

Management and Operations Alternatives

The expanded Beaver Brook Reservation does not have permanently assigned year-round maintenance and operations staff. The reservation is located in the Fells District of the North Region. This is a large and complex region with thousands of acres of parkland, parkways and recreational facilities; the assignment of staff and the allocation of resources (such as operational funding, materials and equipment, and staff) are based on regional management priorities. The historic 59-acre Beaver Brook Reservation is currently managed as a collateral duty by staff assigned to the Alewife and Mystic Reservations. With the acquisition of the 254 acres of the former Met State Hospital and the construction of a new Metropolitan Parkway, funding and allocation of additional management resources is essential to the preservation and safe public use of the expanded reservation. With this in mind, the RMP identifies three alternative staffing levels, which provide corresponding increased resource protection and public benefit:

Level 1 consists of the current staffing levels and management capacity that provides for limited basic operational responsibilities for the entire expanded Beaver Brook Reservation.

Level 2 is the minimal staff needed immediately to provide essential public safety and resource stewardship. This exceeds the current Level 1 staffing level for Beaver Brook and consists of four positions (1 year round Supervisor, 1 seasonal Ranger, 1 year round Laborer, and 2 seasonal Lifeguards).

Level 3 achieves the optimal staffing level including seven positions (2 year round Supervisors, 3 seasonal Park Rangers, 2 seasonal Lifeguards, and 2 year round Laborers).

Future partnerships could include a formal maintenance agreement with AvalonBay Communities, Inc. related to the maintenance of the new Metropolitan Parkway, which provides vehicular access to the new residential development. Future agreements with AvalonBay must be consistent with DCR's conservation, preservation, recreation, and management objectives for the reservation. Opportunities also exist for collaborative evaluation, maintenance and improvement to the multi-use trails, which could alleviate a portion of the maintenance burden and involve critical stakeholders in the active management of the expanded reservation. Staff training with cultural resource specialists, related to the long-term preservation of the MetFern Cemetery will ensure that the DCR staff has the tools and knowledge to appropriately care for the historic cemetery.

Recommendations for Further Study

The following recommendations include tasks associated with additional research, planning, design, or documentation that are needed either prior to undertaking physical work, or which would enhance the overall understanding of the reservation.

1. Assess cost and feasibility alternatives for the water tower, including removal.
2. Undertake additional trail evaluations in the North Reservation in collaboration with trail users;
3. Coordinate with Lexington, Waltham and Belmont on traffic monitoring related to the use of the Metropolitan Parkway and the safety of the Trapelo Road intersection;
4. Conduct structural and code compliance evaluation of the bridges and dams;
5. Complete a National Register nomination and a Cultural Landscape Report for Beaver Brook Reservation;
6. Conduct periodic water quality monitoring in ponds and along the Beaver Brook watercourse;
7. Conduct rare species monitoring and continue to evaluate and certify the potential vernal pools;
8. Complete a structural evaluation of the Stearns Barn;
9. Complete additional design work necessary to implement the priority improvements identified in this RMP, particularly the DCR parking area and critical trail connections;
10. Conduct a recreational user study of the Beaver Brook North Reservation to determine existing uses as baseline for assessing changes over the next five to ten years;
11. Prepare an accurate GIS base map for both properties, particularly focused on locating existing and proposed trails n the North Reservation.

Endnotes

[1] DCPO, MSH Reuse Plan, p. 7.

[2] Betsy Friedberg, MHC to Julia O'Brien, MDC. June 20, 1991 regarding a determination of eligibility for the entire Metropolitan Park System.

[3] In 2009, several Western Green trail markers were in place in the North Reservation.

Figure 1.1: Emergent marsh in the Beaver Brook North Reservation, 2005 (Pressley Associates).

Chapter 1

Introduction

This Resource Management Plan for the Expanded Beaver Brook Reservation was prepared under the direction of the DCR Resource Management Planning Program, by Pressley Associates and LEC Environmental Consultants. The RMP evaluates and makes recommendations for both the original Beaver Brook Reservation and the 254-acre Beaver Brook North Reservation, formerly a portion of the Metropolitan State Hospital (MSH). In addition, the RMP addresses a 54-acre parcel, also formerly part of the MSH property and now owned by the City of Waltham, on which DCR holds a conservation easement.

With sound land stewardship as a guiding principle, the RMP proposes short and long-term development, programming, and management strategies that will enhance the recreational, ecological, cultural, and visual resources within the expanded Beaver Brook Reservation.

DCR Mission

The Department of Conservation (DCR) is responsible for the stewardship of approximately 450,000 acres of Massachusetts' forests, parks, reservations, historic sites and landscapes, seashores, lakes, ponds, reservoirs, and watersheds. It is one of the largest state park systems in the country. The mission of DCR is to protect, promote and enhance our common wealth of natural, cultural, and recreational resources.

In meeting current needs and responsibilities, and planning for the future, DCR focuses on:

- Improving outdoor recreational opportunities and natural and cultural resource conservation;
- Restoring and improving DCR facilities;
- Expanding public involvement in carrying out the DCR's mission; and
- Establishing first-rate management systems and practices.

The DCR was created by state legislation in 2003 (FY04), which merged the former Metropolitan District Commission (MDC) and the former Department of Environmental Management (DEM). The Division of State Parks and Recreation manages approximately 317,000 acres of state forests, beaches, mountains, ponds, riverbanks, trails and parks outside greater Boston, excluding water supply lands that contribute to the total 450,000 acres under DCR stewardship. The Division of Urban Parks and Recreation manages approximately 18,000 acres of woodlands, river, and coastal reservations within the greater Boston area and has broad management responsibilities for the preservation, maintenance, and enhancement of the natural, scenic, historic, recreation, and aesthetic resources that characterize the state reservations in this area. The health and happiness of residents of and visitors to Massachusetts

depends on the accessibility and quality of our green spaces, including the natural and cultural resources, recreation facilities, and historic landscapes comprising the state park system. DCR continues to improve this vital connection between people and their environment.

Figure 1.2: Picnic area near the Duck Pond along Mill Street, Beaver Brook Reservation, 2006 (Pressley Associates).

Resource Management Plans

Resource Management Plans (RMPs) are "working" documents that consider the past, present, and future of a forest, park, or reservation. They include an inventory and assessment of environmental, cultural, and recreational resources; identify unique characteristics and values; and develop clear management goals and objectives. RMPs provide a guide to the short and long-term management of properties under the stewardship of the DCR. They are intended to be working documents for setting priorities, capital and operational budgeting and resource allocation, and enhancing communication and cooperation with park visitors and the surrounding communities.

This RMP is part of a comprehensive, state-wide effort coordinated by the DCR to provide sound stewardship for the state parks and forests under its care. This includes a focus on the protection of natural and cultural resources and provisions for public input in developing an RMP. M.G.L. Chapter 21, Section 2F revised as Chapter 25, Section 79 in July 2003, provides more specific direction related to the preparation of resource management plans for state parks, reservations, and forests, a portion of which is included below:

> The commissioner of conservation and recreation shall submit management plans to the stewardship council for the council's adoption with respect to all reservations, parks, and forests under the management of the department, regardless of whether such reservations, parks, or forests lie within the urban parks district or outside the urban parks district. Said management plans shall include guidelines for the operation and land stewardship of the aforementioned reservations, parks and forests, shall provide for the protection and stewardship of natural and cultural resources, and shall ensure consistency between recreation, resource protection, and sustainable forest management. The commissioner shall seek and consider public input in the development of management plans, and shall make draft plans available for a public review and comment period through notice in the *Environmental Monitor*. Within thirty days of the adoption of such management plans, as amended from time to time, the commissioner shall file a copy of such plans as adopted by the council with the state secretary and the joint committee on natural resources and agriculture of the general court.
>
> The commissioner of conservation and recreation shall be responsible for implementing said management plans, with due regard for the above requirement.

The DCR Stewardship Council is a 13-member citizen advisory board that works with the Department to provide a safe, accessible, well-maintained, and well-managed system of open spaces and recreational facilities that are managed and maintained on behalf of the public for the purposes of natural, historic, and cultural resource protection, sustainable recreation, and education.

Resource Management Plans generally follow a consistent organizational structure and content. They begin with a description of the property; identify and assess existing conditions; identify the defining characteristics and management goals; and conclude with management recommendations. This structure was developed to present information concisely, while providing sufficient detail to understand a property's resources, potential, and management needs. Because RMPs follow a standard organization, information contained in these plans may

be compared across properties (i.e., plans) to identify common issues, challenges, and opportunities.

Much of the information in an RMP is conveyed through maps. The maps provide extensive information on a property's physical and social settings, its natural and cultural resources, locations of proposed management actions, and land stewardship zoning. These maps both clarify and expand upon information presented elsewhere in the RMP.

Resource Management Plans are written to meet the information needs of a diverse audience. Those decision-makers directly involved in the operation and management of a property, and those involved in the regional or system-wide administration of that property are the primary audiences. However, RMPs are not intended as internal DCR documents. Information contained in these plans benefits a variety of stakeholders including individuals and organizations interested in recreation, natural resources, cultural resources, and environmental education and interpretation. Those in local, regional, and State government will also benefit from information contained in RMPs. Finally, RMPs are of value to those who live near a state park, forest, or reservation and are interested in learning more about that property and how decisions affecting it are made. Information contained in RMPs helps all of these stakeholders become more engaged in the operation and management of lands within the DCR system.

The Planning Process

Resource Management Plans are developed by the DCR Resource Management Planning Program and its consultants through an iterative process of data gathering and analyses, public input, review, and revision. The first step in preparing an RMP is identification of the property or properties to be included in the plan (i.e., the planning unit). Some RMPs cover a single property, while others cover multiple properties. Once the planning unit has been identified, administrative, cultural (i.e., historic), ecological, recreational, social, and spatial (i.e., mapping) information is gathered. Sources of information include site visits and data collection, administrative files and reports, legal documents, map data, municipal and regional plans, and interviews with DCR staff.

A draft RMP comprised of text, photographs, and maps is prepared following the standard content developed by the DCR RMP Program. This draft is then distributed within the DCR to the Commissioner; Division, Regional, and District staff; Bureau of Planning and Resource Protection, and others for internal review. The draft RMP is repeatedly reviewed and corrected to produce a revised draft RMP for public review and comment.

The Expanded Beaver Brook Reservation

Project Area

The primary project area of the Beaver Brook RMP includes the 254 acres of the former MSH land and the historic 59-acre Beaver Brook Reservation (Figure 1.3). The secondary study area also includes the 54-acre parcel owned by the City of Waltham, over which DCR holds a conservation easement. An evaluation of the City's proposal for a 9-hole municipal golf course is included as Appendix E. Public and private park and conservation lands not owned by the DCR, but which are located adjacent to or nearby the Beaver Brook Reservation are considered briefly in the RMP because the geographic relationship between the parcels provides connections that enhance both conservation values and recreation opportunities.

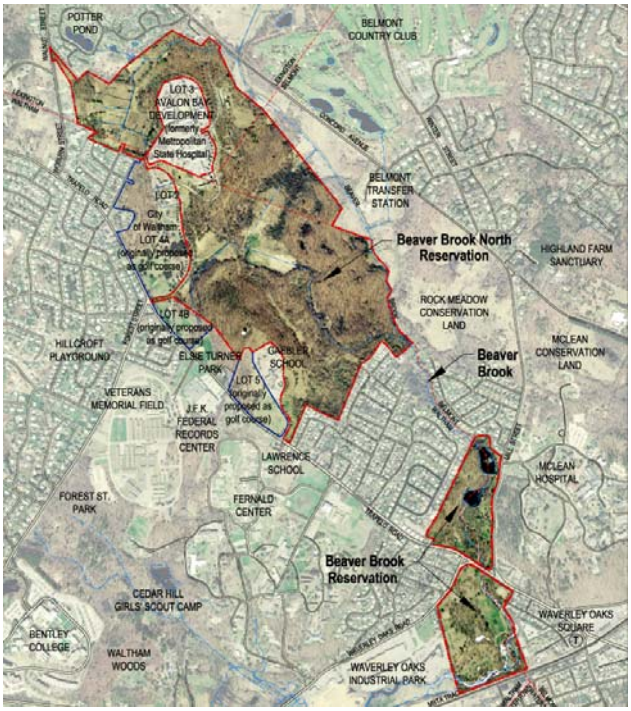


Figure 1.3: RMP Project Area (Pressley Associates).

Beaver Brook Reservation is comprised of 59 acres of land bisected by Trapelo Road. The northern (Mill Street) parcel is triangular in shape, and is bordered by Mill Street on its eastern boundary, Trapelo Road along the southern boundary, and residential properties along its western boundary. The southern (Waverley Oaks) parcel is bordered by Trapelo Road and Waverley Oaks Road to the north, an MBTA railroad to the south, and commercial and residential development. Parking for the reservation is found on Waverley Oaks Road, Mill Street, and along Trapelo Road. In addition, Waverley Square in

Belmont, located very near the existing reservation, has MBTA bus and commuter rail service.

Figure 1.4: Picnic area along Beaver Brook in the Waverley Oaks parcel of Beaver Brook Reservation (Pressley Associates).

The 254-acre Beaver Brook North Reservation is located north of Trapelo Road between Marguerite Avenue and Porter Street, extending northerly toward Beaver Brook. This property located northwest of the original reservation with entrances off Trapelo Road and Concord Avenue. The property is nine miles northwest of Boston, three miles east of Route 128, and falls inside the borders of Waltham, Lexington and Belmont. The DCR land is also easily accessible from Rock Meadow conservation land in Belmont.

Structures and infrastructure associated with the former Metropolitan State Hospital are located adjacent to the reservation; selected buildings were recently rehabilitated by AvalonBay Communities, Inc. as residential (apartment) dwellings. The remainder of the Beaver Brook North site contains a broad expanse of undeveloped land containing a diverse assemblage of habitat types.

Beaver Brook Reservation contains a mixture of maintained recreational parklands (particularly within the southern parcel) and natural, relatively undisturbed forested areas (more so in the northern parcel). Beaver Brook flows through the reservation, including two ponds, Mill Pond and Duck Pond, within the northern parcel, continuing southerly toward the MBTA railroad, where the brook redirects in a westerly direction. It is located within walking distance from Waverley Square.

The expanded Beaver Brook Reservation is strategically located amidst several open space parcels including Belmont's Rock Meadow Conservation Land, Massachusetts Audubon Society's Highland Farm and Habitat Sanctuary, Waltham Woods, Middlesex County Hospital open space, McLean Hospital open space, and Concord Avenue Conservation Land in Lexington. In combination with the open space resources of the expanded reservation, these properties provide an important network of wildlife habitat and public recreation opportunities within the metropolitan region area known as the Western Greenway.

Figure 1.5: Picnic pavilion near the spray pool in the Beaver Brook Reservation, 2006 (Pressley Associates).

Characteristics

The original Beaver Brook Reservation property is geographically divided by Trapelo Road, creating two distinct properties. Prior to acquisition by the Metropolitan Park Commission, the land was farmland, with a wooded area north of Trapelo Road that contained two ponds, a dam and cascade, and two abandoned mill sites. Today, the reservation's open fields, wetlands, archaeological sites, and woodlands offer opportunities for hiking and exploring. Ponds, fields, marsh, and a cascading waterfall make the park's north section located off Mill Street, scenic. The more developed south section features ball fields, tennis courts, a spray pool, and a playground. Features associated with Beaver Brook Reservation include the remains of a 17th and 18th century fulling and grist mill, the historic [Landscape Architect] Robert Morris Copeland House (c.1835), and a monument to the Waverley Oaks, celebrated during the nineteenth century. While Beaver Brook Reservation, established in 1893, was the first state reservation in the Metropolitan Park System, it is not yet listed on the State or National Registers of Historic Places although the entire Metropolitan Parks System has been declared eligible for NR listing by the Massachusetts Historical Commission.

Figure 1.6: Cascade in the north parcel of Beaver Brook Reservation (Pressley Associates, 2005).

The Beaver Brook North Reservation has abundant natural resources including two bordering vegetated wetlands, three restricted wetland systems, fourteen vernal pools, woodlands, meadows, a pond, three perennial brooks, and several intermittent streams supporting four major plant communities with over 225 species of trees and shrubs identified and a diverse population of reptiles, amphibians, birds, and mammals. This relatively undeveloped site provides important protection to the water quality and flood storage capacity of the Beaver Brook watershed with its extensive wetlands and open space. Mackerel Hill, the primary geologic feature offers splendid views of the surrounding open space and the Boston skyline while providing visual and acoustic buffer to the site's open space resources. The existing path system provides opportunities for hiking, jogging, cross-country skiing, bird watching, and nature study.

The North Reservation is also part of a larger historic district, listed on the National Register of Historic Places in 1994. Contributing resources listed in the nomination and located on DCR land include the cemetery, carriage roads, water tower, and several buildings demolished by DCAM in 2005. The balance of the MSH property has been disbursed by the Division of Capital Asset Management (DCAM), including the aforementioned land acquired by the City of Waltham, which also includes the historic former MSH Administration Building. A private residential development utilizing many of the former hospital buildings has been created in the core campus by AvalonBay Communities, Inc. DCAM also constructed a new parkway through the former MSH site to provide access to the private development and parkland, and cleaned up the former debris site. The non-active MetFern Cemetery is also located in the center of the 254 acre parcel.

Figure 1.7: Open meadow in the Beaver Brook North Reservation, 2006 (Pressley Associates).

Figure 1.8: Carriage road in the Beaver Brook North Reservation, 2009 (Pressley Associates).

RMP for the Expanded Beaver Brook Reservation

Purpose

The purpose of the RMP for the Expanded Beaver Brook Reservation is to develop a feasible management strategy to protect and enhance the ecosystem of the reservation and promote opportunities for passive and active recreation, developed with public participation and stakeholder input. The RMP addresses the expanded reservation in the context of a larger open space system and provides recommendations to strengthen the park boundaries, provide trail linkages to adjacent properties, and address issues related to adjacent uses, encroachments, or intrusions.

Goals and Objectives

In order to meet the purposes established for the RMP Program, the comprehensive RMP for the expanded Beaver Brook Reservation supports the following goals for the property:

- Preserve and enhance wetlands and natural communities for the health and diversity of the flora and fauna;
- Preserve the cultural and historic resources of the expanded reservation, including its cultural landscapes, archaeological sites, and historic buildings and structures;
- Manage the new Beaver Brook North Reservation as an ecological preserve open to the public;
- Enhance and refine existing access, including the network of trails throughout the property;
- Maximize environmental education opportunities afforded by the reservation;
- Ensure the public's enjoyment of the reservation by promoting its diversity of flora and fauna, extensive views, cultural resources, and opportunities for solitude in a natural setting;
- Strengthen the reservation boundaries and prevent/resolve inappropriate encroachments or intrusions;
- Assess the environmental impacts of the City of Waltham's proposed nine hole golf course on both the reservation and DCR's conservation easement;
- Identify opportunities for strengthening the open space network around the reservation by identifying potential parcels for acquisition or conservation easement, and maintaining key connections to other public open spaces;
- Decrease any non-point pollutants presently entering the reservation or brook;
- Provide opportunities for public education to promote the natural and cultural resources of the reservation;
- Continue to strengthen DCR's relationship with constituency groups, with a particular focus on joint ventures with neighbors and communities abutting the reservation;
- Determine areas most suitable/desirable for recreation, education, and natural/cultural resource preservation.

The RMP also identifies specific strategies and actions to meet the following objectives:

- Continue development of a greenway corridor that provides continuity throughout the reservation to the adjacent open space properties;
- Develop policy guidelines, procedures, and techniques for daily maintenance, management and operation of the reservation;
- Develop a public participation and volunteer framework to help care for the reservation;
- Identify opportunities to obtain private funding for capital improvements, maintenance, and operation; and
- Develop a phasing strategy for RMP implementation.

Methodology

The RMP for the Expanded Beaver Brook Reservation uses a multi-phased methodology to address the issues pertaining to the property and identify feasible management alternatives. In 2005-2006, Pressley Associates utilized available written documentation, plans, site maps, GIS files, and aerial photography to produce scaled base plans of the reservation. These base plans are then used to record information related to existing site features, resources, and conditions, which were collected through a combination of field inventory, research, and the review of select historic documents. LEC Environmental Consultants also reviewed appropriate maps and scientific literature to compare existing site conditions with wildlife habitats and ecological relationships documented under similar conditions throughout New England. This combined documentation and research developed a knowledge base for understanding the natural and cultural resources, and analyzing existing conditions and prevalent uses of the reservation.

The findings of the inventory and analysis were presented at a public meeting in March 2006 to discuss the issues pertaining to the reservation and to introduce the RMP concept to the community and stakeholders. Management recommendations were also developed for the reservation based on public input to identify and prioritize issues. The recommendations were evaluated and revised following the second public meeting in May 20006 that presented the draft RMP for public review and comment. A revised draft plan was prepared incorporating public comments, for additional review by DCR staff. In 2009, DCR finalized the RMP, integrating DCR review comments and updating some of the site conditions information so that the recommendations could be completed for resource stewardship; interpretation and education; recreational activities and site accessibility; management, maintenance, and operation; and capital improvements. Supplementary Appendices compiled in a separate volume include Cultural Resource Technical Appendices and the Metropolitan State Hospital Reuse documents.

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 species[3].

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.

Tartarian 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-dimenational '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 aboreal and semi-aboreal 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 aboreal mammals such as Porcupine (*Erethizon dorsatum*), Gray Squirrel* (*Sciurus carolinensis*) and Red Squirrel (*Tamiasciurus hundsonicus*). 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 platypteris*) 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* (*Thtyothorus 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 (*Geothylptis 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 platyrhynochos*), 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 (*Opheodrys 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* (*Zenaida macroura*), Black-Billed Cuckoo (*Coccyzus erythropthalmus*), Common Nighthawk (*Chordeilis 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 (*Sternothaerus 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.

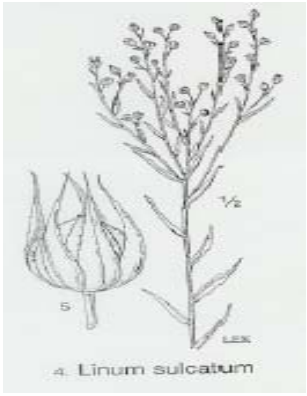


Figure 2.11: Grooved Flax (LEC)

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.

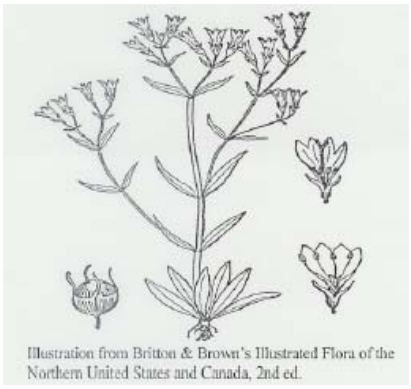


Figure 2.12: Long-leaved Bluet (LEC)

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.

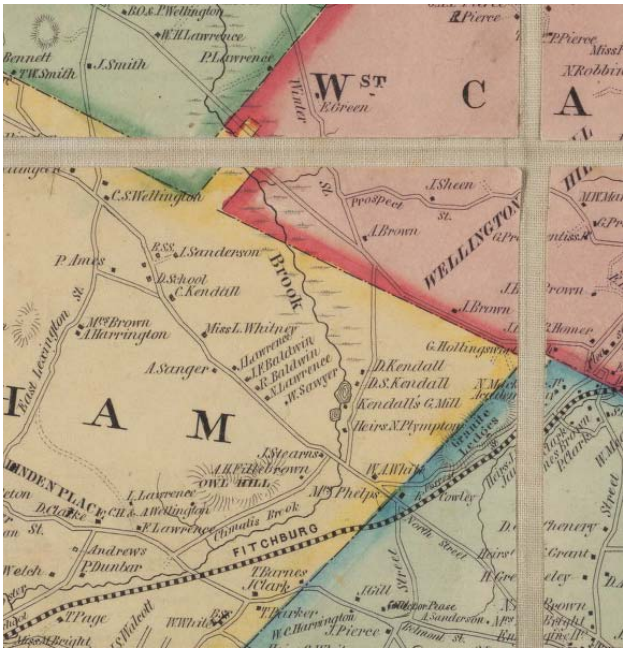


Figure 2.14. Detail of an 1853 map of the Boston area by James C. Sidney showing the two mill ponds and the newly-established Fitchburg railroad (Harvard Map Collection).

Beaver Brook Reservation

Prehistoric Cultural Resources

A 1989 archaeological survey[29] 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 satinet 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 satinet 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 house[34] 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]

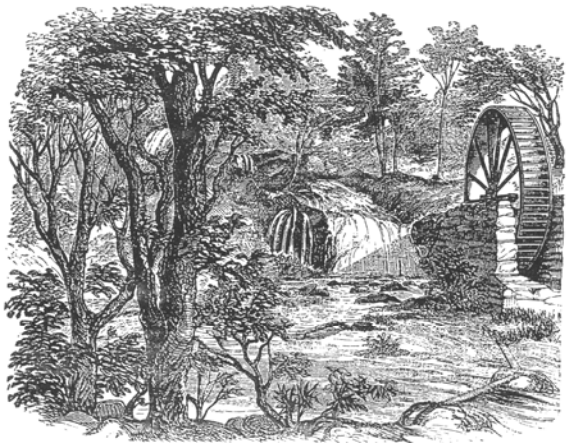


Figure 2.18: Lower Mill remains and the falls at Beaver Brook, 1859 (Ballou's *Pictorial*).

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 earlier[50] 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.

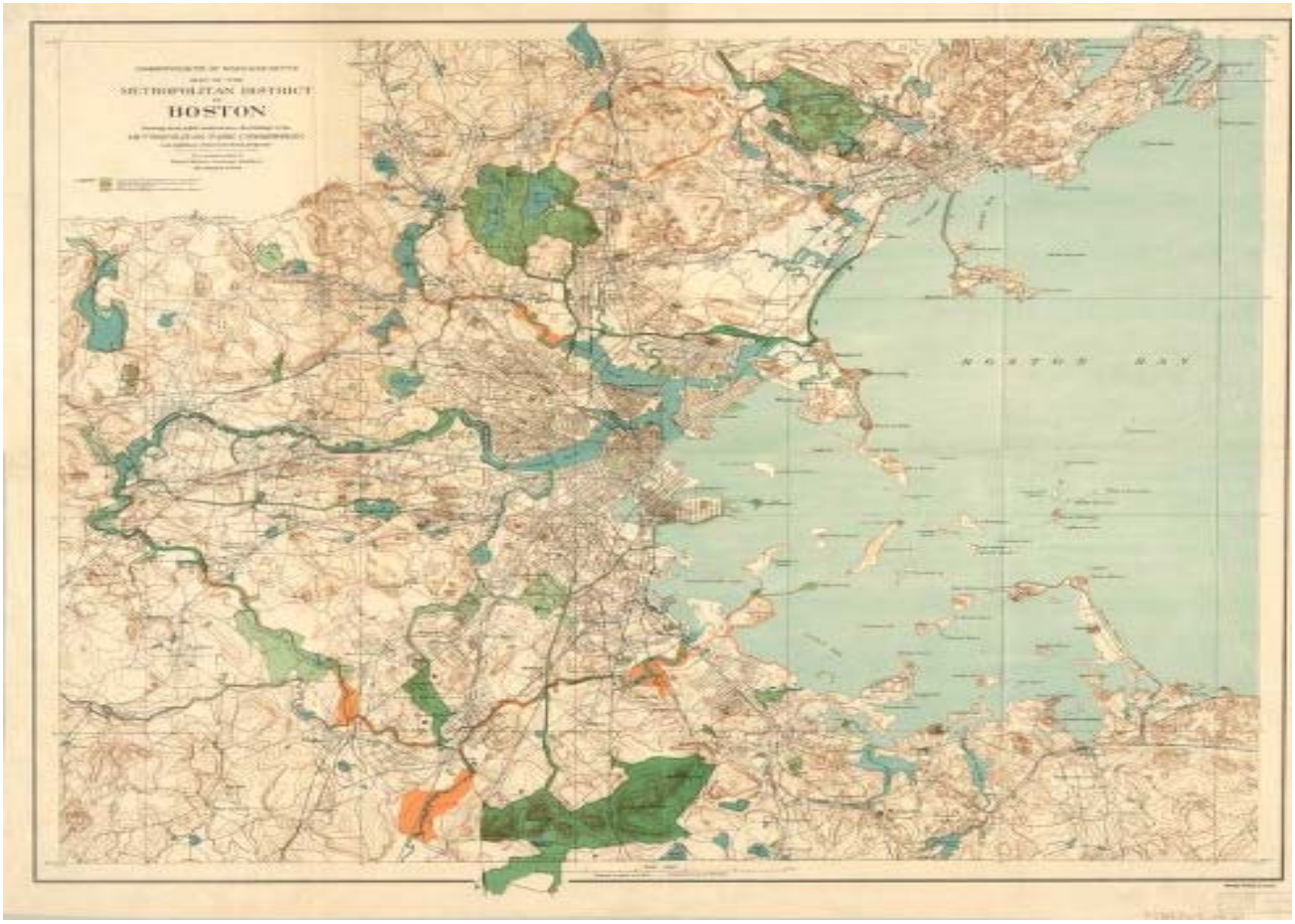


Figure 2.22: Map of the Metropolitan District of Boston, 1898 showing Beaver Brook as one of the original holdings of the Metropolitan Park Commission (Harvard Map Collection).

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 1896[54] 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.

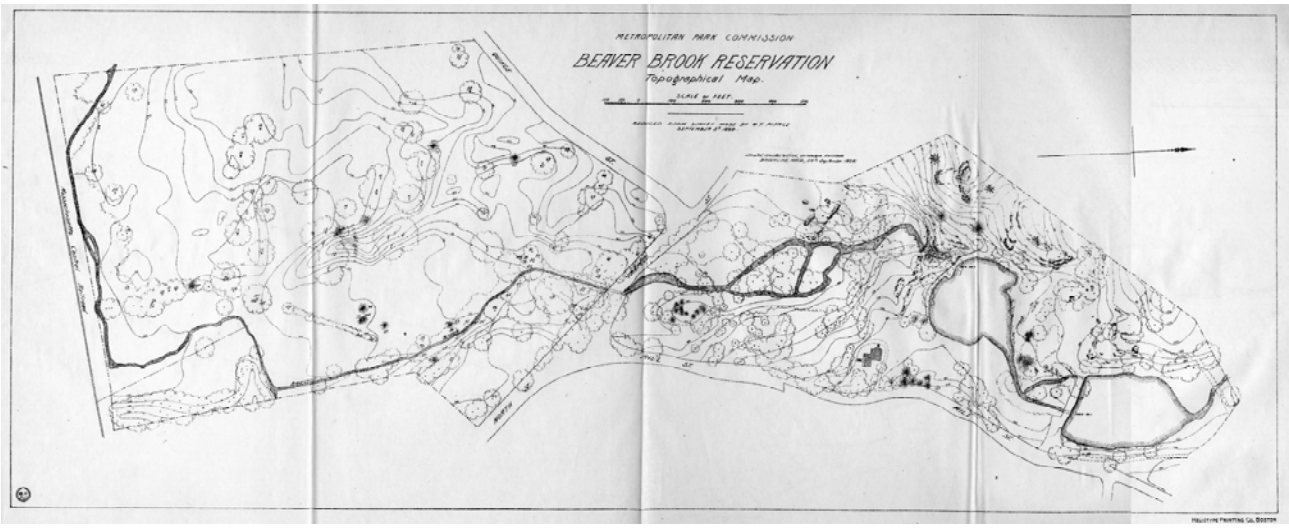


Figure 2.23: Olmsted, Olmsted & Eliot 1894 plan of Beaver Brook Reservation (Metropolitan Parks Commission Report, 1895).

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 1876[61] 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 20th 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
18th century	Grist mill on upper pond and two stone runs	Archeological remains only
17th -18th 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 Hospital[71]

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.

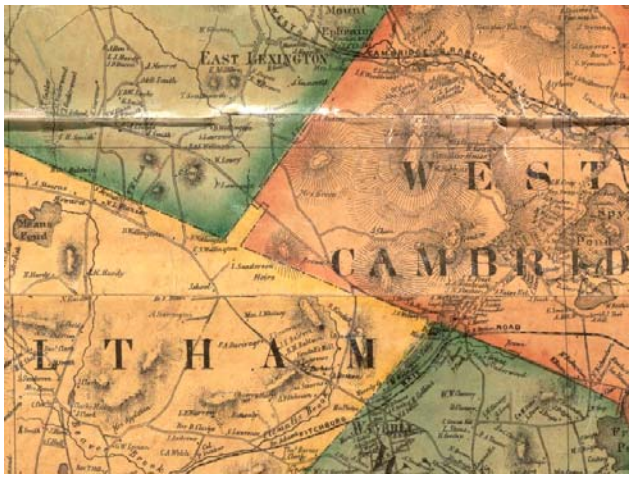


Figure 2.28: The future site of the Metropolitan State Hospital, shown on the 1856 Walling Map of Middlesex County (detail) (Harvard Map Collection).

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.

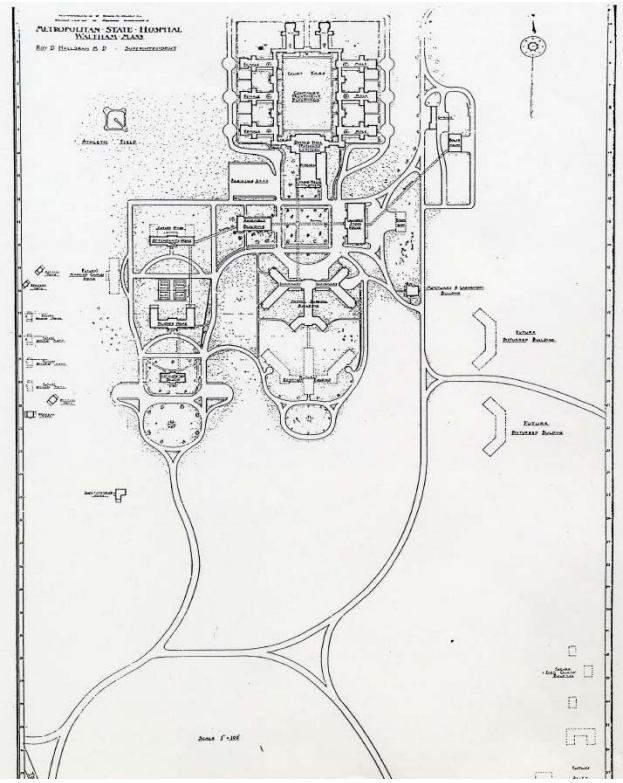


Figure 2.29: Original 1934 plan for Metropolitan State Hospital (National Register of Historic Places).

Metropolitan State Hospital proved to be the last of the great institutional facilities that the state created to care for it's 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.

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.

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

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 Plan[72] 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).

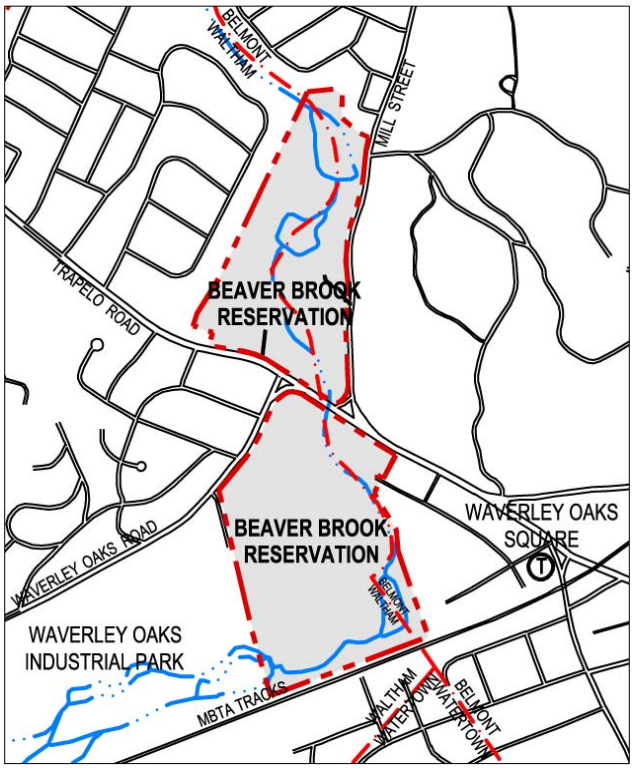


Figure 2.36: Location of the Beaver Brook Reservation (Pressley Associates).

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.

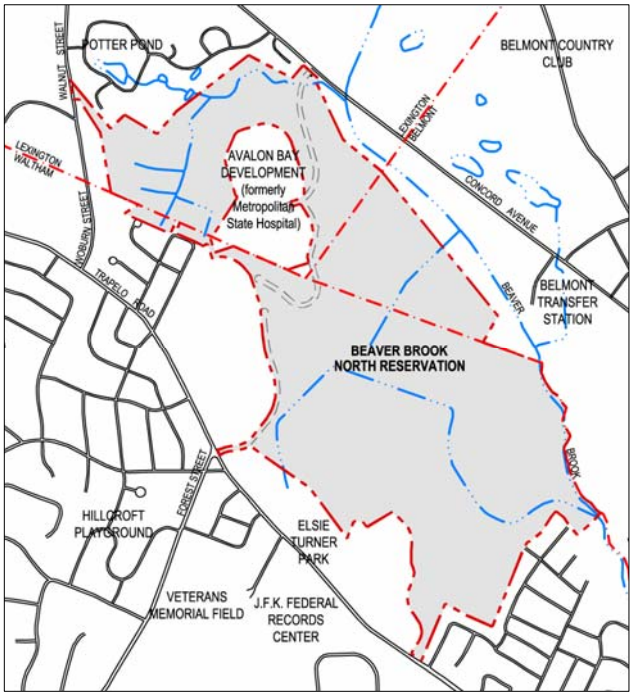


Figure 2.38: Location of Beaver Brook North Reservation (Pressley Associates).

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.

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

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

INSERT SITE FEATURES
BEAVER BROOK RESERVATION

INSERT SITE FEATURES
NORTH RESERVATION

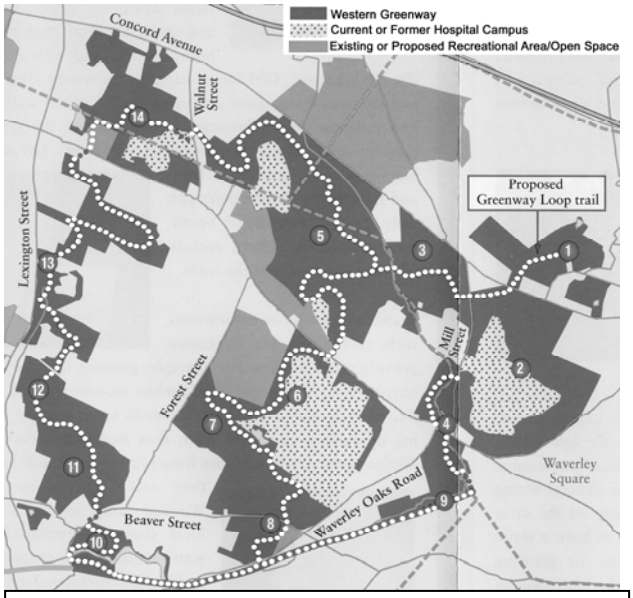
Relationship to Adjacent Open Space

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 it's 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; Pequosette, 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.

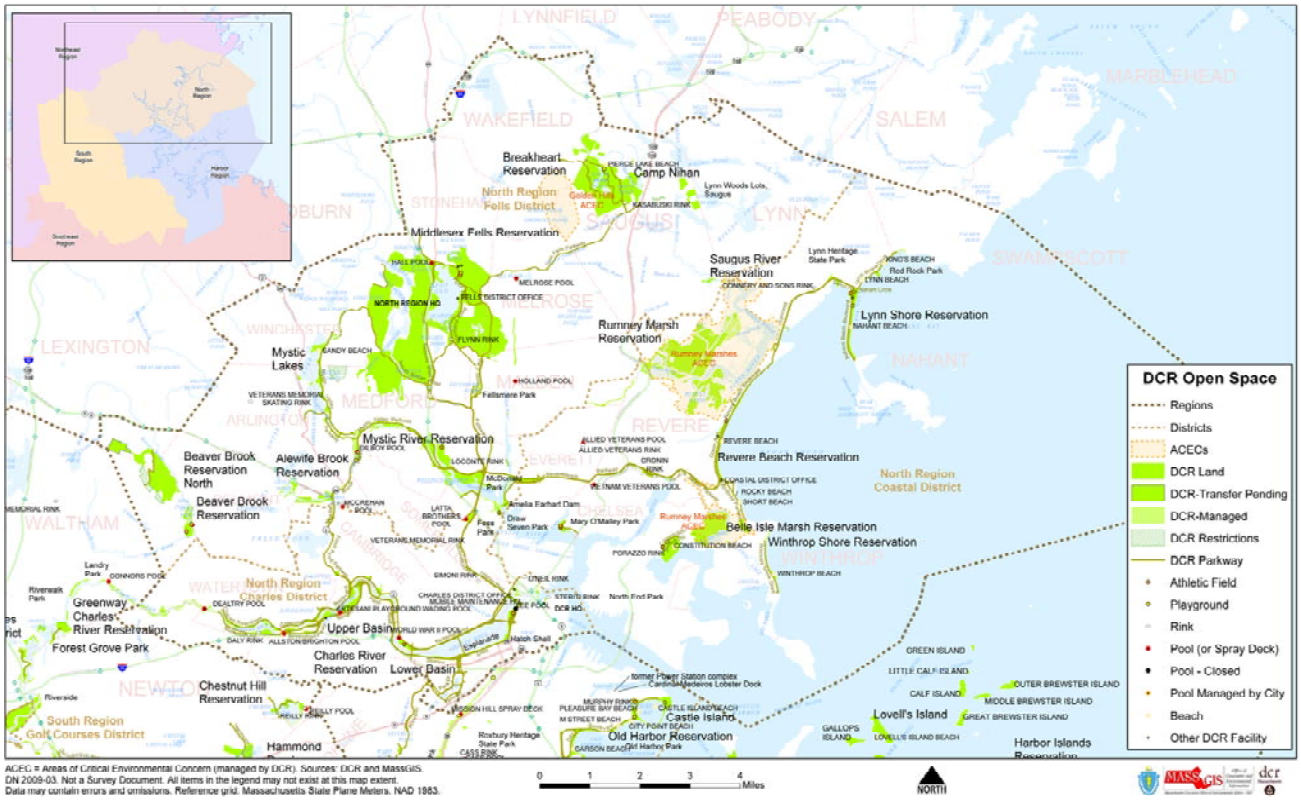


Figure 2.65: DCR Division of Urban Parks and Recreation - North Region (DCR).

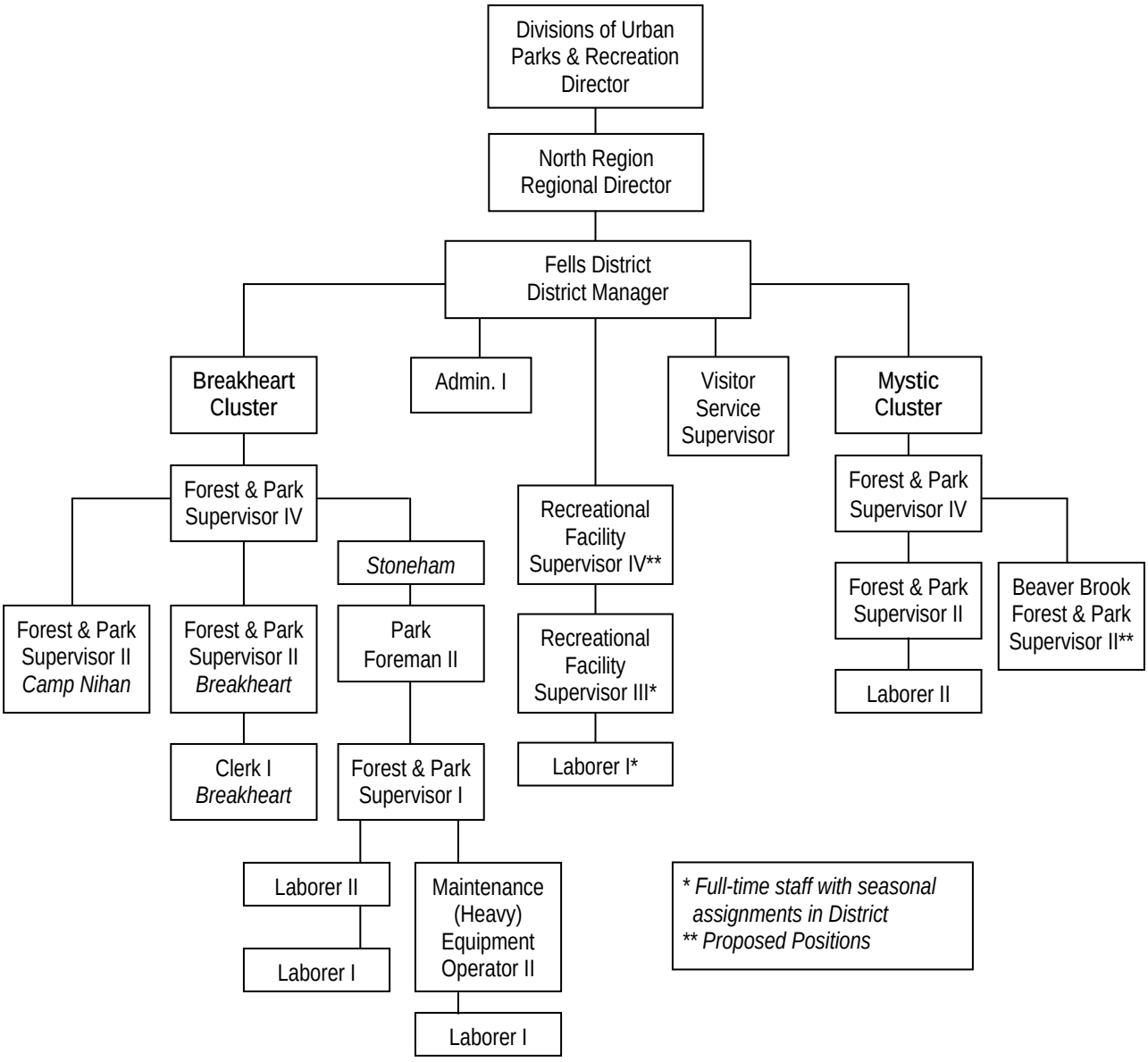


Figure 2.66: Fells District DCR management structure (DCR)

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 Arleyn 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."

[51] Levee, "Beaver Brook Reservation."

[52] Massachusetts Horticultural Society, *Transactions of the Massachusetts Horticultural Society for the Year 1894* (Boston, MA: Massachusetts Horticultural Society, 1894), 163-164.

[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.

Figure 3.1: Rolling terrain bordering the Lowell Path in Beaver Brook Reservation, 2005 (Pressley Associates)

Chapter 3

Resource Protection and Land Stewardship Zoning

Resource Protection

Under this Resource Management Plan (RMP), the Department of Conservation and Recreation will manage the expanded Beaver Brook Reservation as a significant natural, cultural, and recreational resource. This management strategy is reinforced by the designations and regulatory protections currently in place at the property which include:

- Protections under the Wetlands Protection Act as administered by the Belmont, Lexington, and Waltham Conservation Commissions;
- Listing on the National Register of Historic Places as part of the thematic nomination for state hospitals and as the first public reservation in the metropolitan park system;
- Specific agreements between DCR, DCAM and the municipalities of Belmont, Lexington, and Waltham related to the Reuse Plan and amendments for the former Metropolitan State Hospital grounds (Beaver Brook North Reservation).
- M.G.L. Chapter 9, Section 26-27c, as amended by Chapter 254 as well as other state regulations (CMRs), which addresses DCR's responsibility regarding the preservation of historic resources.
- Each of these designations, agreements, and regulations has implications for the management of the expanded Beaver Brook Reservation. As a result, the recommendations of this RMP must be consistent with the applicable laws, as well as the professional standards, guidelines, review processes, and practices promulgated by the associated agencies, and the implementation of the recommendations must follow all applicable regulatory procedures.

Natural Resource Regulations

Wetland Protection Act

Existing Wetland Resource Areas, including the Beaver Brook watercourse, riverfront area, surrounding wetlands, floodplain, and vernal pools are protected under the Massachusetts Wetlands Protection Act (WPA, M.G.L. c. 131, s. 40) and its implementing Regulations (310 CMR 10.00). Massachusetts enacted the Wetlands Protection Act in 1963 to protect wetlands, associated resource areas, and floodplains from adverse impacts associated with development and resource area alteration, thus becoming the first state to adopt regulations protecting wetlands. The Act and Regulations set forth a public review and decision making process by which certain wetland resource areas are to be regulated by local conservation

commissions and the Massachusetts Department of Environmental Protection (DEP) in order to ensure maximum environmental protection for environmentally sensitive areas.

The following areas are subject to protection under the WPA: any (a) bank, (b) freshwater wetland, (c) coastal wetland, (d) beach, (e) dune, (f) flat, (g) marsh, or (h) swamp that border on the ocean, any estuary, creek, river, stream, pond, or lake. Also included are land under any of the above listed water bodies, land subject to tidal action, land subject to coastal storm flowage, land subject to flooding, and riverfront area. In certain circumstances, the protected area may include the buffer zone, which is land extending 100 feet horizontally outward from the boundary of certain areas. The WPA contributes to the following eight interests: (1) protection of public and private water supply; (2) protection of ground water supply; (3) flood control; (4) storm damage protection; (5) prevention of pollution; (6) protection of land containing shellfish; (7) protection of fisheries; and (8) protection of wildlife habitat. Any activity proposed or undertaken within an area listed above which will remove, fill, dredge, or alter that area is subject to regulation under the WPA and requires the filing of a Notice of Intent. In addition, activities located within 100 feet of the above listed protected areas which, in the judgment of the local conservation commission, will alter the protected area are subject to regulation under the WPA. 310 CMR 10.00 is intended solely for use in administering M.G.L. c. 131, § 40 with the purpose to define and clarify the process by establishing standard definitions and uniform procedures by which conservation commissions and the Department may carry out their responsibilities under M.G.L. c. 131, § 40.

Minor activities within the buffer zone which are not subject to WPA regulations include:

- Unpaved pedestrian walkways for private use;
- Fencing that will not constitute a barrier to wildlife movement; stonewalls; stacks of cordwood;
- Vista pruning, which is located more than 50 feet from the mean annual high water line within a riverfront area or from bordering vegetated wetland, whichever is farther. (Pruning of landscaped areas is not subject to jurisdiction under 310 CMR 10.00.);
- Plantings of native species of trees, shrubs, or groundcover, but excluding turf lawns;
- The conversion of lawn to uses accessory to residential structures such as decks, sheds, patios, and pools, provided the activity is located more than 50 feet from the mean annual high-water line within the riverfront area or from bordering vegetated wetland, whichever is farther, and erosion and sedimentation controls are implemented during construction;
- The conversion of impervious to vegetated surfaces, provided erosion and sedimentation controls are implemented during construction; and
- Activities that are temporary in nature, have negligible impacts, and are necessary for planning and design purposes (*e.g.*, installation of monitoring wells, exploratory borings, sediment sampling and surveying).

310 CMR 10.51 through 10.60 details the regulations for the protection of inland wetlands, which includes general provisions, banks, bordering vegetated wetlands, land under water bodies and waterways, land subject to flooding, riverfront area, estimated habitats for rare wildlife, and wildlife habitat evaluations. The Wetlands Protection Act has been revised multiple times in response to critical loss of wetlands over the years.

Figure 3.2: Forested wetlands in the Beaver Brook North Reservation, 2005 (Pressley Associates)

Natural Heritage & Endangered Species Program

The Natural Heritage & Endangered Species Program (NHESP) is a state program under the Massachusetts Division of Fisheries and Wildlife whose sole objective is conservation and protection of Massachusetts' biodiversity. NHESP protects the state's wide range of native biological diversity through 1) Biological Field Surveys and Research, 2) Data Management, 3) Endangered Species Regulation, 4) Rare Species Recovery and Ecological Restoration of Key Habitats, 5) Land Protection, and 6) Education. Currently in Massachusetts, 190 species of vertebrate and invertebrate animals and 258 species of native plants are officially listed as Endangered, Threatened, or of Special Concern under the Massachusetts Endangered Species

Act (MESA; M.G.L. c. 131A). NHESP's primary responsibility is directed towards the regulatory protection of these state-listed rare species and their habitats as codified under the MESA Regulations (321 CMR 10.00) and Massachusetts Wetlands Protection Act (M.G.L c.131s.40) Regulations (310 CMR 10.00).

The Massachusetts Endangered Species Act (MESA) was enacted in December 1990, while the implementing Regulations were promulgated in 1992 and recently revised on July 1, 2005. These most recent revisions were initiated to clarify MESA filing requirements, implement filing fees, and specify timelines for the regulatory review process. Proposed projects or activities within a Priority Habitat of Rare Species require regulatory review by NHESP to determine whether a "take" of a state-listed species may occur. Priority Habitats are the known geographical extent of habitat for all state-listed species, both plants and animals, whereas a "take", in reference to animals, means to "harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct", and in reference to plants, means to "collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct". Project or activities resulting in rare species habitat modification, degradation, or destruction may result in the disruption of nesting, breeding, feeding or migratory activity, thus constituting a "take". Estimated Habitats are a sub-set of the Priority Habitats that depict the geographical extent of only state-listed rare wildlife habitat. Projects or activities requiring submission of a Notice of Intent to local Conservation Commissions and the Massachusetts Department of Environmental Protection (DEP) that are also located within an Estimated Habitat require NHESP review.

NHESP has published the *Massachusetts Natural Heritage Atlas* (last updated, July 1, 2003, 11th edition) to depict all Priority and Estimated Habitats located throughout the state. Habitat designations are based upon recent and historic (within the last 25 years) rare species observations/records, which are stored in NHESP's database. Based on the best scientific evidence, NHESP considers the significance of the local rare species occurrence as it relates to the conservation of the species in Massachusetts, including but not limited to, evidence of breeding, persistence, life stages present, numbers of individuals, extent of necessary supporting habitat, and proximity to other occurrences to ultimately conserve and protect Massachusetts' biodiversity.

Municipal Conservation Commissions

The Belmont Conservation Commission is a permanent commission established by the Selectmen as a regulatory body administering the performance standards of the Wetlands Protection Act (MGL c.131, section 40), the Rivers Protection Act (St. 1996, c. 258), preserving the interests of the Rock Meadow Conservation Land and Victory Gardens, and advising other town boards and officials on aspects of conservation and environmental issues. The Belmont Conservation Commission, through the Wetlands By-Law Subcommittee, is working to develop a local Wetlands Protection By-Law.

The Lexington Conservation Commission was established in 1963 to protect and preserve the natural resources of the town and acquire land for conservation and recreation purposes. It administers and enforces protection for wetlands in accordance with the terms of the Federal Rivers & Harbors Act (33 US Code Part 403) and the State Wetlands Protection law M.G.L. 131 section 40A (Orders protecting inland wetlands.) and the Town's Bylaw XXXII for Wetland Protection as amended in 1985, 1990 and 1992. The Commission also may acquire, in the name of the town, land, easements, conservation restrictions or other contractual rights as necessary to maintain, improve, limit the future use of, conserve and properly utilize open spaces in land and water areas of the town and manage and control the same. There are a total of more than 1300 acres of town owned conservation lands in Lexington under the direct control of the Commission. Many other wetland areas under private ownership are protected by conservation easements or conservation restrictions on development. A major aspect of the Commission's work is reviewing, approving and controlling the conditions under which work may be done which affects a river, stream or wetland in Lexington. Anyone seeking to do any work within 100 feet of a wetland, 200 feet of a river or stream, or in *any* area that may cause additional runoff into a wetland, river, or stream must obtain prior approval of the Commission.

The Waltham Conservation Commission is an appointed board of 7 local residents whose primary charter is to protect the city's natural resources in a regulatory and advisory manner. The Commission is responsible for administering the Massachusetts Wetland Protection Act (M.G.L. c. 131, section 40). All projects in the city that are within 100 feet of wetlands (marshes, wet meadows, bogs, intermittent streams, vernal pools, etc.) or 200 feet from rivers and perennial streams must come before the Commission for formal review. The Commission is also concerned with environmental planning, accepting gifts of land and money for conservation purposes, acquiring grant money for town acquisition of open space and advising other town boards on environmental concerns. Of special interest to the Waltham Commission are the Charles River, Cambridge

Reservoir, and Hardy Pond, as well as other major wetlands throughout the city. The Commission also maintains jurisdiction over the Storer Conservation Land.

Cultural Resource Regulations

The former Metropolitan State Hospital is listed on the National Register of Historic Places and the original Beaver Brook Reservation is eligible for listing on the National Register. By law, DCR must consult with the Massachusetts Historical Commission (MHC) for actions affecting NR properties. Beaver Brook North Reservation also contains the historic MetFern Cemetery, which is subject to a distinctive set of laws and regulations related to cemeteries and buried human remains.

The National Register of Historic Places

The National Register of Historic Places (NR) is the nation's list of historic properties worthy of preservation. Properties on the NR are recognized as making important contributions to a community, the Commonwealth or the nation, because of the property's historical significance based on the property's associations with important persons, historical events, design, or archaeological resources. DCR consults NR nominations to identify features that contribute to the understanding of a place as a historic property. Buildings, structures, sites, and objects that are substantial in scale and which relate directly to significance of property are listed as "contributing resources" in the nomination. Smaller individual features, such as specimen trees and site furnishings are often considered "contributing features" in cultural resource planning. DCR uses the period of significance to prioritize features for preservation and to interpret properties. Later features that do not relate to the period of significance are usually given less priority than those that are associated with historic periods.

The former Metropolitan State Hospital land was listed on the National Register of Historic Places in 1994 with architecture, health/medicine, and social history as the areas of significance. While Beaver Brook Reservation is not yet listed, research conducted by the DCR and for this RMP indicates that it is eligible for listing as the first reservation in the Metropolitan Park System. For the purposes of this RMP, it is assumed that the entire expanded reservation is either listed or eligible for listing on the NR.

Secretary of the Interior's Standards

The Resource Management Plan for the Expanded Beaver Brook Reservation has to facilitate diverse objectives, focused primarily on preserving and enhancing the historic character of the reservation, protecting the natural resources of the property, and adapting public use to support sound environmental stewardship. Given the historic significance of the reservation, the RMP reflects the philosophical approaches for the treatment of the historic properties based on the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, revised in 1995. The Secretary's Standards are the benchmark for preservation practice in the U.S. and provide general principals with four philosophical approaches. The treatments, Preservation, Rehabilitation, Restoration, and Reconstruction define the extent and intent of physical changes proposed for an historic property. The treatments vary in the level of intervention, required documentation and appropriate application as follows.

- Preservation is the act or process of applying measures necessary to sustain the existing form, integrity, and material of a historic property, which includes initial stabilization work, where necessary, as well as ongoing preservation maintenance and repair of historic materials and features.
- Rehabilitation is the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.
- Restoration is the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by removing features from other periods in its history and reconstructing missing features from the restoration period.
- Reconstruction is the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

To protect the significant historic features of the expanded Beaver Brook Reservation, DCR will follow the *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for the Treatment of Cultural Landscapes* and the *Guidelines for the Rehabilitation of Historic Buildings.*

Recommended Treatment

The expanded Beaver Brook Reservation is a property actively used by the surrounding community and represents a unique

recreational, natural, and historical resource. The treatment approach for the reservation demands a strategy for long-term management of the landscape in the context of preserving historical significance while balancing issues of natural resource protection, contemporary use and other operational requirements. Based upon the goals and objectives stated above, the RMP recommends the *Rehabilitation* treatment for Beaver Brook Reservation as it is the most flexible and accommodating of the four treatments.

Rehabilitation combines the retention and maintenance of existing historic features, with limited new construction to meet current needs, and allows selected replacement of missing historic features necessary to retain the property's historic character. This treatment approach allows for the adaptation of the historic landscape to accommodate contemporary use by permitting construction of new additions or alterations, which will not impair the site. In addition, it does not require the reconstruction of missing features or the full restoration of the landscape to a specific period of time, which would be unsuitable with existing land use and management capacity. Rehabilitation is thus an appropriate treatment for Beaver Brook Reservation as it expressly addresses historic properties that must continue to meet contemporary uses.

Figure 3.3: Historic restroom building in Beaver Brook Reservation, 2005 (Pressley Associates).

Standards for Rehabilitation

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new material will match the old in composition, design, color, texture, and where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archaeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.
10. New additions or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

NR Regulatory Compliance

Properties listed on the National Register are automatically included in the State Register of Historic Places, maintained by the Massachusetts Historical Commission (MHC), and are protected from adverse effects of actions by state and federal agencies through a review and consultation process. DCR funded, permitted or approved activities at Beaver Brook Reservation are subject to review by the Massachusetts Historical Commission (MHC) as outlined in M.G.L. Ch.9 ss. 26-

27c as amended by Ch. 254 of the Acts of 1988. Activities which utilize federal funding or require federal permits or approvals are reviewed by the MHC as required under Section 106 of the 1966 Historic Preservation Act.

To comply with these regulations, DCR must file a Project Notification Form (PNF) for all work at the reservation, initiating the consultation with MHC. DCR's Office of Cultural Resources is the liaison with the MHC for regulatory compliance and will coordinate development and submission of all PNFs. The MHC will review projects for consistency with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and make a determination of "no effect," "no adverse effect," or "adverse effect." Adverse effect findings require additional consultation with the MHC, possibly including the negotiation of a Memorandum of Agreement between the agencies to outline mitigation to offset the adverse impacts. By law, the MHC has 30 days to review each PNF, so consultation early in the project planning phase is recommended.

Figure 3.4: Former MSH Administration Building on the City of Waltham land adjacent to Beaver Brook North Reservation, 2005 (Pressley Associates).

Laws and Regulations Protecting Burial Grounds in Massachusetts

The MetFern Cemetery on the former MSH is specifically identified as a contributing resource in the National Register nomination. The *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for Cultural Landscapes* provide guidelines for planning and implementation of historic cemetery preservation. Historic cemetery preservation is also governed by the following laws in Massachusetts:

Massachusetts General Laws

Chapter 114: Section 17. Preservation of Ancient Burial Places

A town shall not alienate or appropriate to any other use than that of a burial ground, any tract of land which has been for more than one hundred years used as a burial place; and no portion of such burial ground shall be taken for public use without special authority from the general court. "Burial place", as referred to in this section, shall include unmarked burial grounds known or suspected to contain the remains of one or more American Indian.

Chapter 38: Section 6. Discovery of Skeletal Remains Likely to be Native American

It shall be the duty of any person who discovers unmarked human skeletal remains or who knowingly causes human remains to be disturbed through construction or agricultural activity, to immediately notify the office. The office shall conduct an inquiry to determine whether the remains are suspected of being 100 years old or more, and, if so determined, shall immediately notify the state archaeologist. The state archaeologist shall determine if the skeletal remains are Native American. If the remains are deemed likely to be Native American, the state archaeologist shall immediately notify the commission on Indian affairs which shall cause a site evaluation to be made to determine if the place where the remains were found is a Native American burial site.

Chapter 9: Section 27C. Projects; Notice; Adverse Effect; Review

Any person, corporation, agency or authority of the commonwealth or any of its political subdivisions who shall discover unmarked human burial or skeletal remains suspected of being one hundred years of more pursuant to section six C of chapter thirty-eight, shall immediately cease any activity, including but not limited to, construction and agricultural activity, which would deface, alter, destroy or otherwise impair the integrity of the site until such time as the state archeologist has completed a site evaluation pursuant to paragraph six of section twenty-six A of chapter nine of the General Laws and until disposition of the remains has been agreed upon pursuant to either section thirty-eight A of chapter seven or pursuant to paragraph seven of section twenty-six A, of chapter nine.

Chapter 114: Section 18. Care of Neglected Burial Places within Limits of Town

Any town having within its limits an abandoned or neglected burying ground may take charge of the same and keep it in good order, and may appropriate money therefore, but no property rights shall be violated and no body shall be disinterred. No fence, tomb, monument or other structure shall

be removed or destroyed, but the same may be repaired or restored.

Chapter 272: Section 71. Disinterring bodies

Whoever, not being lawfully authorized by the proper authorities, willfully digs up, disinters, removes or conveys away a human body, or the remains thereof, or knowingly aids in such disinterment, removal or conveying away, and whoever is accessory thereto either before or after the fact, shall be punished by imprisonment in the state prison for not more than three years or in jail for not more than two and one-half years or by a fine of not more than four thousand dollars.

Chapter 272: Section 73. Tombs, Graves, Memorials, Trees, Plants; Injuring, Removing

Whoever willfully destroys, mutilates, defaces, injures or removes a tomb, monument, gravestone, veteran's grave marker or metal plaque, veteran's flag holder that commemorates a particular war, conflict or period of service or flag, or other structure or thing which is placed or designed for a memorial of the dead, or a fence railing, curb or other thing which is intended for the protection or ornament of a structure or thing before mentioned or of an enclosure for the burial of the dead, or willfully removes, destroys, mutilates, cuts, breaks or injures a tree, shrub or plant placed or being within such enclosure, or wantonly or maliciously disturbs the contents of a tomb or a grave, shall be punished by imprisonment in the state prison for not more than five years or by imprisonment in the jail or house of correction for not more than two and one-half years and by a fine of not more than five thousand dollars.

Chapter 272: Section 73A. Removal of Gravestones and Other Memorials for Repair or Reproduction

In any city or town which accepts this section, the provisions of section seventy-three shall not prohibit the removal, in accordance with rules and regulations promulgated by the state secretary, of a gravestone or other structure or thing which is placed or designed as a memorial for the dead, for the purpose of repair or reproduction thereof by community sponsored, educationally oriented, and professionally directed repair teams.

Code of Massachusetts Regulations

- Permits to restore and reproduce gravestones under the provisions of Chapter 448 of the Acts of 1973 shall be issued by the Secretary of the Commonwealth after he shall have satisfied himself that the proposals for such restoration and/or reproduction meet the standards of educational value, community interest, and professional competence. In making this determination the Secretary may call upon the assistance of the staff and members of the Massachusetts Historical Commission, and local, regional state-wide and national historical and other learned societies and individuals whose expertise he may deem relevant.

- Reproduction of gravestones may only be done for historical purposes by non-profit organizations.

- Request for a permit must be submitted on an application form and shall give a detailed plan of the gravestone restoration project.

The Metropolitan State Hospital Reuse Plan and Associated Documents

The Metropolitan State Hospital Reuse Plan, dated June 30, 1994 and its associated documents set forth a series of specific conditions for the disposition, development, and management of the former hospital grounds. These plans affect both Beaver Brook North Reservation and the City of Waltham land on which DCR holds a conservation easement and are summarized below (see also Appendix G, Volume 2).

Overview

The former Metropolitan State Hospital property was officially declared surplus as of September 15, 1992.[1] The land disposition and development process for the former Metropolitan State Hospital has been coordinated by the Massachusetts Department of Capital Asset Management (DCAM), which serves the Commonwealth by providing professional and comprehensive services to state agencies in the fields of public building design, construction, maintenance and real estate. In 1994, the Metropolitan State Hospital Reuse Plan was prepared through a collaborative effort of DCAM, the DCR (formerly the Metropolitan District Commission), the Department of Mental Health (DMH), and the communities of Belmont, Lexington, and Waltham.[2] The Reuse Plan incorporated housing, recreational, and open space needs of the communities with those of the Commonwealth of Massachusetts in developing long-range reuse plans for the 340-acre campus site. [3]

A Tri-Community Task Force consisting of individual representatives from the three communities participated in the Reuse Plan. According to the Reuse Plan, ten individuals represented Belmont, four represented Lexington, and seven represented the City of Waltham. Additional input was provided by many others including municipal managers, engineers, planners, residents, and organizations such as the Beaver Brook Watershed Coalition.

Reuse Plan

The 1994 Metropolitan State Hospital Reuse Plan was prepared by Goody, Clancy & Associates with Leff Consulting, VHB Inc., and Carol R. Johnson and Associates for the Department of Capital Planning and Operations (now DCAM) Office of Real Estate Management and the Tri-Community Task Force. The Plan provided the planning context, findings, analysis of planning issues and reuse capacity and contained seven technical appendices. The Reuse Plan provided the background and conclusions that define state and local approval processes and which support necessary legislative action, environmental review, traffic impact analysis, and local zoning and site plan approvals.[4] Specific issues contained in the reuse plan that relate specifically to the management and use of Beaver Brook North Reservation are summarized below.

Objectives

The following objectives were defined by the Task Force for the Reuse Plan:

- Creation of a major public open space and preservation of the site's key natural features;
- Redevelopment of portions of the site already largely occupied by buildings, parking, or related outdoor space. Appropriate redevelopment uses include low to moderate-density housing, an institutional use, or a combination thereof; and
- A public nine-hole golf course.[5]

The Task Force further defined the following goals for the site:

- Preserve and protect natural resources on the site as an ecological preserve open to the public;
- Redevelop the site with a mix of publicly beneficial reuses and revenue-producing reuses;
- Consider the site as whole, without regard to municipal boundaries; and
- Carry out environmental clean up as quickly as possible.[6]

Each of the three communities identified specific needs for the site and all strongly endorsed the creation of a DCR [MDC] reservation consisting of wetlands, mature woodlands, an established trail network. New uses should fit in with the neighborhood, with construction activities limited to areas that are not environmentally sensitive. Additionally, the communities sought preservation of the overall campus plan, with its concentration of historic buildings and quadrangle, with preference to the renovation of existing buildings rather than new construction.

Issues Affecting the Reservation

Building on the substantial body of work completed by community open space advocates including the Tri-Community Task Force and the Beaver Brook Watershed Coalition, the Reuse Plan reiterated the importance of the "diverse flora and fauna, and opportunities for solitude in a natural setting" and recommended protection of the "site's 136.5 acres of wetlands, important brooks, fourteen vernal pools, most of Mackerel Hill, mature woodlands, open meadows, important wildlife habitats, vistas, and existing trail network."[7]

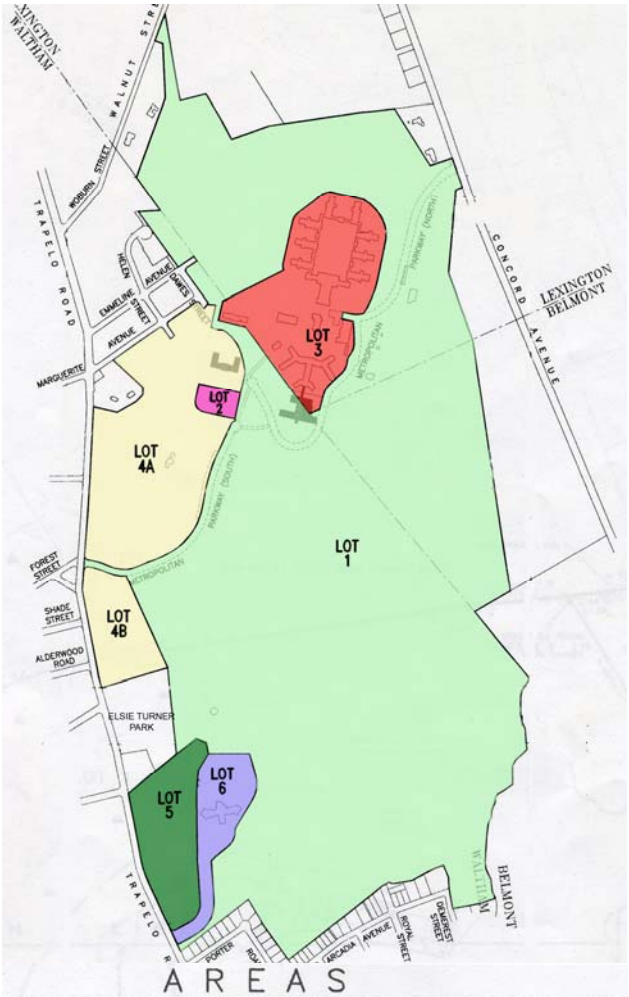
The Reuse Plan proposed a new Metropolitan Parkway, now complete, which provides vehicular and bicycle access from Trapelo Road and Concord Avenue. At the present time, both ends of the vehicular parkway are linked by a temporary connector road in the vicinity of the AvalonBay residential development and the MSH Administration Building, with a continuous bikeway extending through the site. The long-term plan for the Waltham golf course includes construction of a parking lot in the vicinity of the former MSH Administration Building, which will be accessible to park users from both Trapelo Road and Concord Avenue.

All of the proposed new development is required to respect the surrounding natural areas, including measures to control run-off and erosion and providing buffers between natural and developed areas. The proposed new development by AvalonBay, began in 2006 and in 2009 is largely complete, includes 387 units of rental housing, including one, two, and three bedroom luxury units; below-market rate rental units; and units reserved for residents age 55 or older. This development and the demolition of the MSH buildings raised some issues for the adjacent reservation, specifically related to construction monitoring and impacts, re-vegetation or disturbed sites, and the unknown effects of increased public use of the new reservation.

Proposed Waltham Golf Course

The Reuse Plan includes provisions for a 9-hole par three golf course on land acquired by the City of Waltham.[8] This included specific provisions including minimal deforestation of Mackerel Hill, replication of lost wetlands, maintenance of pedestrian connections from Trapelo Road to the reservation, preservation of the large spruce trees, encouragement of winter uses, no user fees, and no driving range. Specific environmental standards for the proposed golf course include the use of Integrated Pest Management (IPM), provide vegetated buffers to filter runoff prior to entering wetlands, maintenance of monitoring wells, monitored purchase of fertilizers and pesticides, completion of an aquatic invertebrate inventory before and after construction, completion of a wildlife inventory prior to construction, and operations with set standards for

groundwater levels. Operating standards for the golf course include employment of a certified golf course superintendent to oversee day to day operations. Lastly, the Reuse Plan stipulated an Advisory Committee comprised of three members from the Conservation Commissions of Belmont, Lexington, and Waltham, with the Waltham Conservation Commission having the primary oversight responsibilities related to environmental matters.



AREAS

	WALTHAM	LEXINGTON	BELMONT	TOTAL	TOTAL SF
LOT 1	162± ACRES	59.40 ACRES	32.65 ACRES	254± ACRES	11,065,000± SF
LOT 2	1.33 ACRES	-----	-----	1.33 ACRES	57,809 SF
LOT 3	0.38 ACRES	22.13 ACRES	-----	22.51 ACRES	980,589 SF
LOT 4A	31.52 ACRES	------	------	31.52 ACRES	1,372,867 SF
LOT 4B	7.52 ACRES	------	------	7.52 ACRES	327,492 SF
LOT 5	11.15 ACRES	------	------	11.15 ACRES	485,815 SF
LOT 6	7.38 ACRES	------	------	7.38 ACRES	321,721 SF
TOTAL	221± ACRES	81.96 ACRES	32.65 ACRES	336± ACRES	14,612,000± SF

Figure 3.5: Former MSH Subdivision Plan, 2002 (Judith Nitsch Engineering, Inc.)

At the time of transfer from the Commonwealth to the City of Waltham, the City paid a lump sum of $600,000 into the DCR Trust Fund, dedicated to the operation and management of the expanded Beaver Brook Reservation. According to the Reuse Plan, three fourths (3/4) of this fund shall be available to be used by the DCR for staffing a ranger or projects not normally funded by the agency. One fourth (1/4) shall remain as principal and be re-invested.

The Reuse Plan also stipulated that a permanent deed restriction (conservation easement) be placed on the golf course, limiting use of the land in perpetuity for "golf course, conservation, playground, recreational and/or park uses" (see below). The Mayor of Waltham, with approval of the City Council, retains the right to transfer the golf course site to the DCR to incorporate it into the expanded Beaver Brook Reservation. Failure to secure a golf course development agreement after a five-year marketing period shall cause the property to revert to the DCR.[9]

First Amendment to the Reuse Plan

The First Amendment, dated September 5, 1995 amended the boundary of the Main Campus Site and the Gaebler Center site, as well as the former MSH Administration Building site, Golf Course site, and the DCR [MDC] reservation site.

Second Amendment to the Reuse Plan

The Second Amendment, dated February 28, 2002 between the municipalities, Tri-Community Task Force, Department of Mental Health, the MDC (DCR), and DCAM set forth new provisions related to the Metropolitan Parkway, survey, disposition documents, the reservation, the golf course and former MSH Administration Building site, and utilities. In concert with the aforementioned Reuse Plan, this is an important document relative to the overall agreements for Beaver Brook North Reservation.

Metropolitan Parkway

This document establishes the physical location of the parkway and the emergency access way, which are "designed to ensure that the Golf Course Site and the MDC reservation site will be retained in perpetuity primarily in their natural, scenic, and open condition for golf course and other recreational, conservation, playground, and park uses…"[10] The amendment defines the golf course parking lot as providing a "vehicular route connecting the cul-de-sacs of the Metropolitan Parkway (North) and the Metropolitan Parkway (South)… designed to allow unimpeded access of [passenger] vehicles."[11]

Disposition Documents

The Second Amendment defines a series of additional documents in order to dispose of the site according to the Reuse Plan. The Care and Control Agreement, summarized below, sets forth conditions related to transferring the reservation site from DCAM to the DCR (MDC). The golf course and former MSH Administration Building site are governed by a Release Deed transferring the site from DCAM to the City of Waltham; a purchase and sale agreement between the City of Waltham and DCAM; a lease agreement between the City of Waltham and the [MDC] DCR, and a conservation easement between the City of Waltham and the [MDC] DCR.

The Second Amendment also clarified issues associated with the granting of rights of way or easements so that DCAM is limited to easements that are directly related to the development of the site. After the completion of the redevelopment of Lot 3 (by AvalonBay), DCAM will have "no further rights … to transfer care, control, or grant any additional rights of way over the golf course site, former MSH Administration Building site and/or the MDC (DCR) reservation site."[12]

Release Deed

A release deed signed January 9, 2003 by MDC [DCR] and Commonwealth of Massachusetts grants the release of the four parcels (Lot 2, 4A, 4B, and 5) to City of Waltham in receipt of $600,000. The deed includes details about uses and restrictions, reservation of easements, easements concerning premises, reverter, and general conditions of the transaction and upholds the Reuse Plan and successive amendments.

Lease Agreement

A lease agreement between the City of Waltham and the Commonwealth, MDC [DCR], signed January 9, 2003 provides for the use of 1,200 sq. feet of the second floor of the former MSH Administration Building (the golf course club house) as a visitor's center. These rights include the construction of common areas such as display reception, conference room, and restrooms. The City of Waltham is responsible for general capital improvements and repairs to the building including structural integrity, repair and renovation of the building, including but not limited to the roof and heating and electrical systems. The City will further provide the DCR with an allowance of $34,320 for the construction of the aforementioned common areas necessary to achieve the visitor's center.

Conservation Easement

The conservation easement by and between the City of Waltham and the Commonwealth of Massachusetts provides specific provisions to retain lots 4A, 4B and 5 (the proposed golf course) "predominantly in their natural, scenic, and open condition for golf course and other conservation, playground, recreational, conservation, and/or park uses consistent with the spirit of the Act, the Metropolitan State Hospital Reuse Plan as amended, Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and to prevent any use of the premises that will impair or interfere with the recreation and conservation values thereof." This prevents construction of any additional buildings, roads, signs, parking areas, utilities or temporary structures beyond what has been previously defined in the Act and the Reuse Plan. Vegetation shall remain, except for removals needed to develop and maintain the proposed golf course or what may be needed for maintenance or conservation purposes. The easement stipulates that the DCR retains access to the golf course for winter recreation, but does not require any maintenance commitment by DCR.

Care and Control Agreement

The Care and Control Agreement between DCAM and the DCR [MDC] dated February 28, 2002 addresses the transfer of land from DCAM to the DCR as a new state reservation consistent with the Reuse Plan, for the area known as Lot 1, the Metropolitan Parkway, and the Emergency Access Way. Under this agreement, the DCR accepted care and control of the new reservation, including maintenance and repair of the new roadways once construction is complete. This agreement reiterates that DCAM will be responsible for the construction of the aforementioned roadways, which may require vehicle and equipment access onto the reservation site during construction. After the development of Lot 3 by AvalonBay, DCAM will have no further right to grant easements in, over, and beneath the reservation.

Under this agreement, the DCR will use the site for a state reservation and park purposes, consistent with the Reuse Plan. "Upon completion of the construction by Asset Management of the Metropolitan Parkway and the Emergency Access Way, MDC [DCR] shall be responsible for all maintenance, repair and upgrades of the Metropolitan Parkway and Emergency Access Way including without limitation plowing, patching, grass cutting, weed control, painting, repairing, repaving, replacement and all other general parkway and utilities maintenance of these services."[13]

The DCR further agreed that any recreational facilities open to the public on the reservation shall be made available to mental health clients in collaboration with the Department of Mental Health. Regarding the MetFern Cemetery, the DCR also agreed to properly memorialize, preserve, and protect the cemetery, allow general public access, and maintain two existing rights of

way that provide access and egress to the cemetery – a footpath from the Gaebler Building, and the carriage path.[14]

Figure 3.6: Carriage path in the Beaver Brook North Reservation, 2006 (Pressley Associates).

Other Agreements

A cell tower is currently located on the water tower at the summit of Mackerel Hill. Income from the lease is paid into the Massachusetts General Fund, and does not directly benefit the park land. Vehicular access to the top of Mackerel Hill for cell tower maintenance currently extends from the former Gaebler School property, which has been recently acquired by the City of Waltham.

DCR Land Stewardship Zoning

Resource Management Plans must protect cultural and natural resources, and ensure consistency and appropriate balance between recreational needs, resource protection, and sustainable forest management (M.G.L. Chapter 21, Section 2F). DCR Land Stewardship Zoning Guidelines provide a general framework for the long-term management of state parks, forests and reservation. These Guidelines define three zones, which are identified for all properties in an RMP. The Guidelines also define significant feature overlays, which are applied as appropriate depending on the unique characteristics of a specific property. The application of the three zones at Beaver Brook is summarized below; for a more detailed description, please see Appendix C.

Applicable Land Stewardship Zones

The expanded Beaver Brook Reservation has three applicable stewardship zones with cultural and natural resource overlays. The original reservation is predominantly Zone 2 with the exception of active recreation areas under Zone 3. Beaver Brook North Reservation is also primarily covered under Zone 2 except for rare species habitat areas and the cemetery under Zone 1 and the Metropolitan Parkway with associated development under Zone 3.

Zone 1

General Description

This zone includes unique, exemplary and highly sensitive resources and landscapes that require special management approaches and practices to protect and preserve the special features and values documented in the Resource Management Plan. Examples of these resources include rare species habitat identified by the Natural Heritage & Endangered Species Program as being highly sensitive to human activities, fragile archaeological or cultural sites, and unique or exemplary natural communities. Management objectives emphasize protecting these areas from potentially adverse disturbances and impacts.

General Management Guidelines

- Only dispersed, low-impact, non-motorized, sustainable recreation will be allowed provided that the activities do not threaten or impact unique and highly sensitive resources.
- Existing trails and roads will be evaluated to ensure compatibility with identified resource features and landscape, and will be discontinued if there are suitable sustainable alternatives. New trails may be constructed only after a strict evaluation of need and avoidance of any potential adverse impacts on identified resources. New roads may only be constructed to meet public health and safety needs or requirements; however, the project design and site planning process must avoid any potential adverse impacts on identified resources and demonstrate that there are no other suitable alternatives.
- Vegetation or forest management will be utilized only to preserve and enhance identified resource features and landscapes.

Zone Description

Both potential and certified vernal pools possess rare species habitat with a sensitive ecological balance. In Beaver Brook North Reservation, Zone 1 includes the buffer zones (100 feet setback) around a cluster of five certified and five potential vernal pools and the historic MetFern Cemetery. There are no areas designated as Zone 1 in Beaver Brook Reservation.

Zone 2

General Description

This zone includes areas containing typical yet important natural and cultural resources on which common forestry practices and dispersed recreational activities can be practiced at sustainable levels that do not degrade these resources and that hold potential for improving their ecological health, productivity and/or protection through active management. Examples include terrestrial and aquatic ecosystems characterized by a diversity of wildlife and plant habitats, rare species habitat that is compatible with sustainable forestry and dispersed recreation, agricultural resources, cultural sites and landscapes. Zone 2 areas may be actively managed provided that the management activities are consistent with the approved Resource Management Plan for the property.

General Management Guidelines

- Management approaches and actions may include a wide range of potential recreational opportunities and settings that are consistent and compatible with natural resource conservation and management goals.
- Protect and maintain water quality by providing for healthy functioning terrestrial and aquatic ecosystems.
- Provide a safe, efficient transportation network with minimal impact on natural and cultural resources while serving public safety needs and allowing visitors to experience a variety of outdoor activities.
- New trails may be allowed dependent upon existing area trail densities, purpose and need, physical suitability of the site, and specific guidelines for protection of rare species habitat and archaeological resources.
- Sustainable forest management activities may be undertaken following guidelines established through eco-region-based assessments, district level forestry plans, current best forestry management practices, and providing for consistency with resource protection goals.
- Utilize Best Management Practices for forestry and other resource management activities to encourage native biodiversity, protect rare species habitats and landforms.
- Roads may be constructed if access for resource management or public access is needed and construction can be accomplished in an environmentally protective manner. Existing roads will be maintained in accordance with the DCR road classification system and maintenance policy.
- Additional site-specific inventory and analysis may be needed prior to any of the management activities described above to ensure that no adverse impacts occur to previously un-documented unique and sensitive resources and landscape features.

In addition to the general guidelines described above, a specific guideline for Beaver Brook is to perform vegetation management in and around the historic archaeological sites.

Zone Description

All non-developed areas with cultural and natural resources that can tolerate visitor use and recreational activities at a sustainable level are classified under Zone 2. In Beaver Brook Reservation, Zone 2 includes the entire northern parcel and the entire Waverley Oaks parcel except for the intensively used and maintained areas - the parking areas, tennis courts, ball field and the spray pool and adjacent picnic pavilion and restroom areas. In Beaver Brook North Reservation, Zone 2 includes all of the property excluding areas under Zones 1 and 3, which cover a cluster of vernal pools and the historic cemetery (Zone 1) and the Metropolitan Parkway, adjacent bike path, and the future DCR parking area (Zone 3).

Zone 3

General Description

This zone includes constructed or developed administrative, maintenance and recreation sites, and resilient landscapes which accommodate concentrated use by recreational visitors and require intensive maintenance by DCR staff. Examples include areas developed and deemed appropriate for park headquarters and maintenance areas, parking lots, swimming pools and skating rinks, paved bikeways, swimming beaches, campgrounds, playgrounds and athletic fields, parkways, golf courses, picnic areas and pavilions, concessions, and areas assessed to be suitable for those uses.

General Management Guidelines

- The management approach and actions will emphasize public safety conditions and provide for an overall network of accessible facilities that meets the needs of DCR visitors and staff.
- Maintenance of these facilities and associated natural and cultural resources, and new construction or development, will meet state public health code, and state building code and environmental regulations and standards.
- Shorelines and surface waters may be used for recreation within constraints of maintaining public safety and water quality.

- Historic restoration, rehabilitation or reconstruction for interpretation or adaptive reuse of historic structures will be undertaken only in conjunction with a historic preservation plan.
- To the greatest extent possible, construction will include the use of "green design" for structures, such as use of low-flow water fixtures and other water conservation systems or techniques, solar and other renewable energy sources, and the implementation of Best Management Practices to protect the soil and water resources at all facilities.

Figure 3.7: MetFern Cemetery and adjacent carriage road, Beaver Brook North Reservation, 2009 (Pressley Associates).

Zone Description

All areas developed for intensive recreation use and transportation amenities that require higher levels of monitoring and maintenance are categorized into Zone 3. Zone 3 includes the parking areas, tennis courts, ball field, and the spray pool and restroom area in the southern Waverley Oaks parcel of In Beaver Brook Reservation. In Beaver Brook North Reservation, Zone 3 is limited to the Metropolitan Parkway, the adjacent bikeway, and the proposed DCR parking area.

Significant Feature Overlays

General Description

The three land stewardship zones may be supplemented with significant feature overlays that identify specific designated/recognized resource features. These significant features are generally identified through an inventory process or research, and are formally designated. The purpose of these overlays is to provide more precise management guidance for identified resources and to recognize, maintain, protect, or preserve unique and significant values, regardless of the zone in which they occur. Examples of significant feature overlays include Forest Reserves, areas subject to public drinking water regulations, or areas subject to historic preservation restrictions.

Cultural Resources Overlay

The Cultural Resource Overlay within Beaver Brook Reservation includes the entire Historic Reservation and MetFern Cemetery in Beaver Brook North Reservation. This includes the cultural landscape to be addressed in a recommended future National Register nomination for the original Beaver Brook Reservation, including landscape features extant from the primary and secondary periods of significance, and historic buildings and structures such as the dams and mill foundations, historic Copeland House, Stearns barn, picnic pavilion, and restroom facility as well as the two prehistoric sites within the southern Waverley Oaks portion of Beaver Brook Reservation. The MetFern Cemetery in the Beaver Brook North Reservation is one of two extant features in the reservation, identified as contributing resources in the National Register listing for former the Metropolitan State Hospital. It is a sensitive resource and needs special protection to preserve its cultural significance. All of the areas covered by the Cultural Resource Overlay should be treated following the *Secretary of the Interior's Standards for the Treatment of Historic Properties* and the *Guidelines for the Treatment of Cultural Landscapes,* with archaeological evaluations completed prior to ground disturbance.

Natural Resource Overlay

The Natural Resource Overlay within the expanded Beaver Brook Reservation, including both properties, covers potential vernal pools that need further evaluation to determine their significance. This overlay includes a 100-foot buffer along the periphery of the vernal pools for resource protection and management. The specific guideline associated with this overlay is to manage these areas consistent with any and all regulatory requirements for Certified Vernal Pools, until and unless it is determined through field research that these areas do not function as vernal pools. Other wetlands in the reservation are largely in zone 2, where they afforded protection under the Massachusetts Wetland Protection Act and DCR management policies.

Endnotes

[1] Metropolitan District Commission, Office of Planning. "A Proposal for the Creation of a Public Reservation at the

Metropolitan State Hospital, Waltham, Lexington, and Belmont, MA," June 1994, p. 1.

[2] Massachusetts Department of Capital Asset Management www.mass.gov/cam/comproj/re_cp/cp_metropolitan_st.html

[3] Ibid.

[4] Massachusetts Department of Capital Planning and Operations. "Metropolitan State Hospital Reuse Agreement," p. 4.

[5] Massachusetts Department of Capital Planning and Operations. "Metropolitan State Hospital Reuse Agreement," p. 3.

[6] Reuse Plan, p. 7.

[7] Reuse Plan, p. 11.

[8] This RMP includes a further evaluation of the golf course relative to the reservation, which is included as Appendix E.

[9] Reuse Plan, p. 14.

[10] "Second Amendment to the Metropolitan State Hospital Reuse Plan," p. 2.

[11] Ibid.

[12] Ibid., p. 4

[13] "The Commonwealth of Massachusetts Division of Capital Asset Management and Maintenance Care and Control Agreement." February 28, 2002, p. 5.

[14] Ibid.

Figure 4.1: Wetland meadow in the Beaver Brook North Reservation, 2005 (Pressley Associates)

Chapter 4

Recommendations

Introduction

This chapter provides a summary of recommendations for both Beaver Brook and Beaver Brook North Reservations that are intended to protect existing resources and facilitate improved public access to the expanded reservation. It begins with a discussion of overall goals for the expanded reservation, followed by specific recommendations organized into four sections: natural resource, cultural resource, site and recreational resource, and management recommendations. Each recommendation includes an assessment of the issue followed by a narrative recommendation. Some of the recommendations are general and apply to both reservations, while others are specific to either Beaver Brook or Beaver Brook North. Costs associated with the capital improvements needed to achieve these recommendations are included in Chapter 5.

Site conditions recorded in 2005-2006 provided the baseline information for these recommendations; a few significant changes implemented between 2006 and 2009 have been noted, such as the completion of the Metropolitan Parkway, building demolition and stabilization of MetFern Cemetery.

Management Goals

This Resource Management Plan for the Expanded Beaver Brook Reservation is intended to meet specific management goals that address the importance of the reservation as an historical, cultural, scenic, and recreational landscape:

- Preserve and enhance the extensive wetlands and natural communities for the health and diversity of the flora and fauna;
- Preserve the cultural and historic resources of the expanded reservation, including its cultural landscapes, archaeological sites, and historic buildings and structures;
- Manage the new Beaver Brook North Reservation as an ecological preserve open to the public;
- Enhance and refine existing access, including the network of trails throughout the property;
- Maximize environmental education opportunities afforded by the reservation;
- Ensure the public's enjoyment of the reservation by promoting its diversity of flora and fauna, extensive views, cultural resources, and opportunities for solitude in a natural setting;
- Strengthen the reservation boundaries and prevent/resolve inappropriate encroachments or intrusions.

- Assess the environmental impacts of the proposed nine hole golf course on both the reservation and DCR's conservation easement;
- Identify opportunities for strengthening the open space network around the reservation by identifying potential parcels for acquisition or conservation easement, and maintaining key connections to other public open space systems;
- Decrease any non-point pollutants presently entering the reservation or Beaver Brook;
- Provide opportunities for public education to promote the natural and cultural resources of the reservation;
- Continue to strengthen DCR's relationship with constituency groups, with a particular focus on joint ventures with neighbors and communities abutting the reservation;
- Determine areas most suitable/desirable for recreation, education, and natural/cultural resource preservation.

Natural Resource Recommendations

The natural resources of the expanded Beaver Brook Reservation, including plant communities, wildlife, and habitats are an important characteristic of the reservation. This RMP recommends that they be managed with a light hand exclusively to protect sensitive resources, perpetuate habitat diversity, and to monitor the health and condition of the ecosystems. Natural resource recommendations related to public use, management of invasive or nuisance species, habitat enhancements, and public education, are described below in priority order. Unless specifically mentioned, these recommendations apply to both the Historic Beaver Brook and the Beaver Brook North Reservations.

Public Access

Assessment:

In order to sustain the health, diversity, and quality of the habitats within the reservation, recreational use should be balanced with the preservation of the significant natural resource areas. Similarly, intensive use by specific groups can severely limit the experience of the reservation by others, as in the case of dogs running off-lease in lower field at Beaver Brook Reservation. Creating this balance between resources and users requires that 1.) in sensitive areas, recreational use is focused on passive activities (e.g. walking and bicycling) and limited to within the existing major trail system; 2.) recreational use is limited or prohibited from areas extending beyond the existing major trail system; 3.) other inappropriate activities (e.g. motorized vehicle usage) are prohibited; and 4.) intensive use by single groups is balanced with the needs of all park users.

Recommendations:

Posting informative signage and/or kiosks at all points of entry to inform the public of access hours and rules/regulations is critical to focusing public utilization of the properties. Specifically, the following information should be posted at each site entry point:

- A map of the site with primary trails clearly marked;
- Notification that the expanded Beaver Brook Reservation is open from dawn to dusk to pedestrians and bicyclists only;
- Notification that all dogs must be leashed at all times; dog walkers must clean up after their dog; and that failure to do so will result in banning dogs from the reservation.
- Notification that no motorized vehicles are allowed-Police Take Notice. It may be prudent to offer a police phone number for pedestrians/cyclists to call if they witness motorized vehicles. Property Owners abutting the Beaver Brook Reservation should also be encouraged to contact police if motorized vehicles are observed or heard within the expanded Reservation;
- Notification that pedestrians and bicyclists should not veer from marked pathways;
- Other information regarding deer ticks, Lyme disease, and/or poison ivy could be included to inform the public of these potential hazards and to deter pedestrians/cyclists from veering from the posted trail system.

During LEC's site inspections, numerous secondary trails, which appear to have been recently created were observed extending from the primary trail system into natural, formerly undisturbed areas. Posting signage at the entry points of the secondary trails that diverge from the primary trails, particularly in the North Reservation, may further reduce usage of the secondary trails. Naming the primary trails on the map posted at the entryways and posting trail name signage along the primary trails should also promote compliance.

It may be prudent to offer plastic bag dispensers and/or small disposal containers for dog feces, provided adequate resources are available for routine maintenance. DCR should consider engaging the dog-walking community in a focused discussion on the off-leash use of fields and trails so that these areas can be shared with other park users.

Public Education

Assessment:

Both properties contain ample opportunities for public education related to natural resources, biological interactions, and management techniques associated with the expanded Beaver Brook Reservation. Public education materials, signage, and programs focused on the natural resources of the Beaver Brook Reservation will promote a greater understanding of the distinctive characteristics of the reservation and explain why the DCR's rules, regulations, and recreational policies are in place, and will thus encourage compliance and enhanced resource stewardship.

Recommendations:

Natural resource information may be incorporated with the aforementioned signage presented at the entry points, and can be further implemented as educational signage along the trails. Several options for educational signage are outlined below:

1. Placards posted on or near specimen trees, shrubs, and/or herbaceous plants demarcating the common and scientific plant names along trails;

2. Appropriately placed, informative signs providing information on key 'umbrella' species or high profile animal species whose presence is indicative of quality habitat (e.g. owls, salamanders, wood ducks, etc.);

3. Appropriately place, informative signs or kiosks describing the fundamentals and importance of habitats, ecosystems, vernal pools, avian migration, food webs, seasonal changes, etc.

Invasive Species Management

Plants

Assessment:

LEC observed numerous invasive/exotic species that have established throughout the different habitat types contained within the expanded reservation. Invasive exotic species tend to form monocultures within different habitat types and displace native plant species. This results in significant reductions in habitat diversity and native food supply and variety for wildlife. While it can be challenging to completely remove these invasive/exotic species, efforts should be made to significantly reduce their numbers, or at least limit further establishment and displacement of native plants. *Galerucella* beetles are currently being used to control Purple Loosestrife at DCR's Fowl Meadow.

Recommendations:

Managing invasive plants should be primarily focused on those natural habitat areas located in Zones 1 and 2 within the expanded Beaver Brook Reservation (see Chapter 3). A three-pronged Integrated Pest Management (IPM) approach that includes physical, chemical, biological, or a combination of these measures, will insure effective, species-specific, invasive species elimination and control. These activities should be conducted in such a manner as to minimize interference with biological interactions such as reproduction, feeding, and avian migration. Only those holding a Massachusetts Pesticide Applicator's license can legally apply pesticides on DCR properties.

1. Apply physical removal of invasive species to those trees, shrubs, and/or groundcover plants in sensitive areas where chemical and biological applications are not appropriate or feasible. Hand or machine removal of the entire plant, including the root system is ideal; however, cutting plants at the base combined with precise chemical application of the stump may be the most effective and/or cost-conscience way of managing invasive plants.

2. Precise chemical application of a 25% solution of glyphosate (commercially sold as Round-up) can be applied to the stumps. This herbicide is generally considered safe, as it binds with the soil particles and becomes inert following several days. Applying glyphosate directly to cut stumps immediately following cutting is especially effective in the fall months. As plants tend to draw nutrients into the root systems for storage over winter, they draw in the glyphosate which targets the plants' root systems. The precise application to the plant stump also reduces the potential for chemical application to non-target species that may occur with spray application. The combination of cutting and herbicide application will likely be the most effective way of managing the majority of invasive woody species contained within the site.

3. Biological control of invasive species should be limited to the control of Purple Loosestrife (*Lythrum salicaria*). Large stands of Purple Loosestrife are contained within the reservation's emergent marsh habitats, particularly in the Beaver Brook North Reservation. Though an exotic species themselves, the use of *Galerucella* spp. beetles as a biological control for *L. salicaria* has proven effective, with a success rate of up to 90% in other areas of North America without visible environmental repercussions.[1] The U.S. Department of Agriculture – Animal Plant Health Inspection Service has approved the release of *Galerucella* for *L. salicaria* control and the beetles have been released

in over 30 states. Additionally, the Minnesota, Michigan, and Wisconsin Departments of Natural Resources have been releasing the beetles since 1994 to manage *L. salicaria* and Massachusetts has been them using them effectively since 2000.[2]

Galerucella spp. is host-specific to Purple Loosestrife and has not had a measurable, adverse effect on any native plants. The beetle larvae feed upon young *L. salicaria* buds and leaves, and teneral (newly emerged) adult beetles appear in July and August and immediately begin to feed on the leaves, stems, and flowers. Adult and larval leaf damage greatly reduces the photosynthetic capability of *L. salicaria*, possibly leading to reduced starch stores in the roots which can result in winter plant mortality. Photosynthetic inhibition results in reduced stem height and root length, both essential to overall plant vigor. With heavy defoliation, the host plant becomes skeletonized and turns brown. Heavily defoliated plants may die or produce fewer shoots the following year. The resultant weakening and/or death of the loosestrife plants provide an opportunity for previously out-competed native plant species to return.

Figure 4.2: Duck Pond and Purple Loosestrife in the original Beaver Brook Reservation, 2005 (Pressley Associates).

Canada Goose (*Branta canadensis*) Management

Beaver Brook Reservation

Assessment:

In urban and suburban areas, Canada Geese tend to congregate where open water abuts manicured lawn areas. This preferred habitat in a suburban or urban setting allows the geese to see potential predators as they move from the open water habitat to the lawn area to feed on the abundance of short grass. Opportunities to effectively manage *B. canadensis* are somewhat limited to the northern parcel of Beaver Brook Reservation, where Duck Pond is bordered by lawn grass along its eastern edge.

Recommendations:

1. Re-vegetate a 10 to 15-foot band of the existing lawn grass along Duck Pond as a wetland buffer with warm season grasses to create a tall herbaceous plant community that will obstruct the geese's visual range, and deter them from using the site to feed, while maintaining recreational views of Duck Pond.

2. Halting public feeding of waterfowl is essential to deterring nuisance geese from inhabiting the area. Artificially feeding waterfowl tends to interfere with migration patterns, as individuals will remain at the site with an abundance of food. This, coupled with a lack of natural predators allows the habitat system to "support" a larger population of waterfowl than it normally would. This typically results in increased nesting occurrences, interaction with humans, and waste. Goslings will also return to the same nesting habitat in which they were reared. Breaking this cycle of re-population is critical to managing Canada Geese associated with the Beaver Brook Reservation.

Establishing strategically-placed signs or information on kiosks informing the public not to feed the waterfowl will also support the overall geese management. Conformance with this rule is more likely when the public is educated as to the reasons why the rules are in place.

Wildlife Habitat Enhancement

Beaver Brook North Reservation

Assessment:

Several opportunities to enhance wildlife habitat exist within the Beaver Brook North Reservation; particularly within those areas recently cleared and/or slated for re-vegetation. Invasive species management will inherently improve and enhance wildlife habitat associated with the site, as will establishing native plant communities, habitat maintenance, and the addition of appropriately placed avian and bat nesting/roosting boxes. Several areas on the Beaver Brook North Reservation have undergone or are slated for demolition and/or clearing, including the former debris site. The resulting open land offers a unique opportunity for habitat creation by establishing native plant communities via seed and/or planting woody plant stock. Establishing a dense plant community will also deter invasive exotic species from further establishing within the landscape,

such as Purple Loosestrife, European Buckthorn (*Rhamnus cathartica*), Multiflora Rose (*Rosa multiflora*), etc.

Figure 4.3: Potential new wetland habitat in the former debris site, Beaver Brook North Reservation, 2009. Note that a small portion of the site has self-seeded in Common Cattail and other wetland species (Pressley Associates).

Recommendations:

1. The former debris (dump) site presents an opportunity to create a new wetland habitat, given the relative topographic grades and seasonal water table (Figure 4.3 and 4.4). Establishment of a wetland includes excavation to an appropriate sub-grade to intercept hydrology, placement of an appropriate soil mixture containing at least 12% organic material, and installation of a native, wetland plant community. The type of wetland created depends on the financial resources available for such an endeavor, and ranges from sowing a wetland seed mixture to supplementing the seed mixture with sapling trees and shrubs, placed up to 5 to 10 feet apart on center. Annual inspection of the created wetland by a qualified Botanist or Wetland Scientist is recommended to monitor plant mortality and recommend replacement and to insure no invasive species are established within the site. Monitoring the groundwater level of the debris area over a calendar year will also provide additional data to determine an appropriate and sustainable planting solution.

2. Two habitats will require regular maintenance in order to avoid succession to forest. They include the meadow and successional shrub habitats. In the absence of natural 'maintenance' such as herbivore grazing and fire, these habitats will ultimately undergo succession and transform into forest over time. In an effort to maintain these habitats, which contribute to the reservation's habitat heterogeneity, routine maintenance in the form of mowing and brush-cutting will be required. All habitat maintenance should be conducted during the fall months following the growing season to avoid interrupting natural biological interactions. Field habitat should be mowed once annually, while brush-cutting successional shrub habitat should occur every 3+/- years.

3. Several existing habitats associated with the expanded reservation could be enhanced by the introduction of wildlife nesting and roosting boxes. Specifically, interior forest (upland and wetland), emergent marsh, and successional shrub habitats can all benefit from carefully sized and placed bird and bat boxes. The Cornell University Laboratory of Ornithology provides informative details of avian box design, placement, and maintenance dependant on the target species, and additional information is available for the construction and placement of bat roosting boxes. A qualified Wildlife Biologist should determine the appropriate location and placement of nesting/roosting boxes. Maintenance typically includes annual inspection and scolding the boxes with boiling water to insure proper function and to eliminate parasites. Bird boxes placed within the emergent marsh will provide nesting habitat for tree swallow (*Tachycineta bicolor*), while forest-dwelling species including Owls, Woodpeckers, and Wrens will likely utilize such nesting boxes in upland forest habitats. Nesting boxes placed within the successional shrub habitat will benefit Eastern Bluebirds (*Sialis sialis*), among other species.

Continuing Site Investigation and Education

Assessment:

The diverse ecosystems of the expanded reservation provide many educational opportunities for local school groups as well as further study and research by local college and university students.

Recommendations:

1. Encourage study topics and educational programs ranging from simple biological principals such as habitat diversity, food webs, vernal pool studies, to more complex investigations including reservation management, and invasive species control.
2. Where appropriate, consider implementing natural resources recommendations through Masters and Doctorate programs through local colleges and universities.

See also additional public education recommendations below, and the recommendations for further research and study.

Cultural Resources Recommendations

Beaver Brook Reservation

Cultural Landscape

Assessment:

Beaver Brook Reservation is a cultural landscape eligible for listing on the National Register of Historic Places, and composed of a number of specific features including buildings, structures, vegetation, circulation systems, constructed water features, site furnishings, and archaeological resources. As the first reservation in the Metropolitan Park System, it is recommended that Beaver Brook Reservation be managed as a cultural landscape that includes active and passive recreational uses and natural communities.

Recommendations:

1. Maintain the historic character of the cultural landscape, including open lawns and specimen trees, water bodies, views, historic circulation systems, historic buildings and structures, and archaeological remains. The recommendations that follow include specific actions needed to preserve, protect, and provide public enjoyment of specific features that contribute to the character and significance of the reservation.

Figure 4.4: Specimen trees and grass in Beaver Brook Reservation, 2005 (Pressley Associates).

Historic Buildings

Assessment:

The picnic pavilion and restroom building constructed by the former MDC along Trapelo Road contribute to the character and significance of the reservation. The pavilion accommodates fixed peripheral seating as well as picnic tables and is heavily used in summer. The restroom should be fully evaluated for universal access.

In the northern parcel, the historic Stearns Barn is visible from Trapelo Road and contributes to the historic significance of the reservation. It is not currently accessible to public. The historic Copeland House along Mill Street is situated in a picturesque setting adjacent to the lower Mill Pond and appears in good condition. It currently functions as DCR staff residence.

Recommendations:

1. Retain and maintain the picnic pavilion in good condition.
2. Retain and maintain the historic restroom in good condition. Evaluate design alternatives to make it more fully accessible while also meeting the *Secretary's Standards*.
3. Retain and maintain the historic Copeland House without additional alterations. Preserve and maintain the building's setting/landscape. Use of the house as DCR staff residence is a compatible use and provides additional security for the reservation.
4. Conduct building condition assessment of Stearns Barn and undertake necessary repairs and stabilization.

Figure 4.5: Historic picnic pavilion from spay pool, Beaver Brook Reservation, 2005 (Pressley Associates).

Dams

Assessment:

Both dams contribute to the historic significance of the reservation and are structurally essential to maintain the two historic mill ponds. Pedestrian access over the dams does not meet current standards for universal access. The historic millstones are hidden by overgrown vegetation. The dam sites may also have sensitive archaeological resources.

Recommendations:

1. Undertake a detailed structural assessment of the two dams to determine specific repairs needed as well as code requirements and routine and cyclic maintenance needs.

2. Any structural or code-related improvements to the dams should be accomplished to respect their historic character, meet the *Secretary's Standards,* and include an archaeological assessment prior to ground disturbance.

3. Retain and maintain both dams with regular seasonal repairs as needed, coordinated through the DCR's Office of Dam Safety.

4. Clear the mill stones on the dams from volunteer growth and use them to interpret the historic significance of the site.

Archaeological Sites

Assessment:

Two prehistoric sites in the southern Waverley Oaks section, and the archaeological remains of 17th and 18th century fulling and grist mills in the northern section require specific management treatments to ensure their conservation and preservation. Active management will enhance these features and better incorporate and integrate them into the landscape.

Recommendations:

1. Care should be taken not to plant or otherwise cause surficial alterations to the toe of the esker south of Beaver Brook in the Waverley Oaks portion of the reservation.

2. Undertake vegetation management in and around the two historic mill sites in the Mill Street section of the reservation. Vegetation should be cut flush to the ground without pulling up root systems. If appropriate, depending on the specific plant species, cut stems should be treated with an herbicide according to the DCR IPM plan.

Ponds

Assessment:

The Duck Pond and Mill Pond reflect the historic character of the reservation and continue to be major attractions of the Mill Street parcel. Visitors regularly feed the ducks in both ponds and the ponds also attract a large Canada Geese colony creating a nuisance. Due to the high level of pedestrian use in concentrated areas of the ponds and along Beaver Brook, some areas are adversely affected by soil compaction, exposing tree roots and causing erosion into the water body.

Recommendations:

1. Periodically monitor water quality of the ponds with regard to temperature variations, chemical components, and species and consider assessing the larger watershed to ensure protection of the Beaver Brook watercourse.

2. Retain and maintain the two mill ponds as contributing resources within Beaver Brook Reservation.

3. Depending on the outcome of the water quality evaluation, DCR should consider developing a policy related to feeding waterfowl.

4. Correct compaction and erosion in specific areas bordering the two ponds and along Beaver Brook.

Cascade

Assessment:

The cascade below the Duck Pond with a constructed overlook structure was photographed in several historic publications and has been a much publicized feature throughout the history of the reservation. It continues to be one of the attractions of the northern parcel. It suffers from insufficient vegetation management and path maintenance to the overlook structure.

Given the topographic change, this feature cannot be universally accessible.

Recommendations:

1. Retain and preserve the cascade and overlook.

2. Improve the path to the overlook and restore compacted areas with additional plantings.

3. Provide safety features on the overlook structure near the cascade in addition to improving the path accessing it.

Stone walls

Assessment:

Stone walls along Mill Street between the driveway to the Copeland House and the maintenance access along Mill Street in the northern parcel separates the parking area from the reservation. A similar stone wall wraps around the southern parcel along Trapelo Road and Waverley Oaks Road with an entrance way to the parking area along Waverley Oaks Road. Sections of this wall along Waverley Oaks Road have deteriorated with dislocated stones. The stone walls add character to the reservation boundary and are visible from the adjacent roads.

Recommendations:

1. Conduct structural evaluation of the stone walls along the boundary and undertake necessary repairs.

2. Develop a protocol for regular inspection and maintenance of the stone walls as they are extant historic features.

Waverley Oaks

Assessment:

The "Waverley Oak" trees in the southern parcel have been recorded in many historic publications and were an essential component of the original Reservation. It is not likely that any of the original oaks remain, but many of the original trees may have been replaced with new trees so that isolated specimen oaks still exist.

Recommendations:

1. The existing oak trees contribute to the historic landscape character of the reservation and should be protected with regular pruning and maintenance, with a long-term program for replacement.

2. The oak trees can also provide a physical feature to interpret the historic landscape of the reservation.

Beaver Brook North Reservation

Cultural Landscape

Assessment:

The former Met State Hospital is a cultural landscape and is listed on the National Register of Historic Places. Historic buildings associated with the former hospital located on the Beaver Brook North Reservation have been demolished by DCAM, but the historic carriage roads and MetFern Cemetery are extant features identified in the nomination. The former Administration Building and Administration lawn remain on land now owned by the City of Waltham, on which DCR holds a conservation easement.

Recommendations:

1. Maintain the extant historic features of the former Hospital as described below.

Buildings

Assessment:

Historic buildings associated with the former Metropolitan Hospital have been demolished as part of the reuse agreement. They included the non-contributing Furcolo building located along the town lines of Lexington and Waltham, the Power Plant, Garage, Incinerator, and Mortuary/Laboratory south of Metropolitan Parkway. The former MSH Administration Building in Lot 2 is within the City of Waltham's land originally proposed for a future golf course on which DCR holds a conservation easement. Due to a long period of abandonment, this building is becoming increasingly threatened so that urgent attention is needed.

Recommendations:

1. If the City of Waltham does not pursue a 9-hole golf course, DCR should work collaboratively with the City to determine a new use for the former MSH Administration Building, including a portion for a DCR visitor/interpretive center.

2. Once a new use is determined, DCR should coordinate with the City of Waltham regarding the rehabilitation of the former MSH Administration Building consistent with the *Secretary's Standards*.

3. Re-vegetate the sites cleared from the demolition of MSH buildings as meadows and maintain in an open condition.

4. Develop interpretive programs that include information on former Metropolitan State Hospital complex and campus.

MetFern Cemetery

Assessment:

When the initial RMP field survey was done in 2005, MetFern Cemetery appeared severely deteriorated due to deferred maintenance and apparent damage caused by private construction vehicles, which resulted in some collapsed graves, damaged stone markers, and damage to the perimeter stone wall. At that time, other threats included volunteer woody vegetation, which had taken hold in the western half of the cemetery. In response to these threats, DCR prepared and began implementation of the draft "MetFern Cemetery Preservation/ Maintenance Plan." In 2009, the cemetery is in vastly improved condition; damaged grave sites have been loamed and reseeded, portions of damaged stone walls have been partially reset; a dry laid field stone wall has been built along the entire length of the road way, with several 6 foot openings to provide access for vegetation management machinery; and poison ivy and other early successional woody species have been eradicated. The Cemetery is now part of the regular maintenance regime of a crew from DURP's North Region, out of Wicklow Street, Medford and is one of the most attractive areas in the Beaver Brook North Reservation.

Recommendations:

1. Continue to implement the recommendations contained in the MetFern Cemetery Preservation/Maintenance Plan.

2. Perform regular maintenance and monitoring of the cemetery.

3. Provide continued visual recognition of the site by maintaining the boundary wall along the carriage road and if appropriate in the future, provide an interpretive sign demarcating the cultural significance of the cemetery, in consultation with family members.

Carriage Road System

Assessment:

The existing trail system includes sections of the historic carriage roads that were historically part of the former Metropolitan State Hospital and are considered contributing resources. Pedestrians and mountain bicyclists use the former carriage roads to traverse the new reservation. The historic character is compromised somewhat by overgrown vegetation and insufficient maintenance. The southern sections of the carriage road were widened substantially by heavy equipment in the vicinity of the debris removal sites, but by 2009, vegetation had recovered along the edges of the carriage roads near the former debris sites. Vehicular access to the carriage road was compromised by the construction of the Metropolitan Parkway, as the connection at the north parkway is impassible to due to the curb, bikeway, and steep grade. Last, there is evidence of substantial uncontrolled motorized vehicle use along carriage roads and trails in the vicinity of the debris areas.

Recommendations:

1. Undertake changes to the connection between the carriage road to the north segment of the Metropolitan Parkway by installing a curb cut and regrading the entrance to the carriage road. Install a gate to prevent unofficial vehicular access to the carriage road. This is a high priority for implementation.

2. Retain and preserve the historic carriage roads with a rural character that reflects the low-intensity passive use recommended for Beaver Brook North Reservation. Where possible, the carriage roads should be maintained with an 8-10' width to allow for maintenance and emergency vehicle access, and occasional vehicular access to the cemetery. Shoulders should be minimally maintained with natural vegetation.

3. Re-vegetate the shoulders of the carriage road in the vicinity of the debris removal areas, where necessary, to re-establish the historic width and character.

4. Develop clear regulations and signage related to unauthorized motorized vehicle use; install barriers where needed and monitor regularly.

Figure 4.6: North parkway, bikeway and carriage road entrance, Beaver Brook North Reservation, 2009 (Pressley Associates).

Figure 4.7: Former carriage road in Beaver Brook North Reservation, 2005 (Pressley Associates).

Site and Recreational Resources Recommendations

Beaver Brook Reservation

Buildings and Structures

Assessment:

The restroom facility and the picnic pavilion structure in the south, Waverley Oaks parcel are both historic structures and function well to support the active play area.

Recommendations:

See cultural resource recommendations above.

Site Access and Circulation

1. Vehicular Circulation System

Assessment:

Beaver Brook Reservation is bordered by Trapelo Road, Mill Street, and Waverley Oaks Road resulting in heavy vehicular traffic around the property. The three parking areas located along Waverley Oaks Road, Wilson Road, and Mill Street provide sufficient parking for the reservation users. There is adequate visual access to the three parking areas from the approach roads. Visitors to the popular spray pool also park along Trapelo Road. Lowell Path in the southern parcel also functions as a maintenance route for service vehicles.

The northern parcel has two gated service entrances located along Trapelo Road and Mill Street but has no designated service route inside the property. Traffic on Mill Street and Trapelo Road is likely to increase following the completion of redevelopment of the McLean Hospital and former Metropolitan State Hospital properties.

Recommendations:

1. Actively participate in long term planning and traffic safety related to Trapelo Road and Mill Street corridors. In particular, the intersection of Trapelo Road and Mill Street should be evaluated to ensure the maximum safety for pedestrians, given the location of the spray pool and play area adjacent to Trapelo Road. Any proposals to widen Trapelo Road or Mill Street would likely adversely affect the reservation.

2. Retain and maintain the existing parking areas, including measures to control direct runoff from the parking areas into the water bodies.

Figure 4.8: Parking area along Waverley Oaks Road in Beaver Brook Reservation, 2005 (Pressley Associates).

2. Pedestrian Circulation System

Assessment:

The pedestrian path network functions well in the southern Waverley Oaks parcel, except for a few desire lines cutting across the central wooded area across the stream. There is heavy pedestrian movement between the parking areas, particularly from the parking area to the open field along the stream, resulting in erosion, compaction problems, and disturbance to the wooded habitat. In the northern Mill Street parcel, pedestrian trails, except Plympton Path, are not cleared regularly which forces reservation users to create paths of their own, further disturbing the habitat. The condition of the Two Bridges Trail, Brookside Trail, and parts of Toboggan Run and Plympton Path in the northern Mill Street parcel are adversely affected by volunteer vegetation. The existing parking area on Mill Street also lacks a clear connection to the designated trail

system. The heavy vehicular traffic on Trapelo Road discourages the use of pedestrian connections between the two parcels.

Recommendations:

North (Mill Street) Parcel

1. All the trails need regular maintenance to decrease loss of paths to invasive woody vegetation.

2. Undertake erosion control measures along the steep slopes of the western boundary along Toboggan Run to reduce soil and vegetation loss.

3. Provide path connections from the parking area to the trail system along Duck Pond to control access to the pond.

4. Extend and maintain the path connection from the Plympton Path to the picnic area north of Duck Pond.

5. Improve pedestrian trails in areas with soil compaction and address inadequate drainage to eliminate muddy conditions.

South (Waverley Oaks Road) Parcel

1. Replace the volunteer paths through the central wooded area with a designated pedestrian path to protect the natural area and provide the stream with buffer vegetation to reduce runoff from the intersecting path.

2. Restrict access to the natural area along the MBTA tracks to protect the wetlands and to avoid unsafe access to the MBTA property.

Site Features and Furnishings

1. Bridges and Dams

Assessment:

The three bridges in the southern Waverley Oaks parcel are in good to fair condition. The bridge north of the play area lost its railing as a result of a fallen tree branch. The five bridges in the northern, Mill Street, parcel including the two over the dams are in fair to poor condition. The Duck Pond and Mill Pond dams are both currently listed in poor condition in the DCR Dam Safety database. The two bridges on Two Bridge Trail are enveloped by overgrown vegetation and one of them has missing planks endangering public use. The bridges over the dams are not level and have loose boards making access difficult. The bridge north of Mill Pond lacks hand rails creating a safety issue.

Recommendations:

1. Evaluate the structural conditions of the bridges in the northern, Mill Street parcel and improve them for public use with sufficient safety features.

2. Clear the volunteer vegetation near bridges so that they are visually accessible to the reservation users.

3. Once the results of the 2006 DCR dam inspection is complete, undertake further study and evaluation to improve both the condition and safety of these features, given their historical and recreational importance. Any improvements to the dams should also consider their historic character, meet the Secretary's Standards, and assess potential archaeological impacts.

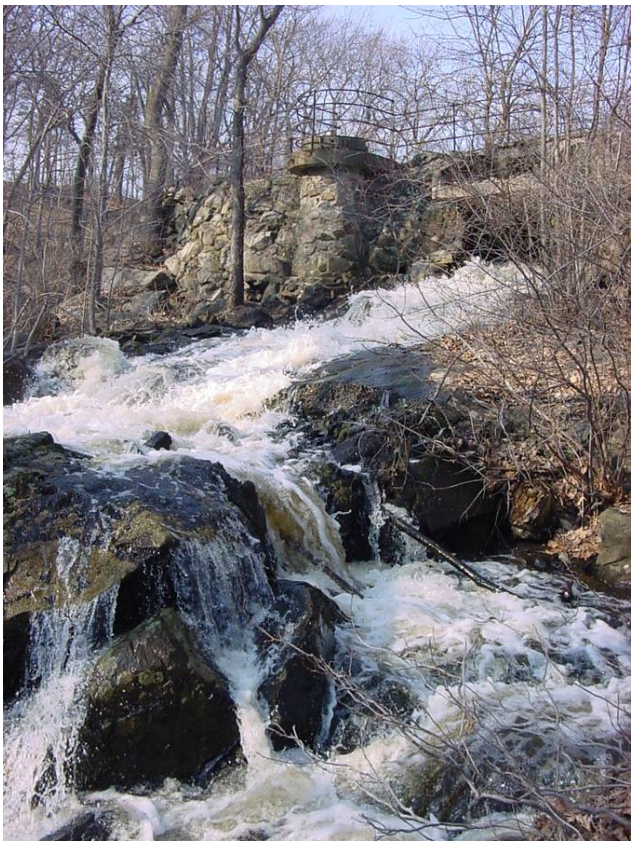


Figure 4.9: Historic dam, overlook and cascade, 2005 (Pressley Associates).

2. Fences and Walls

Assessment:

Stone walls define the reservation boundary along Mill Street in the northern parcel and along Trapelo Road and Waverley Oaks Road in the southern parcel. Sections of the wall along Waverley Oaks Road are deteriorated. The western and

northern boundaries of the northern parcel and the eastern boundary of the southern parcel are secured by chain link fence with few gate panels. Sections of the chain link fence are deteriorated and allow access from adjacent residential properties into the reservation in the northern parcel. Timber fence borders Wilson Road up to the parking area.

Recommendations:

1. Retain all stone walls in good condition. Restore the failing stone walls along Waverley Oaks Road and along Mill Street as they are contributing historic features.

2. Secure the deteriorated sections of the chain link fence and display notice to use designated reservation entrances.

3. Site Furnishings

Assessment:

The site furnishings in the northern parcel are limited to picnic tables, benches, sign posts, and an information board. The wooden bench overlooking Duck Pond on the dam is deteriorated and covered by volunteer growth. The railings on top of the dam do not provide sufficient safety protection for small children. There are no trash cans in the northern, Mill Street parcel.

The site furnishings in the southern parcel are in good condition and compliment the varied recreational opportunities of the site. The drinking fountains near the play area and ball field are in fair condition. Trash cans along Lowell Path are in good condition. The engraved granite plaque and granite boulder are not very visible as they are located amidst mown lawn without any landscape treatment.

Recommendations:

North (Mill Street) Parcel

1. Maintain consistent site furnishings compatible with the historic character of the reservation.

2. Implement regular inspection and repair to the benches and picnic tables.

3. Clearly display no garbage policy in the northern parcel with bag your own garbage messages to protect the visual and environmental quality of the reservation.

4. Update the information displayed on the information board.

South (Waverley Oaks) Parcel

1. Maintain consistent site furnishings compatible with the historic character of the reservation.

2. Emphasize the granite plaque and inscribed boulder on site with better landscape treatment around them. Provide compatible landscape treatment around the engraved granite plaque near the tennis courts and granite boulder in the open field along the stream.

4. Site Utilities

Assessment:

The reservation does not have any site lighting as public use is restricted to dawn to dusk. The municipal infrastructure provides water supply to the rest rooms and drinking water fountain in addition to sewage disposal from the rest rooms in the southern parcel.

Recommendations:

1. Maintain the utility facilities in the southern parcel to support active recreation.

Recreational Uses

1. Passive Recreation

Assessment:

The open field along the stream and shaded paths provide passive recreational opportunities in the southern parcel and it is heavily used for dog-walking, walking, and picnicking. Dog stations and trash cans installed along Lowell Path promote the use of the southern parcel by dog owners. The northern parcel is popular for duck feeding, bird watching, and picnicking.

Recommendations:

1. Retain the northern, Mill Street parcel exclusively for passive recreation to protect the scenic quality of the cultural landscape and the natural habitat.

2. Provide improved site interpretation to enhance passive recreation in the reservation.

3. Clearly display the DCR dog policy in the northern and southern parcels.

4. Re-evaluate duck feeding in the north parcel, consistent with the natural resource recommendations related to Canada Geese management.

2. Active Recreation

Assessment:

Opportunities for active recreation are limited in the northern parcel. Almost half of the southern parcel is maintained as a park for active recreation. Given the high public use of this parcel, the vegetation appears regularly maintained, complimenting the recreational facilities on the property. The lawn areas provide a pleasing backdrop to the active play area, tennis courts, and ball field. Park users pursue jogging, cycling, and roller-skating actively along Lowell Path. The two tennis courts secured with chain link fence are in good condition. However, there are some areas of weed growth and wet patches following rain on the courts. The baseball field is in fair to poor condition. The diamond boundary is not clearly pruned and the turf field has dispersed worn patches. The spray pool and playground are in good condition. The playground is equipped with separate play structures for toddlers and infants and shaded seating for adults. Both the existing ball field and the playground are considered historically significant. The spray pool is well used in summer and the boulders in the spray pool function as an interesting play area even when the water is not running.

Recommendations:

1. Provide active recreation facilities exclusively on the southern, Waverley Oaks parcel. The development of additional recreational facilities is not appropriate for the Beaver Brook Reservation.

2. Control the weed problem on the tennis courts. Resurface the courts to eliminate storm water collection.

3. Rehabilitate the baseball diamond to required dimensions and maintain the turf field to reduce worn patches.

4. Inspect, repair and paint the play equipments on a regular basis. Upgrade worn parts of the play structure and swing sets.

5. Inspect the boulders in the spray pool regularly to smoothen the rough edges and clean slippery spots.

Figure 4.10: Existing tennis courts, Beaver Brook Reservation, 2005 (Pressley Associates).

Views

Assessment:

The northern, Mill Street parcel is very scenic, due to the picturesque character of the ponds, open lawns, cascading brook, and natural vegetation. The lawn area at the primary entrance extending down to Duck Pond and around the Copeland House provides a wide view into the reservation for pedestrians as well as motorists traveling along Mill Street. Views down stream from the dams are blocked by uncontrolled natural vegetation. Lowell Path in the southern parcel provides scenic vistas of the reservation mixed with recreational use.

Recommendations:

1. Undertake selective clearing to open up views from the dams and around the cascade in the northern parcel to improve the visual quality of the reservation.

2. Maintain the open lawns in both parcels to retain the character of the reservation.

Beaver Brook North Reservation

Buildings

Assessment:

All of the former MSH buildings located within the Beaver Brook North Reservation have been demolished. The Reuse Plan provides for the opportunity to develop a small DCR visitor's center including restrooms and display space in the second floor of the former MSH Administration Building, now owned by the City of Waltham. However, this building has been abandoned for some time and is severely deteriorated.

Recommendations:

1. The reservation may benefit from a visitor facility with restrooms, drinking water, interpretive exhibits, public program space, and user information. Consistent with the 1994 MSH Reuse Plan, this RMP recommends a visitor center in the historic former MSH Administration Building (Figure 4.10). This will create the least impact on the reservation grounds, represents an appropriate use of the historic building, and is consistent with the terms of the Reuse Plan. The City of Waltham should conduct a structural integrity analysis of the building as soon as possible to determine reuse feasibility and to determine major repair work needed and issues associated with ADA compliance for both the first and second floors. The originally proposed uses for the building included a City of Waltham Golf Club and DCR visitor center. The DCR visitor facility could also contain staff offices, such as for a park ranger. However, with the future of the Waltham golf course uncertain, it is imperative that a new compatible use is found so the building can be stabilized. Because this is a historic building, all improvements should meet the *Secretary's Standards for Rehabilitation.*

2. On site storage for maintenance equipment will facilitate easier site management. This can be potentially combined with the maintenance facility for the proposed Waltham golf course.

3. The green design principles developed by the U.S. Green Building Council (USGBC) can be used to guide new development, including both the rehabilitation of existing buildings or new construction.

Figure 4.11: Former MSH Administration Building, 2009 (Pressley Associates).

Site Access and Circulation

1. Vehicular Circulation System

Assessment:

The development of Metropolitan Parkway connecting Trapelo Road and Concord Avenue provides vehicular access into the North Reservation. The parkway design includes two separate segments - the north segment from Concord Avenue and the south segment from Trapelo Road – which were connected with an emergency access road by DCAM in 2005-2006. The North Reservation has an internal carriage road system following the carriage roads that was part of the former Met State Hospital grounds, but is now primarily used by pedestrians, dog walkers and mountain bikers. The carriage roads start from behind the location of the former Incinerator building, around the central open wetland, crosses the stream near the open meadow in the south, traces along MetFern Cemetery and the former debris sites and loops back to the former MHS Incinerator site. However, construction of the parkway and bikeway has cut off DCR maintenance vehicular access to the carriage road due to the curb and steep grade. The water tower atop Mackerel Hill is accessible from roads on the Gaebler School property.

Recommendations:

Metropolitan Parkway

1. Once completed, the DCR will be responsible for ongoing regular maintenance of the Metropolitan Parkway, including sweeping, plowing and snow removal, maintenance of the drainage system, and maintenance of the new street trees and lighting system.

2. Design and construct the DCR parking area east of the former MSH Administration Building as a modified version of the 2004 Judith Nitsch plan, since it appears likely it will be constructed before the Waltham golf course parking is constructed. This modified layout provides for access from the emergency access connector road constructed by DCAM in 2006 (see Figure 4.12).

3. Work collaboratively with the City of Waltham regarding the implementation of their parking area in the vicinity of the former MSH Administration Building.

4. Install a curb cut, service gate, and re-grade the entrance to the carriage road from the north parkway to provide maintenance and emergency vehicle access.

5. Monitor the condition of the new parkway. Develop a cooperative maintenance agreement with AvalonBay Communities, Inc. regarding the parkway maintenance.

6. Undertake additional re-vegetation along the Metropolitan Parkway to minimize the opportunity for invasive species.

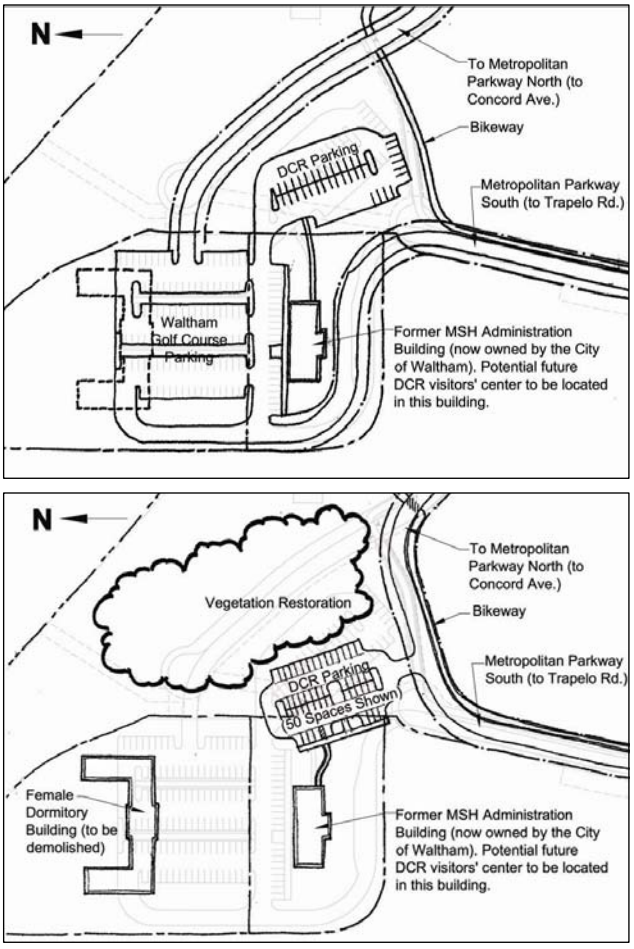


Figure 4.12: Top – 2004 layout of the DCR and City of Waltham parking areas in relation to the north and south parkway segments (redrawn from Judith Nitsch Engineering, Inc.). Bottom – Conceptual layout for the proposed DCR parking area adjacent to the existing access road constructed by DCAM in 2006 (Pressley Associates).

Mackerel Hill

1. If the cell tower on Mackerel Hill is to remain, establish a service access easement agreement with the cell tower vendors and City of Waltham regarding vehicular access to the top of Mackerel Hill from the Gaebler School.

2. Pedestrian Circulation System (includes mountain bikes)

Assessment:

The pedestrian circulation system currently consists of the former carriage roads and narrow trails created by pedestrians and mountain bikes. The steep slopes on the north side of Mackerel Hill suffer from frequent erosion and settlement problems along the pedestrian path. Pedestrian entrances and connections are not defined causing undesirable intrusions into the habitat zones. Construction activities and building demolition have eliminated some connections between the new parkway and the historic carriage roads. Development of a designated and delineated pedestrian and shared use trail system is a priority for this property, with clearly visible entrances and connections to adjacent open space, and the parkway/bikeway. Several additional opportunities for enhanced recreational pedestrian access exist between the north and south sections of the property, Walnut Street, Dawes Street, Royal Street, and Porter Road.

Recommendations:

1. Delineate a shared use trail system that utilizes the existing carriage roads as well as the rustic [single track] trails, connecting to Rock Meadow and easily accessible to the bikeway at both Trapelo Road and Concord Avenue.

2. Designate Mackerel Hill as a temporarily pedestrian-only trail and undertake erosion control measures along the Mackerel Hill trail, including installing water bars and re-routing the trail where necessary so it can be re-opened for shared use including mountain bikes. Access to the water tower should be prohibited for security reasons.

3. Implement critical connections to re-establish access to the trail and carriage road system altered by the construction of the Metropolitan Parkway. This includes a trail connection from the north parkway through the open meadow and a proposed second connection from the south parkway over a small brook (requiring the construction of a pedestrian bridge over the brook).

4. Evaluate alternatives for a wetland boardwalk that provides pedestrian access to Walnut Street and Dawes Street through the open wetlands located north of the parkway.

5. Loop the pedestrian path system around the AvalonBay development property to meet the parkway near the former location of the garage and near the proposed parking lot at the junction of north and south segments of the parkway.

6. Improve the trail connection to Rock Meadow with improved landscape treatment and signage.

7. Promote public awareness to discourage development of additional volunteer trails on Mackerel Hill and in the vicinity of the significant wetlands and vernal pools.

8. Consistent with the terms of the Reuse Plan, retain pedestrian access to the MetFern Cemetery via the footpath from the Gaebler property as well as the primary carriage road.

9. Develop collaborative management strategies with established recreational users related to the evaluation and treatment of trails in the North Reservation.

10. Coordinate with the Friends of the Western Greenway on the designation of the greenway connector trail from Rock Meadow to Walnut Street, passing the cemetery and large emergent marsh.

11. Enhance the path connection to Rock Meadow visually with improved landscape treatment at the stream crossing.

12. Establish clear rules, signage, and barriers related to unauthorized motorized vehicle use.

Figure 4.13: Bridge connecting the North Reservation to Rock Meadow, 2005 (Pressley Associates).

Site Features and Furnishings

1. Structures

Assessment:

The wooden bridge across Beaver Brook connecting to Rock Meadow is in poor condition. This is a critical connection to the adjacent open space. A pedestrian bridge is also needed near the south parkway to re-establish a link to the trail network.

Recommendations:

1. Stabilize the bridge connecting the reservation to Rock Meadow and provide safety railings if needed.

2. Construct a pedestrian bridge over the small brook near the south parkway to re-establish trail connection (see Recommendations map for exact location).

2. Fences and Walls

Assessment:

The stone walls scattered in the property are in fair to poor condition. The chain link fence around cell tower equipment affects the visual quality of the vista atop Mackerel Hill.

Recommendations:

1. Stabilize the stone walls, where needed as they contribute to the physical interpretation of previous land uses.

2. Develop a landscape treatment for Mackerel Hill crown to minimize the visual impact of the cell tower fence. This will depend on the long term plan for both the water tower and cell tower.

3. Site Furnishings

Assessment:

The new light fixtures along Metropolitan Parkway have a compatible base, but the cobra head lamp is not compatible with the historic character of the reservation. There are no other furnishings on the property other than the wooden bench in poor condition along the path connection to Rock Meadow.

Recommendations:

1. Maintain the light fixtures along the parkway in conjunction with parkway maintenance.

2. Provide adequate rustic benches along the pedestrian path to promote passive use of the reservation.

3. Provide dog stations near the proposed DCR parking area with clearly posted rules related to leashed dogs.

4. Provide site interpretation elements along the pedestrian trails and near parking areas to promote cultural and ecological significance of the property.

5. Create two wetland viewing areas overlooking the large emergent [cattail] marsh: one at the proposed wetland restoration area in the former debris site, and one adjacent to the main carriage road.

4. Site Utilities

Assessment:

The existing metal utility poles are currently non functional and poses hazardous conditions along the pedestrian trails. The lead-lined water tower atop Mackerel Hill affects the visual quality of the reservation and presents a safety and liability issue, which has been identified as high priority for DCR Operations staff. The existing cell tower structure has an undesirable visual effect that is not compatible with the natural scenery and the income from the tower does not benefit the reservation.

Figure 4.14: Abandoned utility pole in the North Reservation prior to removal, 2005 (Pressley Associates).

Figure 4.15: Downed utility pole adjacent to existing trail, Beaver Brook North Reservation, existing in 2009 (Pressley Associates).

Figure 4.16: Water tower on Mackerel Hill in the North Reservation, 2005 (Pressley Associates).

Recommendations:

1. Remove all existing utility poles with minimum disturbance to the surrounding landscape. This is a high priority for the reservation given their hazardous condition and should be undertaken as quickly as possible. Note that in 2009, several utility poles have been removed, but some downed poles remain in the vegetation.

2. Assess the cost and feasibility (operational, environmental, public use, and visual issues; and potential positive and negative costs) of removing the water tower. Once this is determined, develop alternatives for the treatment of the water tower:

    a. Removing the water tower and restoring the Mackerel Hill summit to natural conditions with views.

    b. Retaining the water tower and further developing leased cell tower use. This alternative should only be pursued if it presents a demonstrable public benefit to the reservation through increased revenue that directly benefits Beaver Brook.

Recreational Uses

1. Passive Recreation

Assessment:

The reservation is not heavily used because the DCR does not promote access due to the ongoing construction activity. However, the public review process for the RMP did reveal a vociferous community of mountain bicyclists, who have an established history of use and maintenance of the existing trail system. Bicyclists, pedestrians and dog-walkers informally enter the site from Elsie Turner Park and Rock Meadow conservation

land. Nature walks conducted by the Massachusetts Audubon Society and Friends of the Western Greenway are creating increased public awareness about the reservation.

Recommendations:

1. Develop an environment friendly passive recreation program with least impact on the natural habitat of the reservation.

2. Provide improved site interpretation to enhance passive recreation and resource stewardship.

Figure 4.17: Bicyclists on the main carriage road, Beaver Brook North Reservation, 2009 (Pressley Associates).

2. Active Recreation

Assessment:

Active and intensive recreation uses are not promoted in the North Reservation. However, there is ample evidence of past motorized trail bike use in the property, especially around Mackerel Hill and the former debris site with adverse impacts on terrain and habitat. Mountain biking associations have indicated their desire to develop an environmentally sensitive recreation policy and trail system for the site.

Recommendation:

1. Prohibit motorized uses on the property as per DCR Reservation Regulations. Create public awareness and community watch programs to implement the recreation policy.

2. Designate a shared use trail system that includes both the existing carriage roads and most of the narrow [single track] trails that can accommodate both mountain bikes and pedestrians.

3. Develop collaborative programs with established recreational associations to participate in the evaluation, designation, and maintenance of trails in the reservation.

Views

Assessment:

The scenery of Beaver Brook North Reservation is marked by natural areas with varying terrain such as Mackerel Hill, uplands, meadows, and wetlands. Parts of the property have been altered due to the construction of the Metropolitan Parkway, demolition of unused buildings, and the removal of the debris sites.

Recommendations:

1. The disturbed sites associated with demolished buildings and the dump site should be replanted with native vegetation and managed as open meadows to blend with the surrounding natural scenery.

2. To utilize the views enhancing the visual quality of the reservation, maintain proper sight lines along the trails.

3. Undertake selective clearing to open up views from Mackerel Hill.

4. Provide selective views into the central open wetlands from the trails around them.

5. Vegetation treatments are recommended to buffer views from the reservation to adjacent land uses such as residential development, roadway, and golf course.

Figure 4.18: Existing trail bordering the large wetland, Beaver Brook North, 2009 (Pressley Associates).

Management Recommendations

Public Access and Recreational Issues

Beaver Brook Reservation

Assessment:

Public use of Beaver Brook Reservation is well established with existing parking areas and facilities that create distinct experiences in the Mill Street and Waverley Oaks parcels.

Recommendations:

1. DCR should retain and continue existing recreation uses at the Beaver Brook Reservation, which provide a diverse range of passive and active uses for park users.

Beaver Brook North Reservation

Assessment:

The North Reservation is in a state of transition without clear direction related to current public access and uses and their potential effect on natural or cultural resources. The land has not been actively used, although comments received on the draft RMP indicate that there is an established mountain biking constituency. The site is also used informally for dog walking and jogging. However, recreational policies are not yet established and the long term effect of increased public use is not yet known. Furthermore, without active management or DCR presence, the site may be perceived as abandoned property and thus susceptible to inappropriate uses such as inappropriate dumping, storage of construction materials or debris, and homeless encampments.

As Beaver Brook North Reservation evolves, issues associated with public use and recreation will also change, requiring DCR to remain flexible and adaptable to changing conditions.

Recommendations

1. Clearly communicate and post current and future public access policies related to Beaver Brook North Reservation, including allowable uses, entrances, and rules and regulations. This will likely require a dynamic policy, updated or revised seasonally and yearly as the property becomes more widely recognized as public open space and the adjacent redevelopment is completed.

2. Develop a clear and defensible recreation policy for the new reservation, particularly with respect to trail use and if appropriate, seasonal closures for habitat and wildlife protection.

3. Develop an operational strategy to provide access to the cemetery for individuals who are not able to walk the distance from the parkway. This could include providing a vehicular gate at the entrance to the carriage road that can be opened by DCR operations staff by special request.

4. Monitor the site on a regular basis related to potential inappropriate uses, such as dumping and unauthorized motorized vehicle use, and take immediate action if such uses are observed.

5. Remove the existing encampment (visible in 2005-2006) located south of the debris site near the cemetery.

Surrounding Land Uses and Property Issues

Assessment:

The expanded Beaver Brook Reservation is part of a regional open space system, called the Western Greenway, which is a significant recreational and open space resource for the communities of Belmont, Lexington, and Waltham. Both the ecological and recreational linkages to these adjacent properties should be a priority objective for the future management of the expanded Beaver Brook Reservation. In addition to the adjacent municipal and private open space, the redevelopment of the former Metropolitan State Hospital campus will have an effect on Beaver Brook North Reservation, particularly through the construction of the Metropolitan Parkway, AvalonBay Communities' residential development, the use and management of Waltham's conservation land (originally proposed as a 9-hole golf course), redevelopment of the Gaebler School, and the potential development of a golf club/visitor center or other use in the former MSH Administration Building.

The construction of the new Metropolitan Parkway includes changes to the intersection at Trapelo Road, so that the Parkway has a single entry/exit closer to Forest Street, instead of the separate entrance and exit farther down Trapelo Road opposite Doty Street and south of Shade Street. While simplifying the intersection is a positive improvement, the reality of site conditions results in a severely obstructed view of outbound traffic, making it unsafe to make a left turn from the Parkway onto Trapelo Road.

In the past, DCR has pursued an interest in acquiring conservation restrictions along Beaver Brook. This program is no longer active. In 2009, Lot 1, located at the northwest corner of Beaver Brook North had been successfully acquired.

Recommendations:

1. Maintain, enhance, and promote recreational trail connections with adjacent open space properties, particularly Rock Meadow Conservation Land and the new bikeway associated with the Metropolitan Parkway.

2. Actively monitor construction activities associated with the AvalonBay residential development, particularly with respect to use of the parkway, equipment and materials storage, tree protection, and protection of the adjacent Beaver Brook North Reservation. Damage to DCR land or resources, including the new parkway should be reported immediately to the appropriate officials at DCAM, so that immediate repair or restitution can be implemented.

Figure 4.19: 2008 aerial photograph showing the current intersection of the Metropolitan Parkway South with Trapelo Road opposite Forest Street in Waltham, with the former MSH entrance forming a Y opposite Doty Street (Mass GIS).

3. Work actively and collaboratively with the City of Waltham and DCAM related to the future use and rehabilitation of the Administration Building, construction of the proposed parking area, site restoration in the area of the demolished Female Dormitory, site restoration of the area of former roads at the intersection of the Metropolitan Parkway and Trapelo Road, and the redevelopment of the Gaebler School to achieve the City's and the DCR mutual goals related to conservation, preservation, and recreation for Beaver Brook North Reservation.

4. If and when it proceeds, DCR should review the schematic design and construction documents for the Waltham golf course, to ensure that the project meets the requirements of the Reuse Plan and its associated documents, particularly the Second Amendment and Conservation Easement. These documents require that the mature vegetation and wetlands be protected, and that detailed, additional wildlife, aquatic habitat, and water-quality monitoring studies be undertaken prior to construction.

5. Work with the City of Waltham and others to evaluate and resolve safety issues at the Waltham intersection of the Metropolitan Parkway and Trapelo Road due to curvature, slope and alignment of Trapelo Road, as well vegetation and utility poles that block sight lines. Ideally, an evaluation and solution that includes the Forest Street and Doty Street intersections with Trapelo Road will greatly improve vehicular and pedestrian safety in this location.

6. Consider re-activating the voluntary acquisition of conservation easements along Beaver Brook that would provide a protected 10-15' vegetated buffer along the watercourse, and/or work with local Conservation Commissions to develop public information and education programs related to landscape maintenance practices within the wetland setback.

7. Develop long-term plan to include Lot 1 in Beaver Brook North, with connecting trail as part of the Western Greenway.

Operations and Maintenance

Assessment:

Without adequate staff, ongoing maintenance and operation of Beaver Brook Reservation is limited, and a serious need exists related to the 254-acre Beaver Brook North Reservation. Better communication and collaboration is also needed between operations and field staff and the development activities on Beaver Brook North Reservation, as well as with the City of Waltham regarding the condition of their property on which DCR holds a conservation easement.

Recommendation:

1. Recognize the significance of the both Beaver Brook Reservation and Beaver Brook North Reservation and advocate for increased operations funding to meet the maintenance and management needs of both properties.

2. Pursue a formal maintenance agreement with AvalonBay Communities, Inc. related to the maintenance of the new Metropolitan Parkway.

Park Staff

Assessment:

Beaver Brook Reservation does not have any permanently assigned year-round staff and is maintained by staff members from the DCR North Region, Fells District, who also care for many other DCR parks and parkways in the region. Beaver Brook North Reservation is a new acquisition and is not yet staffed. The Reuse Plan requires that DCR assume maintenance and repair responsibility for the Metropolitan Parkway and its access road once construction is complete, which have had an immediate effect on DCR operations since Fall-Winter 2006.

Figure 4.20: Metropolitan Parkway in the North Reservation, 2006 (Pressley Associates).

Recommendations:

1. Develop an immediate and long-term staffing and operations plan for the entire Reservation that provides adequate site maintenance for both the 59-acre Beaver Brook Reservation and the 254-acre Beaver Brook North Reservation, education and interpretation programs, and seasonal staff needed to supervise the spray pool and play area (see Chapter 6 for more detail).

2. Assign DCR staff to actively coordinate with DCAM, AvalonBay, and the three municipalities as the development and construction activities on the former Met State Hospital land concludes to ensure that all of the conditions of the Reuse Plan have been met, and that all disturbed areas have been adequately restored to native vegetation in areas on or near the DCR reservation and the area covered by the conservation easement. Coordinate with DCAM regarding completion of the site clean up and restoration at the debris removal sites including finish grading, removal of silt fencing, re-vegetation, and carriage road restoration.

Public Education and Interpretation

Assessment:

The expanded Beaver Brook Reservation offers opportunities for interpretation of both natural and cultural resources. The mix of woodlands, meadows, wetlands, pools, and riparian buffers along the stream support many diverse species of flora and fauna, which are described in the section devoted to natural resources. The elevation gradation varying between Mackerel Hill and the low lying stream course demonstrates the function of a sub-watershed with additional potential for environmental interpretation. Historic features such as the MetFern Cemetery, Copeland House, Stearns Barn, stone walls, and mill ponds, dams and associated mill foundations provide a visual connection to the history of the landscape and its previous land uses. There is immense potential to develop environmental programs, which could also promote environmental stewardship in the community.

Recommendations:

1. Develop and provide environmental programs and stewardship activities within the expanded reservation. Specific cultural and environmental themes to develop include:
   - Native American land use;
   - The history of the Waverley Oaks and the development of the Metropolitan Park System;
   - Early industrial uses (including various types of milling operations and ice harvesting);
   - Metropolitan State Hospital;
   - Wetlands ecology, systems, and vernal pools;
   - Plant and animal species identification;
   - Habitat diversity, food webs, and invasive species management;
   - Environmental stewardship and reservation management.
2. Develop collaborative approach or partnership with nearby environmental organizations (such as Mass Audubon) and

institutions (such as Bentley College) related to environmental monitoring, inventory, and programs. This could provide an ongoing database of resource information and public programs that supports the mission of DCR and its partners.

3. Collaborate with Belmont on the continued development of the Waverley Trail, which interprets the history of the Waverley Oaks and their role in the history of landscape preservation in Massachusetts and the development of the Waverley Square area.

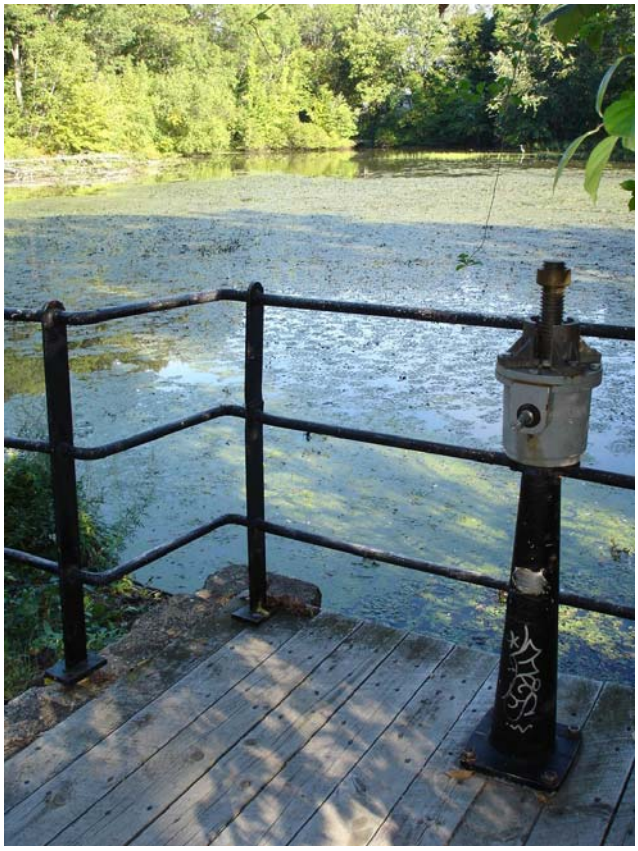


Figure 4.21: Dam over Mill Pond in Beaver Brook Reservation, 2005 (Pressley Associates).

Recommendations for Further Study

Following are recommendations for future research to improve the condition and use of the expanded Beaver Brook Reservation. They include more detailed studies and evaluations, which are outside the scope of the RMP.

General Recommendations

1. Develop a user survey of dog owners and work collaboratively with dog walkers to develop a leash policy for the expanded reservation that meets the needs of all users, and which can be effectively monitored and managed by DCR.

Beaver Brook Reservation

1. Conduct structural and code compliance evaluation of the bridges and dams in the reservation in coordination with the DCR Dam Safety Program and improve them to meet DCR standards, including safety and accessibility where feasible.

2. Document the history of the reservation and prepare a National Register of Historic Places nomination focused on Beaver Brook's role as the first public reservation in the Metropolitan Park System. Consider preparation of a Cultural Landscape Report to document and analyze the reservation and provide more detailed treatment recommendations for the landscape.

3. Undertake periodic water quality monitoring in ponds and along the Beaver Brook watercourse to understand the impact of surrounding land use on the aquatic system.

4. Undertake structural evaluation of Stearns Barn and implement emergency stabilization work to prevent further decline and deterioration.

Beaver Brook North Reservation

1 Assess the cost and feasibility of removing the water tower and fully evaluate two alternatives: a.) removal with an abatement and demolition plan, and site restoration with minimum impact on Mackerel Hill, and b.) retention and enhanced cell tower use provided this has a demonstrable public benefit to the reservation including retained revenue.

2 Undertake additional trail evaluations in the North Reservation in collaboration with trail users to determine specific trails needing boardwalks, drainage improvements or re-routing, and to determine appropriate trail uses.

3 Coordinate with Lexington, Waltham and Belmont on traffic monitoring and mitigation related to the use of the Metropolitan Parkway.

4 Conduct rare species inventory and monitoring to understand the impact of human activities in the reservation on habitat zones and to identify known or potentially occurring rare species. Continue to evaluate and certify the potential vernal pools.

5. Complete additional design work necessary to implement the priority improvements identified in this RMP, particularly the DCR parking area and critical trail connections.

6. Conduct a recreational user study of the Beaver Brook North Reservation to more accurately determine existing uses and as a baseline for assessing changes over the next five to ten years. Update the survey after the completion of the AvalonBay development and golf course construction, if implemented.

7. Prepare an accurate GIS base map, particularly focused on locating existing and proposed trails in the North Reservation.

Related Land Areas

1. Work with the City of Waltham on a traffic/safety study of the Trapelo Road/Metropolitan Parkway south intersection, and implement safety improvements to the intersection.

2. If the City of Waltham's 9-hole golf course does not proceed, DCR should work collaboratively with the City on a reuse and rehabilitation plan for the former MSH Administration Building with a strategy for immediate stabilization work to arrest further deterioration, and site restoration of the area of the former female dormitory on Waltham land covered by the DCR conservation easement.

3. Work collaboratively with the City of Waltham, DCAM and AvalonBay to complete debris removal related to the original Met State entrance off Trapelo Road, and the location of the

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Endnotes

[1] Blossey, 2001, Blossey and Schroeder, 1995.

[2] Blossey, 1997.

Figure 5.1: Beaver Brook in the original reservation, 2005 (Pressley Associates).

Chapter 5

Capital Improvements Implementation Strategy

Introduction

Based on the narrative recommendations outlined in the previous chapter, which address necessary improvements to protect natural habitats, restore historic character, and enhance visitor experience, this chapter presents a focused list of specific improvements based on urgency and priority, reflecting an analysis of existing site conditions, DCR management requirements and capabilities, and public input. The tasks are categorized into two levels of management and services with associated costs, reiterating the goals and objectives of the RMP. Recommendations associated park operations and management are included in Chapter 6.

Basic Level Services represent the most fundamental needs for maintaining the expanded reservation, which if left neglected, would lead to a permanent loss of an important cultural or natural resource, adversely affect the safety of the public, or result in the further decline of the property's infrastructure. The continuation of compatible recreation that connects visitors with the reservation landscape is also considered a basic level of management and service, as are the prevention of impacts to significant habitats and the restoration of the visual and historic character of the reservation. These tasks demand foremost attention and require that public funds be allocated for implementation. Some of these basic level services can be planned as Early Action Projects or projects that could be completed by DCR personnel or volunteers supervised by DCR based on expendable resources and time limitations.

Enhanced Level Services represent an increased level of management necessary to improve the condition of existing resources, enhance programming and public access, and which achieve cosmetic improvements that are not urgently related to public safety or resources protection.

In summary, the basic level of service optimizes existing activities or facilities while the enhanced level expands existing activities or facilities. Recommendations are evaluated to determine if they are associated with the basic or enhanced level of management and services. Factors used to determine which recommendations meet the basic management level include:

- Maintaining or securing public and visitor health and safety
- Maintaining essential property infrastructure
- Providing protection and stewardship for significant or critical cultural or natural resources, and
- Ensuring sustainable public access and recreational activities.

Capital Improvement Tasks

The RMP process identified the priority recommendations in conjunction with DCR management review and community input at public meetings (see Appendix D). These tasks are prioritized into the two categories mentioned above, based on their impact on protecting the prime natural resources of the reservation, restoring the integrity of historic resources, resolving the public safety issues, and enhancing visitor experience. In addition, issues concerning natural systems sustainability, public accessibility enhancement, and maintenance requirements are addressed within these priorities. The categories and recommendations may be considered preliminary in nature and subject to change based upon DCR, city and state agency, and public input in the future. Many of these items could be considered flexible, since priorities could change if funding becomes available for certain types of projects immediately or in the future or if deterioration occurs sooner then anticipated.

The preliminary costs listed below reflect 2009 figures excluding contingencies. Unless specifically mentioned, they also exclude design, engineering, or compliance costs that may be needed to move individual projects into completion and which may add 10-25% of the overall project cost, depending on the technical complexity and permitting.

Basic Level

The following recommendations and associated costs represent the basic level of management and services for both Beaver Brook Reservation and Beaver Brook North Reservation.

Table 5.1: Basic Level of Management and Services

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
GOAL: Natural and Cultural Resource Protection and Resolution of Public Safety			
Reservation-wide			
▪ Establish a dog policy and open hours for the entire reservation.	Operational	NA	DCR staff
Beaver Brook Reservation			
*Mill Pond and Duck Pond Dams**			
▪ Conduct detailed structural and rehabilitation evaluation of both dams.	$ 25,000	General estimate for study	DCR staff and/or contract
*Stearns Barn**			
▪ Conduct structural and rehabilitation evaluation.	$ 50,000	General estimate for study based on size and condition of barn	Contract
Beaver Brook North Reservation			
*MetFern Cemetery**			
▪ Preserve and maintenance existing site consistent with recent stabilization work and DCR Preservation and Maintenance Plan.	Operational	NA	DCR staff
*Carriage road and DCR access/service road**			
▪ Implement curb cut and re-grade the entrance to the carriage road from the north segment of the parkway to allow for DCR maintenance vehicles and emergency access; add a gate to control vehicular access.	$ 5,000	Lump sum estimate	DCR staff and/or contract

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
Non-functional utility poles			
▪ Locate all remaining standing and fallen utility poles on site and on a site plan; prepare specifications for removal, including site protection, re-vegetation after removal, and road/path repairs.	$ 5,000	General estimate based 5 day work crew	DCR staff and/or contract
Metropolitan Parkway			
▪ Implement entrance signage.	$ 5,000	Lump sum estimate	DCR staff
▪ Work collaboratively with the City of Waltham to address visibility and vehicular safety issues at the south parkway entrance on Trapelo Road.	Operational	NA	DCR staff
Avalon Development			
▪ Survey DCR Reservation property line around Lot 3; install boundary markers; follow-up with DCAM and AvalonBay Communities Inc. regarding any visible intrusions.	$ 50,000	Lump sum estimate for survey contract	Survey contract, annual DCR staff monitoring
GOAL: Protection and Stabilization of Prime Natural and Historic Assets of the Reservation			
Beaver Brook Reservation			
Stone walls∗			
▪ Inspect and repair the deteriorated boundary stone wall along Waverley Oaks Road and Mill Street.	$ 22,000	Unit cost of wall restoration	Contract
Pond areas∗ ∗∗			
▪ Rehabilitate compacted and eroded areas along Beaver Brook and ponds.	$ 34,000	Unit cost for soil rehabilitation	Contract
▪ Improve/repair trail leading to the cascade and overlook.	$ 4,000	Unit cost for trail rehabilitation	DCR staff and volunteers or contract
▪ Undertake vegetation management and additional planting where necessary.	$ 48,000	Lump sum estimate	Contract
▪ Remove vegetation from the archaeological mill sites.	$ 10,000	Lump sum	DCR staff and volunteers or contract
Beaver Brook North Reservation			
Site restoration and re-vegetation∗∗			
▪ Replant areas cleared from demolition of historic buildings with native species and ensure that trail connections are re-established.	$ 322,000[1]	Unit cost for native species planting	Contract and/or collaboration with AvalonBay Communities
▪ Re-vegetate areas damaged by motorized vehicle use in the vicinity of the debris removal areas.	$ 50,000	Lump sum estimate	Contract
GOAL: Resource and Visitor Experience Improvement			
Beaver Brook Reservation			
Trails∗∗			
▪ Restore the designated trails lost to volunteer/invasive vegetation growth in the northern parcel.	$ 4,000	Lump sum estimate	Volunteers and staff or contract

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
Pond areas ***			
▪ Improve trail conditions and create a universally-accessible path from the Mill Street parking area to Mill Pond.	$ 14,000	Unit cost for accessible trail	Contract
*Site restoration***			
▪ Plant riparian vegetation along Beaver Brook adjacent to the open field in the southern parcel.	$ 82,000	Unit cost for planting	Contract, DCR staff, and/or supervised volunteers
Beaver Brook North Reservation			
*Trails***			
▪ Implement additional trail connection to Lot 1 with a boardwalk over the northern wetland and a new trail leading to Walnut Street; collaborate with the Friends of the Western Greenway and others to designate and construct this new greenway connector trail.	$ 9,000	Unit costs for boardwalk and dirt trails from Tahawus Trails	DCR staff, contract, and/or volunteers (e.g. NEMBA, Friends of the Western Greenway) - for all trail recommendations
▪ Undertake improvements needed to establish critical trail connections, such as a bridge to connect the south parkway with the trail system near the Trapelo Road entrance; trail through the meadow and cleared areas leading to the north parkway; and connector trail from the Parkway south of the Avalon Development to the existing trail west of Avalon Development.	$ 25,000	Unit cost for dirt trails from Tahawus Trails	
▪ Evaluate the Mackerel Hill trails to determine specific locations needing erosion control, and re-route trails where necessary.	$ 4,000	Lump sum estimate	
Parking			
▪ Pending future developments regarding the City of Waltham's proposed golf course and reuse of the former MSH Administration Building, and in cooperation with the City, design and construct a re-configured DCR public parking area accessible from the emergency access road and near the former MSH Administration Building.	$ 83,000	Unit cost for bituminous concrete parking lot	Design: DCR or contract Construction: Contract
▪ Implement site orientation signage/kiosk at parking area, as well as landscaping adjacent to the new parking area.	$ 50,000[2]	Lump sum estimate	Contract
Site interpretation and education			
▪ Implement interpretive signage related to natural resources.	$ 20,000	Lump sum estimate for two interpretative stations	Research, design and construction: DCR or contract
Site restoration			
▪ Implement native species planting along Metropolitan Parkway on the slope south of the AvalonBay development.	$ 83,000	Unit cost for native species planting	DCR in partnership with AvalonBay

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
City of Waltham land			
▪ Work collaboratively with the City of Waltham, DCAM, and the AvalonBay development to complete site restoration in the area of the female dormitory (demolished) and tennis courts (demolished). Minimally, remove bituminous concrete and other debris, add loam and seed with native grass mix.	$ 139,000	Unit costs for demolition, grading & seeding	DCR with City of Waltham, DCAM and AvalonBay Communities
City of Waltham land continued			
▪ Coordinate with the City of Waltham to complete site restoration in the former entrance (Lot 4B). Remove bituminous concrete entry drive and other debris, add loam, and seed with native mix to restore meadow grassland.	$ 38,000	Unit costs for demolition, grading & seeding	DCR with City of Waltham

NOTES

* Alterations to historic features will be consistent with the *Secretary of the Interior's Standards for the Treatment of Historic* Properties.

** Proposed physical work within the 100' setback of wetlands and certified or potential vernal pools will be coordinated with the Conservation Commissions in the appropriate municipality (Belmont, Lexington or Waltham).

Unit costs are based on RS Means - Site Work & Landscape Cost Data 2009 and figures updated from 2006 draft RMP.

Total Recommended Basic Services – Capital Improvements

Beaver Brook Reservation	$ 293,000	
Beaver Brook North Reservation	$ 888,000	This includes site remediation/restoration costs that should be shared with DCAM, City of Waltham and AvalonBay Communities, Inc.

Figure 5.2: Dam over Mill Pond in the Beaver Brook Reservation, 2006. This is an existing cultural resource for which a structural evaluation is recommended as a basic service (Pressley Associates).

Enhanced Level

The recommendations listed below are necessary to achieve an enhanced level of service for the Beaver Brook and Beaver Brook North Reservations. Implementation of these recommendations will result in expanded public access and understanding, as well as increased resource protection. At present, current DCR staffing levels are insufficient to implement and manage these recommendations in addition to those associated with the basic level of management and service.

Table 5.2: Enhanced Level of Management and Services

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
GOAL: Natural and Cultural Resource Protection and Resolution of Public Safety			
Beaver Brook Reservation			
Mill Pond and Duck Pond Dams *			
▪ Implement needed structural improvements and address safety.	$ 100,000	Lump sum estimate pending DCR dam evaluation	DCR staff and/or contract
Stearns Barn *			
▪ Implement emergency stabilization.	$ 200,000	Lump sum estimate based on 2006 condition	Contract
Beaver Brook North Reservation			
Water tower			
▪ Evaluate the cost and feasibility of removing the water tower on Mackerel Hill and, based on the cost, evaluate alternatives for the water tower: 1.) removal, abatement and site restoration and 2.) retention and development of enhanced cell tower use.	$ 20,000	General estimate for study based on scope	DCR staff and/or contract
▪ If determined to be feasible, remove the water tower.	$ 500,000	Conceptual estimate, see notes below	Contract
MetFern Cemetery			
▪ Design and implement compatible interpretive signage at the MetFern Cemetery*.	$ 5,000	Lump sum estimate for signage	Contract
GOAL: Restoration and Enhancement of the Prime Natural and Historic Assets of the Reservation			
Reservation-wide			DCR in collaboration with the Belmont Land Trust, Trustees of Reservations, Mass Audubon, or others
Conservation Restrictions			
▪ Continue voluntary program to acquire conservation easements along Beaver Brook, so that Beaver Brook North and Beaver Brook Reservations are connected by continuous protected habitat.	$ 500,000	DCR	

RECOMMENDATION	CONCEPTUAL COST	SOURCE	IMPLEMENTATION METHOD
Beaver Brook North Reservation *Wetland Restoration*** ▪ Re-vegetate areas associated with construction activity and debris removal at the former dump site, including establishing a new wetland.	$ 353,000	Unit cost for planting	Contract
GOAL: Resource and Visitor Experience Enhancement			
Beaver Brook Reservation *Site interpretation and education* ▪ Develop interpretive/educational information related to the history of the reservation.	$ 7,500	Lump sum estimate	Research, writing and design: DCR staff or contract; Exhibit/brochure production: contract
Recreational facilities ▪ Rehabilitate existing ball field	$15,000	Unit cost for infield and outfield rehabilitation	Contract
Beaver Brook North Reservation *Visitor Center** ▪ Design and construct new Visitor Center in the former MSH Administration Building with exhibit space, office, restrooms, and storage; *Trails*** ▪ Designate and improve a shared use trail system for the existing historic carriage roads and on specific secondary [single track] trails that connect to Rock Meadow and the north and south segments of the Metropolitan Parkway and bikeway.	$ 375,000[3] $ 364,000	Unit cost for architecture and exhibits based on est. size of facility Unit cost for multi-use trail construction	Contract; coordinate with the City of Waltham regarding overall rehabilitation Contract

NOTES

* Alterations to historic features will be consistent with the *Secretary of the Interior's Standards for the Treatment of Historic* Properties.

** Proposed physical work within the 100' setback of wetlands and certified or potential vernal pools will be coordinated with the Conservation Commissions in the appropriate municipality (Belmont, Lexington or Waltham).

Unit costs are based on RS Means - Site Work & Landscape Cost Data 2009 and figures updated from 2006 draft RMP.

Total Recommended Enhanced Services – Capital Improvements

Reservation-wide	$ 500,000	Acquisition of voluntary conservation restrictions along Beaver Brook.
Beaver Brook Reservation	$ 322,500	
Beaver Brook North Reservation	$ 1,617,000	Note that the estimate for removal and disposal of the water tower is a very conceptual cost ($ 500,000) and should be evaluated in greater detail.

Figure 5.3: Site cleared from debris in the Beaver Brook North Reservation, 2006. This area is recommended for wetland re-vegetation as an expanded level of management and service (Pressley Associates).

Figure 5.4: Bituminous concrete paving west of the former MSH Administration Building, 2009. This paving and associated debris should be removed and the site restored as a basic service in collaboration with the City of Waltham, DCAM, and the Avalon development (Pressley Associates).

Priorities

In general, the basic service capital improvements listed above for the original Beaver Brook Reservation involve the repair of existing features, and work needed to ensure that the reservation can be effectively and safely used by the public. Of these, repair of the existing stone wall and work to address threats to the Stearns Barn are most urgent. Enhanced services at the Beaver Brook Reservation complete needed capital improvements to major features (Stearns Barn and Mill Pond dams), implement universally accessible trails, all of which are urgently needed.

At Beaver Brook North, basic service capital improvements complete the site restoration/remediation associated with the demolition or abandonment of the Metropolitan State Hospital features (buildings, roadways, tennis courts), which is still not fully implemented and which should be done collaboratively with DCAM, AvalonBay Communities Inc. and the City of Waltham. Failure to complete this work conveys a deteriorated and abandoned condition and fosters vandalism, and fails to meet the conditions set forth in the MSH Reuse Plan. The new Beaver Brook North Reservation is currently only accessible by bicycle or on foot from another location, so that construction of the proposed DCR/City of Waltham parking area is considered a basic level of service, as is providing a curb cut on the Metropolitan Parkway to facilitate maintenance vehicle access to the carriage roads. While changing the existing cobra-head light fixtures to a more appropriate acorn fixture is listed in the recommendations in the previous chapter, the high cost (e.g. $350,000) of implementing this recommendation my not be prudent so this cost is not included in Table 5.2. Instead, DCR should focus on immediate health and safety issues, site remediation, and providing basic public access at Beaver Brook North.

The third priority for Beaver Brook North must be a solution for the former MSH Administration Building, which is a contributing [historic] resource and has been abandoned for some time. This was originally slated to be used by the City of Waltham as the golf clubhouse, with space for a DCR reservation visitor center. If the City does not move forward with plans to construct the 9-hole golf course, a new, appropriate use must be found for this building. In the meantime, the City should implement emergency stabilization to prevent further vandalism and repair any condition that threatens the structural and historic integrity of the building.

Figure 5.5: Rear of the former MSH Administration Building, 2009 (Pressley Associates).

Figure 5.6: Front portico of the former MSH Administration Building, 2009 showing graffiti, vandalism, and vegetative threats, which need urgent attention (Pressley Associates).

Endnotes

[1] Annual inspections of the Beaver Brook North Reservation should be done to revisit the re-vegetation recommendations, as the process of volunteer plant growth and natural succession may mean that some areas do not require re-vegetation, or that increased management of invasive species may be needed.

[2] This work should be coordinated with site remediation related to the demolition of the former MSH male and female dormitories.

[3] Note that as of spring 2009, the MSH Administration Building continues to deteriorate, with vandalism evident. Without a current building program and use, nor detailed information regarding the structural integrity, systems, etc., true rehabilitation costs are unknown at this time. The figure listed in the RMP assumes the costs to retrofit existing finished space in a small portion of the building, and does not address broader issues related to improving the condition of the building, finding appropriate new uses, upgrading systems, and accommodating universal access, all of which should be done by the City of Waltham. For more detail on the agreements associated with MSH reuse and disposition, please see supplemental Appendix G, Volume 2.

Figure 6.1: Beaver Brook North Reservation with potential new wetland area in the former debris site, 2006 (Pressley Associates).

Chapter 6

Operations Plan

Introduction

The purpose of the Operations Plan is to identify the resources needed to adequately manage and maintain the expanded Beaver Brook Reservation. As stated in Chapters 2 and 4, DCR does not currently have any staff specifically allocated to the expanded Beaver Brook Reservation, and the property is managed by staff assigned to the Alewife and Mystic Reservations. This is further complicated by the fact that DCR resources and staffing capabilities and operational funding varies from year to year and from season to season, and demands on DCR resources and staffing also fluctuate from year to year (but demands generally increase as a whole.) In addition, the process of transferring management control of the Beaver Brook North Reservation has been complicated by another state agency's (DCAM) authority over construction of the new parkway, demolition of former hospital buildings, remediation of the former debris sites, and the transfer of the central portion of the property for private residential development.

The expanded Beaver Brook Reservation requires a comprehensive management and maintenance program, which is integral to both public enjoyment of the reservation as well protection and perpetuation of the property's significant natural and cultural resources. As the expanded reservation is under the single jurisdiction of DCR, the Beaver Brook Reservation and Beaver Brook North Reservation need to be managed as a single entity to share the vision and goals adopted by DCR. However, despite sharing some maintenance requirements, the properties are significantly different in character. Beaver Brook North Reservation has the potential to develop into a self-sustaining natural system with limited disturbance. One of its most desirable characteristics is the fact that it has not been intensely managed in recent history so that the natural system and carriage roads and trails have a rural character in contrast to other urban parks. The Beaver Brook Reservation is a more actively used area, requiring more frequent intervention and maintenance, but it still has natural woodlands and trails that feel somewhat remote, particularly in the northern parcel.

Conventional urban park maintenance strategies may not be well-suited to the complex management requirements of the expanded Beaver Brook Reservation. Rather, this property calls for a comprehensive program with strategies directed to alleviating the inadequacies in current management and operations funding to ensure the long-term ecological health and integrity of the reservation and provide a meaningful recreational amenity. While park operations must address specific issues such as user safety, supervision, administration, programming, stewardship enhancements, and funding opportunities, the maintenance strategy for this Reservation should promote environmentally and culturally sensitive methods, particularly for Beaver Brook North Reservation.

As part of the Reuse Plan and its associated amendments, DCAM was charged with constructing the Metropolitan Parkway, demolition of structures in the reservation portion of Beaver Brook North Reservation, and clean up of debris areas. Once this work was completed, these specific sites were turned over to the DCR for ongoing maintenance, management and operation. The Second Amendment to the Reuse Plan stipulates that care and control of the Metropolitan Parkway and Emergency Access Way will be the responsibility of the DCR including "without limitation plowing, patching, grass cutting, weed control, drainage, as well as painting, repairing, repaving, replacement, and all other general parkway maintenance repair and replacement. In addition, DCR may negotiate agreements with any or all municipalities for the provision of these services."[1] This increased responsibility has had a real impact on current operations.

The City of Waltham is responsible for golf course development with remediation of site alterations within the specific land area identified in the Reuse Plan, on which DCR also holds a conservation easement. If the golf course development is not carried out, the City can develop the site for "conservation, playground, recreational, and/or park uses."[2] Waltham is also mandated to construct the parking area along the Metropolitan Parkway adjacent to the former MSH Administration Building (which the City also owns). The conservation easement specifically states that DCR is not responsible for maintenance of the Waltham land. However, the Reuse Plan allows the Mayor and the City Council to transfer the proposed golf course property to DCR, to be incorporated into the expanded Beaver Brook Reservation.

AvalonBay Communities, Inc. acquired the core campus of the former Metropolitan State Hospital in 2006, and has renovated the site within the town of Lexington as a residential development.

DCR Management Structure

The Department of Conservation and Recreation manages park, reservation, forest, and recreation facilities under the Division of State Parks and Recreation and the Division of Urban Parks and Recreation. Beaver Brook Reservation is located in the Fells District of the Urban Parks North Region. Assignment of staff and allocation of resources (such as funding, materials and staff positions) is based on regional management priorities. Given the fact that current staffing levels for DCR operations are less than sufficient to support all of the facilities in this region, priorities for staffing are directed to properties based on level of use, intensive recreational facilities, and public safety. As a result, Beaver Brook does not have any maintenance or operations staff assigned exclusively to this reservation. Although the spray pool has seasonal lifeguards borrowed from Sandy Beach, these individuals are assigned to the pool and play area and do not provide services to the reservation as a whole.

Figure 6.2: Spray pool in Beaver Brook Reservation, 2005 (Pressley Associates).

Proposed Management Levels

In order to address this deficit, the RMP identifies a multi-tiered approach to park operations, with three levels of proposed staffing:

- Level 1: Current staffing level that provide limited, basic management responsibilities for the entire expanded Beaver Brook Reservation;

- Level 2: Minimal essential staff needed immediately to maintain both the Beaver Brook Reservation in its current condition, and meet the immediate needs of Beaver Brook North Reservation and the Metropolitan Parkway. Note

that this is not status quo and in fact represents an increase from current staffing levels;

- Level 3: Optimum staffing plan that will make possible both more intensive use, enhanced visitor experience, and opportunities for increased resource stewardship.

Level 1

Level 1 (current staffing) management provides limited, basic management responsibilities for the entire expanded Beaver Brook Reservation. These responsibilities include, for the original Beaver Brook Reservation: road and parking lot maintenance including snow plowing; trash collection; seasonal lawn mowing; seasonal spray pool staffing and maintenance; and seasonal staff attendance at special permit picnic activities. For Beaver Brook North, these responsibilities include: new parkway maintenance including street sweeping, snow plowing, catch basin maintenance; maintenance of the adjacent new bike path; maintenance of MetFern Cemetery, and maintenance of the proposed DCR parking area when it is constructed.

Figure 6.3: Metropolitan Parkway and adjacent bike path in the Beaver Brook North Reservation, 2006 (Pressley Associates).

Level 2

Level 2 management provides maintenance for the reservation in its current condition, with no significant change to the visitor experience. Level 1 (current) staffing levels are not sufficient to achieve the Level 2 goal, largely because of the addition of 254 acres of open space beyond the original 59-acre Beaver Brook Reservation and previous reductions in staffing. Level 2 staffing would provide services to support passive trail use at both properties including walking, birding and dog-walking; active recreational use of the fields, tennis courts, and spray pool in the Beaver Brook Reservation and implementation of high priority and some medium priority recommendations of the RMP. However, Level 2 does not provide for any programmed interpretive services. This includes two full time, year round positions and three seasonal positions. This would also help alleviate some of the region-wide operational burden resulting from shared positions and lack of staff positions assigned exclusively to Beaver Brook. DCR should also negotiate an agreement for snow removal along the new parkway with one of the three municipalities that the parkway will cross in order to alleviate the need for additional district staff during snow events.

Proposed Level 2 Staffing – New Positions

- 1 long-term Forest and Park Supervisor II
- 1 short-term, seasonal Ranger
- 1 long-term, year round Laborer
- 2 long-term, seasonal Lifeguards for the spray pool - June 1 to September 1 or Memorial Day to Labor Day (14-16 weeks)

Level 3

Level 3 staffing achieves the optimum staffing level, which includes supervisory positions, maintenance staff, and visitor services. Under level 3 management, DCR staff will work to further improve the condition of the reservation and provide regular public programs. This could greatly enhance the visitor experience and enhance long-term planning related to needed capital improvements. Annual and routine maintenance activities that enhance resource stewardship and park use include trail and pathway repairs, invasive species management, selective planting, and park interpretive programming. This level of management provides for adequate staffing to meet the routine needs of the park, with the added benefit of public programs. This would be a huge improvement for the reservation and provide a great service to the community. Level 3 should be the ultimate funding and staffing goal for the DCR.

Proposed Level 3 Staffing – New Positions

- 1 long term, year round Forest and Parks Supervisor III
- 1 long term, year round Forest and Parks Supervisor I
- 3 long term, seasonal Rangers I (32 weeks)
- 2 long-term, year round Laborers
- 2 long-term, seasonal Lifeguards for the spray pool

Figure 6.4: Play field in the Waverly Oaks parcel of Beaver Brook Reservation, 2005 (Pressley Associates).

Equipment Needs

The DCR Division of Urban Parks and Recreation has identified the following equipment needs for the expanded Beaver Brook Reservation:

- (1) 1-ton dump 4x4
- 9 ft. snow plow
- Slip on sander
- Trackless sidewalk machine with snow attachments and lawnmower attachment
- Snow blower
- Small lawnmowers
- Weedwackers
- Pole saw
- Chainsaws
- Set of chainsaw related material (gas tanks, sharpening tools, helmet, chaps, etc.)
- Backpack blower
- Chipper
- Misc. hand tools (rakes, brooms, shovels, pick sticks, etc.)
- Related material for chipping (gloves, eye protection, hearing protection, hard hats, etc.)

DCR Urban Parks Trust Fund

Currently, the DCR Urban Parks Trust Fund contains $600,000 principal specifically designated for the expanded Beaver Brook Reservation, which was paid by the City of Waltham as part of their 54-acre acquisition for a proposed new municipal golf course on land formerly part of Met State Hospital. This fund and the interest it generates can be used for staffing and equipment, provided at least 25% of the principal remains intact to generate interest in the future.

Maintenance Areas and Standards

Establishing maintenance areas for both the Beaver Brook Reservation and Beaver Brook North Reservation will greatly facilitate park operations. Maintenance areas are geographically defined areas with a specific landscape cover that require a consistent level and intensity of maintenance work. For example, maintenance activities for the spray pool and play area in the Beaver Brook Reservation are much more intensive and different in character than those required to sustain the natural wetlands in Beaver Brook North Reservation. In addition, there are some areas of Beaver Brook North Reservation that will require a higher level of maintenance during the next few years due to the construction activity, but are expected to stabilize. These include newly planted street trees along the parkway and disturbed areas to be re-seeded or re-vegetated. Once these zones are established, specific maintenance tasks can be defined.

Figure 6.5: Paved path in the Historic Beaver Brook Reservation, 2006 (Pressley Associates).

Recommended Maintenance Areas

Historic Beaver Brook Reservation

Area 1 Intensive recreation areas – paved (play area, spray pool, picnic shelter, restroom, tennis courts, and parking areas)

Area 2 Trees over grass – areas in both the north and south parcels

Area 3 Mown grass and turf field

Area 4 Historic dams, mill foundations, Duck Pond, and Mill Pond

Area 5 Wetland areas

Area 6 Woodlands

Area 7 Trails and pedestrian paths

Beaver Brook North Reservation

Area 1 Metropolitan Parkway including the north and south sections, bikeway, and the emergency access connector.

Area 2 Disturbed areas to be re-vegetated – this includes dump sites construction zones along the parkway, and areas where buildings have been demolished.

Area 3 MetFern Cemetery (see below)

Area 4 Shared-use trail on historic carriage road

Area 5 Rustic [single track] shared-use trails and pedestrian paths

Area 6 Wetlands, vernal pools, and natural communities (see below).

Figure 6.6: Rustic trail in the Beaver Brook North Reservation, 2006 (Pressley Associates).

MetFern Cemetery

The existing cemetery is a highly sensitive resource with specialized maintenance needs. The draft Preservation and Maintenance Plan provides the framework for ongoing care of this cemetery. If DCR is able to establish maintenance positions assigned to the expanded Beaver Brook Reservation, specific training in cultural resource management and cemetery maintenance may be beneficial. Annual conferences and workshops conducted by organizations such as Mount Auburn Cemetery, the National Park Service, and the DCR provide guidance related to maintenance and management of cemeteries and burying grounds. The DCR Office of Cultural Resources and the DCR Archaeologist provide ongoing technical support to the operations staff.

Figure 6.7: MetFern Cemetery, 2005 (Pressley Associates).

Wetlands, Vernal Pools and Natural Communities

The primary maintenance and management activities for these areas should be monitoring, habitat protection, and invasive species management rather than traditional maintenance practices. The Massachusetts Wetlands Protection Act protects 100-foot buffer zones to all wetlands, and more specifically, these regulations protect vernal pool habitat of 100 feet beyond the vernal pool boundary. These buffer zones and habitat areas should be left in their natural conditions with minimal disturbance limited to existing trail maintenance. Depending on the long-term staffing plan for the reservation, additional staff training may be desirable to aid in identifying threats to these resources and any other specific management requirements. These might include seasonal trail closures that may be necessary to protect amphibian and reptile migration during the spring months.

Figure 6.8: Vernal pool in the Beaver Brook North Reservation, 2006 (Pressley Associates).

Collaborative Management Opportunities

Given limited maintenance staff and funding, partnerships and collaborations that achieve mutual goals for the reservation and the adjacent properties will be mutually advantageous:

1. Pursue a cooperative maintenance strategy for the Metropolitan Parkway with AvalonBay Communities, Inc., City of Waltham and the Town of Lexington. This approach would achieve mutual benefit for both DCR, AvalonBay, and the municipalities, ensuring that adequate maintenance capacity exists to care for the parkway and its adjacent trees, bikeway and drainage system now that construction is complete. Ideally, a maintenance strategy for the parkway should be in place as soon as possible so that DCR is prepared for the winter season.

2. Pursue partnerships related to trail management and maintenance. DCR has existing relationships in place with trail users such as the New England Mountain Bike Association (NEMBA) as well as the Western Greenway partners such as Mass Audubon, Town of Belmont, and others, which could be mutually beneficial to both organizations at Beaver Brook.

3. Pursue partnerships and collaborative opportunities related to public education and environmental stewardship. Both Beaver Brook North Reservation and the Beaver Brook Reservation provide tremendous opportunities for school programs, higher education special projects, and environmental education. Several nearby organizations and institutions, along with the school departments of the three communities could be strong candidates for collaborative environmental programming.

Endnotes

[1] Second Amendment, "Metropolitan State Hospital Reuse Plan," p. 6.

[2] As stated in the MSH Reuse Plan, amendments and the conservation easement.

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