2 FINDINGS AND RECOMMENDATIONS

A. CURRENT SITE CONDITIONS

The study area is the last remnant of the former Great Swamp that once stretched from Fresh Pond to the Mystic River. However, this relict ecosystem has been highly altered by the use and re-use of the area over the past 350 years. Even the briefest review of historical descriptions and illustrations makes clear that the appearance of the area and its vegetation, topography, soils, and geomorphology differ greatly from conditions at the time of European colonial settlement. Despite these radical changes, the area still provides ecological functions that are effectively irreplaceable. Fundamentally, water still drains through the subwatershed to the Alewife Brook. This flow of water — however altered the inputs and flow, and however contaminated the water — persists and continues to define the ecological value of the area. Little River and Alewife Brook remain the lifeblood of the area.

A1. Physical Resources

Most of the study area is the floodplain of the Little River and Alewife Brook and is flat and low-lying. The overall elevation gradient along the length of the study area is less than half a foot, and the average elevation of the study area is less than several feet above sea level. The area is so low in elevation that at times the Mystic River flows upstream into Alewife Brook in a reverse flow.

Following the retreat of the last glaciers 15,000 years ago, kettle ponds such as Fresh Pond and Spy Pond formed, and sands and gravels were deposited in the glacial outwash. An ancient riverbed that once ran through the area deposited the clays that were later mined for brick-making. Generally bedrock lies more than five feet below the surface. Most of the surface soils of the Alewife area were subsequently highly disturbed by cut and fill activities during development of the area. Most of the soils now lack characteristics of naturally developed, undisturbed soils, such as defined layers and horizons, and their poor quality may serve as a constraint to restoration.

FIGURE 13. View of Yates Pond from the top of the Alewife subway station.

In addition to the soils, the hydrology of the Alewife area is also radically altered from its original condition. The major tributaries to Little River, Wellington Brook and Winn's Brook, and the original hydrological connection with Spy Pond all enter the system now via underground pipes. Flow from Fresh Pond, the original source of water in Alewife Brook, was blocked in the 1870s, and most of Alewife Brook, upstream of its confluence with Little River, was buried in a pipe in the 1940s. The construction of Craddock Dam (since removed) and Amelia Earhart Dam on the Mystic River blocked tidal flow from Boston Harbor, converting the Great Swamp from a tidal marsh to a freshwater wetland. Finally, the meandering Alewife Brook downstream of its confluence with the Little River was straightened and made to flow in a concrete channel to speed drainage of water from upstream. Urbanization in the surrounding areas decreased groundwater recharge, resulting in lower base flow. The increased stormwater runoff from the contributing watershed also causes increased peak flows. These sudden, high inputs of large amounts of stormwater into the pond and stream system contribute to bank erosion. Despite these modifications to the hydrological system, all the original hydrological connections remain in one form or another, except for the connection to Fresh Pond.

Water quality in Little River and Alewife Brook is poor because of stormwater and sanitary sewer discharges. The degraded condition of Alewife wetlands also means they are less effective at their natural function of buffering and improving water quality. More than 60 stormwater and combined sewer outfalls (CSO) discharge directly to the study area, while Spy Pond, Wellington Brook, and Winn's Pond bring significant quantities of contaminated stormwater from Belmont and Arlington. Recent projects by Somerville and Cambridge to separate storm and sanitary sewer systems have significantly improved water quality, and continuing projects will yield yet more improvements in the future.

FIGURE 14. The Alewife Reservation, shown during a major storm event, serves as the floodplain for the Little River.

Alewife's altered hydrology combined with extensive development in its floodplain results in severe flooding problems for some residents. There is simply too little flood storage capacity to accommodate very large storm events. In addition, hydraulic constrictions, most notably at the Massachusetts Avenue and Broadway bridges over Alewife Brook, impede river flow during high flow events. Given the sanitary sewer inputs to the system, local flooding may be a health hazard as well.

A2. Biological Resources

Although the various places within the Alewife Reservation and the Alewife Brook corridor seem distinct or different, they are all connected by the water that runs through them. Water unifies the Alewife area. Given how difficult it is to see any water when passing through the area on its two major thoroughfares, Route 2 and Alewife Brook Parkway, most people are surprised to learn just how wet the Alewife area is under normal conditions.

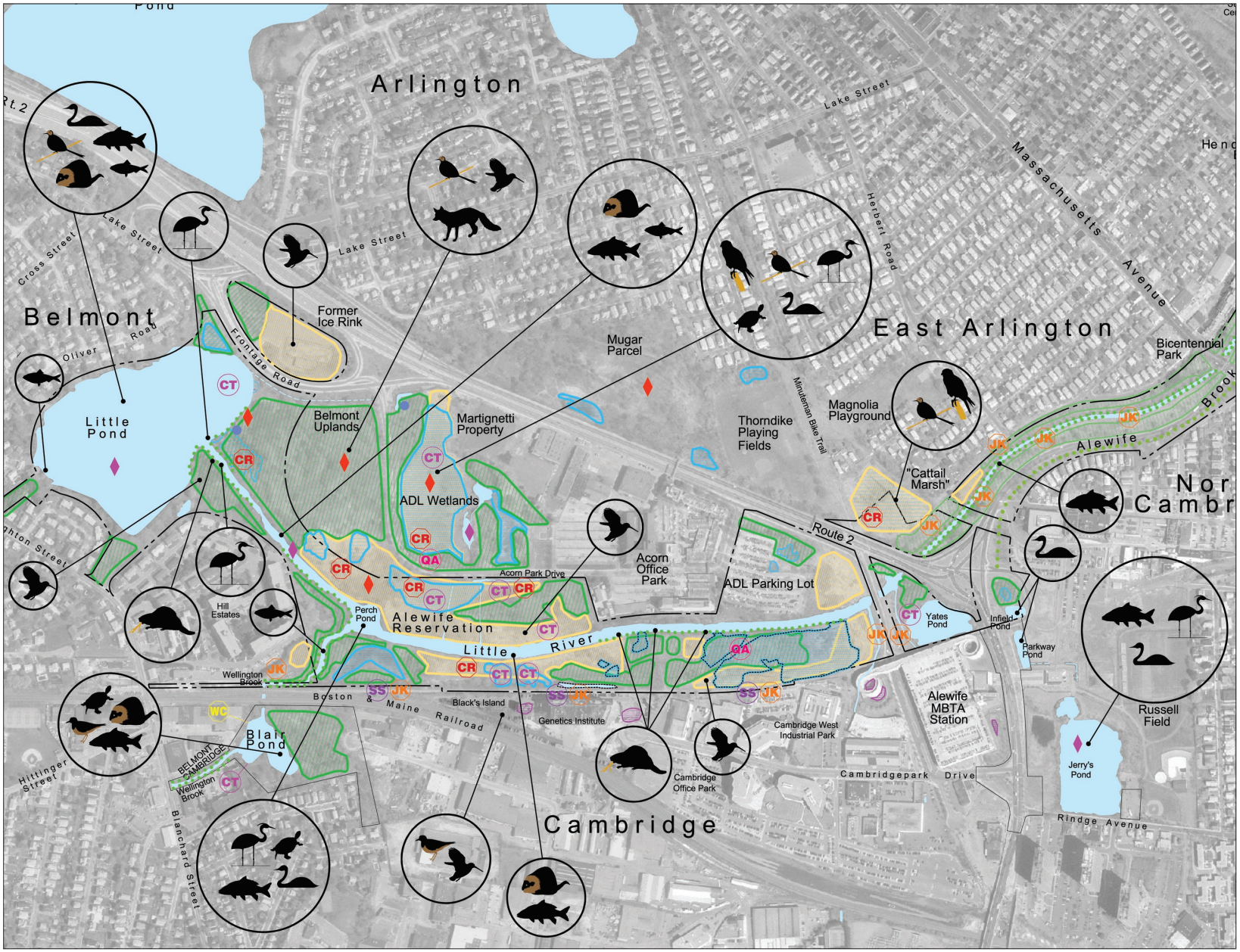
Five ponds lie within the Reservation, and five more ponds lie on adjacent properties. Some ponds are natural, such as Little Pond and Blair Pond, whereas others were made when clay was excavated for brick-making, such as Yates Pond. Three streams, namely, Wellington Brook, Winn's Brook, and Little River contribute to Alewife Brook before it joins the Mystic River. In addition, numerous drainage channels maintain the hydrological connections among the ponds, streams, and wetlands. The wetlands include shallow marshes, wooded swamps, wet meadows, and two human-made wetland types, namely, stormwater detention basins and created mitigation wetlands.

Upland areas, that is, areas that lie outside the 100 year floodplain, are very limited. The only major upland within the Reservation is the site of the former MDC skating rink, northeast of Little Pond. A few other locations in the Reservation and Greenway are elevated, typically because of fill activities, and lie outside of the floodplain. This lack of upland habitat, combined with naturally high groundwater elevations, limit the opportunities to create additional flood storage capacity in the area. The most significant areas that lie outside the floodplain occur on abutting properties such as the Belmont Uplands, portions of the Acorn Office Park (former ADL campus), and the Martignetti property.

Because most of the Alewife area is a low-lying network of wet places, most of the habitat is either aquatic or wetland of various types. Although both the aquatic and wetland habitat are degraded, the aquatic habitat is relatively worse off. Poor water quality, the long stretch of concrete channel, and the extensive siltation that has occurred in the ponds and non-concrete channel beds dramatically reduce the habitat value of the ponds and streams for fish and aquatic plants.

Most of the native fish species that once would have lived and bred in the Alewife waters are no longer found in the system. Fish such as brook trout, brown bullhead, and white perch have been replaced by nonnative species such as largemouth bass and common carp, the dominant fish at Alewife (refer to Appendix A for a list of existing flora and fauna). Anadromous fish species, namely, alewife and blueback herring, were once so abundant that sometimes 50,000 fish were caught in one catch. The Amelia Earhart Dam at Boston Harbor continues to be an obstruction for fish passage but small numbers of alewife and blueback herring still manage to migrate up Alewife Brook and Little River to spawn in Little Pond and Wellington Brook.

Where siltation has reduced stream depth to less than 12 inches, water temperature tends to be too high for many native fish species. Common carp, which tend to fare better un-



HABITAT INVENTORY

LEGEND:	
	LIMIT OF PROJECT AREA (APPROXIMATE)
	TOWN/CITY BORDER
	PLAYING FIELDS (PERVIOUS)
HABITATS	
	OPEN WATER (STREAM, SWALE, POND)
	STANDING WATER WITH EMERGENT VEGETATION
	INTERMITTENT CHANNEL
	WOODLAND / CONTINUOUS CANOPY
	GRASSLAND
	WOODLAND WITH STANDING WATER
	GRASSLAND WITH STANDING WATER
	CREATED WETLAND
	MOWED GRASS WITH SCATTERED TREES
	TREE-LINED BANK WITH CONTINUOUS CANOPY
	PARKWAY EDGE (TREES, MOWN GRASS, PAVING)
	WETLAND DELINEATION APPROVED BY LOCAL CONCOM
	POTENTIAL VERNAL POOL
INVASIVE SPECIES DOMINANCE	
JK	JAPANESE KNOTWEED
CR	COMMON REED
WC	WATER CHESTNUT
MONOTYPIC STANDS OF PLANTS	
CT	CATTAIL
SS	STAGHORN SUMAC
QA	QUAKING ASPEN
HABITAT VALUE FOR WILDLIFE	
	HIGH VALUE AQUATIC HABITAT
	HIGH VALUE TERRESTRIAL HABITAT
WILDLIFE	
	BEAVER
	FOX
	MUSKRAT
	TURTLE
	RIVER HERRING (ALEWIFE, BLUEBACK HERRING)
	OTHER FISH (CARP, ETC.)
	HERONS (GREAT BLUE, BLACK-CROWNED NIGHT, GREEN-BACKED)
	WATERFOWL (CANADA GEESE, BLACK DUCK, MALLARD DUCK, ETC.)
	KILLDEER
	WOODCOCK
	MIGRATORY BIRDS (ROBIN, REDWINGED BLACKBIRD, ETC.)
	BIRDS OF PREY

FIGURE 15. A series of comprehensive maps was produced to illustrate the resources at the Alewife Reservation and the Alewife Brook Greenway. This excerpt from the habitat inventory map shows habitat types and species of importance in the Alewife Reservation.

der these warm, shallow, and low-water-quality conditions, appear to consume most of the aquatic vegetation that does manage to grow in the stream channels. In contrast to the streams, the Alewife ponds have some aquatic plants such as pondweed, bladderwort and water milfoil. Three years ago Blair Pond and Little Pond were badly infested with the invasive water chestnut, but a concerned citizen has controlled the problem by hand-removing the plants at precisely the correct time before they release their seeds. Infestation is under control, but continuing effort is needed to prevent re-infestation.

The land on the north and south banks of the Little River is primarily wetland, but varies from wooded swamp to open wet meadow. Weeping willow, black willow, gray birch, silver maple and quaking aspen are important trees offering canopy cover and habitat for birds and mammals. Coyote scat were found on the north bank during a 2002 wildlife inventory (refer to Appendix A for a list of existing flora and fauna). The MDC land surrounding the Little River and abutting properties (Belmont Uplands, ADL wetland, Martignetti property, and Acorn Office Park) is the largest contiguous area of natural habitat in the area. No doubt this explains the presence of larger mammals such as coyote and deer and its attraction to the large birds of prey that frequent the area.

FIGURE 16. Beavers have recently begun feeding on quaking aspen saplings along the Little River.

The Reservation has plentiful food for predators that feed on rabbits, feral cats, moles, and other small mammals.

Extensive stands of *Phragmites* (common reed) and areas of thick understory shrubs and vines provide extensive cover to small mammals. Common species in the understory include sumac, dogwood, speckled alder, and various *Viburnum*. Bald eagles have been sighted at the Reservation, while other birds of prey appear to be resident. For example, a Peregrine falcon has lived in the area for a number of years and at times is sighted almost daily perched on the top of the Rindge Apartment Towers during morning rush hour. Migratory waterfowl and songbirds also regularly visit the area.

FIGURE 17. Woodcocks, which can be observed in the Alewife Reservation, prefer wet, scrubby habitat interspersed with open grassy areas, a habitat type that is being lost state-wide to forest succession and bottomland development.

Most of the open wetlands are dominated by *Phragmites* due to soil disturbance and altered hydrology. However, several stands of cattail can be found in the Reservation, on the northeast corner of Little Pond, and in the cattail marsh just downstream of the Route 2 rotary.

In the Alewife Brook corridor, along the stream banks, the main habitat types differ from the Reservation. Several long stretches along the Parkway consist of more formal parkland with specimen trees, mown lawn, and pedestrian paths.

The parklike character of the west and east bank Greenway contrasts with the habitat on the banks of the Alewife Brook. In the Greenway section, the Alewife Brook is fenced off and flows through a long stretch of concrete-lined channel. Within the fences that line the brook, the banks support extensive woody vegetation in some areas and in other areas very extensive and well-established stands of another invasive species, Japanese knotweed. Along the tree-lined sections of bank, maple, oak, alder, birch, willow, locust, sycamore, and pin cherry provide a relatively diverse flora. However, less desirable species such as sumac and tree-of-heaven are also common. Horned owls, kingfishers, and great blue herons are some of the birds that are seen, and both red foxes and muskrats are known to use the Greenway.

FIGURE 18. Black-crowned night herons have been reported to roost in the area where the Little River leaves Little Pond.

In summary, significant ecological resources were identified in the Alewife Reservation and Alewife Brook corridor, and for most of these resources, their value extended well beyond the boundaries of the study area. The area provides flood storage capacity to the whole subwatershed and to a "sewershed" that goes beyond the borders of the subwatershed. The wildlife habitat serves to support animals that otherwise would struggle to survive in the surrounding four municipalities. Although not formally recognized, rare, endangered, and/or protected bird species use the area, as well as migrating birds.

FIGURE 19. A number of turtle species can be found in the Alewife Reservation such as these painted turtles.

A3. Cultural and Socio-economic Resources

The Alewife study area provides a rich chronicle of the settlement and development of the New England coastal landscape, with many sites of historical interest and significance. The Reservation provides recreational opportunities to surrounding communities and is ideally located relative to regional bike and pedestrian paths; proximity to public transportation, nearby playing fields and residential developments; and easy access to roads and parking lots. Diverse land uses surround the study area, including commercial shopping districts, industrial and corporate centers, residential communities of predominantly high density, and some public open space. The Alewife Brook Greenway serves as a utility corridor containing gas line easements, telephone lines, and sewer and storm drainpipes (Figure 20 illustrates cultural resources in the Reservation).

More than a dozen citizen interest groups are focused on the Alewife study area. Prevalent issues include, but are not restricted to: reducing flooding and improving water quality, sustaining and enhancing biological diversity within the Reservation, developing educational opportunities for school children and adults, and monitoring and limiting current and proposed future development projects in the area.

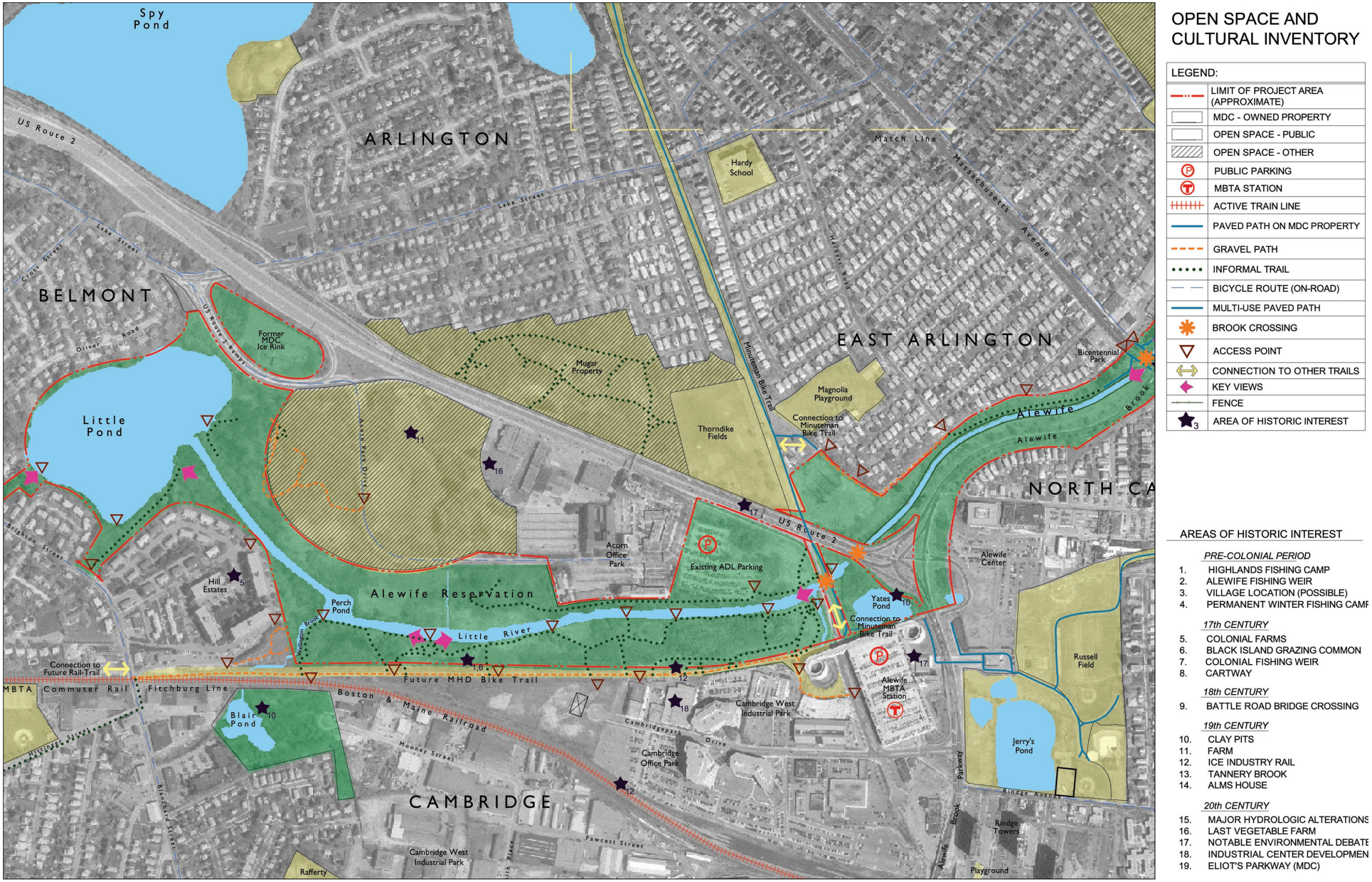


FIGURE 20. This excerpt from a map of cultural resources depicts public and private open space, existing paths, major roadways, parking facilities and historic points of interest in the Reservation and in the southern portion of the Alewife Brook corridor.

B. GOALS AND OBJECTIVES

Along with findings from the Inventory of Resources described above, four Master Planning goals were developed for the proposed restoration and enhancement of the Alewife Reservation and the Alewife Brook. Each of these goals is composed of three or four major objectives, with some overlap among them. Thus addressing one objective will likely address others as well. The ultimate success of restoration efforts will depend on how well these goals and objectives are met. However, it is important to recognize that in some areas the goals may go beyond the limits of the study area itself.

Meeting Goal 1 requires involvement by neighboring communities outside the bounds of the study area. For example, cities and towns should decrease their pollution (especially fecal coliform bacteria) from combined sewer and stormwater overflows by eliminating cross contamination and illegal connections to storm drains. Pollutants washed from parking lots and lawns by stormwater should be reduced or eliminated through low impact development (LID) techniques, e.g., substituting infiltration swales for curbs, gutters, inlets, and drains wherever possible. Placing development limits on the creation of impervious surfaces will maintain stormwater infiltration and enhance the flood storage capacity of the Alewife area.

Goal 1: Improve water quality and restore natural hydrology

Objectives

- Protect existing and increase future storage capacity of stormwater runoff to reduce threats of flooding.
- Decrease pollution from combined sewer and stormwater overflows.
- Decrease nonpoint sources of pollution from stormwater runoff by implementing traditional and innovative best management practices (BMPs).
- Re-establish a more stable and natural stream geomorphology.

Goal 2: Protect and enhance wildlife habitat

Objectives

- Improve migratory and spawning habitat for anadromous fish, especially alewife — the namesake species for the entire region.
- Enhance and expand aquatic and riparian habitat for birds and mammals.
- Protect and expand ecological connections to surrounding, non-MDC, open spaces with a broadened habitat perspective.
- Manage the study area to enhance species and habitat diversity.

Goal 2 also requires efforts that extend beyond the specific recommendations for the study area described in Section 2D. For example, enhancing habitat for migratory birds depends in part on acquiring and protecting abutting wetlands and upland areas. Where protection is not possible, ecologically sensitive development is critical.

FIGURE 21. The Master Plan recommendations will provide opportunities for students to learn ecology lessons through first hand experience at the Alewife Reservation.

Goal 3: Improve recreational, educational and cultural opportunities

Objectives

- Facilitate public use of the Alewife Reservation and Alewife Brook Parkway.
- Increase stewardship of the Reservation by users and other stakeholders.
- Interpret ecological and cultural history from the time of the Great Swamp to today's relict wetland ecosystem.

Recommendations to improve public use of the Reservation and Greenway are presented in Sections 2C and 2D.

There is a recognized need for the MDC to work with abutters, concerned citizens, and interest groups. Citizen-based monitoring and stewardship programs managed and coordinated by the MDC should be encouraged and enhanced to ensure progress implementing the Master Plan. Creative means for obtaining on-going funding for restoration and maintenance need to be explored that will maximize environmental involvement and stewardship by surrounding industries and businesses.

Goal 4: Provide for maintenance that minimizes costs and maximizes effectiveness

Objectives

- Create a low-maintenance, long-term, self-sustaining landscape.
- Implement MDC-managed citizen-based monitoring and stewardship program.
- Identify sources for funding and partships for implementing the Master Plan.
- Properly fund and staff the Reservation.

FIGURE 22. Small platforms connected to boardwalks will enhance wildlife viewing in the Alewife Reservation.

C. PROPOSED SITE IMPROVEMENTS AND AMENITIES

Many of the site improvements and amenities described below are closely linked to each other in their function and have been combined in the design. Together, they are designed to reflect the comprehensive goals set forth in this plan, resulting in improved connections for water, wildlife, and people. For better understanding of recommendations described herein, refer to the fold-out Master Plan drawings in Appendix E.

The following paragraphs describe general improvements and treatments but also give an overview of the site program. For more detailed location descriptions for each area, refer to Section 2D.

C1. General Design Criteria

In developing this Master Plan, the planning team established basic design criteria for site improvements and amenities to ensure that the goals and objectives set forth in the Master Plan are reflected in the individual site program elements. These criteria are as follows.

- Incorporate innovative stormwater management techniques into infrastructure design.
- Create a network of wildlife habitat and plant communities using native species.
- Concentrate wider, primary pathways along Alewife Brook and the Parkway. Leave the Reservation for passive recreation with minimized disturbance in sensitive wildlife habitat areas.
- Include educational components, for example, highlight natural and cultural processes through innovative design and exposed infrastructure.
- Integrate educational, interpretive, and directional features with public art.
- Use sustainable and recycled materials where possible (refer to the List of Sustainable Materials in Appendix C).

C2. Hydrological and Hydraulic Improvements

FIGURE 23. Flooded former ADL parking lot in the Reservation.

Major, sustainable improvements to current problems like flooding of abutting homes and businesses and impaired water quality can only be achieved on a watershed scale, and strategies for those planning efforts are discussed in Section 4B of this Master Plan. However, as water remains the driving factor for life and restoration plans around the Little River and Alewife Brook, many of the site improvements described in this section take water into account. The alterations that resulted in today's hydrologic and hydraulic conditions were severe, therefore many of the improvements listed below must be regarded as long-term actions, potentially requiring more extensive studies, modeling, and close evaluation regarding their feasibility. Some studies are currently underway, such as the MDC Mystic River Hydrologic and Hydraulic Study.

Recommended hydrological and hydraulic improvements are as follows:

1. Increase flood storage volume through dredging of ponds and stream channels. This action must be closely linked to a comprehensive strategy to eliminate re-sedimentation from watershed inputs to the system to ensure long-term success. Potential aquatic habitat impacts must be carefully studied and minimized.
2. Increase flood storage volume by lowering floodplain elevation, e.g., through wetland creation and removal of fill material.
3. Eliminate structural constrictions by widening bridge openings and culverts.

FIGURE 24. This stream channel is being restored using bioengineering techniques. These techniques, originally developed in Europe, combine mainly natural materials such as native plants, coconut fiber mats, and rock. They have proven very successful in restoring natural systems.

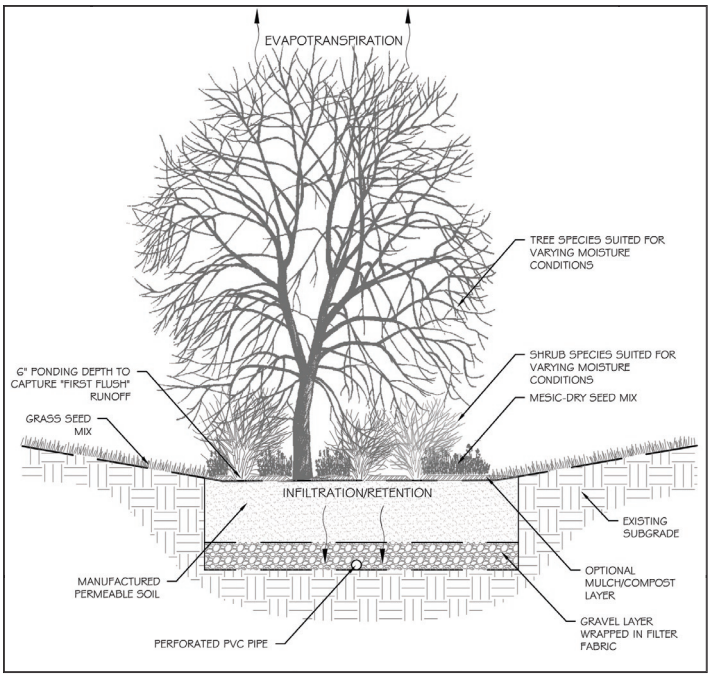


FIGURE 25. Typical bioretention basin for stormwater infiltration and water quality treatment.

4. Realign the stream channel and alter cross sections to achieve a more balanced sediment transport regime.
5. Decrease sedimentation in streams and ponds by stabilizing eroded banks with bioengineering techniques.
6. Improve water quality by enhancing buffer areas, especially using native herbaceous plant communities on stream banks and pond edges.
7. Incorporate innovative stormwater management techniques such as biofiltration basins and stormwater wetlands to improve water quality and decrease water quantity entering the stream system during storm events. These actions must be combined with similar efforts in the entire watershed if a measurable improvement is desired.
8. Achieve a water quality of Class B or better within the Alewife watershed to expand the possible uses of the water bodies to fishing and contact recreation. This effort requires regional planning efforts that focus on the entire watershed (see Section 4B, Recommendations Beyond Study Area). Currently the Little River and Alewife Brook are classified as Class B (swimmable, fishable) streams, but the current water quality does not fulfill the parameters set for a Class B stream and the official process for downgrading the status to the subcategory Class B, CSO is currently underway.

C3. Habitat Restoration and Enhancement

Despite the currently impaired habitat quality, a variety of wildlife is commonly found in the project area and has been identified in recent studies and through observations. However, the remaining habitats are in need of protection and improvements to strengthen the desired wildlife communities already present and to improve the conditions for species currently under-represented, such as blueback herring and alewife. These improvements are expected to result in higher population numbers, higher species diversity, domination of native species over exotic intruders, and better connections between isolated habitats.

Recommended habitat improvements are as follows:

1. Improve habitat for wildlife already using the Reservation and increase habitat diversity to accommodate a greater variety of species. Priority should be placed on improving and enhancing wetland habitats, including forested wetland, the aquatic habitat of ponds and stream channels, riparian habitat along the stream banks, wet meadows and swamps, and vernal pools. Increasing fragmentation should be avoided, rather - habitat areas should

be consolidated into larger, contiguous areas where possible. Upland forest is extremely limited in the Reservation, but it is needed to provide habitat diversity and to provide refuge to some species when flooding is extensive. Priority should be placed on preserving abutting upland parcels as natural areas.

2. Improve the soil by amending existing soils to support healthy vegetation, importing "clean" soil (free of weeds, exotic plant parts and seed), and manufacturing a "new soil" from various individual components, especially for use in bioretention/biofiltration areas.
3. Remove exotic species with low wildlife value and replace with noninvasive native species selected for their potential resource value for nesting, food supply, etc. (see the Maintenance Plan in Appendix D and Plant List in Appendix B).
4. Link habitats of vegetative communities by removing invasive plant species and adding native plantings.

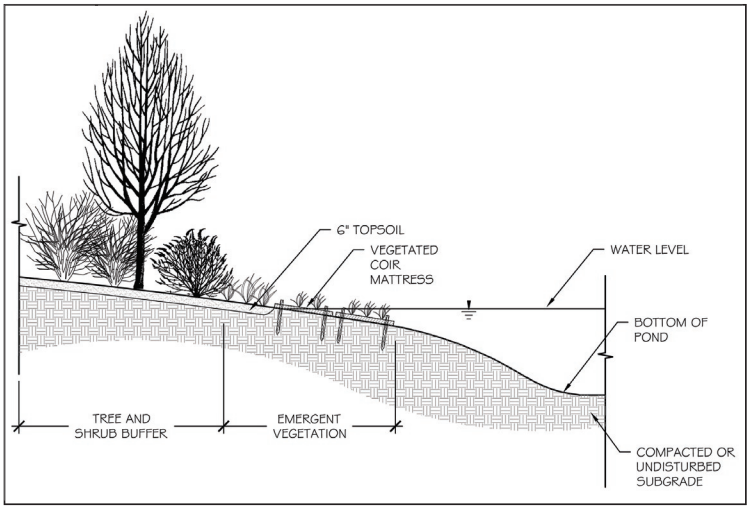


FIGURE 26. Typical emergent pond edge treatment replacing lawn areas, improving habitat diversity, and cleansing water.

FIGURE 27. Meadows serve as habitat for insects such as bees and butterflies, as well as for ground-nesting bird species.

5. Reduce mown lawn areas by adding pockets of upland meadow along the Alewife Brook and Parkway.
6. Replace lawn areas leading up to the water's edge with an emergent plant zone and riparian vegetation to discourage use by Canada geese.
7. Increase flood storage through excavation of the newly created or restored wetlands. Assess feasibility of excavation by testing soils to determine soil contamination from past industrial use and dumping.
8. Design natural areas/habitats to improve water quality by using native plants, especially herbaceous species, that in combination with soil and microorganisms can filter pollutants from the water. Re-grade pond and river banks and shape the channel profile in restored stream sections to encourage the establishment of a herbaceous plant shelf in contact with the water.
9. Decrease sedimentation in streams and ponds by stabilizing eroded banks.

10. Design habitat areas for increased stormwater infiltration by removing existing pavement, adding new native plantings, improving soil conditions (for example, deep tilling in heavily compacted areas, adding of compost and other soil amendments), and importing or manufacturing new soil.

C4. Circulation and Access Improvements

Gateways and Entrances

The Master Plan proposes two major gateways that will serve as the primary access to the Alewife Reservation and Alewife Brook Greenway. The major gateway into the Reservation will be located just northwest of the Alewife Subway Station and adjacent to the Minuteman Bikeway terminus. This area is currently used as the entry point for most Reservation visitors. An information kiosk exists at this entry.

FIGURE 28. This gateway to the Upper Charles Reservation is an example of possible gateway design for the Alewife area.

Obelisks similar to those found at the Minuteman terminus will signal the gateway for the Reservation and the connection to the Fitchburg Cutoff Bicycle Trail, a proposed multi-use trail that the Massachusetts Highway Department (MHD) will construct on the southern edge of the Alewife Reservation. Reservation users crossing a new bridge over old Alewife Brook could orient themselves to the Reservation's rich ecological and recreational history at a new, nearby gathering area. Teachers and naturalists will use the outdoor amphitheater to educate students and other visitors on subjects ranging from birds of prey to wetland systems.

The second major gateway will be located at the northern end of Alewife Brook where it connects to the Mystic Valley River. The Alewife–Mystic Gateway Park will help link these two linear open spaces.

Amenities at the gateways will include seating areas to serve as a gathering point or outdoor classroom, information and directional displays, interpretive and educational signage, and public art. The gateways could also include water fountains and public restrooms. Field and trail guides should be available at these locations.

Several other minor gateways have been identified in the Master Plan including the Reservation access at Brighton/Blanchard Street, the restored east Reservation wetland as well as the Massachusetts Avenue and the Broadway bridge over Alewife Brook. They will incorporate signage, a kiosk/information board to provide general information, trail guide, and interpretive features, and parking (where necessary). Neighborhood residents abutting the park can access the path system in other MDC designated locations, such as at Little Pond and along both sides of the Alewife Brook and Parkway.

Parking

Vehicular parking at Dilboy Field will remain. The existing MDC parking lot there is proposed to be retrofitted or re-built using stormwater best management practices such as infiltration swales and biofiltration areas. These slightly depressed, vegetated areas receive runoff from paved parking surfaces and temporarily store the water above ground, in the soil and in subsurface drainage layers. Biochemical and

FIGURE 29. A biofiltration area in a parking lot.

physical processes would improve the quality of the water before it enters Alewife Brook. A significant amount of the stormwater runoff would return to the hydrologic cycle by means of evapotranspiration through the plants and the soil medium.

The proximity of the Alewife MBTA parking garage to the Reservation provides a good parking option for park users. However, the garage fills up quickly on weekdays with commuters. Parking spaces are more readily available on the weekends and after the afternoon rush hour.

Several new, small parking areas (5 to 20 spaces) are planned to reduce the dependence on the Alewife MBTA parking garage. They are: off Acorn Park Drive near the Belmont Uplands; adjacent to the wetland restoration at the former ADL parking lot; and at Brighton Street to serve people accessing Little Pond. These new parking areas should incorporate biofiltration and porous pavement that allows infiltration of stormwater into the underlying soil for groundwater recharge. Bicycle racks should also be provided for those who want to access the Reservation by nonmotorized transportation.

Public Transportation

The Alewife Reservation is accessible to public transportation (e.g. Alewife subway station and connecting bus routes), however, additional signage is needed to direct visitors to the Reservation gateway. The location of the Alewife subway station presents a great opportunity for people to reach this "outdoor classroom" by means of an environmentally friendly mode of transportation.

Circulation Patterns and Connectivity

The primary goal of the proposed circulation system is to establish appropriate connections to existing trails, eliminate inappropriate trails and develop links to the existing regional path system (e.g. Minuteman Bike Trail). The circulation and path system balances the protection of wildlife habitat with the public's desire to observe and appreciate it. Where feasible, paths have been located on higher ground in the least-sensitive areas. Paths leading through sensitive areas or wetlands will be constructed as boardwalks. Areas currently disturbed by filling and dumping activities or infested with exotic species will be properly rehabilitated in future advanced design stages. Examples of such areas include pieces of land south of Little River and along Alewife Brook.

FIGURE 30. Photosimulation of a bridge crossing to allow for loop trails and better connections.

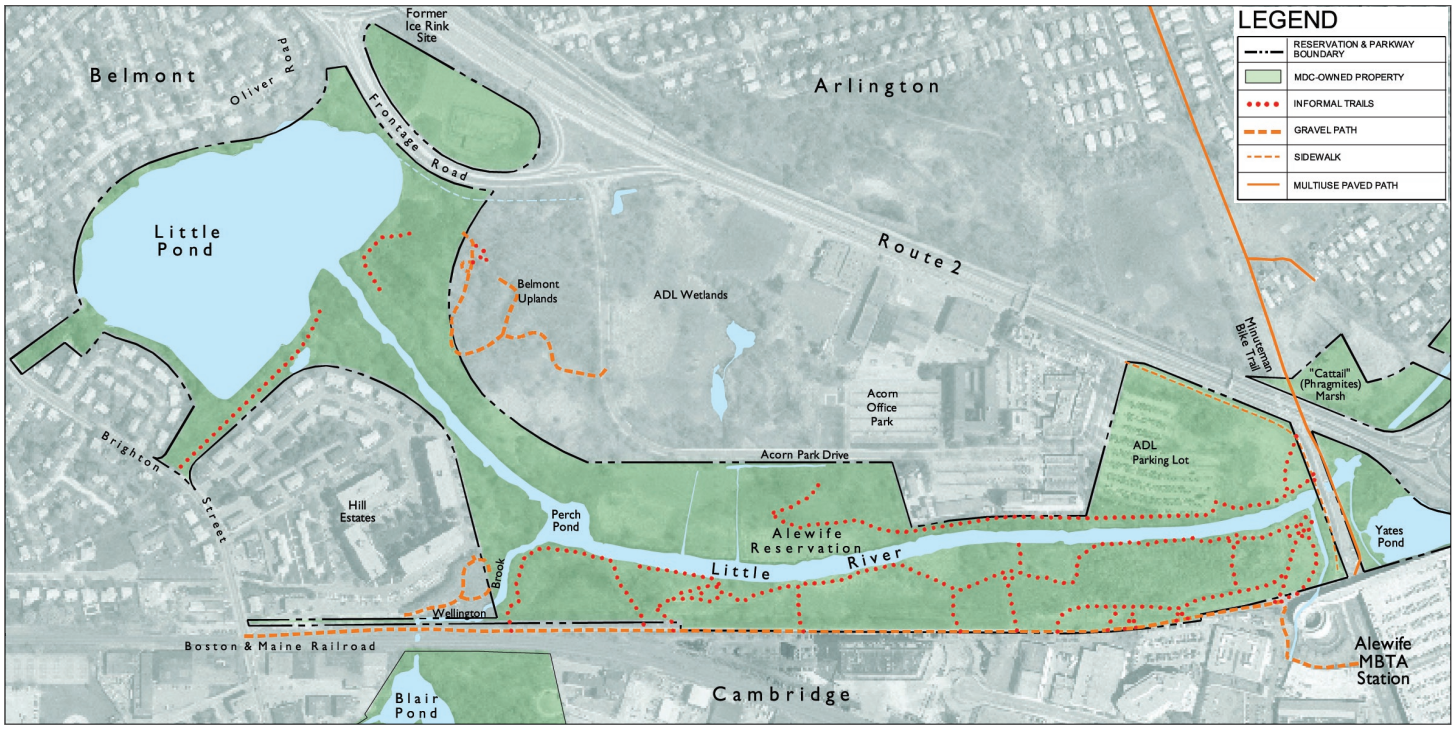


Figure 31: Existing circulation in Alewife Reservation. Numerous informal trails cut through the area north and south of the Little River.

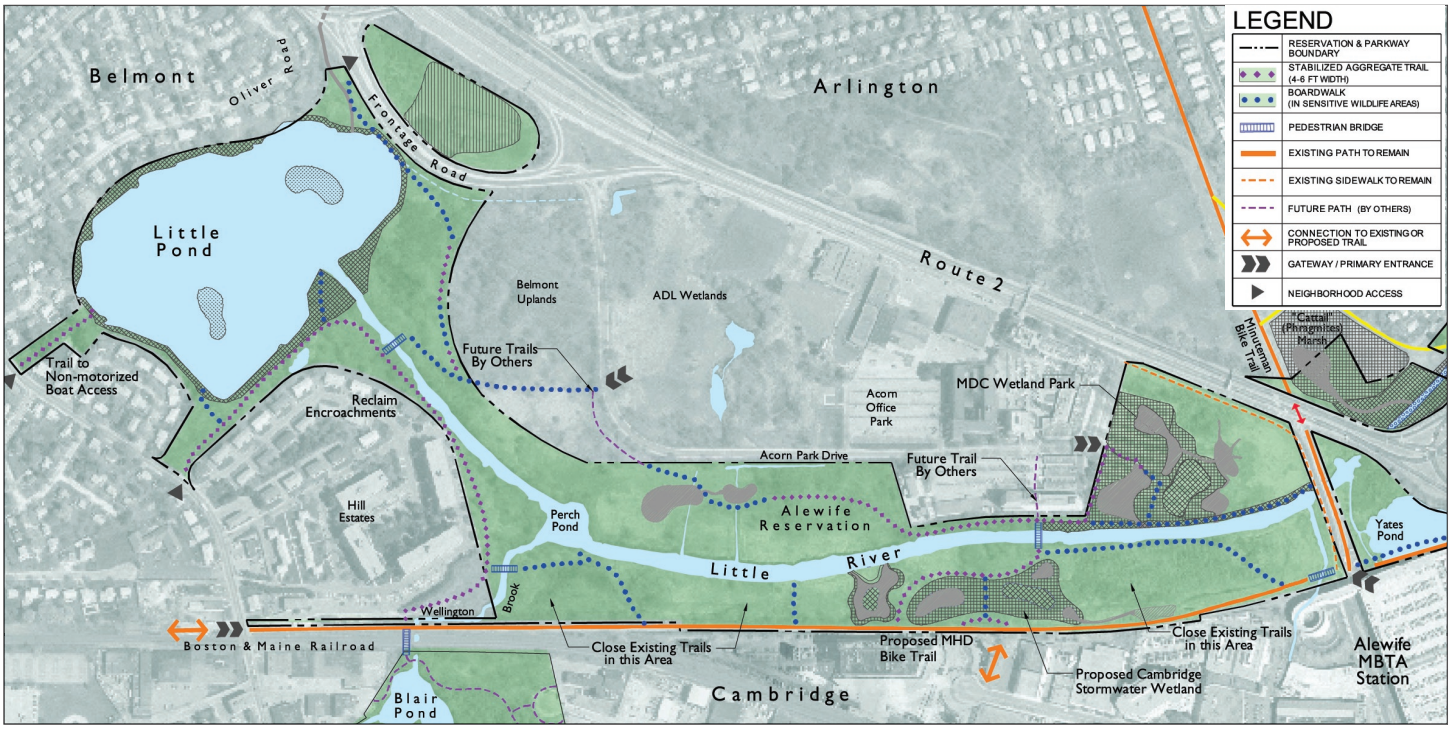


Figure 32: Proposed circulation in Alewife Reservation. The proposed circulation system retains some of the routes of existing trails but converts them to boardwalks to protect sensitive wildlife areas and keep visitors from venturing off the path. Most of the informal trails south of the Little River will be closed using extensive native plantings (thorny species). The proposed paths and boardwalks allow for loop walks, especially in the East Reservation where educational features will enable the area to serve as an outdoor classroom.

The narrow stone dust path that runs along southern edge of the Reservation, also known as the Fitchburg Cutoff Bicycle Trail, is partially located on MDC land. The MHD is planning improvements to that path to provide adequate width and surface. This path will connect to the Minuteman Bike Trail at the Alewife subway station and travel to Brighton/Blanchard Street in Belmont. It will be an important part of the Massachusetts Central Rail Trail (Wayside Section) that is envisioned to span east to west through the entire state. Through the Minuteman Bike Trail, the Fitchburg Cutoff Trail will connect to the proposed Alewife Brook Trail parallel to Alewife Brook through the Greenway and join the Mystic Valley corridor trail system. The major path connection node for the area is conveniently located adjacent to the Alewife subway station. At this location, the proposed paths mentioned above, the Minuteman Bike Trail, and the Linear Path meet existing and potential connections to the Wayside Rail Trail, Fresh Pond, and the Charles River.

The proposed network of trails in the Alewife Reservation focuses on creating several loops that will lead visitors through and around the sensitive wildlife areas using boardwalks and narrow trails. By reducing the existing unplanned network of informal trails, and providing a new high quality path system, negative impact by park users on habitats and animals that live in or use the Reservation will be reduced. Areas where trails will be closed off will be reclaimed for habitat.

The major loop starts at the Reservation gateway behind the Alewife subway station and continues through the area south of the Little River, crossing the Wellington Brook and Little River between Perch Pond and Little Pond. From there, the path runs east along the northern edge of the Reservation, keeping the area along the river undisturbed for wildlife activity. A smaller "educational" trail adjacent to the Alewife subway station incorporates the proposed wetland restoration site in the east Reservation and the proposed stormwater wetland on the south side of the Little River, via a narrow pedestrian bridge. Small platforms, overlooks, and some interpretive features make this smaller loop trail a central focus area for an outdoor classroom.

Trails leading along the edges of Little Pond allow neighbors to access the west Reservation from two points along Brighton Street. A small pedestrian bridge across Little River near Little Pond allows circulation into the areas north of the Little River. The trail alignment in these areas is closely linked with shoreline restoration and riparian habitat enhancements around Little Pond.

Path Types (Width & Surface Material)

Four path types of varying widths and surface material are recommended for the project area. The different types were selected based on anticipated type of use, user frequency, accessibility, and sensitivity to the area where the path will be located. All pathways in the Reservation and along the Alewife Brook are designed primarily for pedestrian and bike traffic. Vehicular traffic (light vehicles such as pick-up trucks) will be necessary on selected paths for maintenance and public safety purposes. Those paths include the trail on the southern edge of the Reservation (Fitchburg Cutoff Trail) as well as the pathways on the west and east side of the Alewife Brook. These paths will be designed to accommodate heavier loads, and collapsible bollards or other appropriate means will prevent access by unauthorized vehicles. There will be path sections with structural limitations that will prohibit maintenance access like the cantilevered path parallel to St. Paul's Cemetery on the east side and the proposed ramp off Broadway on the west side of the brook.

Asphalt Path

Asphalt (bituminous concrete) is a hard surface that accommodates pedestrians, bicycles, wheelchairs, strollers, and in-line skates. Asphalt paths can also be designed to withstand emergency and maintenance vehicles. The generous width of these paths (10 –12 feet) allows for two-way traffic.

Generally the asphalt surface is impervious, but porous formulations are available and can be useful in decreasing runoff. Biofiltration swales parallel to the path or leading from the path to larger biofiltration basins will also be used to retain and treat stormwater. This configuration is suitable along the Alewife Brook Parkway to improve or replace the existing sidewalks.

Stabilized Aggregate Path

This path type is 8–10 feet wide and uses stone dust, crushed stone aggregate (or decomposed granite) and an organic binder to create a semi-porous, stable surface. The path surface is accessible to wheelchairs. The path is semi-permeable and thus most desirable from a stormwater management standpoint. The path usually blends in well with the natural environment. Successful installations of this material type occur on the Minuteman Trail (see Figure 33) and on certain sections of the Fresh Pond Perimeter Trail.

FIGURE 33. A stabilized aggregate path (Minuteman Bike Trail, Concord-Lexington)

FIGURE 34. A stabilized aggregate trail in a natural area.

Stabilized Aggregate Trail

This minor path type is 4–6 feet wide and uses the same surface as described above. It is proposed mainly in the Alewife Reservation where passive recreational activities such as wildlife viewing are common. This path type will provide access while minimizing negative effects on the environment (see Figure 34).

Boardwalks

Six- to eight-foot wide timber boardwalks are proposed in areas where the following conditions occur: in wetland and floodplain areas where impacts to wildlife habitat should be minimized; when the desired path is to be constructed above a certain flood elevation;

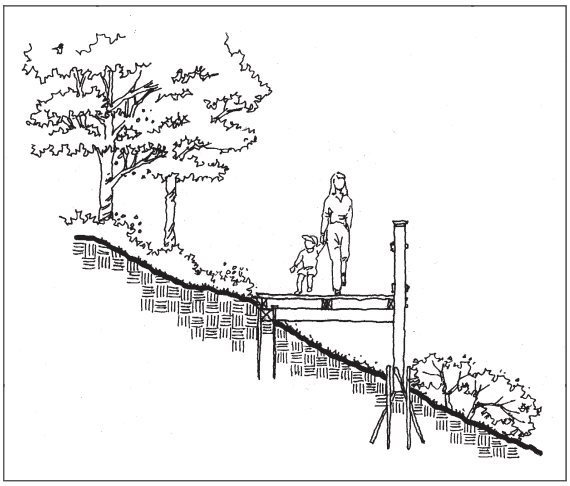


FIGURE 35. Cantilevered boardwalk on a steep slope using pin-type footings on downhill side.

and when paths are proposed on a particularly steep slope or where a significant grade change needs to be accommodated. Boardwalks closer to the ground (up to 2.5 feet) will have timber guards to minimize straying or falling off the edge, while boardwalks higher than 2.5 feet require railings. In sensitive areas, pin-type footings will be used to mitigate impacts to the existing resource area (see Figure 35).

Benches and small viewing platforms can be built into the boardwalks to provide improved opportunities for wildlife viewing and scenic overlooks. Recycled plastic and pressed wood products are preferred building materials to pressure treated wood for their longer life span and to avoid toxic chemicals from the wood treatment process leaching into the surrounding soils. An alternative to timber decking is corrosion-resistant metal mesh, which would allow maximum light penetration beneath the boardwalk/overlooks. This type of decking could be used over channel inlets designed for fish migration into the newly created open water wetlands.

Bridges, Overlooks and Crossings

Along Alewife Brook Parkway, vehicular bridges cross Alewife Brook at five locations: the Route 2 rotary at the beginning of the Parkway, the intersections with Massachusetts Avenue, Broadway, Henderson Street, and the Mystic Valley Parkway. Apart from the crossing at the end of Henderson Street which serves as a neighborhood connection, all of these bridges experience heavy traffic and accommodate pedestrians only with a narrow sidewalk. It is from these bridges that one can obtain the best view into the stream environment. These views will be maintained and may be improved (e.g. added safety measures in these locations, cantilevered platform at an existing bridge, etc.).

The existing bridges should also be used to link proposed paths by installing proper crossings

FIGURE 36. Example of a small platform that could be used on the edge of the Little River.

and directional signage. Crosswalks over roadways should be clearly marked and pedestrian lights installed to ensure safe travel and connection between the path segments. The use of different paving materials can be used as another measure to signal upcoming intersections and crossings.

No additional vehicular or pedestrian bridges are currently proposed for the Alewife Brook and Parkway section of the project area. However, pedestrian bridge crossings at Dilboy Field and over the Mystic–Alewife confluence at the Mystic Valley Parkway were discussed in the master planning process and could be revisited in the future if adjacent neighborhoods expressed a strong interest.

New pedestrian bridges are planned for key locations in the Reservation. These bridges will enhance accessibility and public safety, connect trails to form loops, and provide better views into wildlife areas.

The proposed bridge behind the Alewife subway station over old Alewife Brook must be wide enough for emergency and maintenance vehicles (minimum 12 foot width). All other proposed bridges will vary between 6 and 8 feet in width and will be designed to carry non-vehicular loads. The bridges will be constructed using a mixture of recycled materials, wood and metal, and will be designed to have minimal impact on wildlife. Prefabricated systems

are desirable to minimize costs. Design constraints such as flood elevations will be taken into consideration during design development.

Small platforms and decks integrated into the system of boardwalks will create new scenic views into the restored wetlands and the Little River. Subtle interpretive features will provide opportunities for learning about the history of the Great Swamp, area wildlife, and important ecological functions of this urban ecosystem.

C5. Landscape Furnishings

The Alewife Reservation and Alewife Brook corridor differ noticeably in character. The Reservation is a contiguous open space that functions primarily as a natural area, whereas the Alewife Brook and the Parkway form a linear urban park. The Master Plan not only strives to make the connection between the two more effective and visible but also to improve and maintain their respective qualities. Landscape furnishing can help by creating a unifying character of the space.

Light fixtures typical for the MDC Parkways are proposed along the road edges of the Alewife Brook Parkway to strengthen the Parkway character. The historic lights could also be furnished with a smaller scale light fixture to illuminate the asphalt path parallel to the brook and road. The use of light fixtures that minimize light pollution through cutoff reflectors is also encouraged.

Benches in the Reservation will be provided in the form of structures built into boardwalks and overlooks creating a different character and quality. Standard benches can be used along the MHD Bike trail to provide a continuous connecting element for the users. A modification to the standard MDC bench incorporating sustainable materials links the past to the future.

Carefully selected locations along the Alewife Brook corridor will receive standard MDC benches inviting travelers for a short rest to enjoy the park and brook.

Bike racks should be installed in the vicinity of the intersection between the Alewife Brook Parkway and Massachusetts Avenue, as well as at the Broadway intersection, to accommodate bike commuters who switch to bus transportation in these locations.

A carry-in/carry-out strategy clearly stated on signs in prominent locations is proposed for trash handling to help increase the awareness for environmental pollution. An increase in users and patrolling by MDC rangers and park police will help to eliminate large-scale dumping. Any trash receptacles placed at major gateways should be easily accessible to maintenance vehicles.

C6. Interpretive Features and Signage

Three major themes derived from the history of the Alewife area can serve as the basis for developing interpretive features:

1. past (industrial and agricultural), present and future land use,
2. changes to the natural system and ecology of the area, and
3. Native American history and settlements.

FIGURE 37. This etched boulder calls attention to the species and other natural elements of a site.

Interpretive features should be subtle, low maintenance, easy to change in response to varying program requirements, and accommodate short- and long-term objectives (e.g., expansion of trails along the Mystic River or other connected areas of interest).

Rather than a large number of interpretive signs that could be subject to vandalism, numbered identification markers at various points of interest will relate to an interpretive guide available at all gateway areas. Where signs are used in prominent locations, they should be designed to be durable, nonflammable, and cost-effective for replacement.

C7. Public Art

The Master Plan envisions using art as an element of public education and for creating visual connections between spaces and habitats that are not readily apparent to the traveler. Interpretive elements incorporating art and local artist's visions, similar to those found at the new Fresh Pond facility, are also desired.

FIGURE 38. This art installation made from natural materials also functions as an entrance and play area.

Temporary installations might celebrate seasonal events such as the spring herring run. Natural materials found on-site, such as (willow) twigs, branches, or vines, might become the basis for transient art or play installations. Permanent installations would be placed in prominent locations. Collaborations of artists with local activist groups, residents, school children and businesses can help foster an understanding of the natural and cultural world and enhance the human connection to the wildlife found in the Reservation and the Greenway. A project in this spirit is an environmental mural proposed to adorn the walls of the Alewife subway station. Fundraiser events such as the one organized by the Friends of the Alewife Reservation in November 2002 for the mural are good examples of what can be done to spark interest and help raise some of the necessary funding.

FIGURE 39. An ecological mural is proposed for the Alewife subway station.

C8. Water Access

A key element of the Master Plan is to provide opportunities for users to experience water in new ways. Structural obstacles, including the chain link fence along the Alewife Brook, should be removed to allow for visual access to the any restored sections of the brook. To limit

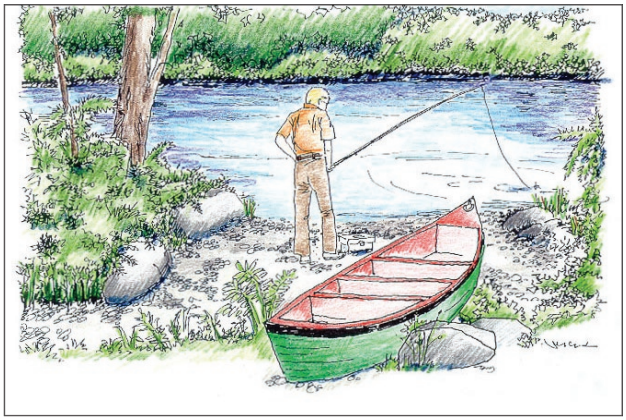


FIGURE 40. Representation of a possible boat access area

the negative impact on the ecosystem, access areas along the Little River and Alewife Brook should be small in scale and well defined.

Many of the site amenities described in this section, including overlooks, platforms, and boardwalks, make access and views to sensitive aquatic areas possible.

Nonmotorized boating is a popular activity that can be facilitated by improved access to the water. New access points for nonmotorized boats are incorporated at Little Pond, the proposed wetland in the east Reservation (current ADL parking lot), and the Dilboy Field parking lot, expanding the routes for canoes and kayaks to travel to the Mystic River. Boat launches will be designed to blend with the surrounding environment (e.g., using cobbles and stone placements to define the launching spot). Stairs leading down to the water could be marked with the flood levels as an educational feature.

FIGURE 41. Water play

The expected improvements in environmental health and water quality within the Alewife watershed will dictate which types of water activities will ultimately be encouraged. Currently the water quality of the Alewife water bodies is not safe for contact recreation. Therefore, other opportunities for water play should be offered, particularly for children. An underground cistern could store potable water that would circulate through different water features by means of solar- or hand-powered pumps or Archimedes screws. Such water play features could also serve as an important educational element for sustainable water and energy use.

C9. Safety and Security

The planned improvements to the Alewife Reservation and Alewife Brook corridor are expected to increase recreational use and visits to the area. Greater public use will help reduce unwanted, illicit activity that currently takes place in several remote areas. In other words, increased use means increased visibility, which in turn promotes increased safety.

In general, night-time use is not planned or encouraged for the Reservation. MDC policy for public use is dawn to dusk (i.e., closed after dark). Another suggested measure to increase safety is increased patrolling by MDC rangers and state and local police (e.g., bicycle-mounted park rangers).

C10. Delineating and Screening the Private-Public Property Interface

FIGURE 42. Example of boundary treatment between private and public property before (above) and after (below).

Where requested and appropriate, strategic plantings and a low wooden fence will be used to clearly define the line between private and public property at the edges of the Reservation and along the Greenway. Dense plantings of woody native species (see plant list in Appendix B) can screen private abutters from park users, ensuring adequate privacy, and clearly delineating between public and private land. Carefully sited openings in the vegetation and/or fence will maintain desired views and access to open space. A wooden guardrail will be used in areas abutting commercial and industrial properties to define the boundaries of the public open space.

D. AREA-SPECIFIC RECOMMENDATIONS

The fold-out master plan drawing in Appendix E is designed to accompany the descriptions and the recommendations in this section.

To facilitate description of the recommendations in more detail, the project area has been divided into seven areas. For each area a short summary of the existing conditions and a statement of the key challenges is provided, followed by a description of the proposed recommendations. The list of recommendations for each area starts with actions related to Master Plan Goals 1 and 2 and their corresponding objectives (i.e., improve hydrology/water quality and habitat) followed by proposed actions fulfilling Goal 3 (i.e., improve recreational, educational, cultural opportunities).

The typical improvements and site amenities that recur in these project areas are described above in detail in Section 3C. Recommendations that require more extensive studies regarding their feasibility are labeled "long-term recommendations." These actions would greatly improve the health of the ecosystem but involve extensive planning, funding, and construction.

AREA 1: LITTLE POND

Existing Conditions and Key Challenges

Much of the shoreline of Little Pond has been modified and few aquatic plants are present. Trees and shrubs dominate about one third of the shoreline; residential yards and lawns, most illegally encroaching, line the remaining two-thirds of shore. There is also a loss of natural shoreline from erosion.

FIGURE 43. View over Little Pond from the north

Although Little Pond is reported to sustain some of the few spawning populations of herring in the area, fishing seems to have decreased in recent years, possibly due to a decline in water quality. (Approximately 20 stormwater outfalls drain to the pond, including a large box-culvert receiving significant runoff from the City of Belmont.) Bordering lands harbor a variety of birds and mammals.

FIGURE 44. Existing Little Pond shoreline with lawns leading up to the water's edge.

No trails circumnavigate Little Pond, although the site does serve as a gateway to the Reservation from several access points. No important cultural resources exist in the area.

Recommendations

1. Reclaim all encroachments and restore the riparian buffer and shoreline around Little Pond. The west side of the pond requires intensive restoration using bioengineering techniques and native herbaceous plantings as well as shrubs and trees. Planting trees at specific intervals will maintain views to the pond from the abutting residential homes. The littoral shelf (the lower, mostly flat and submerged part of the pond bank) should be planted with native emergent wetland species able to trap contaminants, which will improve water quality. In addition, native vegetation provides increased habitat, which can lead to greater diversity of aquatic invertebrates and fish. Removing the lawn abutting the pond will help reduce the Canada Goose problem in the area.
2. Determine sediment depths and explore the feasibility of dredging Little Pond. Increasing pond depth will increase flood storage capacity and can also reduce peak summer water temperatures while increasing dissolved oxygen levels (long-term recommendation).
3. Create predator free islands in the pond that could serve as avian nesting habitat. Flexible modular systems that are anchored to the pond bottom are available that allow herbaceous vegetation to become established.
4. Convert mowed grass south of the pond into low-maintenance meadow communities to increase the diversity of habitat types in this area and reduce goose feeding.
5. Install paths at strategic locations to allow for better access to the Reservation and pond edge. The path system will comprise a combination of trails, boardwalks, and small lookout platforms at locations with scenic views (e.g., on the south side near the neigh-

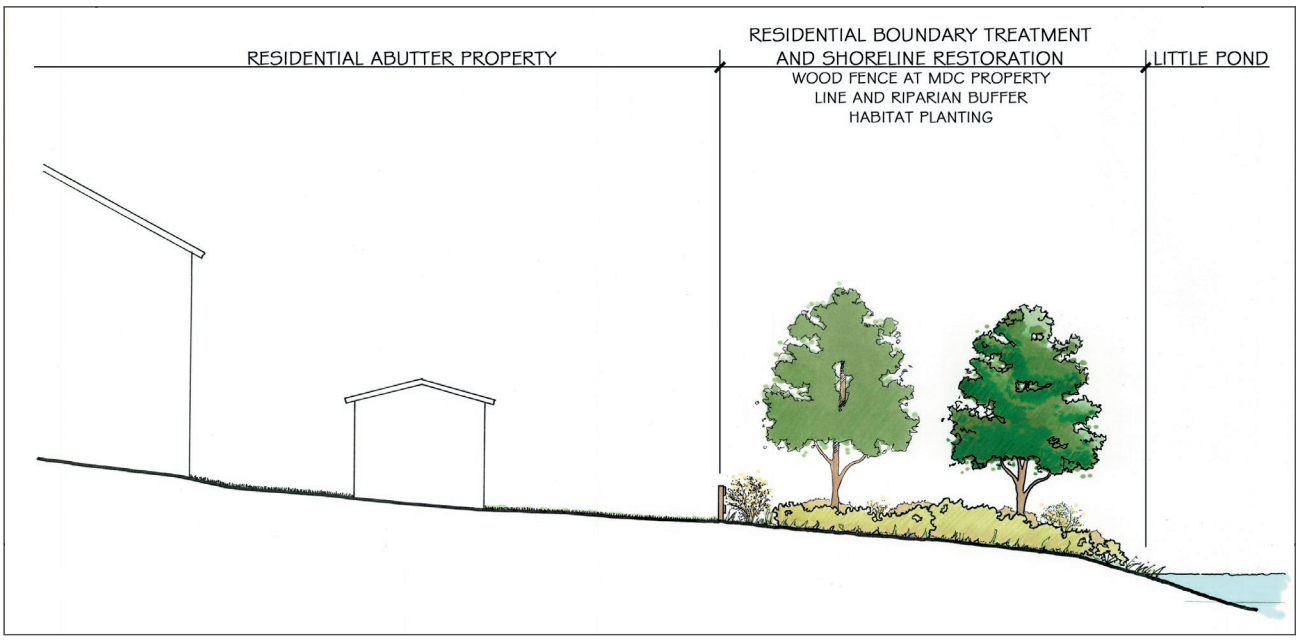


FIGURE 45. Proposed pond shoreline with riparian restoration

borhood access from Brighton Street, at the outlet of the Little River, and on the north side near the neighborhood access from Frontage Road). Access to Little Pond is proposed via neighborhood access points in three locations: two off Brighton Street and one off Frontage Road. Directional signage should be installed in those locations.

6. Install rustic wood benches at key locations along paths and at overlooks.
7. Use porous pavement to create a new ecologically sensitive parking lot (5-10 spots) and access off Brighton Street to serve as a drop-off at the existing MDC dock. Repair and improve the existing dock to allow for easier use as a canoe/kayak launch.
8. Install a wooden fence, with openings if requested by abutters, along the property line and vegetative buffer to delineate public and private space.
9. Reclaim MDC land that has been encroached upon to implement the above recommendations (refer to Section 4F for encroachment solution strategy).

Area 2: Former MDC Skating Rink

Existing Conditions and Key Challenges

This area includes a dense woodland on the west, a woodland border along the north and east sides, and a central disturbed area that was once an MDC skating rink and associated parking lot. In the woodland on the west, signs of former agricultural activity can be found, such as old apple trees. The central disturbed area is a relatively barren grassland. This area is the only large site within the study area outside the 100-year floodplain. Therefore, it has potential to provide additional flood storage volume. The site is fairly isolated by its location between Route 2, Route 2 access ramps and Frontage Road. It provides no terrestrial habitat connection, although birds are able to reach

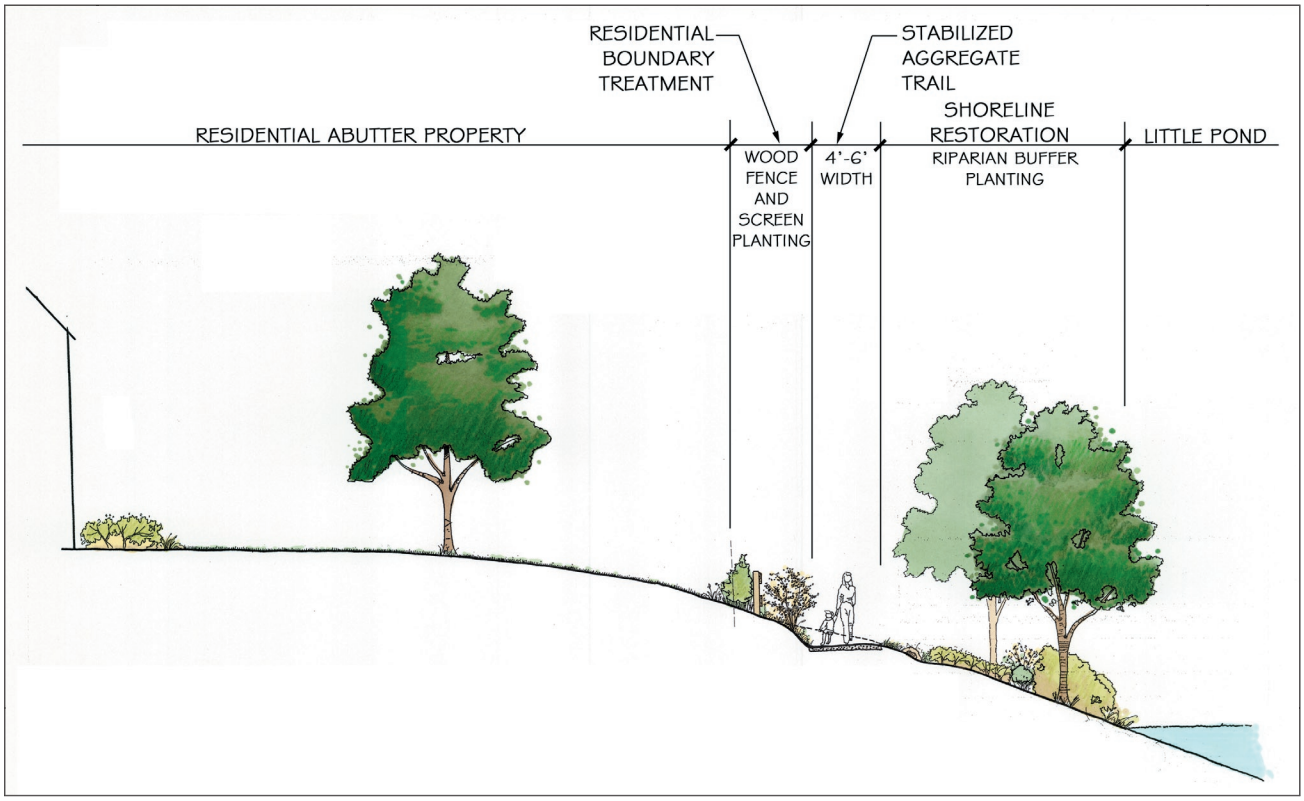


FIGURE 46. Proposed path and public-private property treatment at pond shoreline

the area. Several hydrologic connections via pipes exist. The area received heightened attention over the last two years when the Town of Belmont Recreational Department and the Belmont Hill School were seeking an agreement with the MDC to re-develop this area for playing fields. This project was stalled in 2002 by the Massachusetts State Senate.

FIGURE 47. The former MDC ice rink site is fenced and surrounded by roads and highway ramps.

Recommendations

1. Identify methods for using the area to increase flood storage capacity and estimate cost and feasibility.
2. Manage the site to maintain different habitat types, namely, bordering woodland and open grassland–wet meadow (seasonal flooding).
3. Remove invasive species and plant native vegetation.
4. Remove remnant debris and fabrics that impede development of a diverse plant community.

Area 3: Reservation North of Little River

Existing Conditions and Key Challenges

This portion of the Alewife Reservation is situated within the 100-year floodplain and much of it is classified as wetland habitat. The banks of the Little River are heavily vegetated with trees and shrubs that shade the water between late spring and early fall. Aquatic habitat structure is limited to woody debris, and numerous

FIGURE 48.This grassland is east of the ADL parking lot.

carp are present. Closed canopy woodlands occur east of Little Pond and west of the Acorn Office Park. A relatively open grass/shrubland with scattered trees is found east of the former ADL parking lot.

Important wildlife habitats include the wetlands and uplands located on the abutting private lands to the northwest of the Reservation, some facing future development. The contiguous open space of the Reservation is broken by the Acorn Office Park complex, a large parcel of developed private land that stretches from near the bank of the river north to Route 2. One storm drain outfall from the Acorn Office Park complex discharges to the river.

A dirt trail runs from the Route 2 access road to the MDC-leased ADL parking lot and then soon disappears near where the property fence comes down to the riverbank. The only cultural site is the former location of the last vegetable farm in the area located near Acorn Park Drive.

FIGURE 49. View of ADL parking lot with bordering wetlands from northwest corner.

FIGURE 50. Concept plan for wetland restoration in the East Reservation

Recommendations

1. Determine the depth of unconsolidated sediment in the Little River and Perch Pond and explore the feasibility of dredging to increase channel depth and flood storage capacity and introduce appropriate bed substrate to sustain invertebrate species fed on by fish (long-term recommendation).
2. Stabilize eroding stream banks with native vegetation using bioengineering techniques such as live stakes and brush layers. Establishing herbaceous communities at the water's edge using pre-vegetated systems should also be incorporated to diversify the habitat structure and improve water quality.
3. Restore wetlands on the former ADL parking lot, including open water, marsh, and an upland island (see Figure 50). Connect the restored wetlands to the existing wetlands (forested wetland, wet meadow) to the North and the East, and enhance the disturbed portions of the existing wetlands by removing invasive species (e.g., common reed, Japanese knotweed, Tree-of-Heaven) and planting native vegetation. Improve the riparian habitat on the stream banks and in the floodplain areas (see Appendix B for appropriate species). In addition to significant habitat improvements, this new marsh will improve water quality and provide additional flood storage.
4. Expand the drainage ditches that connect the ADL wetland with the Little River to provide a larger open water area that can be used by a variety of

species. Invasive species in this area should be replaced by native plant communities (Refer to Section 3F for management and maintenance recommendations).

5. Identify and certify vernal pools (seasonal pools that are free of fish) east of Little Pond to protect this valuable habitat, especially for amphibians.
6. Remove the fence that currently blocks continuous access to the Little River at the Acorn Office Park complex. Starting with a ramp off the existing sidewalk at the Route 2 access road, install a trail along the river's edge and the newly created wetland at the former ADL parking lot in the eastern Reservation. A bridge over the Little River at the Acorn complex will connect the wetland on the north side of the river with the stormwater wetland on the south side, creating the possibility for loop circulation. A boardwalk through portions of the wetland will join the river trail. West of the Acorn Office Park complex the trail will move away from the river to protect a larger, contiguous habitat area and connect with a trail entering from the Belmont Uplands. A fork in the trail splits the path with one segment leading along the northern edge of Little Pond and the other crossing the Little River over a bridge to connect to the south side.
7. Provide limited parking off Acorn Park Drive at the trail entrance on the Belmont Upland site and at the end of the road as part of the entrance into the new habitat area. An ecologically sensitive parking area adjacent to the wetland will also serve a boat launch into an open water area connected to the Little River. Small boats such as canoes and kayaks can be carried down steps to access the Little River.
8. Place subtle educational and interpretive signage in key locations explaining the function of wetland systems and their history in the Alewife area.

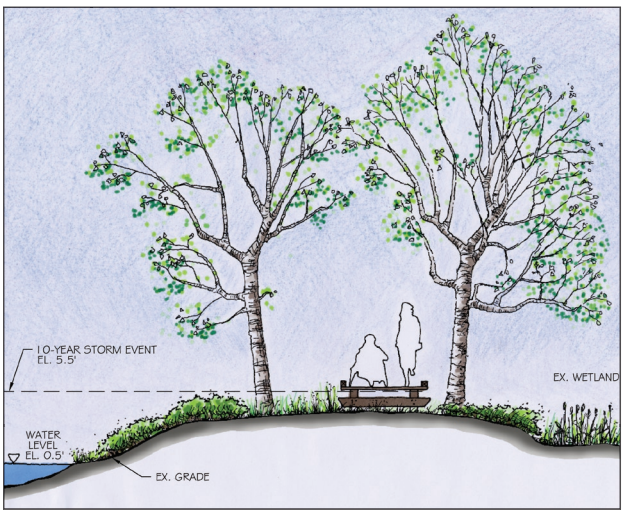


FIGURE 51. A slightly elevated boardwalk along the Little River will allow access even during certain flood events .

Area 4: Reservation South of Little River

Existing Conditions and Key Challenges

This section of the Alewife Reservation lies mainly within the 100-year floodplain and is classified as wetland habitat. The southern banks of the Little River are heavily vegetated by colonizing shrubs and contain patches of canopied woodlands. Disturbed land, in the form of a mosaic of hummocks, and a flood-protecting berm exist in this area as a result of filling activities from construction of the rail line. This is the largest contiguous stretch of land in the Reservation; consequently, it supports a diversity of wildlife.

The substrate of the Little River consists mostly of unconsolidated muck due to sediment input from sewer pipes. One combined sewer overflow (CSO) discharges into the Little River from the south and another discharges into the old Alewife Brook. Sewer overflow discharges can seriously degrade water quality. In addition,

FIGURE 52. Grassland and wetland south of Little River.

Wellington Brook, which enters the western portion of the Reservation from Blair Pond, at times carries stormwater contaminated by unauthorized sewer connections.

A sand and gravel pathway that runs west from the subway station to Brighton Street in Belmont borders the entire southern edge of the Reservation. A network of unplanned and overgrown dirt trails leads off this major pathway and penetrates the Reservation south of Little River. An important access point exists at Perch Pond, where a trail makes a dangerous crossing of the rail line to reach Blair Pond immediately south of the Reservation.

Notable cultural resources include the former location of one of the most important farms

FIGURE 53. Existing dirt trail running along the south edge of the Reservation.

in the area, now occupied by the Hill Estates apartment complex, the old ice industry rail line running along the southern edge of the Reservation, and the historic Black Island upland area that served as a Native American hunting camp and as a colonial grazing common, now mostly covered by the Wyeth building (formerly known as the Genetics Institute). Encroachments exist from the apartment complex located near Perch Pond.

Recommendations

1. Stabilize the eroding banks at Wellington Brook to reduce sediment input into the stream system through bioengineering techniques and enhanced forested riparian buffer.
2. Incorporate an approximately 3.5-acre stormwater wetland adjacent to the existing, delineated wetland in the southeast part of the Reservation (see Figure 54). This wetland is part of the Combined Sewer Overflow Separation project that the City of Cambridge is undertaking with the Metropolitan Water Resources Authority (MWRA) to improve water quality and is described in more detail in Section 4A. The surrounding wetlands are also expected to benefit greatly from this proposed created wetland basin through increased infiltration and temporarily rising groundwater levels. The smaller wetland to the west will feature a large open water area connected to the Little River that will allow fish to enter this protected area for reproduction.
3. Create a major gateway area to the Reservation at the Alewife subway station, incorporating a proposed bridge over Alewife Brook that connects to the planned MHD bicycle path and leads to a public gathering area featuring interpretive and educational elements.

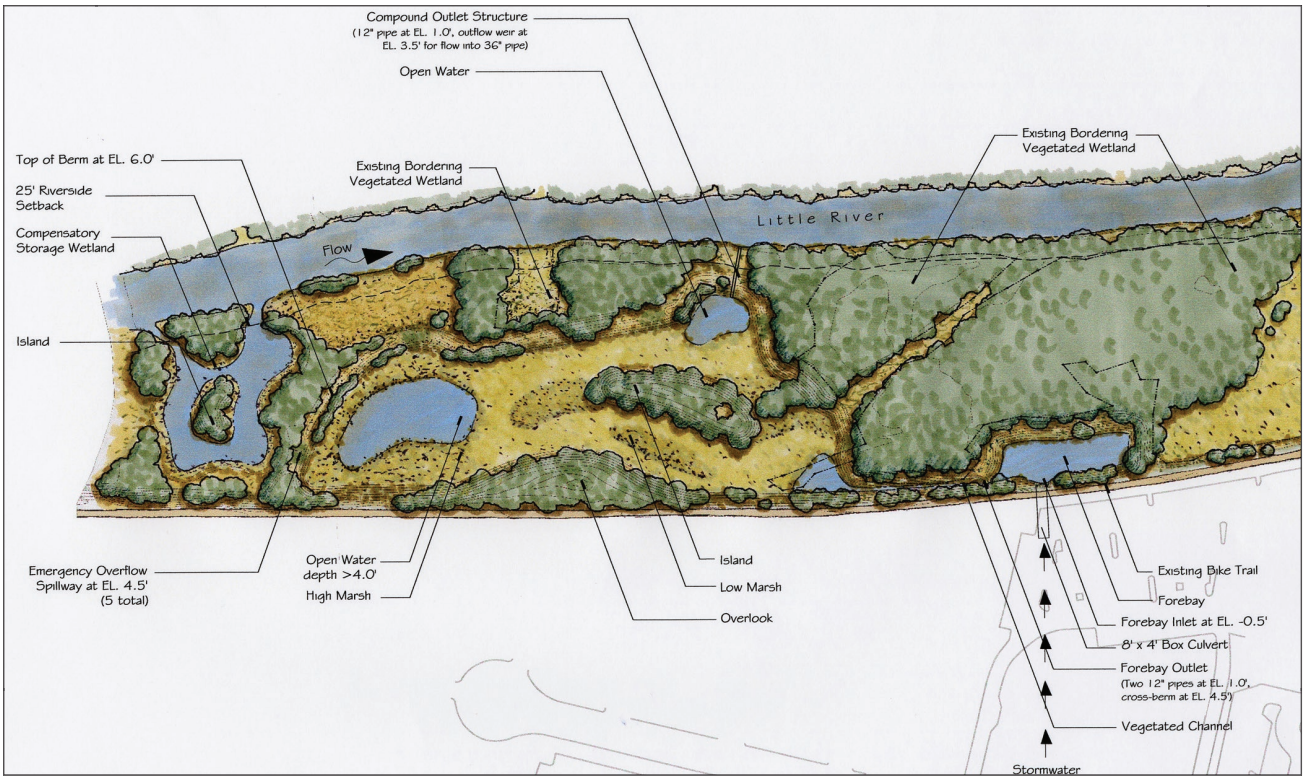


FIGURE 54. Conceptual design of the stormwater wetland. Recreational and educational amenities will be incorporated in the later design phases.

4. Install a circulation system to provide access to key features and allow for pedestrian loops of various lengths. For example, a boardwalk from the gathering area through existing wetlands and down to the river can connect to links through the proposed Cambridge stormwater wetland to the Fitchburg Cutoff Trail, as well as to a proposed bridge across to the north side. Further west, a boardwalk from the path would end in a small, quiet viewing deck. Another boardwalk is proposed leading to Perch Pond and connecting with a bridge over Wellington Brook to a stabilized aggregate trail running between the Little River and Hill Estates apartment complex. This trail would connect to Little Pond and continue with a bridge across the Little River to the north side joining the trail along the Belmont Upland.
5. Place interpretive/educational signage at strategic locations. For example, signage along the trail leading to Perch Pond could identify former Black Island and historic uses like the railroad and ice industry. At the Cambridge stormwater wetland, information could be provided on the history of this wetland system from the days of the Great Swamp to the present. The trail along Hill Estates could present the agricultural history of this area.
6. Place interactive educational features at strategic locations, such as real-time water quality monitoring boards.

Area 5: Alewife Subway Station

Existing Conditions and Key Challenges

This section of the Alewife Reservation occurs within the 100-year floodplain and is classified as wetland habitat. The Alewife Brook, which emerges from its buried pipe to join the Little River near the Alewife subway station, contributes contaminated stormwater runoff and combined sewer overflows. Portions of the Alewife Brook and Little River near the subway station have been armored to prevent further erosion from the storm runoff surges that occur in the area. Yates Pond is infested by both common reed and Japanese knotweed and is entirely surrounded by transportation infrastructure. Stormwater from the subway station parking garage drains to Yates Pond. The location of the subway station, Minuteman Bicycle Trail and nearby recreational fields in both Arlington and Cambridge make this area the most important access point to the MDC parklands. However, Yates Pond is not accessible by any marked trails. The only landscaped portion is the small section where the Minuteman Trail passes through the Reservation along the Route 2 access road. A paved sidewalk runs along the edge of the subway station access road that overlooks Yates Pond, a former clay pit that is an important cultural resource in the area.

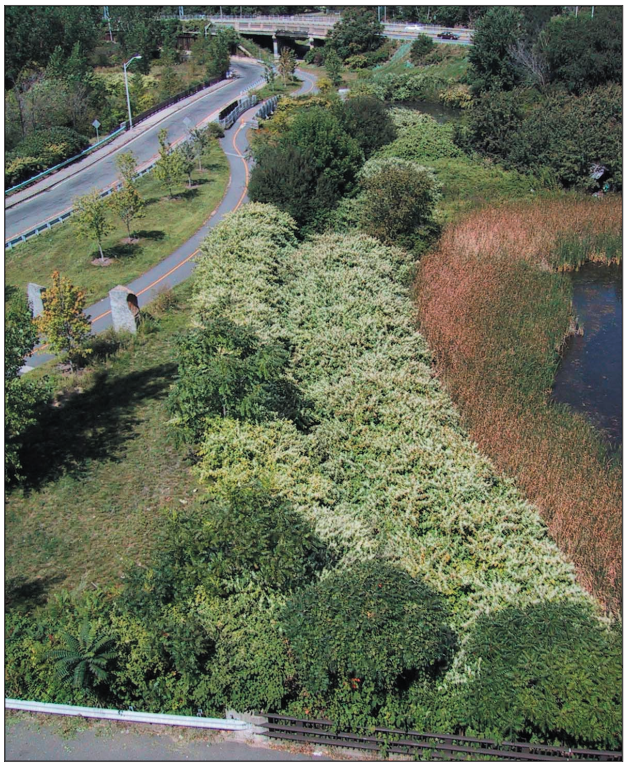


FIGURE 55. Route 2 access road, Minuteman Bike Trail extension and Yates Pond to the right.

Recommendations

1. Remove invasive species and establish native plantings. (Refer to Section 3F for specific management and maintenance recommendations.) Particular attention should be paid to areas along the road so that views of the pond are available year round. Establishing native plant communities, including herbaceous species, can also help to improve the ability of this area to treat stormwater from the Alewife subway station and thus improve water quality.
2. Provide access along Yates Pond with a boardwalk parallel to the sidewalk, providing a safer connection to the Linear Path.
3. Install interpretative signage and educational features. For example, a historic marker could identify Yates Pond as a former clay pit. A real-time water quality monitoring board would inform motorists, bicyclists and pedestrians about the current state of the Alewife Brook and Little River. Public art can

FIGURE 56. Photosimulation of a possible art feature calling attention to the stream and its wildlife for passing motorists.

be incorporated in this area as well, such as a feature creating a visual connection between the Little River and Alewife Brook that disappears here under Route 2 (see Figure 56).

Area 6: Alewife Brook Between Route 2 Rotary and Henderson Bridge

Existing Conditions and Key Challenges

This section of Alewife Brook flows within a concrete trapezoidal channel that is bordered by a chain-link fence, trees, and shrubs, including the invasive Japanese knotweed. Aquatic habitat structure is poor given the absence of a natural substrate that can support in-stream plants. However, the abutting cattail marsh (now colonized by common reed) is home to many birds.

Residences along the Arlington side of the Alewife Brook experience frequent flooding, possibly exacerbated by the hydraulic constriction of the bridge culvert at Massachusetts Avenue. Some encroachments exist here. There are also a dozen stormwater outfalls and two combined sewer outfalls.

This area is a major gateway to the Alewife Brook Greenway, where the well-used Minuteman Bicycle Trail crosses from Cambridge to Arlington, on its way to Lexington. A low-use dirt trail, often overgrown with grasses, winds

FIGURE 57. The Alewife Brook flows in a concrete-lined, straight channel in this area.

FIGURE 58. View over the cattail marsh from the southeast

around the cattail marsh and runs along the western side of the brook to the landscaped Bicentennial Park situated at Massachusetts Avenue. The small dirt path continues between Massachusetts Avenue and the Henderson Bridge on the western side of the brook beside a new hotel and Arlington residences.

A parkland strip of varying width containing mown grass and scattered trees stretches between the tree-lined east side of the brook and the edge of the roadway form Route 2 up to Henderson Bridge. The eastern border of the Alewife Brook Parkway is fringed with trees, residences, a strip of parkland, and a paved sidewalk where encroachments exist.

One cultural feature of note is the Massachusetts Avenue Bridge, which marks the location where British forces crossed the Alewife Brook during their retreat in the wake of skirmishes at Concord and Lexington during the colonial war. Cultural points of interest between the Massachusetts Avenue Bridge and the Henderson Bridge include the historic North Cambridge Alms House on the eastern edge of the Parkway and an inflow that marks the remains of Tannery Brook, a site where the colonial leather-finishing industry developed and where a fishing weir had been used by both colonists and Native Americans.

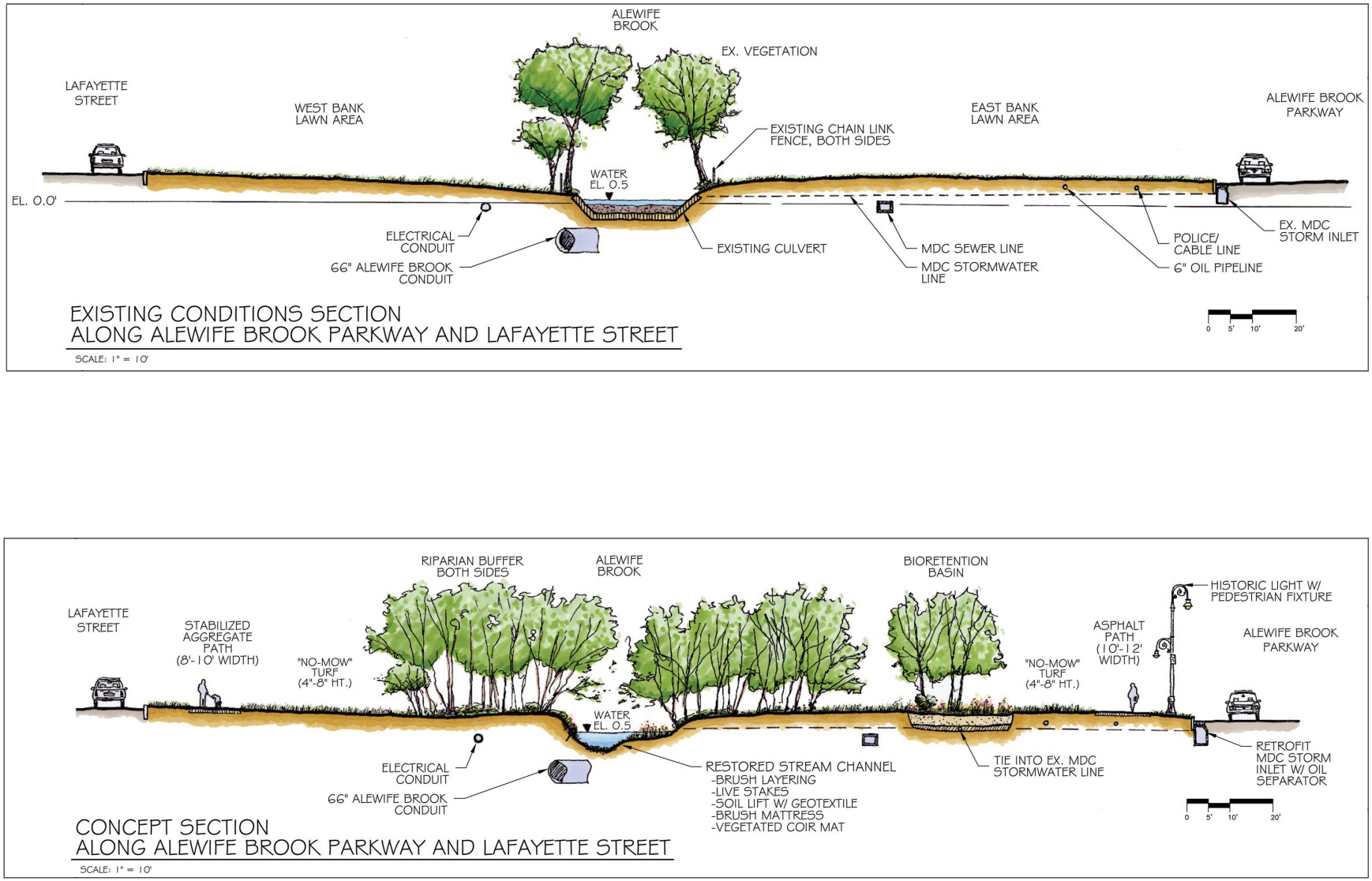


FIGURE 59. Existing (top) and proposed (bottom) conditions along the Alewife Brook Parkway and Lafayette Street

Recommendations

1. Restore the cattail marsh as an ecologically valuable wetland. Remove the invasive common reed (*Phragmites australis*) and establish different habitats including open water, high marsh, and low marsh. Investigate the feasibility of excavation to increase flood storage capacity of the wetland. Create a riparian buffer to increase the diversity of flora and fauna and contribute to the treatment of incoming stormwater. In addition, creating an open, natural channel connection from the marsh to Alewife Brook would provide potential spawning habitat for alewife and blueback herring in the restored marsh. This area is only partially owned by the MDC. The City of Arlington owns the remaining piece necessary to complete the path connections. Land acquisitions in this area or a joint effort for a restoration concept including the different owners are possibilities (Refer to Section 3D). (long-term recommendation)
2. Investigate the feasibility of removing the concrete lining of the Alewife Brook stream bed and banks and restoring a natural channel. If this action is determined to be feasible, replace the concrete trapezoidal channel with a natural channel of varying depth and channel bed composition. Natural bed material can reduce peak summer temperatures and provide beneficial substrate for aquatic organisms. Employ bioengineering techniques to restore vegetated banks and herbaceous vegetation at the stream's edge and create an extended riparian buffer in the floodplain. Increased diversity of riparian vegetation will provide habitat variation for bird species. Increase channel sinuosity to allow for stable transport of channel discharge and sediment (long-term recommendation).
3. Selectively remove exotic species in riparian areas and replace with native plant communities (refer to Appendix B for appropriate plant species).
4. Incorporate biofiltration areas into the park design to treat stormwater runoff from the Alewife Brook Parkway road surface, which is currently discharged untreated into Alewife Brook. Combined with grease and oil separator units that would pre-treat the runoff and discharge it into the vegetated biofiltration area (see Figure 59, Proposed Section) this recommendation could help improve the water quality of the Alewife Brook. Vegetated swales will also be used to capture and treat runoff from the asphalt path.
5. Replace the mown turf grass along the Parkway and Alewife Brook with a low-maintenance, tall-fescue grass mix and seed selected areas with a meadow mix to diversify the habitats in this area (refer to Appendix B for seed mixes).

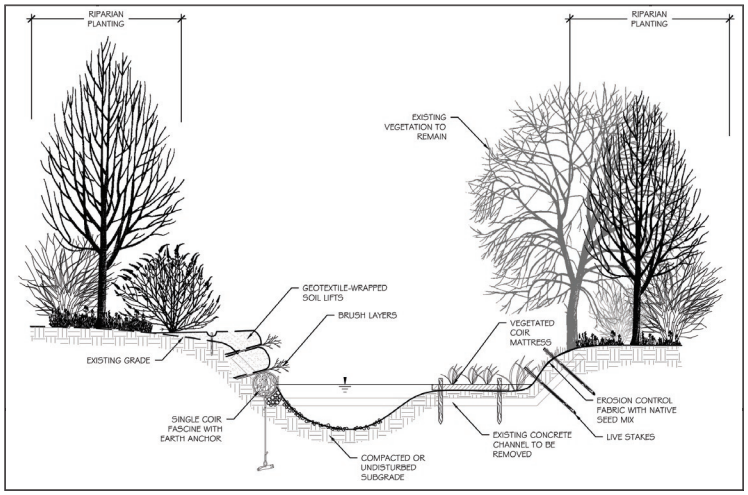


FIGURE 60. Typical stream channel restoration using bioengineering techniques.

6. Remove the fence along Alewife Brook to allow for better visual access. Naturalization of the banks will eliminate the safety hazard of the current steep, concrete banks.
7. Enhance circulation along both sides of the Alewife Brook and create a link to the Minuteman Bike Path. A small portion of this proposed link is located outside the MDC property and must be coordinated with the City of Arlington, the landowner of this parcel. This path leading around the cattail marsh will split at the beginning of the Alewife Brook corridor, continue on the west side up to Henderson Bridge, and cross via a bridge over the Alewife Brook to connect to the east side. On the east side, the existing sidewalk will be replaced or enhanced by a 10- to 12-foot-wide asphalt path, while on the west side, an existing dirt path will be replaced and re-aligned with an 8- to 10-foot- wide stabilized aggregate path that will wind through grass, meadow, riparian, and forested areas, with views of the stream.
8. Improve the Massachusetts Avenue–Alewife Brook Parkway intersection to serve as a gateway to the Alewife Brook corridor. Incorporate directional signage and traffic light controlled crossings for safe travel. Access to the parkland of the Alewife Brook corridor is also possible via multiple neighborhood access points along the east and west side.
9. Prune vegetation at bridges to allow for scenic views (Refer to Section 3F for specific management and maintenance recommendations).
10. Improve the Parkway character by installing typical MDC lights along the road and smaller light fixtures along the asphalt path. Supplement tree plantings on both sides. Seed remaining open areas with a low-maintenance fescue grass mixture. Replace the granite curb defining the road edge where necessary.
11. Incorporate Bicentennial Park and Massachusetts Avenue Bridge history into an interpretive program. The historic location of a Native American fishing weir between Massachusetts Avenue and Henderson Bridge is another point of interest that would allow for interpretation.
12. Reclaim MDC land from encroachments to implement the above recommendations (refer to Section 3F for encroachment solution strategy).

Area 7: Alewife Brook Between Henderson Bridge and Broadway

Existing Conditions and Key Challenges

This section of the Alewife Brook flows within a rectangular concrete channel squeezed between St. Paul's Cemetery and the Alewife Parkway and is lined on both sides by a metal railing. Both the concrete structure and railing are degraded and in need of repair. In-stream habitat structure for sustaining aquatic resources is almost nonexistent. Between Massachusetts Avenue and Broadway, 20 storm drain

FIGURE 61. On the east side, a concrete retaining wall with a cantelivered sidewalk defines the brook's edge in the Parkway section between Henderson bridge and Broadway.

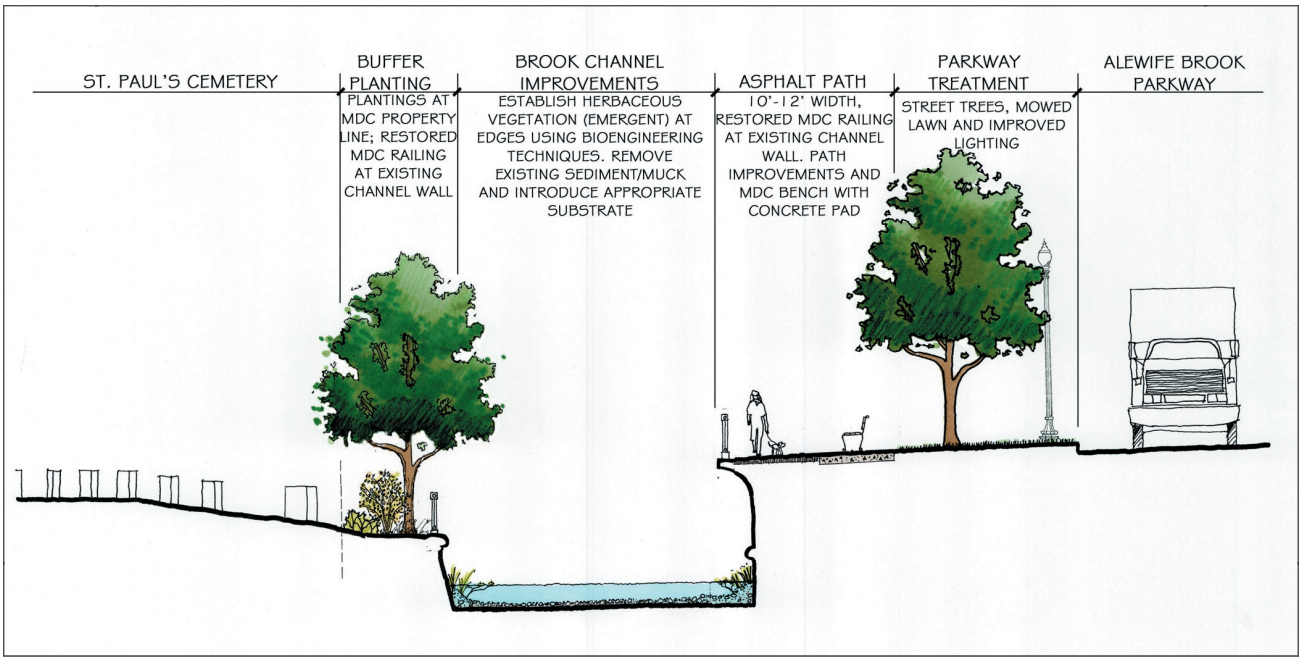


FIGURE 62. Proposed treatment at Alewife Brook Parkway and St. Paul's Cemetery

outfalls discharge to the brook along with three combined sewer outfalls. This is the narrowest portion of park land along the Parkway, with encroachments on either side. The narrow, tree-lined banks of the brook give way on the Arlington side to a small wooded area and cemetery and on the Cambridge side to an eroded paved sidewalk that overhangs the brook, with no trees to shade the water. Views of the open space of the cemetery from either the Henderson or Broadway Bridges are attractive. There are no historic resources of note.

Recommendations

1. Investigate the feasibility of replacing the concrete channel bed with a natural channel bed. A natural channel bed with variation in bed material size can improve the diversity of the benthic fauna and fish communities. Properly armored, a natural channel bed can prevent scour and destabilizing of the concrete channel walls as effectively as the current concrete channel bed. In addition, a natural channel bed can reduce peak summer temperatures and improve dissolved oxygen levels. If it is not feasible to remove the concrete channel bed, then the unconsolidated sediment currently in place should be removed and replaced with appropriate natural bed materials like gravel and cobbles (long-term recommendation).
2. Install in-channel habitat structures to increase diversity, including herbaceous wetland vegetation. Herbaceous vegetation would also have positive effects on water quality.
3. Develop stands of riparian vegetation on the west side of the channel to provide shade during summer months and reduce peak water temperatures.
4. Construct an asphalt path on the east (Somerville) side of the brook. This reach is very narrow, therefore a path is proposed only on the east side, cantilevered over the brook. Supplemental tree plantings along the road and the installation of historic MDC lights will help to define the edge of the road and make passing through this confined section more pleasant.

5. Restore the historic railing on both sides of the brook and repair the concrete retaining wall where necessary.

Area 8: Alewife Brook Between Broadway and the Mystic Valley Parkway

Existing Conditions and Key Challenges

This section of Alewife Brook is a natural channel composed of mostly unconsolidated muck. In a few locations stream bank erosion is occurring or appears imminent. In-stream habitat structure is formed by woody debris, and spawning herring have been observed near the confluence of the Alewife Brook and the Mystic River. Two dozen storm drains discharge into this section of the brook, which is fenced along its entire length.

Most of the western (Arlington) bank is covered by a dense stand of Japanese knotweed, alongside which a dirt path runs and into which some encroachments intrude. The eastern (Somerville) bank is also covered by knotweed, except in the Dilboy Field area where recreational infrastructure and a parking lot front onto the water, severing the dirt path in the process. A wide swath of parkland exists here. Several encroachments are located across the tree-lined Alewife Brook Parkway, along the east side of the Parkway in Somerville.

The confluence of the two waterways represents a major gateway to the Alewife Brook Greenway in that there are potential connections with recreational trails along the Mystic River Reservation. The Mystic River begins at the Lower Mystic Lake on the Arlington/Medford town border and runs southeastwards into Boston Harbor. Two sites of cultural importance are found here — the permanent overwintering campsite of Native Americans at the confluence, and the putative location of another Native village site across from Dilboy Field.

FIGURE 63. This open area on the west side of Alewife Brook will serve as a connection node between the Alewife Brook and the Mystic River Reservation.

Recommendations

1. Stabilize eroding stream banks with native vegetation and remove the fence along the brook. Vegetated banks will reduce the sedimentation of substrates and allow for variation in the channel bed, which in turn will support a more diverse benthic fauna and fish community.
2. Establish an invasive species removal program (see the maintenance recommendations and plan in Section 3F and Appendix D). Enhance the riparian buffer with tree and shrub plantings (see Appendix B). Planting of riparian vegetation will increase the diversity of habitat for birds and other fauna. In addition, shade from trees during the summer months will reduce peak water temperatures. Lower peak water temperatures can reduce algal growth and increase dissolved oxygen levels.
3. Establish a wildflower meadow south of the baseball field to increase diversity of habitats. Seed other open areas with fescue mix. (Refer to Appendix B for seed mixes.)
4. Retrofit parking lots at the MDC swimming pool and Dilboy stadium with best management practices and innovative stormwater management

FIGURE 64. Proposed treatment for the Broadway-Alewife Brook Parkway intersection

techniques, for example, vegetated biofiltration swales to retain and treat runoff from asphalt surfaces before it enters the brook. Combine these treatments with educational features.

5. Install a stabilized aggregate path (8–10 feet wide) to run from Broadway north to the Mystic Valley Parkway on the west (Arlington) side of the Alewife Brook and to the tennis courts at Dilboy Field on the east side of the brook. Continue the path on the east side as a stabilized aggregate trail (4–6 feet wide), north to connections with the Mystic River trails.
6. Improve the Broadway–Alewife Brook Parkway intersection to serve as a gateway to the Alewife Brook corridor (see Figure 64). Incorporate directional signage and traffic light controlled crossings to provide for safe travel. Access to the Alewife Brook and Greenway is also possible via multiple neighborhood access points along the east and west sides.
7. Create a Gateway Park at the nexus of the Alewife Brook and the Mystic River to serve as a major gateway and connection point that will incorporate park amenities, interpretive and play features, paths, and stream access (see Figure 65). Historically used for Native American fishing camps, this area is well-suited for interpretation.

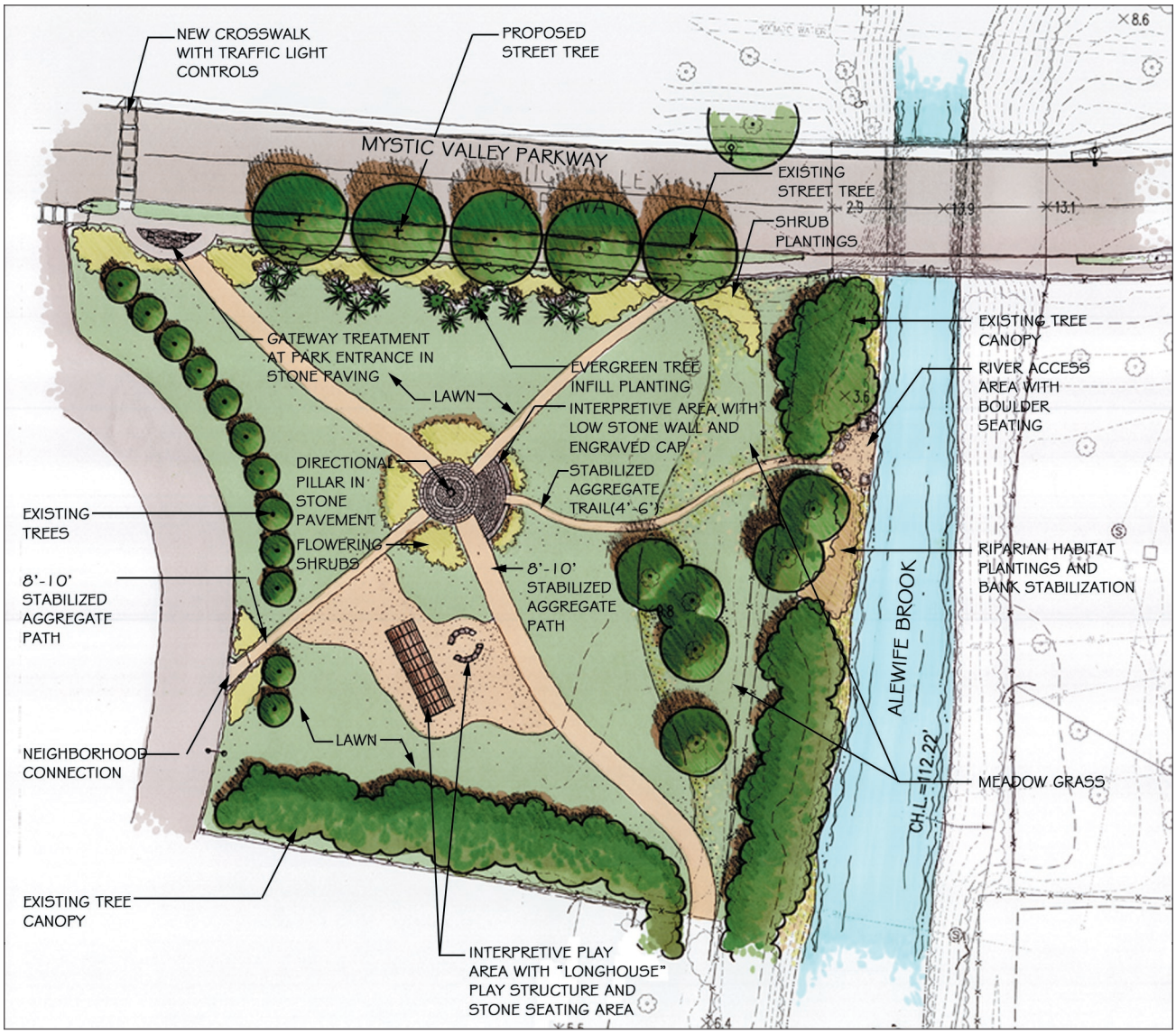


FIGURE 65. Proposed treatment for the Mystic-Alewife Gateway Park

FIGURE 66. The play area at the Gateway Park will feature a Native American longhouse, evoking the history of fishing camps at the confluence of the Alewife Brook and the Mystic River.

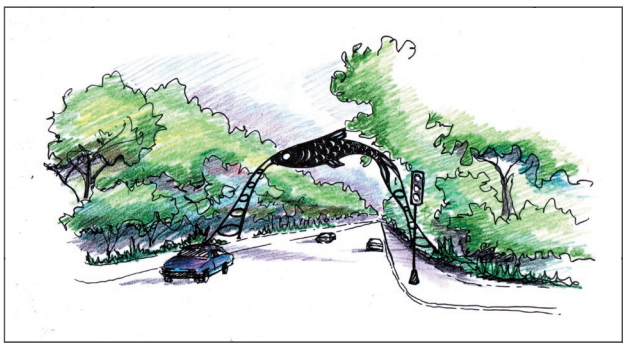


FIGURE 67. Conceptual representation of a gateway treatment that calls attention to key Alewife elements

8. Expand the existing playground north of Broadway to incorporate water play structures for children of all ages to experience water for both fun and learning. Install a viewing area with benches at the stream edge.
9. Provide boat access at the Dilboy parking lot. Install steps leading to the water's edge for access. Remove invasive vegetation in this area.
10. Improve existing active recreational facilities at Dilboy Field, including stadium renovation, improvements to ball fields and pool, and incorporation of bathroom facilities.

FIGURE 68. Interpretive signage can be incorporated into other site elements, such as stone walls.