Muddy River Restoration Project

Project Description

Since the fall of 1996, the Muddy River has flooded three times, causing damage to residents, businesses institutions and the public transit system in Boston and Brookline. The flooding has brought an urgency to the need to restore the river as a step in implementing the *Emerald Necklace Maser Plan* of landscape and historic resource treatments that seek to undo the effects of erosion, storm damage and neglect over the years.

195-Riverway-Boston Park System Muddy River Improvement. View upstream from the Longwood Avenue Bridge in 1920, twenty-eight years after construction (Thomas Ellison, photographer, Frederick Law Olmsted National Historic Site).

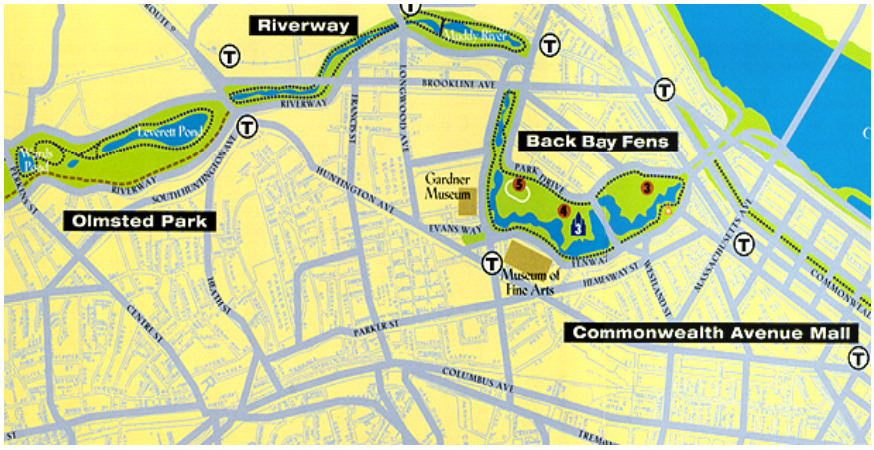
The Muddy River Restoration Project is Phase I of the *Emerald Necklace Master Plan*. The objectives of the Muddy River Restoration Project are:

- ✓ Improvement of flood control
- ✓ Improvement of water quality
- ✓ Enhancement aquatic/riparian habitat
- ✓ Rehabilitation of landscape and historic resources
- ✓ Implementation of Best Management Practices (BMPs)

Subsequent phases will continue the treatment and restoration of historic and landscape resources; implement traffic circulation improvements for motor vehicles, pedestrians and bicyclists; and restore bridges and other structures.

Project Area

The Project Area is approximately 3.5 miles long and includes portions of Boston and Brookline. The watershed of the Muddy River encompasses 5.6 square miles and includes a portion of the City of Newton.



The river's headwaters stem from Jamaica Pond and flow downstream through Wards Pond, Willow Pond and Leverett Pond in Olmsted Park. Crossing under Route 9 in a large conduit, the river flows through a long, narrow park section know as the Riverway. At the former Sears parking lot, the river flows through pipes underground to a gatehouse at Brookline Avenue. Historically, at the time of Olmsted, this gatehouse separated the fresh water Muddy River from the salt-water marsh known as the Back Bay Fens.

From the gatehouse, a portion of the river's flow passes through a large underground pipe – known as the Muddy River Conduit – under Brookline Avenue to the Charles River near Kenmore Square. The other portion of the flow passes under Brookline Avenue into the Back Bay Fens.

Beyond Brookline Avenue, the watercourse continues through the Fens, and under the Richardson Bridge at Boylston Street, where it enters the Charlesgate Area. In this area, there are numerous bridges: Ipswich Street, CSX Railroad (formerly Conrail), Massachusetts Turnpike (I-90), Commonwealth Avenue, Beacon Street and, above the entire Charlesgate area, the Bowker Overpass. From the Charlesgate area, the watercourse passes through conduits under Storrow Drive and empties into the Charles River.

Flood Control

The objective of flood control is to remove restrictions in the river so that the flooding during major storms (such as the flood of 1996) does not damage adjacent properties or the subway. These restrictions include the build-up of sediments in the riverbed, the filling of the river accompanied by extending culverts and the growth of invasive vegetation, such as tall reeds (*Phragmites)*.

Floodi ng at Olmsted Park, 1996

After the construction of the dam on the Charles River, the Fens and the Muddy River were no longer subject to tidal flushing. Today, there is only a one-foot drop in water level between Leverett Pond and the Charles River Basin. As a result, over the years, flow in the Muddy River has diminished as silt and sediment (e.g. sand) from roadways and other development have filled in the rivers and ponds.

Other flow restrictions have occurred over the years as sections of the river were filled and pipes were installed. This occurred at the Fens Bridge and Brookline Avenue where pipes were installed and the river was filled in the 1940s in anticipation of roadway widening. In front of the Landmark Center, the river was filled for a parking lot. These pipes or culverts also restrict flow in major storms events, contributing to the flooding.

Invasive vegetation, particularly *Phragmites* reeds, has grown up along the banks and in shallow open waters resulting in a narrowing of the watercourse.

Flood control strategies will address the three problems that restrict the capacity of the river:

1. The built-up sediment will be dredged to restore the original depth and width of the river;
2. A combination of “daylighting” and the installation of larger culverts (pipes) will occur in areas where the river has been filled;

3. Invasive vegetation will be completely removed and the historic shoreline restored.

What is "daylighting?"

Daylighting exposes sections of the river that have been diverted through underground pipes and opens them up to the daylight. The fill and the pipes will be removed. In their place, the river will be restored as an open stream.

Improvement of Water Quality

The Muddy River Restoration Project will improve the water quality in the river itself and also improve the quality of stormwater entering the river from local storm drainage systems. Water quality in the Muddy River is impacted by urban stormwater runoff, which carries sand, sediments and various pollutants from streets and parking areas into the river. The low flow rate during dry weather does not allow for the flushing of the channel, or sufficient dilution of the pollutants discharged from the storm drains. At the one location in the Fens, a combined sewer overflow (CSO) remains where a mixture of storm drainage and sewage is occasionally discharged during major storms.

Under other currently ongoing projects, the Boston Water & Sewer Commission (BWSC) has been mitigating the impacts of the combined sewer overflow (CSO) to the Fens, while the Town of Brookline has eliminated the discharge of combined sewage into drains that flow into the river. Both municipalities have also investigated, discovered and eliminated over ___ illegal connections of building sewers to the storm drainpipes that flow to the

Muddy River. BWSC will shortly embark on a project to inventory and better maintain its catch basins, which will help to reduce the volume of sediment reaching the Muddy River.

The Muddy River Restoration Project will generate additional water quality improvements, including the removal of sediments in the river and ponds, as well as better maintenance practices involving street sweeping, catch basin cleaning and other measures to improve the quality of stormwater entering the river.

Habitat Enhancement

The Muddy River Restoration Project will enhance the wildlife habitat in and adjacent to the river. Habitat refers to the nesting, breeding and feeding places for a wide variety of birds, mammals, invertebrates, fish, amphibians and reptiles that populate the river and adjacent parklands. The subtle meandering of the river and the diverse and varied plantings designed by Olmsted created a rich habitat for wildlife.

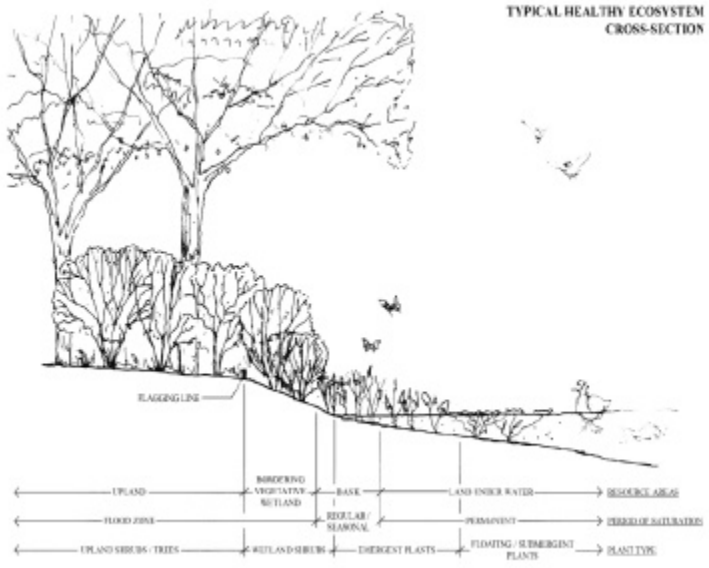


Figure shows a typical section of a diverse habitat including emergents (water plants), wetland plants, shrubs and trees.

This habitat has been degraded since Olmsted's day through the loss of vegetation and the overgrowth of invasive species such as *Phragmites*, Japanese knotweed

and purple loosestrife. The project will enhance habitat in and along the river through the removal of invasives and replacement with a diverse cross section of plantings including emergents (water plants), wetland species, low and high shrubs and trees.

Thick stands of the invasive reed *Phragmites* can be seen in the Back Bay Fens from the Boylston Street bridge.

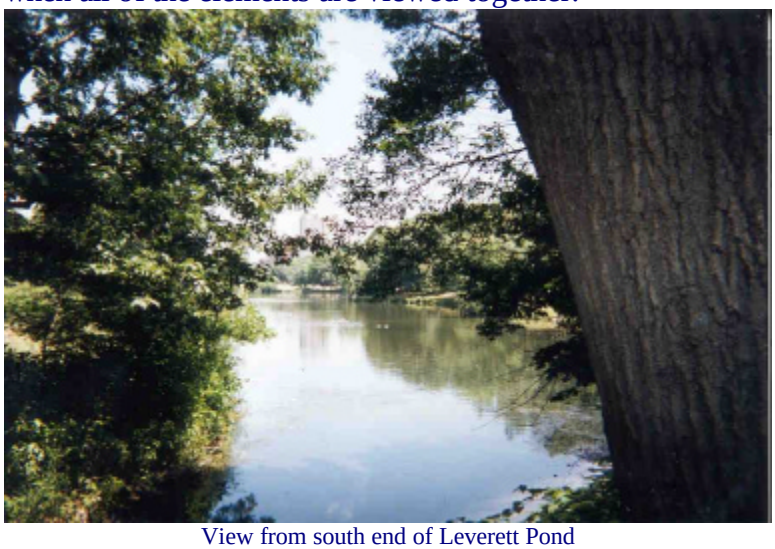
Rehabilitation of Landscape & Historic Resources

The Muddy River Restoration Project will include the rehabilitation of elements of the historic landscape that includes the river and adjacent parklands. These parklands include four sections of the Emerald Necklace: Charlesgate, the Back Bay Fens, the Riverway and Olmsted Park.

Foot bridge near Chapel Street in the Riverway

Historic landscape resources include the grading or shaping of the land itself, plantings (trees, shrubs, turf), pathways,

parkways, park “furniture” (benches, fences, etc.), bridges and other structures such as the Duck House in the Back Bay Fens. But the historic landscape is more than the assemblage of its parts – it is also the visual texture created when all of the elements are viewed together.



View from south end of Leverett Pond

The objective of rehabilitating the landscape and historic resources includes the protection of existing plantings and structures, as well as the development of appropriate historic landscape treatments for areas disturbed by the execution of the Muddy River Restoration project.

The historic landscape includes the elements of grading, planting and structures as well as the visual texture created when these elements are viewed together.

A detailed inventory was made of the landscape and historic resources, including topography, vegetation, circulation patterns, monuments, site furnishings, bridges and other structures. The EIR will identify potential impacts of the project on these historic landscape resources and how these impacts can be mitigated or eliminated.

The project will also include the preparation of a historic landscape treatment plan based on the *Emerald Necklace*

Master Plan. A portion of the landscape work will be implemented as part of the Muddy River Restoration Project (Phase I of the Master Plan), particularly as replacement and mitigation for the impacts of construction equipment and related activities in the park. Additional landscape and historic work will be done during Phase II and III.

Best Management Practices

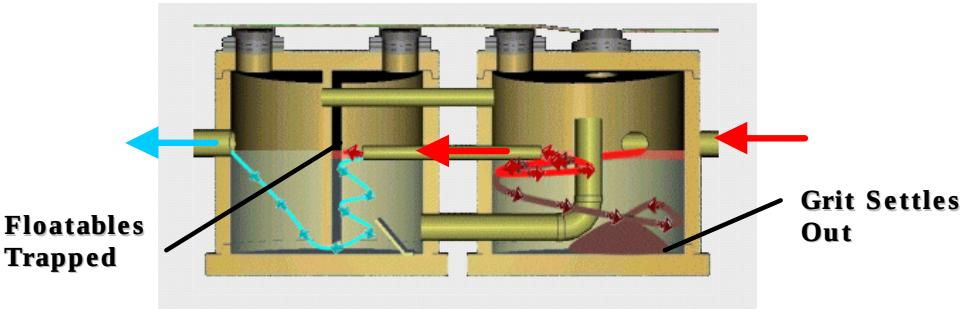
In order to protect the investment in the restored Muddy River, a program of Best Management Practices (BMPs) will be employed. These BMPs include maintenance practices that will sustain the project's benefits for decades after construction is completed.

The US Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (DEP) have identified various BMPs that can improve water quality in storm drainage systems. Improved water quality will translate into a reduction of sediment and other pollutants entering the river.

BMPs can be classified as source controls and treatment controls. Source control BMPs are performed throughout the watershed. These include street sweeping and catch basin cleaning, which removes sediment before it enters the storm drainage piping and the river.

Source control BMPs include the periodic removal of sediment from storm drains and catch basins.

Treatment control BMPs typically include localized devices that remove sediment in the storm drainpipe before it discharges into the river. Examples include particle separators (underground tanks with baffles) and vegetative swales. See pictures below.



Example of an Underground Particle Separator used to remove sediment from storm water

The objectives of the BMP Program for the Muddy River Restoration Project are to:

1. Minimize the Re-Sedimentation Rate in the River and Ponds
2. Improve/Maintain Water Quality in the River and Ponds
3. Maintain Project Improvements:
   - Flood Control
   - Water Quality
   - Wildlife Habitat
   - Historic Landscape Treatment
4. Contribute to a Fishable and Swimmable Charles River by 2005

Source control BMPs will include improved street sweeping and catch basin cleaning programs in both Brookline and Boston. A program of treatment control BMPs will be determined based on a study of the effectiveness of the existing particle separators.