MYSTIC RIVER SUBWATERSHED- RIVER AND ESTUARY SEGMENT ASSESSMENTS

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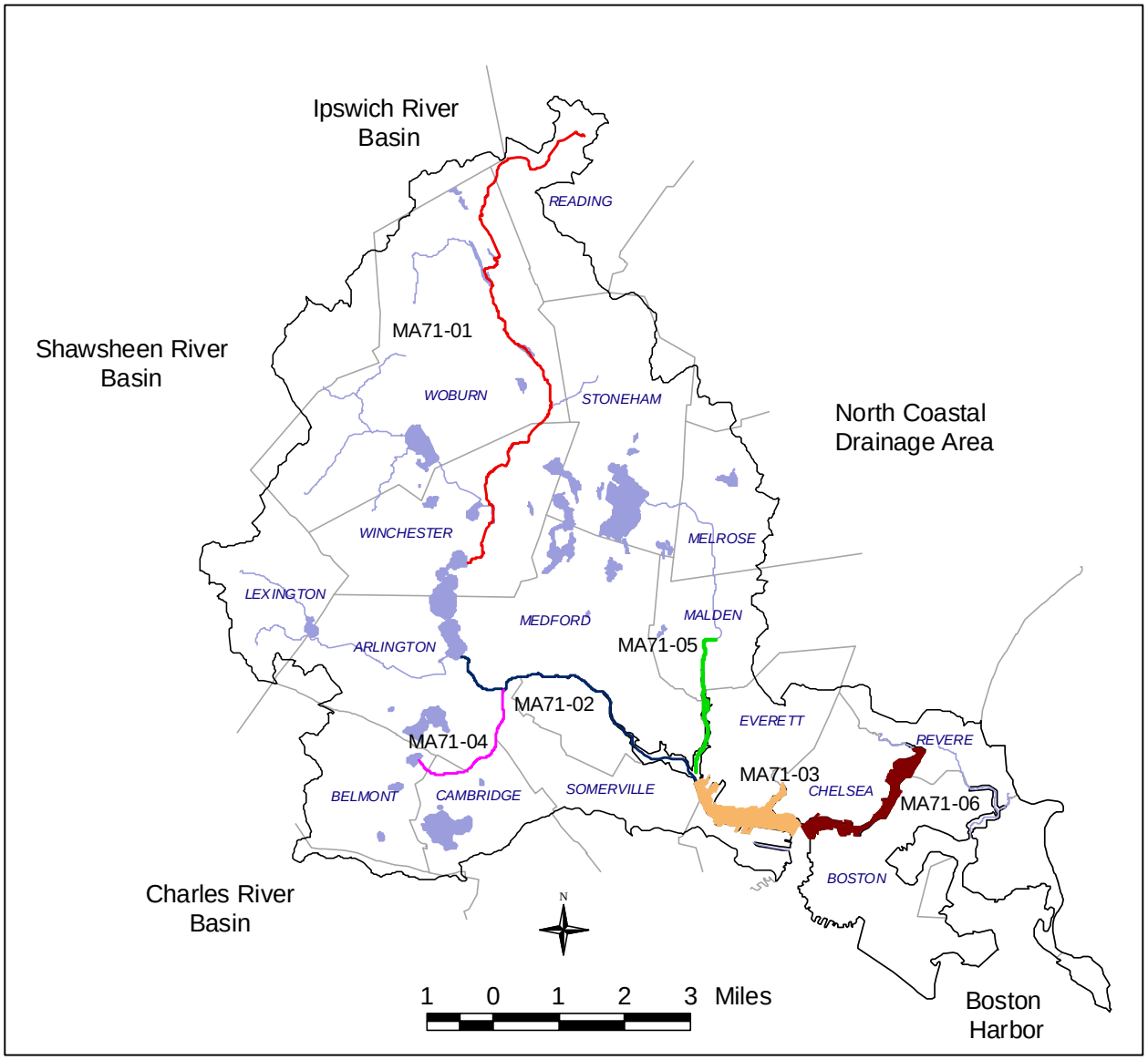


Figure 14. River/Estuarine Segments in the Mystic River Subwatershed

GENERAL ISSUES/RECOMMENDATIONS FOR THE MYSTIC RIVER SUBWATERSHED

Water quantity is an important issue throughout the Boston Harbor Watershed. The majority of public water, whether from local supplies or through the interbasin transfer of water from Quabbin Reservoir in central Massachusetts by the MWRA, is processed at the MWRA's Deer Island Wastewater Treatment Plant and discharged to Massachusetts Bay, bypassing local streams. Recharge of the local systems is mainly limited to precipitation events and low streamflow is a serious problem.

Above and beyond the water brought in from the Quabbin or water pumped from local aquifers, the sewer collection system drains an even larger amount of clean rain water and ground water from the Boston Harbor Watershed in the form of inflow and infiltration -- water which finds its way into the sewer system through cracks, poor joints, and illegal cross connections. Inflow and Infiltration (I/I) accounts for approximately 60% of overall sewer flow in the MWRA collection system, with some communities showing I/I rates of up to 75%. The overwhelming majority of the I/I problems are associated with municipal portions of the regional sewer system and not with the MWRA owned/operated lines. The municipal element includes both I/I in the 5,400+ miles of sewer lines owned/maintained by the municipality, and the 5,000+ miles of privately owned lateral connections. Infiltration is a major problem relative to groundwater loss. Inflow is most often associated with storm events and peak flows and tends to be a major cause of sanitary sewer overflows/backups. This loss of water essentially reduces available streamflow, and threatens instream uses such as aquatic life, habitat quality and quantity and recreational uses. A comprehensive regional I/I control program, involving the MWRA, municipal and privately owned sections of the sewer, should be developed to identify and remove sources of inflow and infiltration. A key component of the program is to develop a preventive and reactive operation, maintenance and rehabilitation program; without operation, maintenance and rehabilitation, sewer systems will continue to deteriorate and I/I will increase (Cooke and Lipman 2002).

Strong conservation measures through implementation strategies such as block rate pricing, installation of water-saving devices in homes and public buildings, and tying outdoor water use restrictions to streamflow levels, in concert with a strong educational program, will all help reduce the stress placed on the water resources throughout the Boston Harbor Watershed (Cooke and Lipman 2002).

Bacteriological contamination of waterbodies is a concern in the Mystic River Subwatershed and throughout the Boston Harbor Watershed. Pathogens may enter a waterbody as point or non-point source pollution. Point sources in the watershed are generally addressed under the National Pollutant Discharge Elimination System permitting program. Nonpoint source pollution can include urban runoff, faulty septic systems, and illegal/cross connections between the sewer and stormdrain systems. To improve water quality in the Mystic River Subwatershed, EPA / MA DEP sent letters to six communities (Arlington, Belmont, Cambridge, Somerville, Winchester and Medford), requesting information regarding dry weather discharges from storm water discharge pipes. Included in the information requested are maps of the location and size of the municipal storm water outfalls; maps of the location of any combined sewer/stormdrain manholes, sewer underdrains, and siphon structures; visual observations at all storm water discharge locations; outfall sampling from each discharge at least twice for fecal coliform bacteria and a plan to identify and eliminate illegal sewer discharges to stormdrains. The communities have responded to the letter and have taken action to identify and eliminate illegal discharges.

Under the Title 5 Program, the Commonwealth has developed three programs to assist homeowners with wastewater management problems. The Homeowner Septic Loan Program provides low interest loans to homeowners to upgrade systems that will not pass Title 5 inspections. The Comprehensive Community Septic Management Program provides betterment loans to communities to target known or suspected failures or to develop a community-wide management plan. The third option allows homeowners to claim tax credits for septic upgrades. Additional information about the Title 5 Program is available online from the MA DEP website http://www.state.ma.us/dep/brp/wwm/T5pubs.htm#add. In the Mystic River Subwatershed, the towns of Malden and Winchester have participated in the Comprehensive Community Septic Management Program (Chesebrough 2002).

The Boston Harbor Association with financial support of the Massachusetts Port Authority, the mayor's office, the City of Boston Environment Department, the Massachusetts Water Resources Authority, the

United States Environmental Protection Agency, the Massachusetts Environmental Trust, and the Massachusetts Office of Coastal Zone Management, initiated the Boston Harbor Marine Debris Salvage Program to clean up the waterfront and inner tributaries of Boston Harbor. This project has led to efforts to curtail the entrance of debris from the shore to the harbor. The Boston Conservation Commission and MA DEP have developed certain conditions to keep waterfront construction debris from entering Boston Harbor. Numerous cleanup projects along the Charles River, the Mystic River, and harbor beaches have also resulted (East Boston 21 August 2000).

Environmental Monitoring for Public Access and Community Tracking (EMPACT) is an EPA program created in 1996 to help communities collect and disseminate environmental data in almost real-time. The Town of Somerville has received an EPA grant in the amount of $363,257 to fund the installation of three monitoring sites along the Mystic River, and one site on Alewife Brook. The Mystic River, draining into Boston Harbor, has been plagued with chemical, nutrient, and hydrocarbon inputs, as well as pathogens and road salt from storm water runoff. The installation, and operation, of these sites will be conducted by the Mystic Watershed Collaborative (a partnership between the Mystic River Watershed Association (MyRWA) and Tufts University). The Collaborative will monitor fecal coliform bacteria, dissolved oxygen, conductivity, pH, and water depth at least five times per week. These data will be combined with meteorological information and presented in almost real-time in a web-based format. It is hoped that this data will spur public concern and action to remediate the Mystic River Subwatershed (EPA 2001c).

RECOMMENDATIONS

- Work with the MyRWA and the Executive Office of Environmental Affairs (EOEA) Mystic River Watershed Team to identify dry weather sources of bacteria in the Mystic River Subwatershed (e.g., nonpoint source pollution, wildfowl).

- Track progress of illegal connection identification and removal programs.

- Track progress of storm water management plans and implementation of best management practices.

- Determine the status of the septic system repairs being implanted under the Title 5 program in Malden and Winchester.

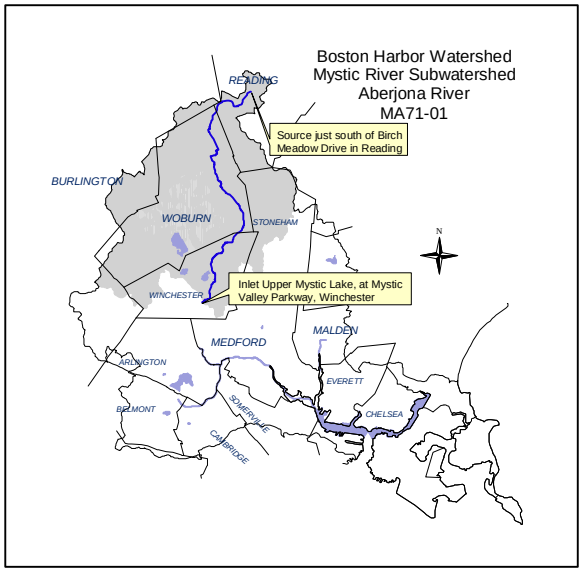
- Work with local citizens, watershed associations, and the EOEA Team to remove/reduce the trash and debris through the Mystic River Subwatershed

- Track progress of sewer separation projects and conduct monitoring to determine the effectiveness of these projects.

- Track progress of CSO abatement projects and conduct monitoring to determine the effectiveness of these projects.

ABERJONA RIVER (SEGMENT MA71-01)

Location: Source just south of Birch Meadow Drive in Reading to inlet Upper Mystic Lake, at Mystic Valley Parkway, Winchester.
Segment Area: 9.2 miles.
Classification: Class B, Warm Water Fishery, CSO.



Land-use estimates for the subwatershed (map inset, gray shaded area):

Residential	49%
Forest	17%
Industrial	11%

This segment is on the 1998 303(d) list of impaired waters, needing confirmation, for unionized ammonia, organic enrichment/ low DO, and pathogens (MA DEP 1999a).

The Upper Mystic Lake Dam is at the end of this segment of the Aberjona River. The dam is maintained by MDC with no provisions for fish passage thereby limiting the spawning habitat/migration of anadromous fish (Chase 1996).

The Woburn landfill is located along this segment. (Additional information on landfills can be found in Appendix F).

The use assessments for Horn, Winter, Wedge, Judkins, and Mill ponds are provided in the Lakes section of this assessment report (Table 5).

USGS collected sediment and pumpkinseed (*Lepomis gibbosus*) samples from the Aberjona River at Winchester (below Waterfield Rd.) in September 1999 and again in August 2000 as part of their Toxics Substances Hydrology Program (an extension of the National Mercury Pilot Study), Urban Land Use Gradient Study (part of the NAWQA program) and the MA DEP Merrimack Valley Fish Study. The sediment was analyzed for total and methyl mercury, trace elements and organic compounds (Chalmers 2001). A five fish fillet composite pumpkinseed sample was analyzed for total mercury. The data from these analyses are not yet available (Chalmers 2001).

USGS Volatile Organic Compound (VOC) National Synthesis Team is attempting to assess atmospheric sources of VOC's to urban streams. Twenty-three surface water samples were collected between 1999 and 2000 from the Aberjona River at Winchester and analyzed for 85 VOCs. Concentrations of 78 of the VOCs were either below the Minimum Detection Limit (MDL), or their concentrations were estimated (Campo 2002). The remaining 7 VOCs, which were above the MDL, were all below the EPA Maximum Contaminant Level. No water quality standards have been accepted for these VOCs and, at present, only guidelines exist for the allowable concentrations that will be protective of aquatic life and human health. Additional atmospheric VOC samples, surface water VOC samples, and precipitation samples were collected in 2001 (Campo 2002).

Excerpted from the EPA New England National Priorities List (NPL) Fact Sheet (EPA 2001a):

> The Industri-Plex site is a 245-acre industrial park that from 1853 to 1931 was used for manufacturing chemicals (e.g., lead-arsenic insecticides, acetic acid, and sulfuric acid) for local textile, leather, and paper manufacturing industries. Chemicals manufactured by other industries at the site include phenol, benzene, and toluene. From 1934 to 1969, the site was used to manufacture glue from raw animal hide and chrome-tanned hide wastes. The by-products and residues from these industries caused the soils within the site to become contaminated with elevated levels of metals, such as arsenic, lead and chrome. From 1969 to 1980, the site was developed for industrial use. Excavation in the 1970's uncovered and mixed industrial by-products and wastes accumulated over 130 years. During this period, residues from animal hide

wastes used in the manufacture of glue were relocated on-site from buried pits to piles near swampy areas on the property. Many of the animal hide piles and lagoons on-site were leaching toxic metals into the environment. In the 1980's, the site contained streams and ponds, a warehouse and office buildings, remnant manufacturing buildings, and hide waste deposits buried on the site. Animal hide residues are found on approximately 20 acres of the site in four different piles. Portions of the animal hide piles sloughed off, causing the release of hydrogen sulfide gases to the atmosphere and toxic metals to surrounding wetlands. Residences are located within 1,000 feet of the site, and more than 34,000 people live within three miles of the site.

Excerpted from the EPA New England National Priorities List (NPL) Fact Sheet (EPA 2001b):

Wells G & H were two municipal wells developed in 1964 and 1967 to supplement the water supply of the City of Woburn. The wells supplied 30 percent of the city's drinking water. In 1979, city police discovered several 55-gallon drums of industrial waste abandoned on a vacant lot near the wells; subsequently these drums were removed. As a result of this discovery, the nearby wells were tested and found to be contaminated. Both of the wells were shut down in 1979 and a supplemental water supply arranged for the city. Five separate properties on the site were found to be the contributing sources of contamination to the aquifer that supplied the water to these two municipal wells. The total Superfund site covers an area of 330 acres. The site includes commercial and industrial parks, as well as recreational areas and some residential gardens. The Aberjona River flows through the middle of the site. Surface water runoff from the site is directed through drainage systems toward the river and its tributaries.

The EPA is conducting an investigation of the potential risk to human health and the environment in the Aberjona River from the Wells G&H Superfund Site to the Mystic Lakes. The investigation includes the collection of surface water and sediment samples, and the preparation of a baseline risk assessment. EPA anticipates completing the human health portion of the baseline risk assessment in Summer 2001. EPA has evaluated preliminary surface water and sediment data collected from the Wells G&H Operable Unit 3 (OU-3), Aberjona River Study. The preliminary data indicates that the primary contaminants of concern in the surface water and sediments are metals. The Industri-Plex Superfund Site is located immediately upstream of the Wells G&H Superfund Site and is connected to the site via the Halls Brook Holding Area (HBHA) and Aberjona River surface water flow. Based upon the preliminary data from the Wells G&H Site, EPA has decided to merge these portions of the river into one comprehensive Multiple Source Groundwater Response Plan (MSGRP) comprehensive Remedial Investigation/Feasibility Study (RI/FS) because they have similar contaminants of concern and fate and transport mechanisms, and it is reasonable and efficient to manage and evaluate potential cleanup alternatives for the river as a whole system. The MSGRP RI/FS will collect additional environmental samples from the river to fill in any significant data gaps within the Wells G&H OU-3, Aberjona River Study, and the Industri-Plex OU-1, Groundwater and Surface Water Response Plan (GSIP), as necessary. The implementation of the MSGRP RI/FS environmental sampling program began in July 2000, and will continue through Spring 2002 (EPA 2001b).

Work to be conducted as part of the MSGRP RI/FS environmental sampling program along the Aberjona River from the Industri-Plex site downstream to Route 128 is summarized below (Mayor 2001):

Surface Water Monitoring Work: Regularly monitor surface water quality as it leaves the Halls Brook Holding Area pond and the downstream wetlands to establish baseflow conditions. Samples were collected from where Hall Brook Holding Area pond empties into the outlet channel, and where the HBHA outlet channel crosses under Mishawum Road. Samples were collected monthly for one year. Analytes included: toluene, benzene, arsenic (total and dissolved), chromium (total and dissolved), mercury (total), iron (total), and geochemistry parameters.

Toxicological Work (May and June, 1999): Collect and analyze surface water, fish, sediment, benthic invertebrates, and vegetation samples, and evaluate ecological habitats and sediment biotoxicity studies. Each area was analyzed for the following:

- Sediment (13 locations)--chemical, physical, and toxicity [VOCs, SVOCs, pesticides, PCBs, total metals, acid volatile sulfide/simultaneously extractable metals, TOC, grain size, and biotoxicity testing]
- Surface water (15 locations)--chemical [VOCs, SVOCs, Pesticides, PCBs, total metals, dissolved metals, TSS, TOC, temperature, pH, conductivity, DO, and turbidity]
- Fish tissue--chemical [total metals and arsenic organic/inorganic speciation]
- Fish--external observation for abnormalities
- Benthic invertebrate tissue--chemical [PAHs and total metals]
- Benthic invertebrates (13 locations)--community structure
- Vegetation--chemical [total metals]

Downgradient Transport: Determine the hydraulic characteristics of the Halls Brook Holding Area Pond and wetlands over a range of discharge scenarios, identify sediment physical characteristics, quantify sediment loading, retention and export budgets for Halls Brook Holding Area under normal and high-flow. Samples were analyzed for the following:

- Depth-integrated sampling (nine locations) -- flow-weighted composite samples for three seasons, three sampling events per season, and nine sampling locations [TSS, total arsenic, dissolved arsenic, total chromium, total lead, total mercury, Bis(2ethylhexyl) phthalate, diethylypthalate, PAHs, 4-Methyl-2-pentanone, and 4-Methylphenol].
- Halls Brook Holding Area Pond discharge, and wetland discharge: at each location flow-weighted composite samples for 3 seasons, 3 events per season [Target Compound List VOCs, Target Compound List SVOCs, and Target Analyte List metals].

WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G1):

Facility	PWS ID#	WMA Permit #	WMA Registration #	Source G = ground S=surface	Authorized Withdrawal (MGD)	1999 Average Withdrawal (MGD)
Winchester Water Department	3344000		31934402	01S North Reservoir	1.06*	1.17
Woburn Water Department	3347000		31934703	01-10 G	4.07*	3.11
Kraft General Foods			31934704	Wells 1,2,5,6,7	1.0	0.75
Parkview Condominiums		9P231934403		NA	0.36	0.36**
Winchester Country Club		9P31934402		Irrigation Well Irrigation Pond	0.16 (180 days)	Well Never installed

*System-wide withdrawal **Parkview Condos newly issued permit on 6/30/2000 - 1999 average withdrawal is estimated from WMA permit application.

NPDES SURFACE DISCHARGE SUMMARY:

Olin Chemical, Wilmington (MA0005304) is permitted (issued 2000) to discharge 0.043 MGD treated wastewater from groundwater remediation activities to Halls Brook, a tributary to the Aberjona River. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ and a CNOEC $\geq 100\%$.

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

USE ASSESSMENT

AQUATIC LIFE

Biology

During July 1999, DWM conducted a benthic macroinvertebrate survey at one station on this segment: AR01—Aberjona River at the USGS gaging station in Winchester (Appendix C). The benthic community at AR01 received the lowest total metric score of the 14 biomonitoring stations surveyed in the Boston Harbor watershed survey, representing only 47% comparability to reference conditions (moderately impacted). Filter-feeding Hydropsychidae were hyperdominant, comprising over 60% of the sample. The abundance of filter-feeding organisms, along with gathering collectors such as the oligochaete worms and gammarid amphipods, implies that suspended and deposited forms of organic matter are the primary food resources in this portion of the river.

USGS conducted biomonitoring on the Aberjona River at Winchester (150 m reach downstream from gage) as part of the NAWQA NECB study during 1999, 2000, and 2001. Their sampling included reach delineation, fish community assessment, macroinvertebrate/algal sample collection and analysis, and habitat assessment. The data from the macroinvertebrate samples are currently being analyzed. Fish species collected included American eel (*Anguilla rostrata)*, bluegill (*Leopomis macrochirus*), brown bullhead (*Ameriurus nebulosus*), largemouth bass (*Micropterus salmoides*), pumpkinseed (L*epomis gibbosus*), white sucker (*Catastomus commersoni*), yellow perch (*Perca flavescens*), golden shiner (*Notemigonus crysoleucas*), and green sunfish (*Lepomis cyanellus*) (Beaulieau 2001). The assemblage is comprised mostly of macrohabitat generalists and may be considered pond species (Maietta 2001). However, one fluvial dependant (white sucker), a species that requires flowing water for some aspect of its life history, was collected in all three years.

The Mystic River Watershed Association (MyRWA) collected and analyzed benthic macroinvertebrate samples at two stations (ABR028- Aberjona River at Washington Street and ABR006- Aberjona River at USGS gaging station) on 4 and 18 November 2000 along this segment of the Aberjona River. At the upstream station (ARB0028), the sample was comprised of amphipods, oligochaetes, chrionomids, and hydropsychids. These results indicated a moderately impacted community on 4 November and a severely impacted benthic macroinvertebrate community on 18 November (MyRWA 2001). As part of their sampling in 2001, MyRWA will perform habitat assessments at both sites. The majority of organisms collected by MyRWA at the downstream station were hydropshchids, a very pollution tolerant taxon. Based on metric scores and guidelines from New York State, MyRWA concluded that site ARB006 was severely impacted on 4 November and slightly impacted on 18 November (MyRWA 2001).

Habitat/Flow

During the July 1999 macroinvertebrate survey, DWM noted sediment deposition throughout the reach. Filamentous green algae covered approximately 10% of the reach and were restricted to the rocky substrates in the riffle areas (Appendix C).

The Aberjona River is defined in the Massachusetts Stream and River Identification System (SARIS) as interrupted. Between Atlantic Avenue and Constitution Way the river is culverted and channeled underground thereby eliminating natural habitat for aquatic life.

The USGS NAWQA program collected flow data from their gage on the Aberjona River in Winchester. In 1999 the discharge ranged from 2.0 to 197 cfs. During the months of June, July, and August the flow was less than 10 cfs. The average flow for the month of June was 4.58 cfs. For July, the average discharge was 7.11 cfs and for the month of August, the average flow was 3.99 cfs. In 2000 the discharge ranged from 4.6 to 312 cfs. Discharges in July and September were mostly below 10 cfs, which is approximately half the annual average flow (Socolow *et al.* 1999 and Socolow *et al.* 2000).

Additionally, as part of the Massachusetts Watershed Initiative 99-02 grant project, flow data were collected by USGS at two sites on the Aberjona River on ten occasions between May 1999 and June

2000. Discharges at Salem Street in 1999 ranged from 0.95 to 3.3 cfs and in 2000 ranged from 4.4 to 89 cfs. Discharges at Washington Street ranged from 0.43 to 6.0 cfs in 1999 and from 7.6 to 196 cfs in 2000 (Socolow *et al.* 2000 and Socolow *et al.* 2001). It should be noted that 1999 was a drought year. Average monthly flows in June were lower than have been recorded in decades (USGS 5 June 2001).

Toxicity

Effluent

Between February 1996 and April 2001, Olin Chemical conducted 20 whole effluent toxicity tests using *Ceriodaphnia dubi*a and 17 whole effluent toxicity tests using *Pimephales promelas*. No acute whole effluent toxicity was detected *(*LC_{50}'s >100%). Of the 20 *C. dubi*a tests, three were below the CNOEC limit of 100%: August 1998 = 50%, February 2001 = 25%, and April 2001 = 50%. Of the 17 *P. promelas* tests, only one was below the CNOEC limit of 100%: August 1998 = 50%. Olin Chemical discharges to Halls Brook, a tributary to the Aberjona River.

Chemistry – water

MyRWA collected water quality data at three sites on the Aberjona River: Salem Street, Woburn; Washington Street, Woburn; and the USGS gage in Winchester. Monthly samples for dissolved oxygen, conductivity, pH, temperature, total suspended solids, nitrate, and nitrite were collected between July and December 2000 and in May 2001 (MyRWA 2001).

USGS also collected water quality samples at Washington Street (01102474) and Salem Street (01102460) as part of the Massachusetts Watershed Initiative 99-02 grant. Dissolved oxygen, temperature, pH, ammonia-nitrogen, and total phosphorus samples were collected during May, June, July, September, and November 1999 and January, March, May and June 2000 (Socolow *et al.* 2000 and Socolow *et al*. 2001). Additionally, the USGS NECB- NAWQA program collected water quality data (pH, temperature, dissolved oxygen, ammonia -N, and phosphorus) from their gage (#01102500) at Winchester from October 1998 to September 1999 (Socolow *et al.* 1999 and Socolow *et al.* 2000).

DO

Dissolved oxygen concentrations were low at the Salem Street station as recorded by both MyRWA and USGS. DO concentrations measured by MyRWA ranged between 3.4 and 10.0 mg/L with three out of seven measurements below 5.0 mg/L (43%). USGS DO concentrations (n=10) ranged from 3.0 to 8.9 mg/L with one measurement below 5.0 mg/L.

Downstream at Washington Street, MyRWA dissolved oxygen concentrations ranged between 6.4 and 13.2 mg/L. DO at this station recorded by USGS ranged from 4.3 to 10.9 mg/L with three out of ten measurements below 5.0 mg/L.

At the downstream end of this segment at USGS gage #01102500 MyRWA recorded DO from 5.6 to 11.4 mg/L (n=7). USGS recorded dissolved oxygen levels from 3.0 to 12.8 mg/L in 1999. Half of the USGS weekly measurements during June, July, and August were below 5.0 mg/L. During 2000, however, DO levels ranged from 5.5 to 14.5 mg/L. In both years, a total of 11 out of 74 measurements were below 5.0 mg/L (15%).

No samples were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature

Temperature readings did not exceed 28.3ºC in any of the measurements collected in 1999 and 2000.

pH

MyRWA and USGS reported pH levels within the SWQS for a Class B, warm water fishery.

Total Suspended Solids (TSS)

TSS concentrations collected by MyRWA at their three stations ranged between below detection limit (BDL) and 10.5 mg/L (n=21).

Ammonia-Nitrogen (as N)

USGS ammonia-nitrogen concentrations ranged between BDL and 6.18 mg/L (1.9 times the Criterion Continuous Concentration or CCC). Eleven of the 96 samples were above the CCC.

Total Phosphorus (as P)

MyRWA total phosphorus concentrations (n=17) ranged between BDL and 0.15 mg/L with one greater than 0.1 mg/L.

During the NECB-NAWQA survey, total phosphorus concentrations ranged from 0.012 to 0.197 mg/L (n=53) with two greater than 0.1 mg/L. Total phosphorus levels collected as part of the MWI project were less than 0.070 mg/L at both stations (n=21).

No data/information were available to assess the upper 2.6 miles of the Aberjona River (not assessed). From the Industri-plex Site downstream, based on a loss of habitat, an impaired benthic macroinvertebrate community, low dissolved oxygen concentrations, and elevated nutrients the *Aquatic Life Use* is assessed as non-support (6.6 miles).

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

The MyRWA collected fecal coliform bacteria samples at two sites on the Aberjona River, Salem Street and Washington Street (dry weather conditions) in 2000 and 2001. At Salem Street, fecal coliform counts ranged between 30 and 2,700 cfu/100 mL (n=7). On three occasions levels were above 400 cfu/100mL (43%). Fecal coliform levels ranged between 100 and 1,050 cfu/100mL at Washington Street (n=7). Bacteria counts were above 400 cfu/100mL on three occasions (43%).

No data/information were available to assess the recreational uses for the upper 2.6 miles of the Aberjona River (not assessed). Based on elevated fecal coliform bacteria counts during dry weather conditions, the *Primary Contact Recreational Use* is assessed as non-support from the Industri-plex Site to the inlet of Upper Mystic Lake (6.6 miles). The *Secondary Contact Recreational Use*, however, is assessed as support (6.6 miles) since no counts were above 4,000 cfu/100mL.

AESTHETICS

During the July 1999 benthic macroinvertebrate survey, DWM identified moderate levels of instream turbidity (Appendix C). Although a narrow riparian buffer was noted, no obvious signs of objectionable deposits, odors or colors were recorded.

No data/information were available to assess the upper 2.6 miles of the Aberjona River (not assessed). Based on the overall high aesthetic quality of the lower 6.6 miles of the Aberjona River, the *Aesthetics Use* is assessed as support.

Aberjona River (MA71-01) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		NOT ASSESSED upper 2.6 miles NON SUPPORT lower 6.6 miles	Organic enrichment/low DO, other habitat alterations, Unknown		Hydromodification and unknown	Urban runoff/storm sewers
Fish Consumption		NOT ASSESSED				
Primary Contact		NOT ASSESSED upper 2.6 miles NON SUPPORT lower 6.6 miles	Pathogens		Unknown	Illicit sewer connections, wildfowl
Secondary Contact		NOT ASSESSED upper 2.6 miles SUPPORT lower 6.6 miles				
Aesthetics		NOT ASSESSED upper 2.6 miles SUPPORT lower 6.6 miles				

RECOMMENDATIONS ABERJONA RIVER (MA71-01)

- The Olin Chemical Corp (MA0005304) should collect water from Halls Brook upstream of their discharge to use as dilution water in their whole effluent toxicity tests. If the Brook water does not meet the control test acceptability criteria (e.g., survival > 80% at 7-day), then Halls Brook water must still be utilized as a test control and not as a diluent.

- When available review the USGS sediment and fish data collected as part of their Toxics Substances Hydrology Program, Urban Land Use Gradient Study, and the MA DEP Merrimack Valley Fish Study to further assess potential impacts to aquatic life in the Aberjona River.

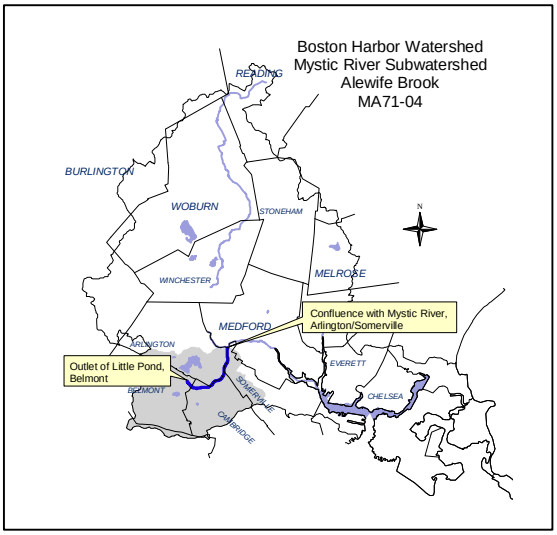
- When available review the USGS macroinvertebrate/algal sample collection and habitat assessment data from the Aberjona River at Winchester (150 m reach downstream from gage) collected as part of the NAWQA NECB study to further assess potential impacts to aquatic life in the Aberjona River.

- When available, review the data collected as part of the EPA MSGRP RI/FS environmental sampling program along the Aberjona River to further assess potential impacts to aquatic life in the Aberjona River.

- Work with the MyRWA and the EOEA Team to identify and eliminate dry weather sources of bacteria in the Aberjona subwatershed (e.g., nonpoint source pollution, waterfowl).

ALEWIFE BROOK (SEGMENT MA71-04)

Location: Outlet of Little Pond, Belmont to confluence with Mystic River, Arlington/Somerville
Segment Area: 2.25 miles.
Classification: Class B Warm Water Fishery*.
(*In the 2002 updated SWQS Alewife Brook will be reclassified as Class B, CSO Variance. See Classification section.)



In future assessment reports, Alewife Brook (MA71-04) will be divided into two segments: Little River (MA71-07) from the outlet of Little Pond to the confluence with a small unnamed tributary near the Cambridge/Arlington town line and Alewife Brook (MA71-08) from the confluence with the Little River, Cambridge/Arlington to the confluence with the Mystic River, Arlington/Somerville.

Land-use estimates for the subwatershed (map inset, gray shaded area):

Residential	61%
Open Land	11%
Commercial	11%

This segment is on the 1998 303(d) list of impaired waters for pathogens (MA DEP 1999a)

The use assessments for Spy, Hill, and Clay Pit ponds and Blacks Nook are provided in the Lakes section of this assessment report (Table 5). The Amelia Earhart Dam controls the water level in Upper Mystic River and Alewife Brook.

WMA WATER WITHDRAWAL SUMMARY:
There are no regulated water withdrawals from the Alewife Brook subwatershed.

NPDES SURFACE DISCHARGE SUMMARY:
Massachusetts Water Resources Authority Deer Island WWTP (MA0103284) is permitted (issued 2001) to discharge up to 1,270 MGD treated wastewater to Massachusetts Bay via outfall 001 and combined sewage via CSO's 003, 201, 203, 205, 010, 018, 019, 020, 021, 022, 023, 205A, 207, 209, 211 to Alewife Brook, Inner Harbor, Mystic River, Charles River, and Dorchester Bay. The facility's whole effluent toxicity limit is $LC_{50} \geq 50\%$. The facility's TRC limit is 631 µg/L (maximum daily).

The City of Somerville (MA01101982) was permitted to discharge combined sewage via six CSOs to Alewife Brook. The permit expired 29 September 1997. Somerville has eliminated 5 of the 6 CSO outfalls and now only has a single permitted CSO outfall, SOM 001A. The NPDES Permit is expected to be reissued in 2002.

The City of Cambridge (MA0101974) is permitted to discharge via seven CSOs to Alewife Brook. The permit expired 25 April 1998. The permit is expected to be reissued in 2002.

On 5 March 1999, a CSO Variance was issued by the MA DEP for the CSO discharges to the Alewife Brook/Upper Mystic River watershed. The Conditions of the Variance require MWRA to move forward with CSO projects determined to be feasible and cost-effective in the CSO Facilities Plan, and also gather more information on CSO and storm water loads in the watershed. The CSO projects slated to move forward included sewer separation work in Cambridge to substantially mitigate CSO discharges to Alewife Brook. During detailed design for these facilities, the City determined that the combined sewer system was much more extensive than previously documented, and in fact discovered an additional, unpermitted CSO outfall. Subsequently, after environmental review, MWRA and the City of Cambridge have revised and expanded the sewer separation program to a $ 74 million program to address the more extensive

CSO discharges and to prioritize protection of the City of Cambridge drinking water reservoir, Fresh Pond. The City of Cambridge is now proceeding with the permitting phase of the project (Brander 2001b).

Work completed to date has resulted in the closure of six of the 14 CSO outfalls in the Alewife/Upper Mystic watershed. The sewer separation work noted above, along with the hydraulic relief projects and floatables control facilities, which are now moving forward, are expected to substantially mitigate existing untreated CSO discharge by reducing the volumes by 84% and limiting annual activations to less than seven events per year on average. Floatables controls will be provided for all active CSO outfalls (Brander 2001b).

Based on the progress of the CSO abatement work, and the additional water quality and technical information gathered, MWRA will develop a Final CSO Assessment Report during the Variance timeframe. This Report will be subject to public environmental review, and EPA and MA DEP will determine at that time if higher levels of CSO control are required pursuant to the federal and state regulations (Brander 2001b).

Consistent with the 1997 Final CSO Facilities Plan, MWRA will be required to periodically reassess, optimize, and enhance its CSO Control Plan based upon new or updated information as may be received during future CSO implementation activities during the Project design phase. In general, any proposed revision that would result in a substantive increase in the number of CSO activations and/or result in a significant increase in the volume of CSO discharge would require a formal public review and comment process, and subsequent revision(s) to the NPDES Permit and/or Court Order (Brander 2001b).

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from MA DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

Dry weather sampling programs have identified many storm drains in this segment that appear to be conveying wastewater flows. MA DEP has issued Notices of Noncompliance (NONs) to communities in the Alewife/Mystic watershed requiring them to move forward with programs to identify and remove illegal connections to storm drains. While initial phases of the work are underway, further work is needed to eliminate these pollution sources (Brander 2002).

USE ASSESSMENT

AQUATIC LIFE

Habitat/Flow

As part of the Massachusetts Watershed Initiative 99-02 grant project, flow data was collected by USGS at one site on Alewife Brook on ten occasions between May 1999 and June 2000. Discharges in 1999 ranged from 1.4 cfs to 5.9 cfs and in 2000 ranged from 5.4 cfs to 45 cfs (Socolow *et al.* 2000 and Socolow *et al.* 2001).

Chemistry - water

The MyRWA collected water quality data at one site on Alewife Brook (ALB006, Broadway Arlington/Somerville). Monthly samples for dissolved oxygen, pH, temperature, and total suspended solids were collected between July and December 2000, and May 2001 (MyRWA 2001).

As part of the MWI 99-02 grant, USGS sampled Alewife Brook at the same location as MyRWA on ten occasions between May 1999 and June 2000. Parameters measured included dissolved oxygen, temperature, ammonia-nitrogen (as N), and total phosphorus (Socolow *et al.* 2000 and Socolow *et al. 2001*).

The Alewife/Mystic River Advocates collected wet and dry weather water quality samples at five stations along Alewife Brook: SOM 001-Woodstock St, Broadway-Broadway Bridge, SOM 002-Powder House Blvd., SOM 003-Powder House Blvd., and SOM 004-Gordon St. Between November 1999 and November 2000, as part of a 319 grant with the City of Somerville, they also collected pH, temperature, and dissolved oxygen data (DFWELE 2001a).

The Massachusetts Water Resource Authority (MWRA) collected water quality samples at four stations on Alewife Brook between 1996 and 2000 as part of their ongoing CSO monitoring program (Coughlin 2002):

070- Alewife Brook off Mystic Valley Parkway B
074- Alewife Brook offramp to Alewife T
174- Alewife Brook (Little River) 415 ft upstream of Route 2E Offramp to Alewife T
172- Alewife Brook upstream side of Mass. Ave. Bridge, mid channel

Samples were analyzed for DO, % saturation, temperature, and turbidity.

DO

Dissolved oxygen concentrations reported by Alewife/Mystic River Advocates fell below 5.0 mg/L in nine of the 49 samples collected. These low concentrations were recorded in the summer (June, July and August) of 2000. Thirteen of the percent saturations were below 60% (n=49).

Dissolved oxygen concentrations reported by MyRWA at Broadway ranged between 3.4 mg/L and 10 mg/L (n=7) with two samples below 5.0 mg/L. At the same station, DO concentrations reported by USGS ranged from 2.7 to 9.2 mg/L with 4 out of 11 measurements were less than 5.0 mg/L.

Dissolved oxygen concentrations reported by MWRA ranged between 1.77 and 11.36 mg/L with 76 less than 5.0 mg/L (n=244). Percent saturations ranged between 17 and 110.8% with 104 out of the 243 measurements less than 60%.

No samples were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature

Temperature readings did not exceed 28.3ºC in any of the measurements collected by MyRWA USGS, and MWRA (n>250).

pH

MyRWA and USGS reported pH levels within the SWQS for a Class B, warm water fishery (n=19).

Turbidity

Turbidity measurements recorded by MWRA ranged between 0 and 38.1NTU with an average of 5.53 NTU (n=145).

Suspended Solids

TSS concentrations collected by MyRWA ranged between 5.8 and 24 mg/L (n=7).

Ammonia-Nitrogen

In the USGS surveys, ammonia-nitrogen (as N) concentrations ranged from 0.123 to 0.724 mg/ L (n=12). All were below the acute and chronic water quality criterion for ammonia-nitrogen.

Total Phosphorus (as P)

MyRWA and USGS reported total phosphorus concentrations at Broadway ranged from 0.078 to 0.23 mg/L (n=19) with 15 greater than 0.1mg/L.

Chemistry – sediment

In 1999, eleven surface sediment samples were collected from Alewife Brook and analyzed using Instrumental Neutron Activation Analysis and Flame Atomic Absorption Spectroscopy for a suite of

elemental contaminants as a part of a Tufts Masters thesis research (Ivushkina 1999). The results of this study are presented below. Sediment concentrations of both copper and lead were found to be above the severe effect level (S-EL) for aquatic life. Arsenic, cadmium, chromium, and zinc were all found to be above the lowest effect level (L-EL).

Element	Min	Max	Mean	n	L-EL (Persuad *et al.* 1993)	S-EL (Persuad *et al.* 1993)
As	8	38	20.84	11	6	33
Cd	0.4	3.3	1.16	11	0.6	10
Cr	56	150	92.55	11	26	110
Cu	57	290	139.4	10	16	110
Pb	170	1000	362	10	31	250
Zn	100	3100	649.09	11	120	820

The *Aquatic Life Use* for Alewife Brook is assessed as non-support due to low DO concentrations, low percent saturations, moderately high nutrients, and elevated levels of trace elements in the sediments.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

As part of the MWI Grant 99-02, USGS sampled Alewife Brook at Broadway on three occasions (20 May, 17 June and 30 June 1999). Fecal coliform levels ranged from 900 cfu/100mL to 17,000 cfu/100 mL (Socolow *et al.* 2000 and Socolow *et al.* 2001).

The MyRWA collected fecal coliform bacteria samples (dry weather) also from Broadway on seven occasions between July and December 2000 and May 2001. Concentrations ranged from 260 to 38,900 cfu/100mL. Six of the seven samples were above 400 cfu/100mL, two were above 2,000 cfu/100mL and one was above 4,000 cfu/100mL (MyRWA 2001).

MWRA collected fecal coliform bacteria samples and Secchi disk depth readings at their four stations on Alewife Brook between 1996 and 2000 as part of their ongoing CSO monitoring program (Coughlin 2002). Fecal coliform bacteria counts ranged between 10 and 110,000 cfu/100mL (n=257). During the primary recreation season, fecal coliform bacteria counts ranged between 10 and 110,000 with 152 counts greater than 400cfu/100mL. Secchi disk depths (n=71) recorded by MWRA ranged between 0.2 and 9 m (at station 070 at the Mystic Valley Parkway bridge) and could be seen all the way to the bottom on 15 occasions.

It should be noted that this segment currently receives the flow from eight active untreated CSOs. MWRA and the cities of Cambridge and Somerville have completed sewer separation projects and are implementing hydraulic relief projects and floatables control facilities which are expected to substantially mitigate existing untreated CSO discharge by reducing the volumes by 84% and limiting annual activations to less than seven events per year on average (Brander 2001b).

Based on the elevated fecal coliform bacteria counts, the *Primary* and *Secondary Contact Recreational* uses for Alewife Brook are assessed as non-support.

AESTHETICS

The Alewife/Mystic River Advocates and the Friends of the Mystic River conducted shoreline surveys of the Mystic River, Alewife Brook, and the Malden River during spring 1995 and fall 1996. Alewife Brook runs channelized and fenced for most of its length. The surveys indicated many discharge pipes (including CSOs), oily sheens, rotten egg odors, a concrete river channel, trash, and little aquatic/terrestrial life (AMRA 1997).

R. Frymire sampled (during dry and wet weather) pipes discharging to Alewife Brook and the Little River (within the cities of Cambridge, Somerville, Belmont, and Arlington) for the MyRWA. During dry weather conditions several pipes were discharging. Additionally, sewage odors, invasive aquatic plants (*Phragmites australis*), and oil sheens were noted (Frymire 2000).

The Alewife Brook/ Little River Stream Team conducted shoreline surveys of 21 reaches along Alewife Brook and Little River during June 2000. They noted “muddy” water, trash, erosion, invasive species

(*Phragmites australis* and Japanese Knotweed), outfalls/pipes, sewage odor, and an oil spill along Alewife Brook. There is public access along the brook and much of the land surrounding the brook is owned by MDC (DFWELE 2000a).

Due to an overall degraded aesthetic quality (i.e., trash and debris, odors, and oily sheens) the *Aesthetics Use* is assessed as non-support

Alewife Brook (MA71-04) Use Summary Table

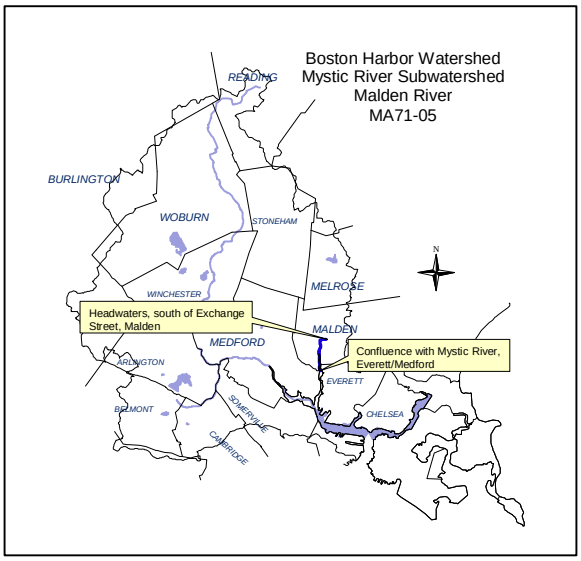
Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		NON-SUPPORT	Organic enrichment/low DO, nutrients, metals		Urban runoff/storm sewers, CSO	Illicit sewer connections
Fish Consumption		NOT ASSESSED				
Primary Contact		NON-SUPPORT	Pathogens		CSO	Illicit sewer connections
Secondary Contact		NON-SUPPORT	Pathogens		CSO	Illicit sewer connections
Aesthetics		NON-SUPPORT	Objectionable deposits, taste/odor, oil and grease		Urban runoff/storm sewers, CSO	

RECOMMENDATIONS ALEWIFE BROOK (MA71-04)

- Work with local citizens and stream teams to remove/reduce the trash and debris in Alewife Brook.
- Continue implementation of the $74 million MWRA CSO Abatement Plan in the Alewife/Mystic watershed.
- Work with MDC to develop water release practices at the Amelia Earhart Dam that will benefit the aquatic life of the Alewife/Mystic subwatershed.
- Work with the City of Cambridge to implement the Fresh Pond Reservoir Watershed Protection Plan and Stewardship.

MALDEN RIVER (SEGMENT MA71-05)

Location: Headwaters, south of Exchange Street, Malden to confluence with Mystic River, Everett/Medford.
Segment Area: 1.9 miles.
Classification: Class B Warm Water Fishery.



Land use estimates for this segment are unavailable.

This segment is on the 1998 303(d) list of impaired waters for organic enrichment/ low DO, pathogens, and suspended solids (needs confirmation) (MA DEP 1999a). Included within the Malden River subwatershed is part of the Middlesex Fells Reservation. This MDC managed property is the largest open space in the Mystic River subwatershed (Perez 2002).

WATER WITHDRAWAL SUMMARY
There are no regulated water withdrawals from the Malden River.

NPDES SURFACE DISCHARGE SUMMARY:
Rohm Technology Inc (MA0031780); AVCO Everett Lab/Textron (MA0032301); Gateway Condominiums (MA0030759); Wellington Business Center (MA0030546); Imported Stone Inc. (MA0034622, expired 17 June 1993) are all listed on the 24 October 2000 EPA active facility list.

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

USE ASSESSMENT

AQUATIC LIFE
Chemistry - water
MyRWA collected water quality data at one site on Malden River—MAR036 at Medford Street. Monthly samples for dissolved oxygen, conductivity, pH, temperature, and total suspended solids were collected between July and December 2000, and in May 2001 (MyRWA 2001).

DO
Dissolved oxygen concentrations ranged between 5.3 and 10.6 mg/L (n=6). No samples were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature
All temperature measurements were below the SWQS for a Class B waterbody (n=6)

pH
pH ranged from 6.9 SU to 8.9 SU (n=5) with one measurement above 8.5 SU.

Total Suspended Solids
TSS concentrations ranged between 2.5 and 8.2 mg/L (n=6).

Total Phosphorus (as P)

Total phosphorus concentrations ranged from BDL to 0.17 mg/L (n=5) with two samples greater than 0.1 mg/L.

Too little instream data (limited spatial coverage) are available to assess the *Aquatic Life Use*; therefore, this use is currently not assessed.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

MyRWA collected dry weather fecal coliform bacteria samples on seven occasions on the Malden River at Medford Street between July and December 2000 and May 2001. Bacteria counts ranged between <10 cfu/100mL and 940 cfu/100mL, with two counts greater than 400 cfu/100mL (MyRWA 2001).

Too little instream data (limited spatial coverage) are available to assess the *Primary and Secondary Contact Recreational* uses; therefore, it is currently not assessed. The Malden River, however, is on "Alert Status" due to slightly elevated bacteria counts during dry weather and the urban nature of this subwatershed.

AESTHETICS

Alewife/Mystic River Advocates and Friends of the Mystic River conducted shoreline surveys of the Malden River on 20 August and 23 October 1996. They noted overall instream conditions as poor; tires littered the entire length of the river; the water appeared cloudy and opaque in color; oil sheens and oil smells, and an abundance of trash were common. Sixteen storm water pipes were noted within the survey area. Water levels were very low and "although the water is seldom observed over three feet deep, the bottom is not visible" (AMRA 1997). Additionally, little to no formal public access exists.

Based on the evidence of trash and debris, oil sheens, and other aesthetic quality degradation, the *Aesthetics Use* is assessed as non-support for the entire length of the Malden River.

Malden River (MA71-05) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		NOT ASSESSED				
Fish Consumption		NOT ASSESSED				
Primary Contact*		NOT ASSESSED*				
Secondary Contact*		NOT ASSESSED*				
Aesthetics		NON-SUPPORT	Objectionable deposits, oil & grease, and taste & odor		Urban runoff/storm sewers	

* "Alert Status" issues identified; see *Primary* and *Secondary Contact Recreational Use* assessment

RECOMMENDATIONS MALDEN RIVER (MA71-05)

- Work with local citizens and stream teams to remove/reduce the trash and debris in the Malden River.

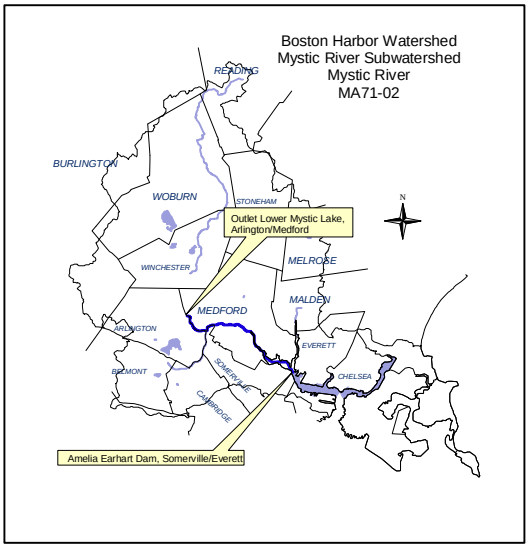
- Work with MyRWA and EOEA to increase water quality monitoring (i.e., spatial coverage) to assess the designated uses.

- Conduct biomonitoring and fish toxic monitoring to assess the Aquatic Life and Fish Consumption uses for the Malden River.

- Work with EPA to determine if Rohm Technology Inc (MA0031780), AVCO Everett Lab/Textron (MA0032301), Gateway Condominiums (MA0030759, Wellington Business Center (MA0030546), and Imported Stone Inc. (MA0034622) are still discharging to the Malden River.

MYSTIC RIVER (SEGMENT MA71-02)

Location: Outlet Lower Mystic Lake, Arlington/Medford to Amelia Earhart Dam, Somerville/Everett.
Segment Area: 5.4 miles.
Classification: Class B, Warm Water Fishery, CSO.



Land use estimates for this segment are unavailable.

This segment is on the 1998 303(d) list of impaired waters for metals, nutrients, and pathogens (needs confirmation) (MA DEP 1999a).

"The privilege of taking fish was given in 1633-34 by the General Court to Governor Winthrop and Matthew Craddock at the weir 'at Mysticke' situated where High Street, Medford, now crosses the river". Provisions for passage and restrictions on fishing methods and locations were established in 1789. In 1966, the Amelia Earhart Dam, maintained by the MDC, was built to prevent salt water intrusion into the Lower Mystic Lake. The Mystic River anadromous fish run is currently managed under state regulations (Brady 2001).

Downstream from the confluence with Alewife Brook flow of the Mystic River is restricted by the remnants of the Craddock locks. Debris is restricting flow at the locks; however, MDC is currently working to alleviate this problem. Camp Dresser & McKee conducted a hydraulic study of the Craddock Locks for MDC and determined that removal of the locks would not be cost effective, as they support most of the Main Street bridge (Laramie 2002).

Included within the Malden River subwatershed is part of the Middlesex Fells Reservation. This MDC managed property is the largest open space in the Mystic River subwatershed (Perez 2002).

The use assessment for Bellevue Pond is provided in the Lakes section of this assessment report (Table 5).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G1):

Facility	PWS ID#	WMA Permit #	WMA Registration #	Source G = ground S=surface	Authorized Withdrawal (MGD)	1999 Average Withdrawal (MGD)
Winchester Water Department	3344000		31934402	02s middle reservoir 03s south reservoir	1.06*	1.17**

* System-wide withdrawal ** Exceeded WMA threshold of >0.1MGD over registration volume

NPDES SURFACE DISCHARGE SUMMARY:
The City of Somerville (MA01101982) is permitted to discharge via two CSOs to the Mystic River. The permit expired 29 September 1997. Somerville has since eliminated one CSO outfall and has only one remaining, SOM 007A, which discharges only treated CSO flows. Somerville's NPDES permit is expected to be reissued in 2002.

The City of Chelsea (MA0101877) is permitted to discharge via one CSO to the Mystic River. The permit expired 13 August 1998. The permit is expected to be reissued in 2002.

On 5 March 1999, a CSO Variance was issued by the MA DEP for the CSO discharges to the Alewife Brook/Upper Mystic River watershed. The Conditions of the Variance require MWRA to move forward with CSO projects determined to be feasible and cost-effective in the CSO Facilities Plan, and also gather more information on CSO and storm water loads in the watershed. The CSO projects slated to move forward included sewer separation work in Cambridge to substantially mitigate CSO discharges to Alewife Brook. During detailed design for these facilities, the City determined that the combined sewer system

was much more extensive than previously documented, and in fact discovered an additional, unpermitted CSO outfall. Subsequently, after environmental review, MWRA and the City of Cambridge have revised and expanded the sewer separation program to a $74 million dollar program to address the more extensive CSO discharges and to prioritize protection of Fresh Pond, the City of Cambridge drinking water reservoir. The City of Cambridge is proceeding with the permitting phase of the project (Brander 2001b).

Work completed to date has resulted in the closure of six of the 14 CSO outfalls in the Alewife/Upper Mystic watershed. The sewer separation work noted above, along with the hydraulic relief projects and floatables control facilities, which are now moving forward, are expected to substantially mitigate existing untreated CSO discharge by reducing the volumes by 84% and limiting annual activations to less than seven events per year on average. Floatables controls will be provided for all active CSO outfalls (Brander 2001b). Additional work includes upgrades to the Somerville Marginal CSO Treatment Facility. This facility provides screening and disinfection of CSO flows prior to discharge at MWR 205, just downstream of the Amelia Earhart Dam. When tidal conditions prevent discharge from MWR 205, the treated CSO flow is discharged through SOM 007A in this segment upstream of the Dam.

Based on the progress of the CSO abatement work, and the additional water quality and technical information gathered, MWRA will develop a Final CSO Assessment Report during the Variance timeframe. This report will be subject to public environmental review, and EPA and MA DEP will determine at that time if higher levels of CSO control are required pursuant to the federal and state regulations (Brander 2001b).

Consistent with the 1997 Final CSO Facilities Plan, MWRA will be required to periodically reassess, optimize, and enhance its CSO Control Plan based upon new or updated information as may be received during future CSO implementation activities during the project design phase. In general, any proposed revision that would result in a substantive increase in the number of CSO activations and/or result in a significant increase in the volume of CSO discharge would require a formal public review and comment process, and subsequent revision(s) to the NPDES Permit and/or Court Order (Brander 2001b).

Dry weather sampling programs have identified many storm drains in this segment that appear to be conveying wastewater flows. MA DEP has issued Notices of Noncompliance to communities in the Alewife/Mystic watershed requiring them to move forward with programs to identify and remove illegal connections to storm drains. While initial phases of this work are underway, further work is needed to eliminate these pollution sources.

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from MA DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

USE ASSESSMENT

AQUATIC LIFE

Biology

The Mystic River presently supports a good population of Alewives and Blueback herring, which pass through the Amelia Earhart Dam and concentrate each spring at the dam apron between Upper and Lower Mystic Lakes. Provisions for passage and restrictions on fishing methods and locations were established in 1789. The Mystic River run is currently managed under state regulations. Anecdotal information indicates that the run is likely in a state of dynamic equilibrium and in the several hundred thousand individual range (Brady 2001).

Chemistry - water

MyRWA sampled water quality in the Mystic River at Route 60, near Lower Mystic Lake. Monthly samples for dissolved oxygen (DO), conductivity, pH, temperature, and total suspended solids (TSS) were collected between July and December 2000 and May 2001 (MyRWA 2001).

USGS sampled two sites on the Mystic River in 1999 and 2000 as part of the MWI 99-02 grant project. Dissolved oxygen, pH, temperature, ammonia-nitrogen, and total phosphorus samples were collected at gage 01103017 at Route 60 on five occasions in 1999 and on four occasions in 2000. Data were also collected on 30 December 1999 and 4 January and 21 June 2000 at gage 01103033 at Main Street, Medford (Socolow *et al.* 2000 and Socolow *et al.* 2001).

MWRA collected water quality samples at seven stations on this segment of the Mystic River between 1996 and 2000 (Coughlin 2002):

057- at Mystic/Alewife confluence
083- upstream of Mystic/Alewife confluence
066- at Boston Ave. bridge
056- 100m upstream of Route 93
067- Route 28 bridge
059- Mystic/Malden confluence
167- Amelia Earhart Dam upstream side.

Samples were analyzed for DO, % saturation, temperature, turbidity, and chlorophyll *a*.

DO

MyRWA dissolved oxygen concentrations recorded at Route 60 ranged from 7.1 to 10.6 mg/L (n=7) while USGS concentrations at this location ranged from 4.7 to 12.0 mg/L (n=9). Only one measurement was less than 5.0 mg/L. Dissolved oxygen levels at Main Street ranged from 7.9 to 11.3 mg/L (n=3).

MWRA DO concentrations from their seven stations ranged between 0.1 and 18.64 mg/L with only 63 out of 989 measurements less than 5.0 mg/L. Percent saturation ranged from 1.2 to 156.8% with 81 measurements less than 60% and 62 measurements greater than 115% (n=989). It should be noted that at Station 167, upstream of the Amelia Earhart Dam, dissolved oxygen concentrations in the bottom waters were consistently below 5.0 mg/L and 60% saturation during the summer months. Additional data is needed to determine if this is the result of salt-water seepage through the Amelia Earhart Dam and to determine if low dissolved oxygen concentrations during the summer months persist throughout the segment.

No samples were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature

All temperature measurements collected by MyRWA, USGS, and MWRA were below the Class B SWQS (n>1,000).

pH

pH recorded by MyRWA and USGS ranged from 6.5 to 8.9 SU at Route 60 (n=16) with three above 8.3. At Main Street, USGS recorded pH measurements between 6.6 and 7.0 SU.

Turbidity

Turbidity measurements recorded by MWRA ranged between 0 and 42 NTU with an average of 5.19 NTU (n=639).

Total Suspended Solids

TSS levels collected by MyRWA at Route 60 ranged from BDL to 8.0 mg/L (n=7).

Chlorophyll a

Chlorophyll a concentrations reported by MWRA ranged between 1.84 and 131 µg/L (n=263).

Ammonia-Nitrogen (as N)

Ammonia-nitrogen concentrations recorded by USGS at Route 60 ranged from BDL to 0.663 mg/L (n=10). All measurements were below the acute and chronic water quality criteria for ammonia-nitrogen.

Total Phosphorus (as P)

Total phosphorus concentrations measured by MyRWA and USGS at Route 60 ranged between BDL and 0.129 mg/L (n=16) with only one sample greater than 0.1 mg/L.

This segment of the Mystic River supports the *Aquatic Life Use* based on chemical water quality parameters within the SWQS for a Class B Warm Water Fishery. However, this segment is on 'Alert Status" due to slightly elevated nutrient concentrations (i.e., total phosphorus and chlorophyll a) and low dissolved oxygen concentrations in bottom waters during summer months.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

MyRWA collected seven dry weather fecal coliform bacteria samples at Route 60 (near outlet of Lower Mystic Lake) between July and December 2000 and May 2001. Bacteria counts ranged from <10 to 6400 cfu/100mL with one count greater than 400 cfu/100mL (MyRWA 2001). USGS also collected three fecal coliform bacteria samples at Route 60 as part of the MWI 99-02 grant project. Bacteria counts ranged from 20 to 70 cfu/100mL. (Socolow *et al.* 2000 and Socolow *et al.* 2001).

MWRA collected fecal coliform bacteria samples at seven stations as part of their ongoing CSO monitoring program between 1996 and 2000 (Coughlin 2002). Samples were collected during both wet and dry weather conditions. Fecal coliform bacteria counts ranged between <5 and 30,400 cfu/100mL with only 38 samples greater than 2,000 cfu/100mL and 17 samples greater than 4,000cfu/100mL (n=732). During the primary contact season, fecal coliform bacteria counts ranged between <5 and 30,400cfu/100mL (n=543) with 107 greater than 400cfu/100mL (20%). Secchi disk depth readings recorded by MWRA ranged from 0 to 9m and could be seen all the way to the bottom on 68 occasions (n=548).

Additionally, this segment receives flow from one active CSO. MWRA and the cities of Cambridge and Somerville have completed sewer separation projects and are implementing hydraulic relief projects and floatables control facilities which are expected to substantially mitigate existing untreated CSO discharge by reducing the volumes by 84% and limiting annual activations to less than seven events per year on average (Brander 2001b).

Based on elevated fecal coliform bacteria counts during both wet and dry weather conditions, the *Primary* and *Secondary Contact Recreational uses* are assessed as partial support for this segment.

AESTHETICS

The Alewife/Mystic River Advocates and the Friends of the Mystic River conducted shoreline surveys of the Mystic River, Alewife Brook, and the Malden River during spring 1995 and fall 1996. The water from the outlet of Lower Mystic Lake to the Water Street Bridge appeared "fairly clear"; with limited trash and debris. Downstream from Main Street (lower 2.7 miles), a number of pipes were discharging in dry weather. In addition, oil sheens, trash and debris, and car tires and batteries were seen in the streambed (AMRA, 1997). MDC owned parkland surrounds much of the river. People actively frequent the banks of the river for recreational use.

Secchi disk depth readings recorded by MWRA ranged from 0 to 9 m and could be seen all the way to the bottom on 68 occasions (n=548).

The *Aesthetics Use* is assessed as support for the upper mile of the Mystic River due to good water clarity and high aesthetic quality. This use is not assessed downstream from Alewife Brook (lower 4.4

miles) due to the lack of current instream aesthetic quality observations (i.e., observations are greater than 5 years old).

Mystic River (MA71-02) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		SUPPORT*				
Fish Consumption		NOT ASSESSED				
Primary Contact		PARTIAL SUPPORT	Pathogens		CSO	Urban runoff/ storm sewers
Secondary Contact		PARTIAL SUPPORT	Pathogens		CSO	Urban runoff/ storm sewers
Aesthetics		SUPPORT upper 1.0 miles NOT ASSESSED lower 4.4 miles				

* “Alert Status” issues identified; see *Aquatic Life Use* assessment

RECOMMENDATIONS MYSTIC RIVER (MA71-02)

- Work with local citizens and stream teams (Alewife/Mystic River Advocates and the Friends of the Mystic River) to remove/reduce the trash and debris in the Malden River.

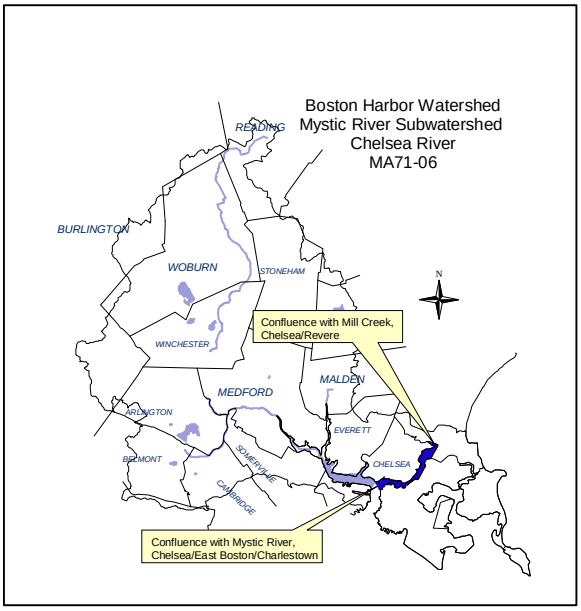
- Continue implementation of the $74 million MWRA CSO abatement program in the Alewife/Mystic watershed.

- Work with the MDC to determine to what extent salt water may be seeping through the Amelia Earhart Dam and determine if salt water intrusion may be contributing to low dissolved oxygen concentrations observed at MWRA sampling location 167.

- Work with the MWRA to collect bottom dissolved oxygen data during summer months from all of their sampling locations to determine if low dissolved oxygen levels in bottom waters are common throughout this segment of the Mystic River.

CHELSEA RIVER (SEGMENT MA71-06)

Location: Confluence with Mill Creek, Chelsea/Revere, to confluence with Mystic River, Chelsea/East Boston/Charlestown.
Segment Area: 0.5 square miles.
Classification: Class SB, CSO*.
(* In the 2002 updated SWQS, Chelsea Creek will be designated SB/CSO. See Classification section.)



Land use estimates for this segment are unavailable.

Chelsea River (locally known as Chelsea Creek) is an urban river flowing from Boston's Inner Harbor, between East Boston and Chelsea to the mouth of Mill Creek, between Chelsea and Revere. (Mill Creek is the only area where direct access to the water is possible). For centuries, Chelsea Creek has been flanked by working industries, many of which used the channel to transport raw materials and finished goods. The Creek is officially classified as a Designated Port Area: a stretch of waterfront set aside primarily for industrial and commercial use. With a shipping channel dredged to 38 feet, the creek handles most of the oil tanker traffic in and out of the Port of Boston. Most of the petroleum delivered to this area is offloaded to facilities along its banks. Army Corps of Engineers (ACOE) embarked on a navigation improvement project for Boston Harbor to increase the depth of the channel in the Mystic River to 40 feet and in the Chelsea River to 38 feet. The project used an innovative concept in disposing of silty material in deep confined aquatic disposal cells dredged below the existing channel and capped with clean sand. The project dredging was scheduled to be completed by early November 2001. MA DEP has given ACOE permission to leave a confined disposal cell in Chelsea River uncapped for up to five years so that it can be used for future maintenance dredging (ACOE 31 October 2001).

In addition to these industrial uses, the City of Boston and MassPort store road salt directly on the banks of the Chelsea River.

This segment is on the 1998 303(d) list of impaired waters for unionized ammonia, organic enrichment/ low DO, pathogens, oil and grease, taste, odor, and color, and turbidity (MA DEP 1999a).

Urban Wilds are small parcels of existing, and reconditioned, natural habitats and parks within the greater Boston area. The Boston Parks and Recreation Department administer the Urban Wilds Initiative. The Urban Wilds Initiative has as its goals the protection of city owned urban wilds, the management and maintenance of urban wilds, and the promotion of use of urban wilds (City of Boston, 2000a). A new urban wild/park, called the Condor Street Urban Wild, is slated to be constructed on the banks of the Chelsea River in East Boston. This park will be the first of many derelict spaces transformed into a public park. From the early 1920's until 1976 the Condor Street Parcel was used as a cleaning facility for a sand and gravel company. The on-site contamination is mostly concrete debris. The land will be remediated employing the debris to form dune-like structures (Hargreaves Associates 2002). Construction of the park is scheduled to begin in the spring of 2002. Once constructed, this park will provide the only public access to Chelsea Creek. It is hoped that, in the future, Chelsea Creek will be cleaned-up and eventually opened to canoeing and kayaking, similar to the Charles River. Neighborhood of Affordable Housing/Chelsea Creek Action Group, in East Boston has successfully applied for a $10,000 State Technical Assistance Grant to hire a consultant to provide technical expertise as well as to develop educational materials for the public to help increase their understanding of and involvement in site cleanup activities. In 1999-2000, working with the Chelsea Creek Action Group and the Urban Ecology Institute, Save the Harbor/Save the Bay secured commitments of more than $1.5 million private, public and philanthropic funds to plan, permit and remediate Condor Street Urban Wild. Additionally, these funds will be used to build the first new park

on either side of Chelsea Creek in a generation. In 2001, the Water's Edge Trust awarded Chelsea Creek $10,000 for an open space master plan. (Save the Harbor/Save the Bay undated).

WATER WITHDRAWAL SUMMARY:
There are no regulated water withdrawals from the Chelsea River Subwatershed.

NPDES SURFACE DISCHARGE SUMMARY:
The City of Chelsea (MA0101877) is permitted to discharge via three CSO outfalls to the Chelsea River. The permit expired 13 August 1998 and EPA expects to re-issue it in 2002.

Mobil Oil- East Boston, also known as TOSCO East Boston Terminal (MA00004006) is permitted to discharge oil/water separator discharge from storm water runoff to the Chelsea River. The facility's whole effluent toxicity limit is $LC_{50} \geq 50\%$. The permit will expire 14 August 2005.

Glyptal (MA0003867) is permitted to discharge storm water to the Chelsea River. The permit includes an 83°F temperature limit, pH range 0f 6.5-8.5 and an oil/grease limit of 15 mg/L. The permit expired 30 September 1991.

Coastal Oil Chelsea Inc. (MA0004375) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH and PAH, has a TSS limit of 100 mg/L, and an oil/grease limit of 15 mg/L. The permit will expire 2 November 2002.

Gulf Oil LP a.k.a Catamount Petroleum. (MA0001091) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH, flow, VOC, and PAH, has a TSS limit of 100 mg/L, an oil/grease limit of 15 mg/L, and a benzene limit of 500µg/L. The permit will expire 2 November 2002.

Global Petroleum Corp. (MA0003425) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH, flow, VOC, and PAH, has a TSS limit of 100 mg/L, an oil/grease limit of 15 mg/L, and a benzene limit of 500µg/L. The permit will expire 2 November 2002.

Chelsea Sandwich, LLC (MA0003280) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH, flow, and PAH, has a TSS limit of 100 mg/L, and an oil/grease limit of 15 mg/L. The permit will expire 2 October 2005.

Global South Terminal LLC (MA0000825) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH, flow, VOC, and PAH, has a TSS limit of 100 mg/L, an oil/grease limit of 15 mg/L, and a benzene limit of 500µg/L. The permit will expire 2 November 2002.

Irving Oil Terminals (MA0001929) is permitted to discharge storm water to the Chelsea River. The facility is required to report pH, VOC, and PAH, has a flow limit, a TSS limit of 100 mg/L, an oil/grease limit of 15 mg/L, and a benzene limit of 500µg/L. The permit will expire 2 November 2002.

Global Revco Terminal LLC. (MA0003298) is permitted to discharge storm water via outfalls 001-006 to Sales Creek, in the Chelsea River subwatershed. The facility is required to report pH, flow, and PAH, and has a TSS limit of 100 mg/L, an oil/grease limit of 15 mg/L, and a benzene limit of 500µg/L. The permit will expire 2 November 2002.

Boston Inner Harbor will be reclassified as an SB_{CSO} water body under the updated 2002 Massachusetts Surface Water Quality Standards. The discharge of CSO in this segment is authorized in accordance with the final approved 1997 MWRA CSO Facilities Plan. Hydraulic relief projects and outfall improvements are proceeding in the Chelsea sewer system in accordance with the approved Plan. Discharges from active CSO outfalls will be limited to the frequency and volume established for a typical year under recommended plan conditions in the approved CSO Facilities Plan; discharges from active untreated outfalls are expected to occur less than four times per year on an average basis when the planned facilities are constructed. Floatables controls will be provided for all active CSO outfalls (Brander 2001a).

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from MA DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Effluent

Between March 1999 and September 2000, Mobil Oil East Boston conducted five whole effluent toxicity tests using the shrimp, *Mysidopsis bahia*. There was no acute toxicity detected in any of the tests ($LC_{50} \geq$ 100% effluent).

Chemistry – water

From 1996 through 2000, as part of their ongoing CSO monitoring program, MWRA collected monthly surface and bottom water quality samples (DO, temperature, and turbidity) at station 027, Inner Chelsea Creek, mid-channel (Coughlin 2001a).

DO

Bottom dissolved oxygen levels ranged from 1.62 to 9.93 mg/L with five samples below 5.0 mg/L. Bottom percent saturation levels ranged from 13.54 to 105.3% with four saturations below 60%. Surface dissolved oxygen levels ranged from 3.0 to 11.05 mg/L with two samples less than 5.0 mg/L. Surface percent saturation levels ranged from 13.62 to 143.3% with only 2 saturations below 60%. No samples (n=201) were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature

No temperature readings (n=212) were above the SWQS for a class SB waterbody.

Turbidity

Turbidity measurements were taken on 117 occasions and ranged between 0 and 154 NTU with an average of 4.0 NTU.

On 8 June 2000 an oil spill occurred in Chelsea Creek, adjacent to the Chelsea Street Bridge connecting East Boston and Chelsea. After being struck by a tugboat, the 40,000-ton oil tanker *Posavina* spilled 58,000 gallons of No. 6 fuel into the river. Despite prompt Coast Guard efforts to mitigate the spill, fuel oil has appeared in other parts of the harbor (MA DEP 3 July 2000). On 17 August 2000, another 250-gallon spill occurred by the Sithe-Mystic power plant, and on 1 December 2000 a third spill of 600 gallons occurred at Global Revere Terminal.

Chemistry – sediments

The creek is one of the most polluted tributaries of Boston Harbor. Sediments are contaminated by years of polluted runoff from the adjoining industrial land areas, from shipping and from sewer outfalls (EPA 5 November 2001).

It is noted that dissolved oxygen concentrations in Chelsea River are improving, however, based on the urban nature of the watershed (>90%), resultant storm water runoff, the close proximity of multiple oil terminals, frequent oil spills, and contaminated sediments (historical data), the *Aquatic Life Use* for the Chelsea River is assessed as non-support.

FISH CONSUMPTION

In 1988, MDPH issued an advisory concerning consumption of seafood from Boston Harbor, including Quincy Bay (Celona 2001):

> "Lobster tomalley—all persons should eliminate consumption of the lobster tomalley (liver). This recommendation applies to tomalley from lobsters from any source due to the finding of abnormally high chemical contaminant levels…
>
> Boston Harbor Fishery Products—Pregnant and breast –feeding women, women who intend to become pregnant, children under the age of 12, and individuals with lowered immunity should avoid consuming certain fishery products from Boston Harbor. This applies to lobster, flounder, soft-shell clams and other bivalves…"

Based on the MDPH seafood fish consumption advisory, the *Fish Consumption Use* is assessed as non-support for the Chelsea River.

SHELLFISHING

The DMF Shellfish Status Report of October 2000 indicates that shellfish growing area GBH4.0 is prohibited (DFWELE 2000b).

Based on the prohibited status, the *Shellfishing Use* is assessed as non-support for 0.50 mi^2 of this segment of the Chelsea River.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

As part of their ongoing CSO monitoring program, MWRA recorded Secchi disk depth readings at station 027 Inner Chelsea Creek, mid-channel (Coughlin 2001a). Secchi depths ranged from 1 to 5.5 m with only two of the 87 readings below 1.2 m. Chelsea River receives the untreated flow from three active CSOs. In 2000 multiple oils spills on the Chelsea River were reported. Most of the river is fenced and, therefore, access is restricted.

It is best professional judgment that, because of the aesthetic quality degradations described below, the recreational uses be assessed as non-support.

AESTHETICS

Chelsea River receives the untreated flow from three active CSOs. In 2000 multiple oils spills on the Chelsea River were reported. Additionally, the many oil terminals along the Chelsea River frequently cause heavy oil odors. Access to the river is restricted for its entire length and the majority of the banks are seawalls with limited to no vegetation in the riparian zone.

More than 130 barrels of small debris, 300 pieces of large debris, and 30 pieces of piers and other oversized debris were collected between July 1, 2000 and September 15, 2000 during the pilot year of the Boston Harbor Marine Debris Salvage Program. Debris was collected from "high activity areas" such as the downtown waterfront, the Charlestown Navy Yard, the East Boston waterfront, South Boston waterfront, the Outer Fort Point Channel, and Chelsea Creek. Additionally, more than 57 tons were collected in 2001 (East Boston 21 August 2000).

The *Aesthetics Use* is assessed as non-support due to aesthetic quality degradation (e.g., frequent oil spills, multiple CSOs, trash and debris) in the Chelsea River.

Chelsea River (MA71-06) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		NON-SUPPORT	Oil & grease, unknown	Metals, priority organics, turbidity	Urban runoff/storm sewers, industrial point sources, contaminated sediments, spills	
Fish Consumption		NON-SUPPORT	Unknown toxicity		Unknown	
Shellfishing		NON-SUPPORT 0.50 mi^2 For watershed-wide shellfish growing area data see Appendix E.				
Primary Contact		NON-SUPPORT	Oil & grease, taste & odor, unknown, trash & debris	Turbidity, pathogens	Urban runoff/storm sewers, industrial point sources, spills, CSO	
Secondary Contact		NON-SUPPORT	Oil & grease, taste & odor, unknown, trash & debris	Turbidity, pathogens	Urban runoff/storm sewers, industrial point sources, spills, CSO	
Aesthetics		NON-SUPPORT	Oil & grease, taste & odor, unknown, trash & debris	Turbidity	Urban runoff/storm sewers, industrial point sources, oil spills, CSO	

RECOMMENDATIONS CHELSEA RIVER (MA71-06)

- The EOEA Watershed Team should work with state and federal agencies (e.g., DEP, CZM, USGS, ACOE) to conduct biological monitoring (e.g. benthic macroinvertebrates, fish population) to determine if the effect(s) of NPDES discharge(s) and habitat quality negatively impact the aquatic life in this segment of the Chelsea River.

- Mobile Oil East Boston (MA0004006) should collect water from the Chelsea River upstream of their discharge to use as dilution water in their whole effluent toxicity tests. If the river water does not meet the control test acceptability criteria (e.g., survival > 80% at 7-day), then Chelsea River water must still be utilized as a test control and not as diluent.

- Work with local citizens and stream teams to remove/reduce the trash and debris in the Chelsea River and on land adjacent to the river.

- Conduct compliance inspections of the oil terminals on the Chelsea River to determine if the facilities have implemented their pollution prevention plans as required in their NPDES permits.

- Continue to work with MassPort, Eastern Minerals Salt Company, and the City of Boston to better contain the road salt piles along the Chelsea River (e.g., covering, containment booms).

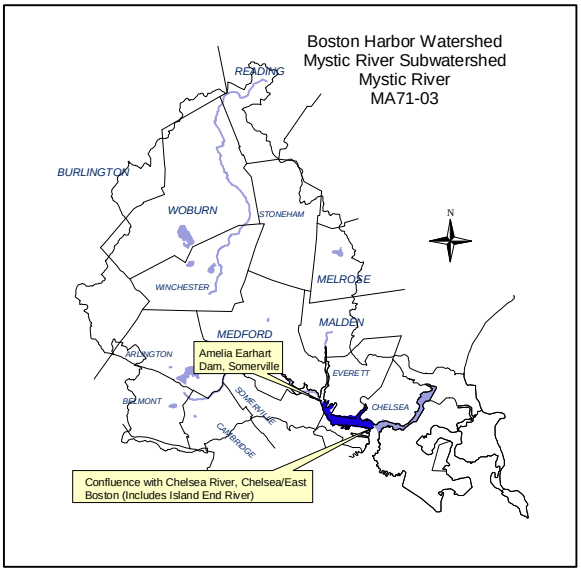
- Work with local, state, and federal agencies including Chelsea Green Space, Urban Wilds Initiative, Save the Harbor/Save the Bay, to implement the Condor Street Urban Wild project and to improve public access to the Chelsea River through Brownfield reclamation, parks development and urban wild restorations.

- Continue to support the Boston Harbor Marine Debris Salvage Program.

- Assess the implementation and success of the NPDES Phase I Storm water plan for East Boston on reducing impacts from urban runoff.

MYSTIC RIVER (SEGMENT MA71-03)

Location: Amelia Earhart Dam, Somerville to confluence with Chelsea River, Chelsea/East Boston (Includes Island End River).
Segment Area: 0.7 square miles.
Classification: Class SB, Shellfishing (Restricted), CSO.
(In the 2002 updated SWQS, this segment of the Mystic River will be reclassified as SB/CSO. See Classification section.)



Land use estimates for this segment are not available.

This segment is on the 1998 303(d) list of impaired waters for unionized ammonia, organic enrichment/ low DO, pathogens, oil & grease, taste, odor, & color, and turbidity (MA DEP 1999a). ACOE embarked on a navigation improvement project for Boston Harbor to increase the depth of the channel in the Mystic River to 40 feet. The project used an innovative concept in disposing of silty material in deep confined aquatic disposal cells dredged below the existing channel and capped with clean sand. The project dredging was scheduled to be completed by early November 2001. The final capping of the last of the confined aquatic disposal cells in the Mystic River was completed in August 2000 (ACOE 31 October 2001).

WATER WITHDRAWAL SUMMARY:
There are no regulated water withdrawals from this segment of the Mystic River.

NPDES SURFACE DISCHARGE SUMMARY:
Exxon Everett - Everett (MA0000833) is permitted (April 2000) to discharge holding tank #140 discharge via outfall 001A and holding tank 140 bypass via 001B to the Mystic River/Island End. The facility's whole effluent toxicity limit is LC_{50} >50%.

Monsanto Corporation- Everett (MA0000809) was permitted to discharge to the Mystic/Malden River. The facility ceased operations in the late 1990's.

In 1990 Cabot Power Corporation filed for approval with the Executive Office of Environmental Affairs to construct, own, and operate a 350-megawatt, gas-fired, combined-cycle cogeneration power plant in the Island End Industrial Park, Everett, MA. The facility has not been and may not be constructed. As part of the process, Cabot Power Corp applied for and received an NPDES permit. When that permit expired, EPA issued the Island End Cogeneration Project a new NPDES permit (MA0040126) that allows the facility to discharge 40,000 GPD of floor drain and boiler blowdown water to the Mystic River/Island End River via outfall 001and includes a TSS limit of 30 mg/L and an oil and grease limit of 15 mg/L. The permit MA0040126 will expire in May 2005.

Allied Concrete Corp. (MA0002038) is permitted to discharge 2000 GPD to the Island End River. The facility's permit includes a TSS limit of 2.5 mg/L.

Sithe Mystic (MA0004740) is permitted to discharge 754 MGD from four power generation units to Mystic River subwatershed. The permit contains a 93 °F temperature limit and a 0.1mg/L total residual chlorine limit (2 hour max; one unit at time). The permit was reissued in 2001.

Distrigas of Massachusetts Corp. (MA0020010) is permitted to discharge operation wastewater and storm water to the Mystic River Channel. This natural gas distributor was required to implement a BMP plan. The permit was reissued in 2001.

The City of Chelsea (MA0101877) is permitted to discharge via one CSO to the Mystic River. The permit expired 13 August 1998. The permit is expected to be reissued in 2002.

Boston Inner Harbor is an SB_{CSO} waterbody under the Massachusetts Surface Water Quality Standards. The discharge of CSOs in this segment is authorized in accordance with the final approved 1997 MWRA CSO Facilities Plan. These CSOs are permitted to MWRA, Boston Water & Sewer Commission, and the City of Chelsea. The approved Facilities Plan includes a combination of sewer separation, CSO storage, and CSO treatment facilities. These improvements will substantially mitigate CSO discharges at these outfalls. Discharges from active CSO outfalls will be limited to the frequency and volume established for a typical year under recommended plan conditions in the approved CSO Facilities Plan; discharges from active untreated outfalls are expected to occur less than four time per year on an average basis when planned facilities are constructed. Floatables controls will be provided for all active CSO outfalls (Brander 2001a).

Under NPDES permit number MA0103284 MWRA is permitted (issued 2001) to discharge CSO from the Somerville Marginal CSO Treatment Facility (MWR 205) to the Mystic River, just downstream from the Amelia Earhart Dam. The facility is required to conduct and report on the results of two whole effluent toxicity tests annually. This outfall also has average discharge event TRC limits of 0.1 mg/L. MWRA has upgraded the facility to improve treatment performance and meet new chlorine residual discharge limits.

All communities in the Boston Harbor Watershed (excluding Boston) are required to obtain Phase II NPDES storm water general permit coverage for their municipal drainage systems. EPA is currently writing this general permit (with input from MA DEP) and a preliminary draft is currently available for internal review. The draft for public comment should be available by the end of June 2002. The final version of the Phase II storm water general permit for regulated small municipal separate storm sewer systems (MS4) will be issued by December 9, 2002. The towns must submit applications for coverage under the permit to EPA by March 10, 2003 (Scarlet 2002).

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Effluent

Between March 1996 and March 2001, Exxon Everett conducted 17 whole effluent toxicity tests using the shrimp, *M. bahia*. There was no acute toxicity detected in any of the tests ($LC_{50} \geq 100\%$ effluent). TRC concentrations at both outfalls ranged from BDL to 0.3 mg/L. Four tests were conducted on effluent from outfall 001B between 12 September 1999 and 22 March 2001. The effluent from this outfall was not acutely toxic to the test organism.

Between September 1995 and September 1996, Mosanto Everett conducted three whole effluent toxicity tests using the shrimp, *M. bahia*. *M. bahia* LC_{50}'s ranged from 83 to 100% effluent.

In October 2000 and January 2001, MWRA Deer Island (MA0103284) conducted two whole effluent toxicity tests using the mysid shrimp, *M. bahia* and the inland silverside, *M. beryllina* on Somerville Marginal CSO Pretreatment facility outfalls. Additionally, in March 2001, two whole effluent toxicity tests were conducted using the fathead minnow, *P. promelas* and the water flea, *C. dubia*. The CSO discharges were not acutely toxic to any test organism in any test event.

Chemistry – water

From 1996 to 2000, as part of their ongoing CSO monitoring program, MWRA collected monthly surface and bottom water quality samples (DO, temperature, and turbidity) at three stations on this segment of the Mystic River. Additionally, TSS samples and chlorophyll *a* samples were collected at station 137 (Coughlin 2001a and 2002):

052- Mystic River at Somerville Marginal, downstream of dam
069- Mystic River near Schraffts BOS 017
137- Mystic River Mouth, 1/3 –mile upstream of Tobin Bridge

DO

Dissolved oxygen concentrations ranged between 1.38 and 17.53 mg/L (n=626) with 34 bottom concentrations and five surface concentrations below 5.0 mg/L all during summer months. Percent saturation levels ranged from 8.66 to 167.9% with 28 saturations below 60% and 13 greater than 115% (n=626). No measurements were collected pre-dawn and, therefore, these data do not represent worst-case conditions.

Temperature

All temperature measurements (n=663) were below the SWQS for a class SB estuary.

Turbidity

Turbidity measurements ranged between 0 and 369 NTU (n=360) with an average less than 10 NTU. Ten of the 360 measurements were greater than 25 NTU and three measurements, collected during dry weather conditions, were greater than 100 NTU.

Chlorophyll-a

Bottom chlorophyll *a* concentrations ranged from 0.19 to 19.4 µg/L (n=185) while surface concentration ranged from 0.21 to 49.2 µg/L with and average of 5.33 (n=185).

Suspended Solids

TSS measurements taken on 354 occasions with bottom concentrations ranging from 0.87 to 115 mg/L (average 7.62 mg/L) and surface concentrations from 1.11 to 10.2 mg/L (average 4.72 mg/L).

Chemistry – sediments

Eastern Gas & Fuel Co. owned a coal gasification plant property, including a coal tar processing facility on the Island End River. The site is classified as a Tier IA disposal site by MA DEP. The facility as a whole operated from the late 1800's until the 1960's, as a coal gasification plant (extracting natural gas from coal). The Former Coal Tar Processing Facility was a portion of the plant which took in the tars that were a byproduct of the gasification process, and processed them into various consumer products: roofing and roadway materials, resins, dyes, etc. Wastes associated with these products were improperly disposed of and when the facility was shut down in the 1960's large quantities of waste tars were left behind. Immediately adjacent to the Former Coal Tar Processing Facility, large quantities of separate-phase tars are intermingled with the sediments, to a depth of approximately twelve feet below the river bottom. These separate-phase tars well up from the bottom regularly, creating sheens and odors. There is also a great deal of coal tar contamination in upland portions of the site. The most recent environmental risk assessment was completed by Ogden Environmental, Inc. in July 2000 for the Primary Responsible Parties and will be compiled into a final version to be submitted to MA DEP. During the next phase, work will be done to characterize the impacts and risks to the benthic communities (Roberson 2002).

The Aquatic Life Use is assessed as non-support for the portion of this segment that encompasses the Island End River due to contaminated sediments. Based on water chemistry data (DO, temp, turbidity, TSS) the remaining 0.67square miles of this segment of the Mystic River are assessed as support. This segment is, however, on “Alert Status” due to organic enrichment/low DO in the bottom waters during summer months.

FISH CONSUMPTION

In 1998, MDPH issued an advisory concerning consumption of seafood from Boston Harbor, including Quincy Bay (Celona 2001):

> “Lobster tomalley—all persons should eliminate consumption of the lobster tomalley (liver). This recommendation applies to tomalley from lobsters from any source due to the finding of abnormally high chemical contaminant levels…
>
> Boston Harbor Fishery Products—Pregnant and breast –feeding women, women who intend to become pregnant, children under the age of 12, and individuals with lowered immunity should avoid consuming certain fishery products from Boston Harbor. This applies to lobster, flounder, soft-shell clams and other bivalves…”

Based on the MDPH seafood fish consumption advisory, the *Fish Consumption Use* is assessed as non-support for this segment of the Mystic River.

SHELLFISHING

The DMF Shellfish Status Report of October 2000 indicates that shellfish growing area GBH4.0 is prohibited (DFWELE 2000b).

Based on the prohibited status, the *Shellfishing Use* is assessed as non-support for 0.7 mi^2 of this segment of Mystic River.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION

The MWRA collected fecal coliform bacteria samples at their three CSO outfall monitoring stations (see above) between 1996 and 2000 as part of their ongoing CSO monitoring program (Coughlin 2001a and 2002). Samples were collected during both wet and dry weather conditions. Fecal coliform bacteria counts ranged from <5 to 1,340,000 cfu/100mL (n=719) with 52 counts greater than 2,000 cfu/100mL and 36 counts greater than 4,000 cfu/100mL. During the primary contact season, fecal coliform bacteria counts ranged between <5 and 1,340,000 cfu/100mL (n=495) with 89 counts greater than 400 cfu/100mL. It should be noted that the highest count was collected during dry weather at station 052 in the vicinity of the Somerville Marginal CSO Treatment Facility in July of 1997 and that of the 105 surface samples collected at this station, 51 were greater than 400 cfu/100mL (49%) and 30 were greater than 4,000 cfu/100mL. At stations 069 and 137, only 21 (6%) of the 324 samples were greater than 400cfu/100mL and six were greater than 4,000 cfu/100mL during wet weather.

Additionally, MWRA recorded 401 Secchi disk depths between 1996 and 2001 at their three CSO outfall monitoring stations. Secchi disk depths ranged from 0.3 to 6 m with 37 measurements less than 1.2m. The Secchi disk could be seen on the bottom on 21 occasions.

In the vicinity of the Somerville Marginal CSO Treatment Facility, the *Primary and Secondary Contact Recreational uses* are assessed as non-support for 0.01 sq miles due to elevated fecal coliform bacteria counts in both wet and dry weather conditions. Additionally, the area of this segment that encompasses the Island End River (0.03 square miles) is also assessed as non-support due to aesthetic quality degradation (see below). The remaining 0.66 square miles are assessed as partial support, due to elevated counts in wet weather. It should be noted that in the 2002 updated SWQS this segment of the Mystic River will be reclassified as a Class SB_{cso} waterbody.

AESTHETICS

The Mystic River receives the flow from several CSOs. Additionally, the oil terminals in the Mystic River subwatershed cause oil odors. Access to the river is restricted for most its length and the majority of the banks are seawalls with limited to no vegetation in the riparian zone. Noxious odors and sheens from contaminated sediments associated with the former Eastern Gas and Fuel Company are common on the Island End River.

The Aesthetics Use is assessed as non-support for 0.03 square miles, the portion of this segment that encompasses the Island End River, and the remaining 0.67 square miles are not assessed.

Mystic River (MA71-03) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		NON-SUPPORT 0.03 mi^2 SUPPORT* 0.67 mi^2	PAHs, metals, other inorganics		Contaminated sediments	
Fish Consumption		NON-SUPPORT	Priority organics		Unknown	
Shellfishing		NON-SUPPORT 0.7 mi^2 For watershed-wide shellfish growing area data see Appendix E.				
Primary Contact		NON-SUPPORT 0.04 mi^2 PARTIAL SUPPORT 0.66 mi^2	Pathogens		CSO, urban runoff/storm sewers	
Secondary Contact		NON-SUPPORT 0.04 mi^2 PARTIAL SUPPORT 0.66 mi^2	Pathogens		CSO, urban runoff/storm sewers	
Aesthetics		NON-SUPPORT 0.03 mi^2 NOT ASSESSED 0.67 mi^2	Odors, oil sheens		Contaminated sediments	

* "Alert Status" issues identified—See *Aquatic Life Use* assessment

RECOMMENDATIONS MYSTIC RIVER (MA71-03)

- Exxon Everett (MA0000833) should collect water from the Mystic River upstream of their discharge to use as dilution water in their whole effluent toxicity tests. If the river water does not meet the control test acceptability criteria (e.g., survival > 80% at 7-day), then Mystic River water must still be utilized as a test control and not as diluent.

- Work with local citizens and stream teams to remove/reduce the trash and debris in the Mystic River.

- Conduct compliance inspections of the oil terminals on the Mystic River to determine if the facilities have implemented their storm water pollution prevention plans as required in their NPDES permits.

- Work with local, state, and federal agencies to improved public access to the lower Mystic River through Brownfield reclamation, parks development and urban wild restorations.

- When and if the Island End Cogeneration facility assumes operation, reevaluate their current NPDES permit (MA0040126) and determine if temperature limits and whole effluent toxicity testing requirements are warranted.

MYSTIC RIVER SUBWATERSHED- LAKE ASSESSMENTS

A total of 50 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) have been identified and assigned Pond and Lake Information System (PALIS) code numbers in the Mystic River Subwatershed (Ackerman 1989 and MA DEP 2001b). These lakes represent a total surface area for the Mystic River Subwatershed lakes of 1,482.9 acres. They range in size from one to 307 acres; 37 lakes are less than 50 acres, five are greater than 100 acres, and, of these, one is greater than 200 acres. Information on 10 of the lakes are reported here, and stored in the WBS database. The other 40 lakes, which total 1,011 acres, are unassessed, and they are not currently included as segments in the WBS database.

Lake assessments are based on information gathered during DWM surveys (recent and historic) as well as pertinent information from other sources (e.g., abutters, herbicide applicators, diagnostic/feasibility studies, MDPH, etc.). The 10 lakes assessed in this report represent 381.9 of the 1,482.9 or 26% of the acreage in the Mystic River Subwatershed (Figure 15). Seven of the lakes assessed are less than 50 acres in total surface area.

During the summer of 1999, intensive in-lake sampling was conducted by DWM on two lakes (Lower Mystic Lake and Winter Pond) as part of the Mystic River Subwatershed Baseline Lakes Survey. This sampling included in-lake measurements of dissolved oxygen, pH, temperature, Secchi disk transparency, nutrients, and chlorophyll *a*, as well as detailed macrophyte mapping. While these surveys provided additional information to assess the status of the designated uses, fecal coliform bacteria data were not available and, therefore, the *Primary Contact Recreational Use* for Lower Mystic Lake was not assessed and Winter Pond was assessed based on macrophyte cover. No other lakes in this subwatershed were assessed for the *Primary Contact Recreational Use* due to lack of current bacteria data and detailed macrophyte coverage.

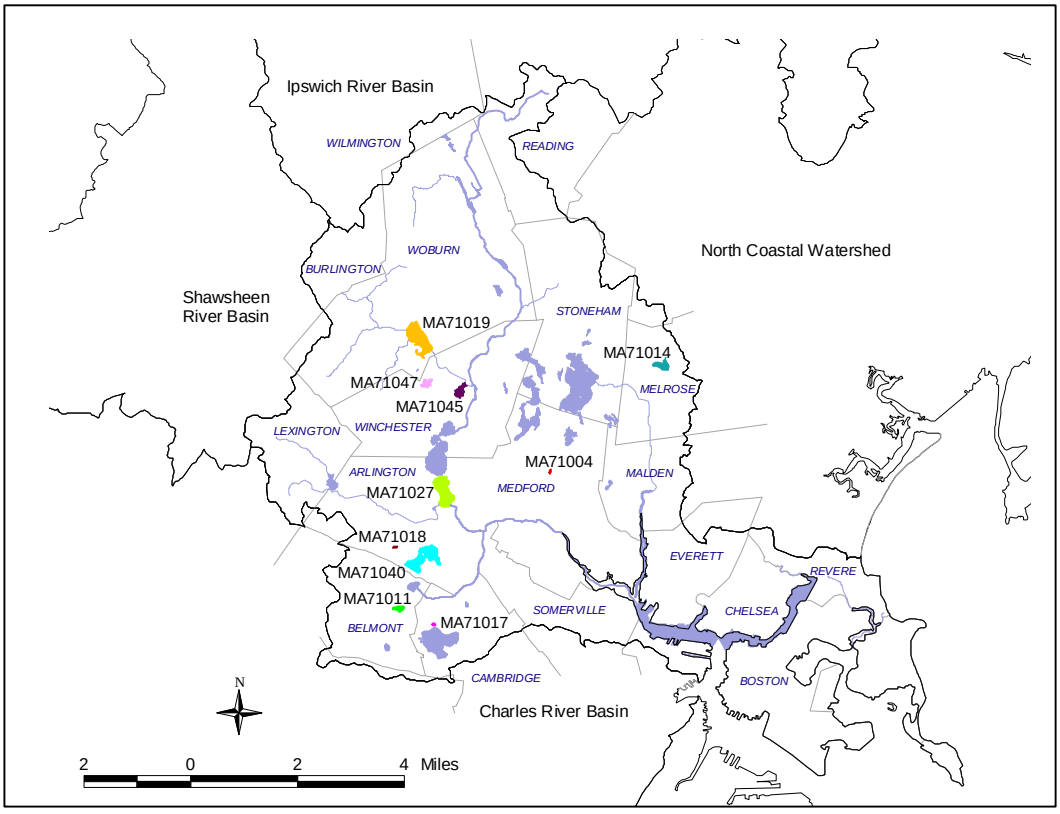


Figure 15. Lake segments in the Mystic River Subwatershed

In the case of the *Fish Consumption Use*, fish consumption advisory information was obtained from the Massachusetts Department of Public Health (MDPH 2001). The use assessments and supporting information were entered into the EPA WBS database.

It should be noted that Judkins and Mill ponds are not included in the lakes assessment section of this report. These two pond segments are impoundments of the Aberjona River and therefore are not assessed as ponds. The designated use status of these two impounded ponds is derived from the assessments of the Aberjona River (Segment MA71-01).

AQUATIC LIFE

Lower Mystic Lake is a meromictic lake, meaning that a noncirculating bottom layer does not mix with the circulating upper layer. In Lower Mystic Lake, the deepest waters contain high concentrations of sea water (and CH_4 and H_2S) and are denser than the surface waters (Ludlam and Duval 2001). These conditions were first noted in 1857. In 1860, the chemocline (the chemical boundary separating the circulating and noncirculating layers or water masses of a lake) was described as being 5-6m below the surface. Before completion of the Craddock Dam and Locks in 1908, saltwater entered Lower Mystic Lake and recharged the high-density, stable, stagnant or noncirculating lower layer. After the dam was completed, saltwater could still enter the lake during operation of the locks. The up welling of the gas-laden (H_2S) deep waters caused a fish kill in 1965 that involved alewives migrating down from Upper Mystic Lake.

The Amelia Earhart dam was designed to prevent any further influx of saltwater to the lake. This dam was completed in 1966, and the operation of the Craddock Locks was discontinued in 1968. By this time, natural processes had removed more than 80% of the monimolimnion. However, the MDC decided to remove the remaining sulfide-laden waters by pumping them out of the lake. Water was pumped from a depth of ~3m above the deepest point. Approximately 240,000 cubic meters of the lake (below the chemocline) were removed. This pumping operation ran sporadically from 1982 until 1990 when it was finally curtailed (Ludlam and Duval 2001).

In 1999, DWM water quality sampling of Lower Mystic Lake, Medford identified oxygen depletion in the bottom waters and in the thermocline (Appendix B, Table B3). Therefore, the *Aquatic life Use* is assessed as non-support for Lower Mystic Lake. The salt layer was also very high in phosphorus indicating an internal nutrient-loading problem. A sediment toxicity study was conducted on Lower Mystic Lake (Ivushkina 1999). In the one sample analyzed As, Cr, Cu, Pb and Zn concentrations were above their respective S-ELs. Although the sediment data were too limited for assessment purposes, contaminated sediments are of concern.

It should be noted that in 2000 MyRWA collected water quality samples from Mill Brook (at Mt. Pleasant Cemetery, Arlington), a tributary to Lower Mystic Lake (MyRWA 2001). Based on the available data (elevated TSS and TP), this brook is suspected as a source of impairment for the Aquatic Life Use in Lower Mystic Lake.

The 1999 DWM water quality sampling in Winter Pond identified high dissolved oxygen concentrations in the surface waters, coupled with high percent saturations and high concentrations of total phosphorus (as P) (Appendix B, Table B3). Therefore, the *Aquatic Life Use* is assessed as partial support for Winter Pond. Although the sources of impairment are unknown, urban runoff/ storm sewers are suspected to contribute nutrients to the pond. In June 1999 this pond was treated with two herbicides (SONAR and Rodeo) to control the growth of aquatic and wetland plants (MA DEP 2000b). Although no non-native aquatic plants were identified during DWM's 1999 surveys (MA DEP 1999e) the non-native wetland species, Purple Loosestrife (*Lythrum salicaria*) was identified in Winter Pond (Appendix B, Table B2).

Subsequent to a 1986 Diagnostic/Feasibility Study of Hills Pond a lake restoration project was undertaken by the Town of Arlington. As part of this restoration the pond was drained and dredged in 1993. Additionally, a storm water management system was installed to reduce sediment inputs and nutrient loadings. The pond was drained and dredged again in 1994. By 1995, the pond was finally refilled with water, restocked with fish, and the banks and peripheral wetlands were graded and revegetated (Fugro

East Inc. 1996). Not enough current water quality data were available to assess the *Aquatic Life Use*; therefore, it is not assessed.

In 1997 and 1998 sediment toxicity analyses were conducted at Spy Pond in Arlington (Ivushkina 1999). Both surface and core samples were analyzed for trace elements including As, Cd, Cr, Cu, Pb and Zn. Multiple parameters were above both the L-EL and S-EL in the surface samples (Cu, Pb, and As). Although the sediment data were too limited for assessment purposes contaminated sediments are of concern. Aquatic Control Technologies performed a Baseline Aquatic Vegetation Survey of Spy Pond in November 1999 (Smith, 2000). The survey identified excessive aquatic vegetation growth exacerbated by the non-native Eurasian milfoil (*Myriophyllum spicatum)*. The possible path of downstream spreading of Eurasian milfoil from Spy Pond to other waterbodies is presented below.

Spy Pond (Arlington) ⇒ unnamed tributary (below ground) ⇒ Little Pond (Belmont) ⇒ Little River ⇒ Alewife Brook ⇒ Mystic River.

Based on the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* for Spy Pond is assessed as partial support.

FISH CONSUMPTION

The MDPH fish consumption advisory list contains the status of each water body for which an advisory has been issued. If a water body is not on the list, it may be because either an advisory was not warranted or the water body has not been sampled. MDPH's most current Fish Consumption Advisory list is available online at http://www.state.ma.us/dph/beha/fishlist.htm.

In 1999 DWM conducted fish toxics monitoring on Lower Mystic Lake. Composite skin-off fillets of common carp, largemouth bass, white perch and yellow perch were analyzed for priority organics, metals, and pesticides (Appendix B, Table B7). No contaminants were identified at concentrations above the MDPH action levels.

MDPH issued a fish consumption advisory for Clay Pit Pond in 1996 due to elevated levels of chlordane in fish tissue. The advisory recommends that the general public should not consume any fish from this waterbody (MDPH 2001). Therefore, Clay Pit Pond is impaired (non-support due to chlordane contamination) for the *Fish Consumption Use* (Table 6).

No other lakes in the Mystic River Subwatershed currently have individual fish consumption advisories; therefore, they are not assessed for fish consumption use.

In July 2001, MDPH issued new statewide consumer advisories on fish consumption and mercury contamination. The MDPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MDPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MDPH 2001b)."

Additionally, MDPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury (MDPH 2001b)."

MDPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially. The statewide advisory encompasses all freshwaters in

Massachusetts and, therefore, the *Fish Consumption Use* for lakes in the Mystic River Subwatershed cannot be assessed as support or partial support.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS

The five Secchi disk depth measurements (Appendix B, Table B5) collected by DWM from Lower Mystic Lake were all greater than 1.2 m (the bathing beach standard), however, no fecal coliform bacteria data were collected. Therefore, the *Primary Contact Recreational Use* is not assessed. Low densities of aquatic plants and algae were documented during the 1999 survey. Additionally, no objectionable conditions were noted (i.e., odors, trash, oil sheens). The *Secondary Contact Recreational* and *Aesthetics Uses* of Lower Mystic Lake are assessed as support (Table 6). It should be noted that in 2000 MyRWA collected water quality samples from Mill Brook (at Mt. Pleasant Cemetery, Arlington), a tributary to Lower Mystic Lake (MyRWA 2001). Based on the elevated fecal coliform bacteria counts, this brook is suspected as a possible source of bacteria to Lower Mystic Lake.

One of the three Secchi disk depth measurements (Appendix B, Table B5) collected by DWM from Winter Pond was less than 1.2 m (the bathing beach standard). Therefore, the *Primary Contact Recreational Use* is assessed as partial support. Although sources of this impairment are currently unknown, urban runoff/storm sewers are suspected to contribute to the decreased water clarity. While sparse aquatic plants or algae were identified during the September 1999 survey, the pond had been treated with herbicides in June to control the growth of aquatic plants. Additionally, no objectionable conditions were noted (i.e., odors, trash, oil sheens). The *Secondary Contact Recreational* and *Aesthetics uses* of Winter Pond are assessed as support (Table 6).

No lakes in the Mystic River Subwatershed were assessed as supporting the *Primary Contact Recreational Use*. Eight lakes in the Mystic River Subwatershed (not discussed above) are currently not assessed for the *Recreational* and *Aesthetics* uses (Table 6).

SUMMARY

Only two lakes in this subwatershed were assessed for any uses (Lower Mystic Lake and Winter Pond). Site-specific sources of impairment to these lakes are largely unknown. However, nutrient enrichment from storm water runoff is likely to have increased the macrophyte productivity and decreased the water clarity resulting in impairments to the *Aquatic Life*, *Recreational,* and *Aesthetics* uses.

Table 6 presents the use assessments for the lakes in the Mystic River Subwatershed.

RECOMMENDATIONS – LAKES

- Mystic River Watershed Association, with the assistance of Tufts University and EPA, conducted water quality monitoring between June and October 2000 to better understand the temporal and spatial variations in nutrient levels in Upper Mystic Lake. Samples were collected from the Aberjona River at the USGS gauging station in Winchester, the outlet of the lake (discharge structure on the dam separating Upper and Lower Mystic), and three sites along a vertical transect at a single fixed location in the deepest part of the lake. Parameters measured included depth/flow, temperature, pH, dissolved oxygen, conductivity, total dissolved solids, total suspended solids, total Kjeldahl nitrogen, nitrate/nitrite, sulfate, bromide, chloride, fluoride, ammonia, total phosphorus, ortho-phosphate, total organic carbon (dissolved organic carbon), alkalinity, and chlorophyll. It is recommended that Upper Mystic Lake be added to the WBS and that the data and final report from this study be reviewed to assess the designated uses of Upper Mystic Lake.

- Coordinate with DEM and/or other groups conducting lake surveys to generate quality assured lake data. Conduct more intensive lake surveys to better determine the lake trophic and use support status and identify causes and sources of impairment. As sources are identified within lake watersheds, they should be eliminated or, at least, minimized through the application of appropriate point or non-point source control techniques.

- Implement recommendations identified in the TMDLs and lake Diagnostic/Feasibility studies, including lake watershed surveys to identify sources causing impairment.

- For non-native aquatic plant species that are isolated to one or a few location(s), quick action is advisable to manage these populations in order to alleviate the need for costly and potentially fruitless efforts to do so in the future. Two courses of action should be pursued concurrently. More extensive surveys need to be conducted, particularly downstream from these recorded locations (Table 6), to determine the extent of the infestation. And, "spot" treatments (refer to the draft Generic Environmental Impact Report for Eutrophication and Aquatic Plant Management in Massachusetts [Mattson et al, 1998] for advantages and disadvantages) should be undertaken to control populations at these sites before they spread further. These treatments may be in the form of carefully hand-pulling individual plants in small areas. In larger areas, other techniques such as selective herbicide application may be necessary. In either case, the treatments should be undertaken prior to fruit formation and with a minimum of fragmentation of the individual plants. These precautions will minimize the spreading of the populations. This draft aquatic plant report (Mattson et al, 1998) should be consulted prior to the development of any lake management plan to control non-native aquatic or wetland plant species.

- Conduct follow-up monitoring at Hills Pond to determine if the Restoration Project was effective.

- Determine the fishing pressure on Spy Pond and if warranted conduct fish toxics monitoring.

Table 6. Mystic River Subwatershed Lake Assessments. (**Bold** indicates 303 (d) listed waters).

LAKE	Waterbody Identification Code WBID	SIZE Acres	 AQUATIC LIFE *Causes*	 FISH CONSUMPTION *Causes*	 PRIMARY CONTACT *Causes*	 SECONDARY CONTACT *Causes*	 AESTHETICS *Causes*
Bellevue Pond, Medford	MA71004	3.0	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Blacks Nook, Cambridge	MA71005	2.5	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Clay Pit Pond, Belmont	MA71011	13.0	Not Assessed	NON-SUPPORT *Chlordane*	Not Assessed	Not Assessed	Not Assessed
Ell Pond, Melrose	MA71014	22.4	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Hills Pond, Arlington	MA71018	2.0	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Horn Pond, Woburn	MA71019	104.0	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Lower Mystic Lake, Medford	MA71027	93	NON-SUPPORT *Unknown, organic enrichment/low DO, salinity*	Not Assessed	Not Assessed	SUPPORT	SUPPORT
Spy Pond, Arlington	MA71040	103.0	PARTIAL SUPPORT *Non-natives*	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Wedge Pond, Winchester	MA71045	22.0	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Winter Pond, Winchester	MA71047	17.0	PARTIAL SUPPORT *Unknown, nutrients*	Not Assessed	PARTIAL SUPPORT *Turbidity*	SUPPORT	SUPPORT