



Mystic River Watershed

Baseline Index Report

2001 – 2007



Map of watershed with Mystic Monitoring Network baseline sites in red

Executive Summary

The Mystic River Watershed Association (MyRWA) has been monitoring water quality at ten sites in the Mystic River Watershed on a monthly basis since the summer of 2000. With the help of a dedicated group of nearly 30 volunteers, the Mystic River and several tributaries are tested for bacteria levels (*E. coli*), nutrients (total phosphorus and nitrate-nitrite), total suspended solids, dissolved oxygen, and water temperature. The 2007 Baseline Index Report provides a qualitative summary of these water quality parameters over a seven-year period. The report includes color-coded Baseline Index tables for each year, and provides a general assessment of water quality trends.

The 2007 Baseline Index Report indicates that none of the 10 monthly monitoring sites is pollution-free in the Mystic Watershed. Each site has received a poor score for nutrient pollution in each year of monitoring. Bacteria contamination is also highly concerning, particularly during wet weather. Upper Mystic Lake often receives an excellent score for swimming and boating in dry weather, but some tributaries regularly receive a poor score for both swimming and boating in dry weather.

Although there has been no overall improvement in water quality over the past seven years, this Baseline Index report marks an important contribution to our understanding of where problems in nutrient pollution, bacteria contamination, and low dissolved oxygen levels are the most pressing in the Mystic River Watershed. This information has enabled us to design increasingly rigorous sampling programs to precisely target pollution ‘hot spots’ and report our findings to municipalities and other stakeholders.

The information in this report also signals a call to action on the part of municipalities, state and federal agencies, citizens, and concerned community groups. The data we have collected since 2000 speak to the need for dedicated support from all stakeholders to clean up the Mystic Watershed. We encourage all stakeholders to contact us to learn more about opportunities to help reach MyRWA’s goal of a fishable and swimmable Mystic River.



Photograph taken by M. vanBeuzekom

About the Watershed

The Mystic River watershed is a collection of rivers, streams, lakes and ponds that drain an area of approximately 76 square miles north of Boston. It includes 21 cities and towns. The Mystic is a sub-watershed of Boston Harbor, and the Mystic River watershed in turn includes a number of distinct sub-watersheds. The headwaters are in Reading and form the Aberjona River, which flows into the Upper Mystic Lake. The Mystic River flows from Lower Mystic Lake and empties into Boston Harbor. Main tributaries to the Mystic River include Mill Brook, Alewife Brook, Malden River, and Chelsea River. The watershed contains 44 lakes and ponds, ranging from small water bodies like Smith Pond (2.5 acres) in Winchester, to the largest water body, Spot Pond (282 acres), in the Middlesex Fells.

The Mystic River and its tributaries are subject to all the problems of a heavily urbanized watershed – bacterial contamination from aging sewer systems, toxics from abandoned industrial sites, stormwater runoff, flooding, and lack of open space. Much work is still needed to reduce sewage and nutrient contamination, remediate contaminated sediments, control invasive plants, and reclaim access to the water. Despite its many challenges, the watershed makes many contributions to the quality of life in our communities. With the help of many hands, the watershed is becoming the valuable natural asset its residents deserve!

MyRWA's Baseline Monitoring Program

Since the summer of 2000, MyRWA's Mystic Monitoring Network (MMN) has been collecting long-term water quality data from ten sites in the freshwater part of the watershed (see cover page map). Created under a grant from MassDEP to collect data from the main stem of the Mystic as well as several of its tributaries, the MMN is the first large scale volunteer monitoring program in the watershed. The goals of the MMN are to:

- Build on work by local "Friends" groups to establish a high quality baseline of water quality data for the watershed,
- Evaluate changes in water quality to identify and address water pollution problems,
- Raise public, municipal, and state agency awareness of water quality in the Mystic through timely and widely distributed communication, and
- Create a network of informed and active citizen advocates who will act as watershed stewards.

Nearly 30 volunteers are instrumental in collecting water samples each month and assisting with data management. The Massachusetts Water Resources Authority's (MWRA) laboratory at the Deer Island sewage treatment plant donates lab analyses for some of the parameters measured during baseline monitoring events – *E. coli*, conductivity (not included in this analysis), nitrates-nitrites, total phosphorus, and total suspended solids. Dissolved oxygen concentration is determined by titration (MyRWA's staff scientist), and other parameters are measured in the field by volunteers – color, odor, pH and temperature of water and air.

In January of 2008, MMN added three additional baseline sites in the lower portion of the watershed below the Amelia Earhart dam. Data from those sites will be incorporated in subsequent Baseline Index Reports.

What is the Baseline Index and how does it work?

The Baseline Index (BI) summarizes water quality data from each year of baseline data collection. It is designed to present information in an easily understood and informative format. It can be used to identify major problems in different parts of the watershed and track trends over time.

The BI is a modified version of the Smart Monitoring Index developed by the Massachusetts Department of Environmental Protection (MassDEP). For every year of data, each indicator (e.g., pH, total phosphorus) is given a score (excellent, good, fair, poor), with a different color signifying the score (Table 1).

For most of the indicators, the score is based on the maximum or minimum data point collected that year (e.g., a very low maximum nitrate-nitrite value or a very high minimum dissolved oxygen value would receive a score of “excellent”). Because bacterial concentrations naturally fluctuate, bacterial scores are based on the maximum value *and* the geometric mean of the values (see Appendix I for index values). The final bacterial score is designated based on the worse scoring of the two. When indicators are grouped together (e.g., nitrate-nitrites and total phosphorus in the group “Nutrients”), the group score is based on the worst scoring indicator. In the report card table, a letter code specifies the indicator(s) contributing to a rating of “fair” or “poor” (Table 2).

What parameters are included in analyses?

Bacteria

- *Escherichia coli* (*E. coli*) – This type of bacteria often indicates the presence of sewage contamination in the water. High concentrations of *E. coli* can indicate the presence of organisms that can be dangerous to swimming or even boating in the water body. In Mystic River water bodies, bacteria concentrations are typically elevated following rain events. Ratings have therefore been separated for dry and wet conditions in accordance with swimming and boating standards. The state standard for swimming (Class B) is geometric mean of 126 *E. coli* organisms per 100 mL and for boating (Class C) the standard is 630 organisms per 100 mL. Massachusetts Department of Environmental Protection (MassDEP) designates most of the Mystic River waterbodies as Class B.

Chemical Characteristics

- *Dissolved Oxygen (DO)* – Dissolved oxygen must be available for fish and other aquatic organisms to survive. Low DO values indicate excessive biological oxygen demand, often attributed to the input of nutrient pollution. MassDEP recommends that DO levels remain above 5.0 mg/L.
- *Water temperature* – Changes in water temperature can be harmful to organisms living in streams. Water temperature can increase or decrease uncharacteristically when there is a lack of shade along historically vegetated riverbanks, from discharges of industrial cooling water, as a result of storm water run-off from hot pavement, or when cool water from underground

aquifers is diverted from the stream by nearby wells. MassDEP recommends water temperatures remain below 28.3°C.

- *pH* – a measure of the acidity of water. pH is important since water that is too acidic or too basic can be toxic to fish and other aquatic life. pH also plays an important role in how other pollutants, such as heavy metals, behave in the environment. High or low pH levels can be the result of acid rain/snow, chemicals getting into the waterways, or certain natural conditions. The range for pH for Class B waters should be between 6.5 and 8.3 standard units.

Nutrients

- *Nitrate-Nitrite* – Nitrate (NO₃) is the form of nitrogen that is essential for plants and animals. Nitrogen is also found in aquatic systems as nitrite (NO₂), and ammonia (NH₃). Nitrates and nitrites enter rivers and streams naturally from soil, animal wastes, and decomposing plants. The major human sources are sewage, fertilizers and animal waste. US EPA recommends levels below 0.31 mg/L.
- *Total Phosphorus* – Phosphorus can enter rivers and streams through many sources: animal wastes, human wastes, fertilizer, detergents, erosion, and storm water runoff. Because phosphorus is a limiting factor to plant growth, an excess of this nutrient will stimulate aquatic plant growth, often causing algal blooms. When the plants or algae die, the decomposition process uses dissolved oxygen thereby depleting the amount of dissolved oxygen available to other organisms. US EPA recommends levels below 0.02375 mg/L.

Aesthetics Component

- *Total Suspended Solids (TSS)* – a measure of dust, dirt, sand, and other particles suspended in the water. Excessive amounts of TSS can bury aquatic plants, deter reproduction by fish and other aquatic organisms, and can make water bodies unpleasant for recreation. In addition, other pollutants such as oil, heavy metals, and nutrients are frequently attached to suspended solids. Thus, TSS can sometimes provide a very rough indication of where there might be problems with these other pollutants. MassDEP requires that waterways “...be free from suspended and settleable solids in concentrations and combinations that would impair any use assigned with this Class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.”



Summary of Baseline Index Findings

- We are pleased to report that the bacterial indicator suggests that some sites often had good or excellent boating and (more rarely) swimming ratings during dry weather (Upper Mystic Lake, Mystic at High St., Alewife Brook, Malden River). However, ratings dramatically worsen as a result of wet weather events at most sites. ***MyRWA recommends avoiding the recreational use of the rivers and streams of the Mystic Watershed in the 48 hours following a large rain event.***
- Nutrient loading in the Mystic watershed is a widespread problem. All sites received the lowest possible score for nitrate-nitrite, and in most cases, for phosphorus. Many sites had concentrations that greatly exceeded the “poor” rating. The data also show a relationship between wet weather and nutrient levels at each site. In 2006, phosphorus levels peaked during storm events while nitrate-nitrite levels were notably lower. An investigation into the sources of nutrients (e.g., sewage or fertilizers) is needed in order to better understand wet weather data.
- More than half of the sites received good or excellent scores for the indicators in the aesthetics and chemistry groups (total suspended solids, dissolved oxygen, water temperature, and pH). However, Alewife Brook consistently scored in the “poor” range for the TSS criteria. Both Alewife Brook and the Aberjona at Salem Street consistently scored poorly for dissolved oxygen levels. These poor scorings indicate an inability for both sites to support aquatic life, particularly in the summer months.
- 2003 was a drier year than the other years although there were an equal number of dry and wet bacterial samples. This may have resulted in the improved swimming/boating ratings during 2003. Because sample size is small in each year, it is hard to draw any conclusions about the improved scores in 2003.
- Unfortunately, there does not appear to be any trend towards improved water quality during the 7-year period over which monitoring occurred. The strongest pattern that emerged was the tendency for bacteria counts to increase dramatically in wet weather. The two best sites were the Upper Mystic Lake and Mystic River at High Street, while the site with the poorest water quality was Winn’s Brook in Belmont.
- The Baseline Index raises several questions that future studies need to address, 1) How does the quantity of water affect water quality? (e.g., bacteria associated with stormwater, low flows contributing to low oxygen levels, and increasing phosphorus inputs associated with high flow) 2) What is the effect of wet weather events on bacteria counts? (failing and leaky sewer infrastructure, and the frequency and duration of Combined Sewer Overflow (CSO) and Sanitary Sewer Overflows (SSO)) 3) How can we quantify each source of nutrients so that a nutrient Total Maximum Daily Load (TMDL) can be developed to manage nutrient loads.

Findings by Group

UPPER MAIN STEM: ABERJONA RIVER SITES

- **Summary:** Generally, there are no discernible trends over the seven-year period. In most years, ABR049 in Woburn was slightly worse than the two downstream Aberjona River sites in terms of bacteria levels. ABR049 consistently has some of the lowest dissolved oxygen scores in the watershed.
- **Bacteria:** The Baseline Index swimming criteria for bacteria never reaches higher than “fair” in the Aberjona River, but a “good” score for boating is occasionally met in dry weather. 2007 was a bad year for bacteria levels; during one storm, bacteria counts exceeded 24,000 cfu *E. coli*/100 mL at each of the three sites on the Aberjona River. Based on these results, MyRWA is undertaking an extensive study of bacteria inputs to the Aberjona River in wet weather to investigate the possibility that SSOs may be occurring during extreme wet weather events.
- **Aesthetics:** The aesthetics score (based on TSS) is generally in the good to excellent range, with an outlier data point lowering the 2006 score (the TSS concentration was multiple times a typical value during a moderately large rain event).
- **Chemistry:** With the exception of Aberjona-Salem, the chemistry indicator scores are generally in the good to excellent range. However, conditions are almost always anoxic in the summer months at the ABR049 site (Aberjona-Salem). Low flows in the Aberjona as well as high biological oxygen demand from upstream shallow wetland environments may contribute to this value.
- **Nutrients:** Nitrate-nitrite levels in the Aberjona River are among the highest in the watershed, with only Winn’s Brook reaching similar levels. While the phosphorus parameter often scores in the fair range, nitrate-nitrite values are usually several times the maximum for a poor score, indicating that these sites have more of a problem with nitrate loading than phosphorus loading.

MAIN STEM: UPPER MYSTIC LAKE & MYSTIC RIVER SITES

- **Summary:** The Upper Mystic Lake and Mystic River at High Street are the best of the sites monitored in the watershed. Both sites score in the good to excellent range regularly in dry weather, though the Mystic River site is more likely to be degraded in wet weather. During the seven-year period, 2007 was the worst year for water quality at both sites.
- **Bacteria:** Although it is occasionally unsafe for swimming after wet weather, the UPL001 site (Upper Mystic Lake) is generally safe for swimming and boating. This is good news for the many people swimming near this site at the Medford Boat Club. Approximately a third to half the time, the MYR071 site (Mystic-High) was unsafe for swimming, but usually safe for boating. Sanitary sewer overflows occurred near this site in April 2007 and may have contributed to severe water quality impairments, as evidenced by bacteria counts exceeding 24,000 cfu/100 mL.
- **Aesthetics and Chemistry:** Both sites generally have good to excellent scores for aesthetics and chemical indicators throughout the study.
- **Nutrients:** Although phosphorus levels sometimes score in the fair range, nitrate-nitrite values usually exceed the maximum limit for a poor score a large part of the year.

TRIBUTARIES: MILL, WINN'S, ALEWIFE & MEETINGHOUSE BROOKS, MALDEN RIVER

- **Summary: Tributaries contribute a high pollutant load to the Mystic River. Winn's Brook consistently has the poorest water quality of the 10 sites monitored in the Mystic Watershed in terms of bacteria and nutrients. It is the only site that has never received a boating or swimming score better than fair.**

- **Bacteria:** Water quality in the tributaries is usually unsafe for recreational use due to extremely high bacteria levels. Winn's Brook consistently has the worst dry weather bacteria counts among the tributaries, and has never received above a "fair" score for bacteria. Mill Brook typically scores in the fair to poor range, occasionally achieving a good score in dry weather. Alewife Brook consistently has the best dry weather water quality for boating of all the tributaries, scoring in the good to fair range. The Malden River has the most extreme differences between wet and dry weather. In 2006, in-stream bacteria counts in the Malden River reached above 70,000 cfu/100 mL during a storm event. Dry weather bacteria levels in Meetinghouse Brook are often in the excellent to good range, but occasional extreme counts lower ratings in some years. In wet weather, Meetinghouse Brook often has fair bacteria concentrations, while the other tributaries consistently score in the poor range.

- **Aesthetics:** Alewife Brook consistently scores poorly for TSS. The other tributaries have a range of TSS scores from excellent to poor, with Meetinghouse Brook and Mill Brook most likely to have an exceedance.

- **Chemistry:** Alewife Brook is usually anoxic in the summer months and consistently receives low chemistry scores. Chemistry scores in the other tributaries are usually in the good to excellent range.

- **Nutrients:** Nutrients reach unacceptable levels in each of the tributaries. In 2007, Winn's Brook had the highest levels of phosphorus and, in addition to the Aberjona River, the highest nitrate-nitrites. In 2006, during a large storm event, phosphorus levels reached 1.92 mg/L (United States Geological Survey recommends a level of 0.1 mg/L). This phosphorus level corresponds to a bacteria count of greater than 70,000 cfu/100 mL, which suggests the phosphorus may have come from raw sewage discharged in the water.

Acknowledgments

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Table 1. Baseline Index scoring system.

Color	Score	Summary
Blue	Excellent	Comparable with reference sites
Green	Good	Meets criteria
Orange	Fair	Marginally meets criteria or occasionally does not meet criteria
Red	Poor	Does not meet criteria



Photograph taken by Roger Frymire

Table 2. Codes used for each water quality criteria used in the Baseline Index.

Group	Indicator	Code
Bacteria	Swimming	B
	Boating	B
Aesthetics	Total Suspended Solids	C
Chemistry	Dissolved Oxygen	DO
	pH	pH
	Temperature	T
Nutrients	Phosphorus	P
	Nitrogen	N

Appendix I: Baseline Index Criteria

Group/Indicator		Excellent	Good	Fair	Poor
Chemistry					
Dissolved Oxygen	Cold	>9 mg/L	6-9 mg/L	5-6 mg/L	< 5 mg/L
	Warm	>6.5 mg/L	5-6.5 mg/L	4-5 mg/L	< 4 mg/L
pH	S.U.	6.5-8.5 Δ 0.5	6.0-9.0 Δ0.5	5.5-9.0 Δ1.0	< 5.5 or > 9.0 □
	Temperature	Cold	< 15° C (59° F)	15-20° C (59-68° F)	20-24° C (68-75° F)
Warm		< 24°C (75°F)	24-27°C (75-80°F)	27-28°C (80-83°F)	>28°C (83°F)
Nutrients					
Phosphorus	Rivers	<25µg/L	25-50µg/L	50-100µg/L	> 100µg/L
	Lakes	< 10µg/L	10-25µg/L	25-50 µg /L	> 50µg/L
Nitrogen	TSIN	< 0.15mg/L	0.15-0.3 mg/L	0.5-0.5 mg/L	> 0.5 mg/L
	TN	< 0.3 mg/L	0.3-0.6 mg/L	0.6-0.9 mg/L	> 0.9 mg/L
Aesthetics					
Total Suspended Solids		1-10 mg/L	10-25 mg/L	25-80 mg/L	> 80 mg/L

Group/Indicator		Excellent	Good	Fair	Poor
Bacteria (cfu/100mL)					
Fecal Coli form (Primary Contact)	Geometric Mean	< 20/100mL	20-200/100mL	200-2,000/100mL	> 2,000/100mL
	Maximum	< 50/100mL	50-400/100mL	400-4,000/100mL	> 4,000/100mL
<i>E. coli</i> (Primary Contact Swimming)	Geometric Mean	< 25/100mL	25-126/100mL	126-1,000/100mL	> 1,000/100mL
	Maximum	< 50/100mL	50-235/100mL	235-2,000/100mL	> 2,000/100mL
Fecal Coli form (Secondary Contact boating)	Geometric Mean	< 200/100mL	1,000/100mL	1,000-2,000/100mL	> 2,000/100mL
	Maximum	<400/100mL	2,000/100mL	2,000-4,000/100mL	> 4,000/100mL
<i>E. coli</i> (Secondary Contact)	Geometric Mean	<126/100mL	630/100mL	630-1,000/100mL	> 1,000/100mL
	Maximum	<235/100mL	1,260/100mL	1,260-2,000/100mL	> 2,000/100mL

Appendix II: Description of Sites

ABR049- Aberjona River at Salem Street, Woburn, MA.

ABR028- Aberjona River at Washington Street, Winchester, MA.

ABR006- Aberjona River at USGS Stream Gage 01102500, on Mystic Valley Parkway
Winchester, MA.

UPL001- Upper Mystic Lake, at the Mystic Lakes Dam (by Medford Boat Club), Medford, MA.

MYR071- Mystic River at High Street, outlet from Lower Mystic Lake, Medford, MA.

MIB001- Mill Brook at Mt. Pleasant Cemetery, at 2nd separation in fence, Arlington, MA.

WIB001- Winn's Brook at Little Pond, on Brighton St., Belmont, MA.

ALB006- Alewife Brook at Broadway, USGS stream gauge 01103025 Somerville, MA.

MEB001- Meetinghouse Brook, outlet into Mystic River downstream of Winthrop Street bridge,
Medford, MA.

MAR036- Malden River at Medford Street, Malden, MA.

photograph taken of R. Frymire



Appendix III: Baseline Index Tables 2001 – 2007

Mystic River Watershed Baseline Index - 2001 With Causes of Impairment							
Segment	Human Use				Aquatic Life		
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B		DO	N, P
Aberjona at Washington	B	B		B			N, P
Aberjona at USGS	B	B	B				N, P
Mystic RIVER							
Upper Mystic Lake							N, P
Mystic at High St.		B					N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B			N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B	B	B	C	DO	N, P
Meetinghouse Brook	B	B	B	B	C		N, P
Malden River at Medford St.	B	B	B	B		T	N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 5 dry fecal coliform samples per site

* There were 7 wet fecal coliform samples per site, except the Upper Mystic Lake site (5 samples) and the Malden River (6 samples)

* Chemistry is based on DO and water temperature (10-12 samples), and pH (9-12 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (9-11 samples)

* Aesthetics is based on total suspended solids (10-12 samples)

Mystic River Watershed Baseline Index - 2002 With Causes of Impairment							
Segment	Human Use				Aquatic Life		
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B	B	B		DO	N, P
Aberjona at Washington	B	B	B	B			N, P
Aberjona at USGS	B	B		B			N, P
Mystic RIVER							
Upper Mystic Lake		B					N, P
Mystic at High St.		B		B	C		N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B	C		N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B		B	C	DO	N, P
Meetinghouse Brook	B	B	B	B	C		N, P
Malden River at Medford St.	B	B	B	B		DO	N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 4 dry *E. coli* samples per site

* There were 3 wet *E. coli* samples per site, except the Meetinghouse Brook site (2 samples)

* Chemistry is based on DO and water temperature (11-13 samples), and pH (10-13 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (11-13 samples)

* Aesthetics is based on total suspended solids (12-13 samples)

Mystic River Watershed Baseline Index - 2003							
With Causes of Impairment							
Segment	Human Use				Aquatic Life		
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B		DO	N, P
Aberjona at Washington	B	B		B			N, P
Aberjona at USGS	B	B					N, P
Mystic RIVER							
Upper Mystic Lake							N, P
Mystic at High St.	B	B					N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B	C		N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B		B	C	DO	N, P
Meetinghouse Brook	B	B	B		C		N, P
Malden River at Medford St.		B		B		pH	N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 5 dry *E. coli* samples per site, except the Aberjona at USGS site (4 samples), and Upper Mystic Lake and Malden River (3 sample)

* There were 5 wet *E. coli* samples per site, except Aberjona at USGS, Upper Mystic Lake, and Meetinghouse Brook (4 samples each)

* Chemistry is based on DO and water temperature (8-11 samples), and pH (3-10 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (6-11 samples)

* Aesthetics is based on total suspended solids (8-11 samples)

Mystic River Watershed Baseline Index - 2004							
With Causes of Impairment							
Segment	Human Use				Aquatic Life		
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B		DO	N, P
Aberjona at Washington	B	B	B	B		pH	N, P
Aberjona at USGS	B	B	B	B			N, P
Mystic RIVER							
Upper Mystic Lake		B					N, P
Mystic at High St.	B	B		B			N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B	C		N, P
Winn's Brook at Little Pond	B	B	B	B	C		N, P
Alewife Brook at Broadway	B	B	B	B	C	DO	N, P
Meetinghouse Brook	B	B		B	C		N, P
Malden River at Medford St.		B		B			N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 3 dry *E. coli* samples per site, except the Upper Mystic Lake site (2 samples)

* There were 8 wet *E. coli* samples per site, except the Mystic at High St. site and the Alewife Brook site (7 samples each)

* Chemistry is based on DO and water temperature (9-11 samples), and pH (3-10 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (10-11 samples)

* Aesthetics is based on total suspended solids (9-11 samples)

Mystic River Watershed Baseline Index - 2005							
With Causes of Impairment							
Segment	Human Use					Aquatic Life	
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B		DO	N, P
Aberjona at Washington	B	B		B			N
Aberjona at USGS	B	B					N, P
Mystic RIVER							
Upper Mystic Lake						DO	N, P
Mystic at High St.		B					N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B			N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B		B		DO	N, P
Meetinghouse Brook	B	B		B	C		N, P
Malden River at Medford St.	B	B	B	B			N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 2 dry *E. coli* samples per site

* There were 9 wet *E. coli* samples per site, except the Aberjona at USGS site and the Mill Brook site (8 samples each)

* Chemistry is based on DO and water temperature (10-11 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (10-11 samples)

* Aesthetics is based on total suspended solids (10-11 samples)

Mystic River Watershed Baseline Index - 2006							
With Causes of Impairment							
Segment	Human Use					Aquatic Life	
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B		DO	N, P
Aberjona at Washington	B	B	B	B	C	DO	N, P
Aberjona at USGS	B	B		B			N, P
Mystic RIVER							
Upper Mystic Lake							N, P
Mystic at High St.	B	B	B				N
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B		B	C		N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B		B	C	DO	N, P
Meetinghouse Brook	B	B		B		DO	N, P
Malden River at Medford St.	B	B		B	C		N, P

* Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)

* There were 6 dry *E. coli* samples per site

* There were 6 wet *E. coli* samples per site

* Chemistry is based on DO and water temperature (10-12 samples)

* Nutrients is based on nitrates/nitrites and phosphorus (12 samples)

* Aesthetics is based on total suspended solids (12 samples)

Mystic River Watershed Baseline Index - 2007 With Causes of Impairment							
Segment	Human Use				Aquatic Life		
	 Swimming	 Swimming	 Boating	 Boating	 Aesthetics	 Chemistry	 Nutrients
Aberjona RIVER							
Aberjona at Salem	B	B		B	C	DO	N, P
Aberjona at Washington	B	B	B	B			N, P
Aberjona at USGS	B	B	B	B			N, P
Mystic RIVER							
Upper Mystic Lake	B	B		B			N, P
Mystic at High St.	B	B	B	B			N, P
Tributaries							
Mill Brook at Mt. Pleasant Cemetery	B	B	B	B			N, P
Winn's Brook at Little Pond	B	B	B	B			N, P
Alewife Brook at Broadway	B	B		B	C	DO	N, P
Meetinghouse Brook	B	B	B	B		DO	N, P
Malden River at Medford St.	B	B	B	B			N, P

- * Swimming and Boating columns with rain cloud icon are for bacterial data collected during wet weather (any precipitation in preceeding 48 hours)
- * There were 4-6 dry *E. coli* samples per site
- * There were 4-6 wet *E. coli* samples per site
- * Chemistry is based on DO and water temperature (9-12 samples)
- * Nutrients is based on nitrates/nitrites and phosphorus (10-12 samples)
- * Aesthetics is based on total suspended solids (10-12 samples)