Massachusetts Department of ENVIRONMENTAL PROTECTION

2007 DWM ENVIRONMENTAL MONITORING OVERVIEW

(CN 278.0)

Water quality monitoring, assessment and management activities of the MassDEP are sequentially performed in accordance with a rotating five-year watershed schedule. Surface waters are typically monitored during Year 2 of the cycle by the Division of Watershed Management's (DWM) Watershed Planning Section. The main programmatic objectives of the DWM related to surface water quality monitoring are to:

- Collect chemical, physical and biological data to assess the degree to which designated uses, such as primary and secondary contact recreation, fish consumption, aquatic life and aesthetics, are being met in waters of the Commonwealth;

- Collect chemical, physical and biological data to support analysis and development of implementation plans to reduce pollutant loads to waters of the Commonwealth;

- Screen fish in selected waterbodies for fish tissue contaminants (metals, PCBs and organochlorine pesticides) to provide for public health risk assessment;

- To the extent feasible, locate pollution sources and promote and facilitate timely correction;

- Over the long term, collect water quality data to enable the determination of trends in parameter concentrations and/or loads;

- Develop new or revised standards, which may require short-term research monitoring directed towards the establishment or revision of water quality policies and standards; and to

- Measure the effectiveness of water quality management projects or programs (such as the effectiveness of implementing TMDLs, Best Management Practices (BMP) for the control of nonpoint pollution, or a state-wide policy or permitting program).

Quality assurance is maintained for DWM's watershed monitoring program to ensure implementation of an effective and efficient sampling design, to meet programmatic goals and to provide data meeting specific data quality objectives. The U.S. Environmental Protection Agency (USEPA) has approved a comprehensive Quality Assurance Program Plan (QAPP) that applies to the generation and use of surface water quality data by DWM for a five-year period (2005 through 2009). This five-year *program* QAPP is annually supplemented by project-specific Sampling and Analysis Plans (SAPs), which provide detailed information regarding individual *project* organization, tasks, background, sampling design and non-direct measurements.

The DWM performed monitoring activities in 2007 primarily within the *Charles, Housatonic, Hudson and Ten Mile* watersheds and *North Coastal* drainage area. In consultation with appropriate agencies and organizations (e.g., USEPA, USGS, watershed associations, etc.) DWM monitoring coordinators reviewed historical data and information, examined GIS data layers, reviewed NPDES and water withdrawal permits, conducted reconnaissance and formulated individual watershed SAP's. While some of the DWM monitoring activities in 2007 were targeted at specific issues of concern, the majority of the monitoring in the "Year Two" watersheds was aimed at providing the necessary data and information to assess the extent to which water bodies are supporting their intended uses, as designated in the Massachusetts Surface Water Quality Standards. This information supports individual watershed assessments, which, in turn, inform the Massachusetts Integrated List of Waters submitted to the EPA in fulfillment of sections 305b (Summary of Water Quality) and 303d (List of Impaired Waters) of the Clean Water Act (CWA).

The DWM continued to make progress in 2007 with automating selected routine data collection activities. Prior to 2005, the DWM attempted to collect "worst-case" dissolved oxygen data from rivers and streams by performing pre-dawn (typically 12-6 am) surveys using portable multiprobes. However, the DWM now deploys unattended, continuously-monitoring multiprobe data loggers at selected locations for approximately 48 hours on multiple occasions throughout the assessment monitoring period. This program yields DO and temperature data that are more representative of typical conditions in a manner that poses less risk to monitoring personnel.

The DWM also continued to collect data in support of ongoing efforts to establish nutrient criteria for Massachusetts. During the summer of 2007 approximately 190 periphyton samples were collected from the Charles, Housatonic, Hudson and Ten Mile river basins. The nutrient criteria work consisted of setting up three transects across a stream and picking up five stones from evenly spaced locations along those transects. The stones were examined for the percent coverage of periphyton and macroalgae. The amount of sunlight and the substrata type were also recorded. The data will help provide a picture of the spatial coverage of the algae and indicate under what physical circumstances particular algal genera are found.

The DWM's annual monitoring to assess surface water quality conditions in Massachusetts provides data for satisfying the reporting requirements of sections 305(b) and 303(d) of the Clean Water Act. Due to constraints on time and resources, however, this monitoring effort is not as useful for 1) identifying with confidence the specific sources of pollution that cause water quality impairments; and 2) executing follow-up actions for remediation. To address the need for this type of data and information, the bacteria source tracking (BST) efforts of MassDEP's regional monitoring personnel were continued with the goal of locating and eliminating sources of bacteria contamination to surface waters in their respective regions.

Although the majority of DWM's monitoring efforts in 2007 were centered in the "Year 2" watersheds, a few miscellaneous projects were undertaken in watersheds apart from the rotating monitoring and assessment schedule. For example, the DWM performed fish toxics monitoring at eight sites in response to public requests or to support ongoing research projects of the MassDEP and other agencies. Other special investigations are summarized below in the section entitled "Additional Monitoring Activities".

More detail pertaining to the monitoring activities accomplished in 2007 is presented below for both the "Year Two" watersheds, as well as throughout the state.

CHARLES

The 2007 surveys of the Charles River Watershed focused on obtaining information to meet the following objectives:

- Determine the water quality and biological health of rivers/streams within the watershed that were not assessed in the 2002 Water Quality Assessment Report and increase coverage to river/streams that have never before been assessed by conducting assessments based on chemical parameters and biological (aquatic macroinvertebrates, bacteria) communities.

- Provide biological and habitat data to document the status of benthic communities over time (trend monitoring); provide biological, habitat, and dissolved oxygen, temperature, and chemical data to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide quality-assured fecal coliform and *E. coli* data for the purpose of assessing *Primary* and *Secondary Contact Recreational* uses in rivers/streams.

- Provide quality-assured dissolved metals data for the purpose of assessing the aquatic life use in rivers/streams

- Provide quality-assured data to DWM's Total Maximum Daily Load Program to assist with TMDL development.

The specific sampling activities of the 2007 Charles River Watershed Year 2 Survey are listed below. A total of 44 river stations (including water quality, fish population, metals, unattended deployment, and biomonitoring) and three lakes were sampled to address the above objectives. Monitoring stations are summarized in the tables at the end of this section.

1) **Water Quality:** Water quality surveys were conducted a total of five times (weeks of May 14, June 18, July 23, August 27, and October 2). Water quality data were collected at 32 stations throughout the sampling season. Data included grab samples for total phosphorus, total nitrogen, ammonia-nitrogen, total suspended solids, color, turbidity, hardness (some sites), and *E. coli* bacteria. Also, in-situ multi-probe measurements for temperature, dissolved oxygen, % oxygen saturation, pH, specific conductance, and total dissolved solids were collected at these sites using attended multi-probe QC units. Continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out at all 32 sites. These unattended probes were deployed to 16 sites on Friday of the weeks preceding the water sampling surveys. Unattended units were re-positioned on Mondays to the other 16 sites with a final retrieval on Wednesday of that same week. Long-term temperature sondes (thermistors) were deployed at 12 sites beginning as early as late June and extending into October. Seven of these sites were at the same locations as the water quality sites and an additional five were set at other stations. Finally, samples were collected for dissolved metals analyses at twelve (12) stations throughout the Charles River Watershed.

2) **Biological Monitoring:** Benthic macroinvertebrate and habitat assessments were performed at 13 stations to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs). Periphyton assessments were performed at 26 sites including those sites where macroinvertebrate sampling was conducted. Periphyton assessment consisted of an approximation of the algal coverage within the reach, and scrapes of various substrates within the riffle zone to obtain samples for taxonomic identification to genus. Fish population monitoring was conducted on four brooks in the Charles River Watershed. These included Trout Brook in Dover, Bogastow Brook in Millis, Seaverns Brook in Newton (two sites), and Stony Brook in Weston (two sites).

3) **Fish Toxics Monitoring:** Fish toxics monitoring was performed at two (2) locations. Fish collections were made on May 17 at Beaver Pond (Bellingham) and on June 20 at Populatic Pond (Norfolk). Edible fillets were analyzed for the presence of heavy metals (including mercury), PCBs, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

4) **Blue-green Algae Bloom Investigations:** Throughout the summer of 2007 MassDEP staff provided laboratory services in response to potentially toxic cyanobacter (blue-green algae) blooms. Samples from the Charles River Watershed, including the mainstem Charles River, Mine Brook, and the Stop River were analyzed for cyanobacter after observations by DWM staff indicated that there was the possibility of a bloom. Phytoplankton identifications were completed for all samples with a subset also analyzed for cell counts. Identifications and counts were used to determine whether the World Health Organization (WHO) criterion for blue-green algae blooms had been exceeded.

5) **2007 Bacteria Source Tracking:** Bacteria source tracking (BST) studies were performed in selected subwatersheds by the DWM Regional Monitoring Coordinators based at the MassDEP Northeast Regional Office (NERO). The BST surveys followed protocols developed in 2004 by the DWM that provide site-specific data for the identification and abatement of specific bacterial pollution sources. More details pertaining to the BST work can be found under “Additional Monitoring Activities”.

The NERO conducted bacteria source tracking in the following streams and rivers in the Charles River Watershed:

Bogle Brook and Tributaries, Wellesley
Fuller Brook and Tributaries, Wellesley
Powissett Brook, Dover

As a result of the BST surveys, evidence of significant bacteria contamination from suspected human sources was detected in Fuller Brook. The regional office notified the appropriate Wellesley authorities and advised them to immediately begin remediation. The regional office is currently monitoring the progress of the actions this municipality is taking to eliminate the illicit sewage inputs to Fuller Brook.

Charles River Watershed – 2007 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Beaver Brook	~725 ft upstream of confluence with Charles River, Bellingham upstream of footpath off Taunton St., Bellingham (1,2,3,4,7,8)
Beaver Brook	At inlet to Mill Pond, Waltham/Belmont (1,2,3,4,7,8)
Beaver Brook	Beaver St., Waltham downstream of Clematis Brook confluence (1,2,3,4,7,8,10)
Beaver Pond	Sampling throughout the pond, Bellingham (12)
Bogastow Brook	At Orchard St. below Bogastow Pond in the northern most outlet, Millis (1,2,3,4,5,6,7,8,9)
Bogle Brook	Upstream of Morses Pond, Wellesley - East side of Overbrook Drive -back of fabric store parking lot (1,2,3,4,7,8)
Cedar Swamp Pond	Upstream side of Cedar Swamp Pond Dam, Milford (10)
Charles River	Route 85 road crossing north of Rt 495, Milford (1,2,3,4,7,8,11)
Charles River	Charles River Just downstream of Saint Gobain Containers Outfall, Approx 312 feet north of Howard Street road crossing, Milford (9)
Charles River	Howard Street Crossing, Milford (10)
Charles River	Maple St., Bellingham (1,2,3,4,7,8,10,11)
Charles River	Walker St., Medway near USGS station 01103280 upstream of CRPCD discharge (1,2,3,4,5,7,8,11)
Charles River	Dean St., Millis downstream from the Charles River Pollution Control District discharge (1,2,3,4,5,7,8,10,11)
Charles River	Rt 27 Road Xing, Medfield/Sherborn (1,2,3,4,7,11)
Charles River	Approximately 1,000 ft upstream of Davis Brook confluence, Natick at informal boat launch off Rt. 16 (1,2,3,4,11)
Charles River	Approximately 500 ft downstream of Willow St./South St., Dover/Needham (Approximately 1,000 ft upstream of USGS Dover gage 01103500) (1,2,3,4,5,7,8,11)
Charles River	South of Rte 16 at the Mary Hunnewell Bridge Xing footbridge west of Wales St./Walnut St., Newton/Wellesley (1,2,3,4,11)
Charles River	Upstream/west side of footbridge above Watertown Dam, Watertown. (1,2,3,4,11)
Charles River	Approximately 100 ft downstream/east of Watertown Dam, Watertown. (5,7,8)
Charles River	Charles River Basin - Riverside Boat Club Beach near back gate to Magazine Beach, Cambridge (10)
Charles River	Charles River Basin at the middle of the Boston University Railroad Bridge, Cambridge (9)
Charles River	River underneath Boston Museum of Science Parking Garage (Immediately upstream of historic dam structure), Cambridge (9)
Charles River	Half way down the narrow boat channel going past the Boston Museum of Science toward Rt93 and drawbridge, Boston (9)
Chicken Brook	Winthrop St. near 2002 benthic station -B0486, Medway (1,2,3,4,7,8)
Dopping Brook	Brook Street near Bio Station B0110, Holliston (1,2,3,4)
Dopping Brook	Upstream/north side at Whitney St. bridge, Holliston (1,2,3,4,5,7,8,11)
Fuller Brook	Dover Rd, Wellesley (1,2,3,4,7,8,9,10)
Godfrey Brook	Vernon Grove Cemetary Entrance Rd., Milford (1,2,3,4,7,8)
Hopping Brook	Hartford Ave., Medway (1,2,3,4,7,8)
Mill Brook (Aka North Brook)	North Meadows Rd, Medfield (1,2,3,4,5,7,8)
Millers River	Millers River, Boston Sand and Gravel Entrance below I93N, Boston (7,10)

River/Stream	Monitoring Site Description (sample type*)
Mine Brook	West Central St. west of I-495, Franklin (1,2,3,4,9)
Mine Brook	Pond St., Franklin (1,2,3,4,7,8,10)
Muddy River	Agassiz Road, Boston (7,10)
Populatic Pond	Sampling throughout the pond, Norfolk (12)
Poss Indian Brook	South St., Natick (1,2,3,4,5,7,8)
Powissett Brook	Downstream from Wilsondale St., Dover (1,2,3,4)
Rock Meadow Brook	Summer St., Westwood (1,2,3,4,5,7,8)
Rosemary Brook	Barton Rd, Wellesley (1,2,3,4,8)
Saint Gobain Containers Discharge	Saint Gobain Containers outfall by company railroad spur, Milford (9)
Seaverns Brook	Downstream side of Shaylor Lane, Weston (6)
Seaverns Brook	Just off Rt. 30 at tractor trailer pulloff - just east of toll, Weston (1,2,3,4,6,7,8,9)
Stony Brook	Church St., Weston. (5,6,7,8)
Stony Brook	Railroad tracks near Sibley Rd, Weston/Waltham (1,2,3,4,6,9,10)
Stop River	Campbell St., Norfolk approximately 1/2 mile upstream of MCI Norfolk Walpole wastewater treatment facility (MA0102253) discharge (1,2,3,4,5,7,8,11)
Stop River	Noon Hill Rd, Medfield (1,2,3,4,5,7,8,9,10,11)
Stop River	Causeway Street, Medfield (CRWA 269T) (3)
Trout Brook	Approximately 15 ft downstream/north of Haven St., Dover (1,2,3,4,5,6,7,8,9,11)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, color, turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III, 6 – fish population, 7 – Periphyton, 8 – habitat assessment,
9 – unattended continuous temperature, 10 – dissolved metals, 11 – hardness

HOUSATONIC

The 2007 surveys of the Housatonic Watershed focused on obtaining information (i.e. water quality, bacteria, and benthic macroinvertebrate populations) at a total of 36 river stations. The specific objectives of this monitoring were to:

- Provide biological and habitat data to document the status of benthic and fish communities over time (trend monitoring).

- Provide biological, habitat, and dissolved oxygen, temperature, and chemical data to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide quality assured fecal coliform and *E. coli* bacteria data for the purpose of assessing *Primary* and *Secondary Contact Recreation* uses.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water Quality:** Water quality surveys were conducted during the months of May, June, July, August, and September. Samples for total phosphorus, total nitrogen, ammonia-nitrogen, total suspended solids, color, turbidity, bacteria counts (*E. coli*), dissolved oxygen and other field measurements were obtained from a total of thirty (30) stations. Additionally, continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out for a minimum duration of 96 hours at 19 sites. Continuous temperature monitoring was recorded from late June through mid-October at nine sites. Dissolved metals sampling was conducted at two sites on 3 occasions.

2) **Biological Monitoring:** Macroinvertebrate sampling, fish population monitoring, and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) and were conducted at fourteen (14) stations. Habitat assessments were also conducted at thirty-three (33) stations. Semi-quantitative periphyton assessments were performed at five (5) sites where macroinvertebrate sampling was conducted. Finally, fish population monitoring was conducted at six (6) stations.

3) **Fish Toxics Monitoring:** Fish toxics monitoring was performed at one location on the Konkapot River in New Marlborough. Edible fillets were analyzed for the presence of heavy metals (including mercury), PCB, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

Housatonic Watershed – 2007 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Anthony Brook	North Mountain Road, Dalton (10)
Beartown Brook	Meadow St., Lee (1,2,3,8)
Cady Brook	Downstream New Windsor Road, Hinsdale (6,8)
East Branch Housatonic River	Old Windsor Road, Dalton (1,2,3,8,11)
East Branch Housatonic River	Most downstream crossing of Route 8, Dalton (5,7,8,9)
East Branch Housatonic River	Downstream of Pomeroy Ave., Pittsfield (2,3,4,8)
East Branch Housatonic River	Hubbard Ave., Pittsfield (5,8)
Egypt Brook	Holiday Road, Dalton (10)
Goose Pond Brook	Tyringham Road, Lee (1,2,3,8)
Green River	Rte 23/41, Great Barrington (2,3,8)
Hop Brook	Meadow Street, Lee (2,3,4,8)
Housatonic River	Holmes Road, Pittsfield (2,3,4,8,11)
Housatonic River	New Lenox Road, Lenox (2,3,4,8)
Housatonic River	360 ft upstream of Valley Street, Lenox (1,2,3,4,5,8)
Housatonic River	Downstream of Lee WWTP discharge, Lee (2,3,5,8)
Housatonic River	Upstream of RR bridge east of Route 183, Stockbridge (2,3,4,5,8,11)
Housatonic River	Division Street, Great Barrington (1,2,3,8,9)
Housatonic River	Kellogg Road, Sheffield (2,3,4,8)
Housatonic River	Rannapo Road, Sheffield (2,3,4,8)
Hubbard Brook	Route 7, Sheffield (2,3,4,6,8,9)
Hubbard Brook	Upstream of Egremont Road, Sheffield (9)
Konkapot River	East side at Clayton Mill River Road, New Marlborough (1,2,3,8,11,12)
Konkapot River	Upstream Konkapot Road, New Marlborough (1,2,3,5,8,11)
Konkapot River	Downstream of Route 7A bridge, Sheffield (2,3,4,8)

Larrywaug Brook	Upstream of Route 183 and South of MA TPK, Stockbridge (2,3,4,5,8)
Onota Brook	Most downstream crossing of Peck's Road, Pittsfield (2,3,4,5,7,8)
Rawson Brook	At oxbow SW of Wellman Road bridge, Monterey (2,3,4,5,8)
Sackett Brook	East New Lenox Rd, Pittsfield (1,2,3,5,6,7,8,9)
Schenob Brook	Upstream of Miller Ave., Sheffield (2,3,4,8)
Southwest Branch Housatonic River	At Clapp park, Pittsfield (2,3,4,8,9)
Town Brook	Miner Rd, Lanesborough (2,3,4,8)
Wahconah Falls Brook	Most downstream crossing of Route 9/8A, Dalton (2,3,5,7,8)
Washington Mountain Brook	Washington Mountain Road, Lee (1,2,3,5,6,8)
West Branch Housatonic River	End of Cedar Street, Pittsfield (2,3,4,5,8,9)
Williams River	Division St., Great Barrington (2,3,4,6,8,9)
Williams River	Downstream of East Alford Road, West Stockbridge (2,3,4,5,6,7,8,9)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, TSS, color, turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III, 6 – Fish population, 7 – Periphyton, 8 – habitat assessment, 9 – unattended continuous temperature, 10 – dissolved metals, 11 – hardness and alkalinity, 12 – fish toxics

HUDSON

The 2007 Hudson River Basin Year 2 Survey focused on obtaining water quality information to determine which water bodies meet state standards and their designated uses. These designated uses include Aquatic Life, Fish Consumption, Primary and Secondary Contact Recreation, and Aesthetics. Furthermore, the sampling program allowed for the assessment of previously unsampled segments. Another goal of the sampling was to evaluate trends at previously sampled sites in order to determine current conditions and possibly allow the removal from the 303(d) List those formerly impaired waterbodies whose water quality now meet standards. The specific objectives of this monitoring were to:

- Collect physico-chemical data to assess the Aquatic Life Use.
- Collect biological data (benthic macroinvertebrate, fish population, habitat assessment and algal population) to assess the Aquatic Life Use. Fish population data will also be used to determine whether a cold-water fishery exists in segments sampled.
- Collect bacteria data to assess Primary and Secondary Contact Recreational Uses. Field observations during sampling will be used to assess the Aesthetics Use.
- Screen fish to provide information to MDPH for public health risk assessment due to fish tissue contaminants (metals, PCBs and pesticides).
- Gather water quality data to determine long-term trends in water quality in the Hudson River Basin.
- Gather stream temperature to determine whether a cold-water fishery exists in segments sampled and determine the impact of point source discharges.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water Quality:** Water quality surveys were conducted in 2007 during the months of April, May, June, August, and September. Water quality samples were obtained from a total of 25 stations and analyzed for ammonia-nitrogen, total nitrogen, total phosphorus, total suspended solids, color, turbidity, bacteria counts (*E. coli*), dissolved oxygen and other field measurements. Due to the heavy rains during the September 11, 2007 water quality sampling event an additional sampling run was conducted on September 27th to collect samples for bacteria counts (*E. coli*). Additionally, dissolved oxygen and continuous temperature monitoring with unattended metered probes was carried out for a minimum duration of 96 hours at 21 sites. However, heavy rainfall on September 11, 2007 resulted in approximately 72 hours of data at the chosen dissolved oxygen and continuous temperature monitoring deployment sites for September. Continuous temperature monitoring was recorded from late June through mid-October at seven sites. Dissolved metals sampling was conducted at two sites on the Hoosic River on three occasions.

2) **Biological Monitoring:** Macroinvertebrate sampling, fish population monitoring, and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) and were conducted at twelve (12) stations. Habitat and periphyton assessments were also conducted at the macroinvertebrate stations. Additional habitat monitoring was conducted at the twelve (12) water quality stations. Finally, fish population monitoring and habitat assessment was conducted at six (6) stations.

3) **Fish Toxics Monitoring:** Fish toxics monitoring was conducted at two locations on the Hoosic River in North Adams. Edible fillets were analyzed for the presence of heavy metals (including mercury), PCB, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

Hudson Watershed – 2007 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Kitchen Brook	Mountain St., Cheshire (1,4,6,9)
Hoosic River	Church Street, Cheshire (1,2,3,4,7,8,9)
South Brook	Wells Road, Cheshire (1,2,3,4,7,8)
Basset Brook	Fred Mason Road (4,5,6,7,9)
Pecks Brook	Adjacent hiking trail off West Mountain Road, Adams (5,7)
Tophet Brook	East Street, Adams (1,2,3,4,8)
Miller Brook	Downstream from East Road, Adams (1,2,3,4,6,9,11)
Hoosic River	Upstream from Adams WWTP, Adams (5,7)
Hoosic River	Upstream Lime St. bridge (1,2,3,10,11,12)
Hoosic River	Downstream Lime St. bridge (4)
Hoosic River	Downstream from Adams WWTP, Adams (5,7)
Southwick Brook	Approximately 70 feet from confluence with the Hoosic River, north of Lime Street, Adams (2,3,7)
Southwick Brook	Davis Road, Adams (2,3)
Hoosic River	Upstream at Hodges Cross Road bridge, North Adams (2,3,10,11,12)

Hoosic River	Downsstream at Hodges Cross Road bridge, North Adams (4)
North Branch Hoosic River	Approximately 550 feet downstream/west of the most westerly Beaver Street (Route 8) bridge crossing in North Adams (1,2,3,8)
Hudson Brook	Approximately 50 upstream of confluence w/North Branch Hoosic River, North Adams (11)
Bentley Brook	Unnamed road west of Corey Road, Hancock (1,2,3,8)
Kinderhook Creek	Potter Mountain Road, Hancock (1,2,3,4,5,7,8,11,12)
West Branch Green River	Upstream from Old Mill Road, Williamstown (5,7)
Green River	Approximately 150 feet downstream of the East Branch Green River confluence, New Ashford (1,2,3,4,12)
East Branch Green River	Approximately 80 feet from confluence with the Green River, New Ashford (east of Route 7, near the Williamstown border) (1,2,3,4,6,9,11,12)
East Branch Green River	Greylock Road, New Ashford (9)
Green River	Upstream from Roy's Road, New Ashford (5,7)
Green River	Route 43 bridge crossing closest to Scott Hill Road, Williamstown (1,2,3,4,7,8)
Green River	Approximately 100 feet upstream of Hopper Road, Williamstown (1,2,3,7,8,11)
Hopper Brook	Approximately 200 feet upstream form the confluence with the Green River, Williamstown (near Hopper Road) (1,2,3,4,11)
Green River	Upstream of access road to Linear Park, Williamstown (6)
Green River	Approximately 450 feet upstream of Route 2 bridge, Williamstown (1,2,3,4,5,7,8,11,12)
North Branch Hoosic River	Approximately 360 feet west of Marshall Street bridge, North Adams (3,12)
North Branch Hoosic River	Near Rte 8. across from the Contemporary Artists Center, Clarksburg (6)
North Branch Hoosic River	Henderson Road, Clarksburg (1,2.3.4,5,7,12)
Hoosic River	Ashton Avenue, North Adams (1,2,3,4,7,8,11)
Paull Brook	Galvin Road, North Adams (1,2,3,4)
Paull Brook	Route 2 crossing, North Adams (2,3)
Buxton Brook	Approximately 700 feet upstream from Main Street, Williamstown (1,2,3,4,5,7,11,12)
Hoosic River	Approximately 1000 feet upstream/east of Route 7 bridge, Williamstown (1,2,3,4,5,7,11,12)
Hoosic River	Approximately 3800 feet downstream of Hoosac WPCF discharge MA0100510) Williamstown (1,2,3,4,5,7,11,12)
Broad Brook	Route 7 (Simonds Road), Williamstown (1,2,3,4,7,8,9,11,12)
Broad Brook	Downstream Steinerfilm discharge (9)
Broad Brook	Upstream Steinerfilm discharge (9)
Hoosic River	Foundry Road Bridge, North Adams (13)
Hoosic River	Approximately 800 upstream of Route 2 near railroad bridge, North Adams (13)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, TSS, color, turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – Fish population, 7 – Periphyton, 8 – habitat assessment, 9 – unattended continuous temperature, 10 – dissolved metals, 11-hardness, 12-alkalinity, 13-fish toxics

NORTH COASTAL

The 2007 surveys of the North Coastal Watersheds focused on obtaining information to meet the following objectives:

- Determine the water quality and biological health of rivers/streams within the watershed and increase coverage to river/streams that have never before been assessed by conducting assessments based on biological (aquatic macroinvertebrates, fish, bacteria) communities.

- Provide biological and habitat data to document the status of benthic and fish communities over time (trend monitoring); provide biological, habitat, and dissolved oxygen, temperature, chemical, and sediment quality/toxicity data to be used in making Aquatic Life and Aesthetics use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide quality-assured fecal coliform and E. coli data for the purpose of assessing Primary and Secondary Contact Recreational uses in rivers/streams.

- Screen fish to provide data to the Massachusetts Department of Public Health (MDPH) for public health risk assessment due to fish tissue contaminants (metals, polychlorinated biphenyls (PCBs) and pesticides).

The specific sampling activities of the 2007 North Coastal Watershed Year 2 Surveys are listed below. A total of 23 river stations (including water quality, sediment quality and biomonitoring) and two lakes were sampled to address the above objectives. Monitoring stations are summarized in the tables at the end of this section.

1) **Water Quality:** Water quality surveys were conducted a total of five times (weeks of April 30, June 5, July 10, August 14 and October 18). Grab samples for total phosphorus, total nitrogen, ammonia-nitrogen, TSS, color, turbidity, and Escherichia coli were collected at a total of 21 stations. On the 1st, 3rd, and 5th surveys, grab samples for hardness were collected at a total of five stations. Continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out at 20 sites. These unattended probes were deployed during the months of June, July, August, and September on Friday of the weeks preceding the water sampling surveys for that month and retrieved five days later. Finally, long-term temperature only data loggers were deployed at six sites.

2) **Biological Monitoring:** Benthic macroinvertebrate and associated habitat assessments were performed at eight stations to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs). Periphyton assessments were performed at sites where macroinvertebrate sampling was conducted. Fish population surveys using a backpack electroshocker and associated habitat assessments were conducted at six sites.

3) **Fish Toxics Monitoring:** Fish toxics monitoring was performed at Chebacco Lake (Essex/Hamilton) and Lake Quannapowitt (Wakefield). Edible fillets were analyzed for the

presence of heavy metals (including mercury), PCB, and organochlorine pesticides. Fish consumption advisories will be issued by the MDPH if necessary.

4) **Sediment Quality/Toxicity:** Composite sediment samples were collected once on November 2 at a total of three sites on Proctor Brook (MA93-39). The sediment samples will be analyzed for toxicity, organochlorine pesticides, metals, PAHs, and PCBs.

North Coastal Watersheds – 2007 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Crane Brook	Pine Street, Danvers (1,2,3,4,5,7)
Goldthwait Brook	Foster Street, Peabody (1,2,3,4,8,9)
Cat Brook	Lincoln Street, Manchester (1,2,3,4,6,8)
Beaverdam Brook	Downstream at Chestnut Street and downstream of pipe under bridge, Lynnfield (1,2,3,4,6,8,9)
Mill River	Farm Street (south off of Route 129), Wakefield (1,2,3,4,9)
Hawkes Brook	North of Hawkes Pond, Salem Street/Route 129, Lynnfield (1,2,3,4,6,8)
Hawkes Brook	South of Hawkes Pond, Spring Street (east off Walnut Street), North Saugus (1,2,3,4,5,7)
Saugus River	Vernon Street/Main Street, Wakefield/Lynnfield (1,2,3,4,9)
Saugus River	Elm Street, Saugus (1,2,3,4,9)
Saugus River	Furthest upstream foot bridge, Cedar Glen Golf Course, Saugus (1,2,3)
Frost Fish Brook	Coolidge Road, Danvers (1,2,3,4,5,7)
Beaver Brook	Pickering Street, Danvers (1,2,3,4,5,7)
Crane River	Ash Street, Danvers (1,2,3,4,5,7)
Proctor Brook	Howley Street, Peabody (1,2,3,4,6)
Alewife Brook	Downstream at Apple Street, Essex (1,2,3,4,5,7)
Causeway Brook	Lincoln Street, Manchester (1,2,3)
Bennetts Pond Brook	At mall entrance south off Lynn Fells Parkway and east of Forest Street, Saugus (1,2,3,4,6,8)
Shute Brook	Upstream of Central Street (upstream of railroad tracks), Saugus (1,2,3,4,6,8)
Unnamed tributary to Chubb Creek	Oak Street, Beverly (1,2,3,4,5,7)
Unnamed tributary locally known as “Curtis Brook”	Tall Tree Drive, Beverly (1,2,3,4,5,7)
Smallpox Brook	Gerrish Road, Salisbury (1,2,3,4)
Chebacco Lake	Wakefield (10)
Lake Quannapowitt	Hamilton/Essex (10)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, TSS, color, turbidity, 3 – E. coli samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – Fish population, 7 – Periphyton, 8 – unattended continuous temperature, 9 – hardness, 10 – fish toxics

TEN MILE

The 2007 surveys of the Ten Mile Watershed focused on obtaining information (i.e. general water quality, total and dissolved metals along with hardness, bacteria, and benthic

macroinvertebrate populations) at a total of 23 river stations. The specific objectives of this monitoring were to:

- Provide biological, habitat, and dissolved oxygen, temperature, and chemical data to be used in making *Aquatic Life* and *Aesthetics* use assessments required by Section 305(b) of the Clean Water Act; provide data for other informational needs of Massachusetts regulatory agencies.

- Provide biological and habitat data to document the status of benthic communities over time (trend monitoring).

- Provide metals data for use in 303d determinations and for a cooperative metals study with Rhode Island DEM.

- Provide quality assured *E. coli* bacteria data for the purpose of assessing *Primary* and *Secondary Contact Recreation* uses.

Individual monitoring elements are described below. Water quality and biological monitoring sites are summarized in the matrix at the end of this section.

1) **Water Quality:** Water quality surveys were conducted during the months of May, June, July (two), and September. Samples for total phosphorous, total nitrogen, ammonia-nitrogen, total suspended solids, color, turbidity, dissolved oxygen and other field measurements were obtained from a total of 18 stations and bacteria (E. coli) were obtained from 22 stations. Additionally, continuous temperature and dissolved oxygen monitoring with unattended metered probes was carried out for a minimum duration of 96 hours at 18 sites. Dissolved metals and hardness sampling was conducted at 7 sites on 5 occasions.

2) **Biological Monitoring:** Macroinvertebrate sampling and habitat assessments were performed to assess the aquatic life use status for 305(b) reporting requirements. The macroinvertebrate sampling procedures utilized Rapid Biomonitoring Protocols (RBPs) and were conducted at six stations.

Ten Mile River Watershed – 2007 Water Quality and Biological Sampling Matrix

River/Stream	Monitoring Site Description (sample type*)
Ten Mile River	Fuller St, Plainville (1,2,3,4,5)
Ten Mile River	West Bacon St, Plainville (1,2,3,4,6,7,8)
Ten Mile River	Orne St, N. Attleborough (3)
Ten Mile River	Rte 1, N. Attleborough (1,2,3,4)
Ten Mile River	Cedar Rd (upstream N Attleborough POTW), N Attleborough (1,2,3,4,5,6,7,8)
Ten Mile River	214 Deanville Rd (below N Attleborough POTW), Attleboro** (1,2,3,4)
Ten Mile River	Unnamed access road (below N Attleborough POTW), Attleboro (1,2,3,4,5,6,7,8)
Ten Mile River	Olive St, Attleboro (1,2,3,4)
Ten Mile River	Tiffany St, Attleboro (1,2,3,4)
Ten Mile River	Pond St (upstream Attleboro POTW), Attleboro (1,2,3,4)
Ten Mile River	Maple Street behind complex, Attleboro (6,7,8)
Ten Mile River	Central Ave, Pawtucket, RI (downstream Attleboro POTW) (1,2,3,4,5,6,7,8)

Bungay River	Holden St, Attleboro (1,2,3,4)
Bungay River	Blackinton Pond outlet (Rte 152), Attleboro (1,2,3,4,5)
Speedway (Thacher) Brook	Rte 152, Attleboro (1,2,3,4,6,7,8)
Unnamed Tributary to Speedway Brook	Rte 152, Attleboro (2,3)
Sevenmile River	Draper Ave, N Attleborough (1,2,3,4,5)
Sevenmile River	Pitas Ave, Attleboro (3)
Sevenmile River	County St, Attleboro (1,2,3,4,6,7,8)
Scotts Brook	High St, N Attleborough (1,2,3,4)
Scotts Brook	S. Washington St, N Attleborough (1,2,3,4)
Fourmile Brook	West St., Attleboro (1,2,3,4)
Coles Brook	Talbot Way, Seekonk (3)
Coles Brook	Rte 152, Seekonk (1,2,3,4)

*1 – Attended multi-probe (DO, temperature, pH, conductance), 2 – nutrients, TSS, color, turbidity, 3 – bacteria samples, 4 – unattended continuous dissolved oxygen and temperature, 5 – Rapid Bioassessment Protocol (RBP) III and habitat assessment, 6 – dissolved metals, 7 – hardness, 8 –Total metals

** The Deanville Road site was sampled in the first survey but, for safety reasons, was changed to the unnamed access road for remaining surveys

ADDITIONAL MONITORING ACTIVITIES – Some monitoring activities were performed in watersheds that were not actually in "Year 2" of the five-year watershed cycle. These are briefly described below:

1) **Fish Toxics Monitoring:** In addition to the sites in the "Year 2" watersheds identified above, DWM completed fish sampling at the following eight (8) sites at the recommendation of the Inter-agency Fish Toxics Committee:

Watershed	Monitoring Site Description
Boston Harbor/Mystic	Mystic River, Medford
Concord	Ashland Reservoir, Ashland
Concord	Chauncy Pond, Westborough
Cape Cod	Long Pond, Wellfleet
Cape Cod	Great Pond, Truro
Cape Cod	Snows Pond, Truro
Cape Cod	Baker Pond, Orleans
Cape Cod	Pilgrim Lake, Orleans

Edible fillets were analyzed for the presence of heavy metals (including mercury), PCB, and organochlorine pesticides. If necessary, fish consumption advisories will be issued by the Massachusetts Department of Public Health.

2) **White Island Pond (Plymouth) Study:** In response to TMDL data needs, White Island Pond (both east and west basins) was sampled four times during the summer. Data collection focused on total phosphorus but some samples were also taken for dissolved (soluble reactive)

phosphorus as well as nitrate-nitrite and total nitrogen. Additional data on Secchi disk transparency, color, chlorophyll a and multi-probe data were collected. Nutrient samples were also taken from commercial cranberry bog discharge waters as they were discharged to the lake. Blooms of cyanobacteria were identified and counted.

3) **Blue-green Algae Bloom Investigation:** During the summer of 2007 approximately 66 samples were collected for cyanobacteria identifications and counts from the lower basin of the Charles River. This work was done in collaboration with the Mass. Department of Conservation and Recreation, Mass. Department of Public Health and the Charles River Watershed Association to monitor the blooms of potentially toxic cyanobacteria. The sampling extended from June to November.

4) **Marion POTW:**
The DWM conducted qualitative, multi-habitat biological monitoring upstream and downstream of the effluent discharge from the Marion Publicly-owned Treatment Works (POTW) to assess potential impacts to the unnamed receiving water (locally known as "Effluent Brook"). This was a follow-up investigation to a similar monitoring effort carried out in 2000 prior to the completion of improvements to the treatment facility. Aquatic benthic macroinvertebrate monitoring was based on modifications to the EPA Rapid Bioassessment Protocol I (RBP I), a screening-level assessment that documents specific visual observations made in the field by trained professional biologists. The protocol also includes an assessment of instream and riparian habitat conditions.

5) **Assabet River Dissolved Oxygen Monitoring:**
Dissolved oxygen probes were deployed in the Hudson and Ben Smith impoundments of the Assabet River, as well as at School Street, Northborough, to augment the existing dissolved oxygen database in light of the ongoing implementation of the TMDL and other water quality management measures.

6) **2007 Bacteria Source Tracking:** Bacteria source tracking (BST) studies were performed in 2007 in selected subwatersheds by the DWM Regional Monitoring Coordinators based at the MassDEP Western (WERO), Southeast (SERO) and Northeast (NERO) regional offices. The bacteria source tracking surveys followed protocols developed in 2004 by the DWM that provide site-specific data for the identification and abatement of specific bacterial pollution sources.

The DWM regional monitoring coordinators reviewed historical and recent bacteria data and information from the MassDEP Integrated List of Waters and Water Quality Assessment Reports, Department of Public Health data, and, in some cases, local watershed association volunteer monitoring data to establish target locations within their respective regions for bacteria source tracking and inspections. Pertinent information was reviewed (such as GIS land use and storm drain and sewer infrastructure maps) and field reconnaissance was conducted to design the sampling plan for each subwatershed and to aid in interpreting the data. Sampling locations were further refined based on bacteria "signals" and field observations. Screening-level bacteria sampling for *E. coli* was conducted in some subwatersheds on multiple occasions (during dry weather only). If results revealed bacteria contamination, iterative dry-weather bacteria sampling for *E. coli* (*Enterococcus* spp. in brackish/marine waters) continued in an attempt to track and isolate the dry-weather source(s) of bacteria. In other subwatersheds, because of input from, and close coordination with, local watershed groups, sampling could often be conducted directly from suspect stormwater outfall pipes, with no need for screening sites.

Occasionally, follow-up analyses (such as the use of optical brighteners, DNA, and caffeine testing) were performed in an attempt to determine if the bacteria were from human or animal sources.

DEP Northeast Region:
In 2007, MassDEP/NERO initiated the Bacteria Source Tracking Program (BST) with the construction of a new bacteria laboratory (set up with facilities for Colilert® and Enterolert®), and the hiring of staff dedicated to the BST program. Bacteria source tracking was conducted in the following subwatersheds:

Alewife Brook: Arlington, Somerville	(Boston Harbor – Mystic Watershed)
Mill Brook: Arlington	(Boston Harbor – Mystic Watershed)
Mystic River: Somerville	(Boston Harbor – Mystic Watershed)
Winn's Brook: Belmont	(Boston Harbor – Mystic Watershed)
Wellington Brook: Belmont	(Boston Harbor – Mystic Watershed)
Neponset River pipes: Boston	(Boston Harbor – Neponset Watershed)
Pine Tree Brook: Milton	(Boston Harbor – Neponset Watershed)
Unquity Brook: Milton	(Boston Harbor – Neponset Watershed)
Bogle Brook: Wellesley	(Charles Watershed)
Fuller Brook: Wellesley	(Charles Watershed)
Farley Brook: Ipswich	(Ipswich Watershed)
Kimball Brook: Ipswich	(Ipswich Watershed)
Bennetts Pond Brook: Saugus	(North Coastal Watershed)
Chubb Creek: Beverly	(North Coastal Watershed)
Patch Beach pipes: Beverly	(North Coastal Watershed)
Salem Harbor pipes: Salem	(North Coastal Watershed)
Sandy Beach (Porter River) pipes: Danvers	(North Coastal Watershed)
Stramski Beach: Marblehead	(North Coastal Watershed)
Mill River pipes and tributaries: Rowley, Newbury	(Parker Watershed)
Upper Shawsheen River tributaries: Bedford/Lexington	(Shawsheen Watershed)
Lower Shawsheen River pipes: Andover, North Andover, Lawrence	(Shawsheen Watershed)
Hop Brook and tributaries: Sudbury	(SuAsCo Watershed)

An aggressive enforcement approach to confirmed bacteria "hot spots" led to issuance of enforcement orders against eight municipalities. The NERO BST coordinator will follow progress on these actions and will conduct follow-up sampling and inspections to confirm identification and elimination of pollutant sources.

DEP Western Region:
DWM regional monitoring coordinators located at the MassDEP's Western Regional Office (WERO) performed Bacteria Source Tracking projects in the subwatersheds listed below. Sample analysis was conducted using the Colilert® enzyme substrate testing system in the laboratory at WERO.

Quaboag River, Warren	(Chicopee Watershed)
Longmeadow Brook, Longmeadow	(Connecticut Watershed)
North River, Colrain	(Deerfield Watershed)

Hoxie Brook, Adams	(Hoosic Watershed)
Pine Street Brook, Adams	(Hoosic Watershed)
North Branch Hoosic River, North Adams	(Hoosic Watershed)
Hoosic River, North Adams	(Hoosic Watershed)
Washington Mountain Brook, Lee	(Housatonic Watershed)
Housatonic River, Pittsfield	(Housatonic Watershed)
Fall Hill Brook, Orange	(Millers Watershed)
East Brook, Brimfield	(Quinebaug Watershed)
Munn Brook, Westfield, Southwick	(Westfield Watershed)
Blandford stormdrain, Blandford	(Westfield Watershed)

Sources of significant bacteria contamination were located in the following subwatersheds: Longmeadow Brook, Longmeadow; North Branch Hoosic River, North Adams; and Blandford stormdrain, Blandford. WERO personnel notified the appropriate municipal authorities in each of these communities and advised them to immediately begin remediation. The MassDEP WERO is currently monitoring the progress of the actions each community is taking to eliminate the illicit sewage inputs to these waterbodies.

The regional monitoring coordinartors also conducted follow-up sampling in subwatersheds where 2006 BST identified significant bacteria contamination to determine the progress of remediation efforts. This sampling determined that remediation efforts in Palmer and Pittsfield were successful at stopping the pollution from the identified bacteria sources. Remediation efforts in Athol reduced the bacteria pollution but more work needs to be done to fully stop the pollution.

DEP Southeast Region:
DWM regional monitoring coordinators in MassDEP's Southeast Regional Office (SERO) used the Colilert® and Enterolert® system located at the DWM Worcester office to analyze their samples. Bacteria source tracking was conducted in the following subwatersheds:

Drinkwater River: Hanover, Rockland, Norwell	(South Coastal Watershed)
Meadow Brook: East Bridgewater, Whitman	(Taunton Watershed)
Salisbury Brook: Brockton, Avon	(Taunton Watershed)
Sandwich Harbor Tributaries: Sandwich	(Cape Cod)
Speedway Brook: Attleboro, Rehoboth	(Narragansett/Mount Hope Bay Watershed)
Town Brook: Quincy, Braintree	(Weymouth, Weir)
Trout Brook: Brockton, Avon, Holbrook	(Taunton Watershed)