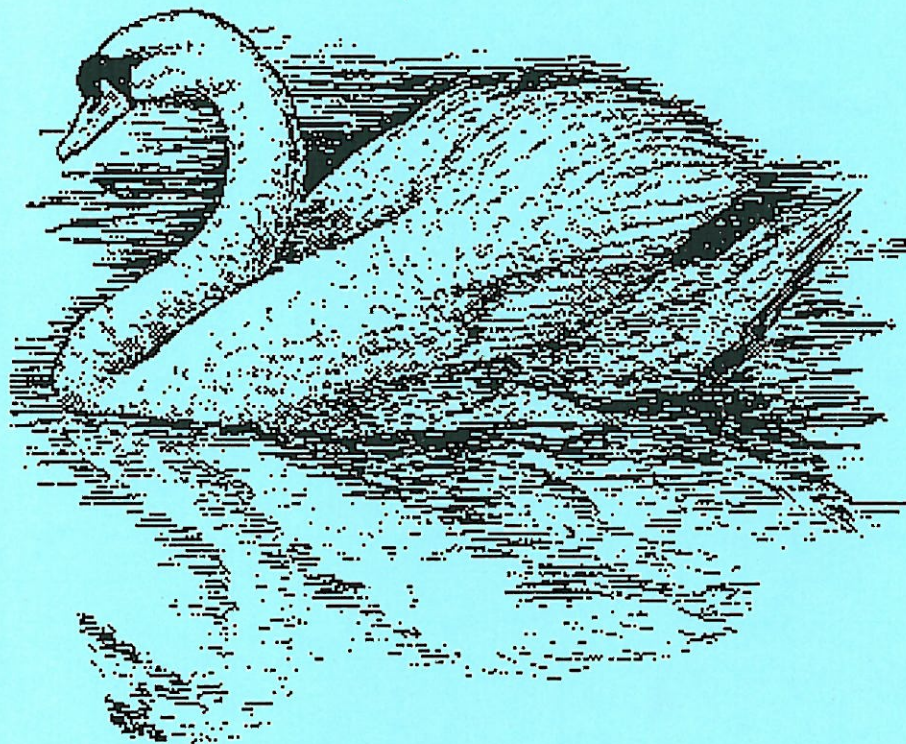
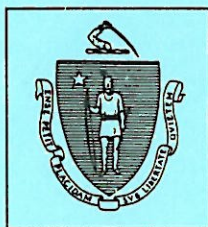


TEN MILE RIVER BASIN 1997 WATER QUALITY ASSESSMENT REPORT



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TEN MILE RIVER BASIN
1997 WATER QUALITY ASSESSMENT REPORT

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Department of Environmental Protection
Division of Watershed Management

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LIST OF ACRONYMS

| | |
|--------------------|--|
| 7Q10 | seven day ten year low flow |
| ACEC | Areas of Critical Environmental Concern |
| BPJ | Best Professional Judgement |
| CFS | cubic feet per second |
| CMR | Code of Massachusetts Regulations |
| CNOEC | chronic no observed effect concentration |
| CWA | Clean Water Act |
| DEM | Department of Environmental Management |
| DEP | Department of Environmental Protection |
| DFWELE | Department of Fisheries, Wildlife, and Environmental Law Enforcement |
| DMR | Discharge Monitoring Report |
| DO | Dissolved oxygen |
| DWM | Department of Watershed Management |
| EPA | United States Environmental Protection Agency |
| GIS (MASSGIS) | Geographic Information System |
| GP(M) (D) | Gallons per (minute) (day) |
| LC ₅₀ | lethal concentration to 50% of the test organisms |
| MDC | Metropolitan District Commission |
| MMDPH | Massachusetts Department of Public Health |
| MEPA | Massachusetts Environmental Policy Act Unit |
| NCCW | non-contact cooling water |
| NH ₃ -N | ammonia-nitrogen |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | non point source |
| NTU | nephelometric turbidity units |
| ORW | Outstanding Resource Waters |
| PAH | polyaromatic hydrocarbons |
| PALIS | Pond And Lake Information System |
| PCB | polychlorinated biphenols |
| PPM | parts per million |
| PWS | Public Water Supply |
| QA/QC | Quality Assurance/ Quality Control |
| RBP | Rapid Bioassessment Protocol |
| SARIS | Stream and River Inventory System |
| SEC | Sprague Electric Company |
| SS | suspended solids |
| SU | standard units |
| SWQS | Massachusetts Surface Water Quality Standards |
| TMDL | total maximum daily load |
| TOC | total organic carbon |
| TRC | total residual chlorine |
| USFDA | United States Food and Drug Administration |
| USGS | United States Geological Survey |
| VOC | volatile organic compound |
| WMA | Water Management Act |
| WPCF | Water Pollution Control Facility |
| WWTP | Waste Water Treatment Plant |

EXECUTIVE SUMMARY

TEN MILE RIVER BASIN 1997 WATER QUALITY ASSESSMENT REPORT

The assessment of current water quality conditions is a key step in the successful implementation of the watershed approach. This critical phase provides basic information for focusing resource protection and remediation activities to be executed later in the watershed management planning process. Detailed information regarding individual river segments and lakes in the Ten Mile River Basin is presented in this assessment report. The following summary provides an overview of the status of water quality conditions in the Ten Mile River Basin based on information available to the Department of Environmental Protection's Division of Watershed Management (DEP DWM) as of February 2000.

TEN MILE RIVER BASIN - RIVERS

This report presents the status of 32.8 river miles in the Ten Mile River Basin representing the Ten Mile River and all major tributaries. These include Scotts Brook; the Bungay River; Speedway Brook; the Sevenmile River and its tributary, Fourmile Brook; and Coles Brook. Smaller unnamed tributaries to these streams remain unassessed.

AQUATIC LIFE USE

The *Aquatic Life Use* is met when suitable habitat (including water quality) is available for sustaining a native, naturally diverse, community of aquatic flora and fauna. The assessment status of this use is derived primarily from benthic community data (Figure 1) and to a lesser extent fisheries and sediment data. The designation of the *Aquatic Life Use* as impaired (non or partial support) results from a combination of stressors including both point and nonpoint sources of pollution. The overall *Aquatic Life Use* status of the 32.8 river miles in the Ten Mile River Basin (mainstem and tributaries) discussed in this report is as follows:

Aquatic Life Use Summary

- 3.0 miles Full Support
- 6.1 miles Partial Support
- 18.8 miles Non Support
- 4.9 miles Not Assessed

None of the 14.5 river miles of the mainstem Ten Mile River supports the *Aquatic Life Use*. The river partially supports the *Aquatic Life Use* upstream of West Bacon Street in Plainville and downstream of Dodgeville Pond in Attleboro. The *Aquatic Life Use* is not supported in the mainstem between these locations. Causes and sources of impairment upstream of West Bacon Street are unknown. Siltation and other forms of habitat alteration, as well as sediment contamination (particularly metals) impair the *Aquatic Life Use* between West Bacon Street and the North Attleborough WWTP discharge. Downstream from the discharge, instream impacts to the benthic macroinvertebrate community attributable to the discharge were also documented. Organic enrichment/low DO was evident in the mainstem Ten Mile River between the North Attleborough WWTP and Dodgeville Pond. Downstream of Dodgeville Pond, instream dissolved oxygen and saturation levels were higher but dropped again as the river flowed into Seekonk. Slight impairment of the benthic community was documented below the Attleboro WPCF discharge as the Ten Mile River entered Pawtucket, Rhode Island. Downstream from Dodgeville Pond, the mainstem Ten Mile River was assessed as partially supporting the *Aquatic Life Use*. Other causes of impairment to the biota in the Ten Mile River include unknown toxicity and sediment toxicity (Wetherells and Dodgeville Ponds) from municipal discharges (North Attleborough WWTP and Attleboro WPCF) and contaminated sediments. Other unknown causes and sources of impairment may also exist.

Tributaries represent 18.3 of the 32.8 river miles in the Ten Mile River Basin. Of these the *Aquatic Life Use* was impaired along 10.4 tributary miles. Additional data would be required to assess the *Aquatic Life Use* in both the Bungay River and Fourmile Brook.

The major cause of impairment to the *Aquatic Life Use* in the tributaries of the Ten Mile River was attributed to low flow conditions. Three stream segments - the upper Sevenmile River (Class A) segment,

Scotts Brook, and Coles Brook - totaling 9.5 river miles, were adversely impacted presumably from either water withdrawals or regulation of impoundments (hydromodification). Other unknown causes and sources of impairment may also exist.

Habitat degradation was observed in the form of sediment deposition and substrate embeddedness directly attributed to road runoff, construction activities, riparian zone disturbance, and other forms of NPS pollution in Speedway Brook impairs the *Aquatic Life Use*. Although the *Aquatic Life Use* was not assessed in the Fourmile Brook, habitat degradation in the form of riparian zone disturbances was observed.

FISH CONSUMPTION USE

The *Fish Consumption Use* is met when pollutants do not result in unacceptable concentrations in edible portions of marketable fish or shellfish or for the use of recreationally caught fish, shellfish, other aquatic life or wildlife for human consumption. This use is assessed using the Department of Public Health's Fish Consumption Advisory List.

In June 1986, the Massachusetts Department of Public Health (MDPH) issued a Fish Consumption Advisory for the Ten Mile and Sevenmile Rivers due to elevated concentrations of lead in edible fillets. Based on subsequent sampling data generated in 1987 and 1990, the MDPH rescinded their 1986 advisory in July 1994. However, it should be noted that because of risks associated with elevated levels of mercury in certain species of freshwater fish, the MDPH has issued a statewide Interim Freshwater Fish Advisory as of September 1994. The interim advisory recommends that "Pregnant women should be advised of the possible health risk from eating fish taken from Massachusetts freshwater bodies in order to prevent exposure of developing fetuses to mercury." The advisory does not include stocked trout or farm-raised fish sold commercially. The *Fish Consumption Use* for the entire Ten Mile River Basin (32.8 river miles) included in this report is summarized as follows:

Fish Consumption Use Summary

32.8 river miles Not Assessed. (There are no site specific MDPH fish consumption advisories in place in the Ten Mile River Basin.)

RECREATIONAL USES

The *Primary Contact Recreational Use* is defined as any recreation or other water activity during which there is prolonged and intimate contact with the water with a significant risk of ingestion. These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The *Secondary Contact Recreational Use* is defined as any recreation or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. The overall support status (data summaries in Figure 1) for the entire Ten Mile River Basin (32.8 river miles) included in this report are summarized as follows:

Primary Contact Recreational Use Summary

- 0.0 miles Full Support
- 4.3 miles Partial Support
- 3.9 miles Non Support
- 24.6 miles Not Assessed

Secondary Contact Recreational Use Summary

- 0.0 miles Full Support
- 4.3 miles Partial Support
- 0.9 miles Non Support
- 27.6 miles Not Assessed

Too little current data exists to assess any stream in the Ten Mile River Basin as full support for either the *Primary* or *Secondary Contact Recreational Use*. Elevated fecal coliform densities were initially documented in Coles Brook during the DEP DWM Ten Mile River Basin survey. Follow-up investigations, funded through the Massachusetts Watershed Initiative (MWI) Grant Program in a project entitled *An Assessment of Non-point Source Pollution in the Coles Brook Subwatershed of the Ten Mile River Basin* (Fennessey 1999), confirmed the presence of elevated fecal coliform bacteria in Coles Brook under wet weather conditions. As a result, the *Primary and Secondary Contact Recreational Uses* are assessed as

partial support in Coles Brook. Additional monitoring will be required to isolate sources of bacteria. Two other tributaries of the Ten Mile River, the upper segment of the Sevenmile River (Class A waterbody) and Speedway Brook, both had elevated fecal coliform densities that impaired both recreational uses. Both the *Primary and Secondary Contact Recreational Uses* were not supported in Speedway Brook, while only the Primary Contact Recreational Use was not supported in the upper Sevenmile River (Class A) segment. The source(s) of fecal coliform bacteria inputs to these streams are unknown at this time.

AESTHETICS USE

The *Aesthetics Use* is met when surface waters are free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The overall *Aesthetics Use* status (data summary, Figure 1) of the 32.8 river miles in the Ten Mile River Basin discussed in this report follows:

Aesthetics Use Summary

- 8.5 miles Full Support
- 12.9 miles Partial Support
- 1.2 miles Non Support
- 10.2 miles Not Assessed

The *Aesthetics Use* is partially supported in the mainstem Ten Mile River downstream from West Bacon Street in Plainville (12.9 river miles). This use is impaired primarily from turbidity and noxious aquatic plants, particularly in the impounded (lakes) reaches of the river. Sediment deposition and anthropogenic "trash" deposits also degrade the aesthetic quality in isolated areas. Two tributaries, Speedway Brook and the lower 0.3 miles of the Bungay River, do not support the *Aesthetics Use*. The cause of the impairment is siltation and turbidity in Speedway Brook, and turbidity from a waterfowl staging area (duck feeding pond) in the Bungay River near its confluence with the Ten Mile River.

TEN MILE RIVER BASIN - LAKES

Overall use support status and trophic status of the lakes surveyed in the Ten Mile River Basin are presented in Tables 1 and 2, respectively. It should be noted that lakes or portions of lakes were listed as undetermined when obvious impairments were not readily observable. With this approach, the assessment of lakes in the Ten Mile River Basin is limited to a "best case" picture (i.e., only the most obvious impairments are reported). Potentially more of the lake acreage would be listed as impaired or in a more enriched trophic status if more variables were measured and more criteria assessed. Surveys also focused on the presence or absence of non-native macrophytes. Three non-native aquatic species and two non-native wetland species were observed.

Table 1. Ten Mile River Basin lakes use support summary (in acres).

| USE/DEGREE SUPPORTED | SUPPORT | PARTIAL SUPPORT | NON SUPPORT | NOT ASSESSED | NOT ATTAINABLE |
|----------------------|---------|-----------------|-------------|--------------|----------------|
| AQUATIC LIFE | 0 | 128 | 0 | 881 | 40 |
| FISH CONSUMPTION* | 0 | 0 | 0 | 1009 | 40 |
| SWIMMABLE | 0 | 121 | 112 | 776 | 40 |
| SECONDARY CONTACT | 776 | 121 | 112 | 0 | 40 |
| AESTHETICS | 776 | 121 | 112 | 0 | 40 |

*Fish Consumption results do not include the statewide consumption advisory.

N.B. - These results represent the most recent assessments of lakes/ponds in the Ten Mile River Basin. These data also represent about 52% (22 of 42) of the lakes/ponds in the Ten Mile River Basin and about 80% (1,049 of 1,315) of the acreage.

Table 2. Ten Mile River Basin lakes trophic status summary.

| TROPHIC STATUS | NUMBER OF LAKES | ACRES |
|------------------------------|-----------------|-------|
| Oligotrophic | 0 | 0 |
| Mesotrophic | 3 | 234 |
| Eutrophic | 6 | 115 |
| Hypereutrophic | 8 | 364 |
| Dystrophic | 0 | 0 |
| Undetermined/ Not Attainable | 5 | 336 |
| Total | 22 | 1049 |

N.B. - These results represent the most recent assessments of lakes/ponds in the Ten Mile River Basin. These data also represent about 52% (22 of 42) of the lakes/ponds in the Ten Mile River Basin and about 80% (1,049 of 1,315) of the acreage.

Despite the "best case" scenario that is favored by the Ten Mile River Basin lake assessment approach, 64 % (representing 46 % of the surveyed area) of the lakes showed symptoms of advanced succession (eutrophic or hypereutrophic). Presumably additional testing of dissolved oxygen, chlorophyll, and/or nutrients would corroborate these trophic status conditions.

Three non-native aquatic plant species, fanwort, variable water milfoil, and Eurasian water milfoil were found infrequently in the lakes of the Ten Mile River Basin. They are, however, particularly invasive species that spread vegetatively via cuttings that may float downstream or be transported mechanically between lakes.

The most frequently occurring non-native wetland species was purple loosestrife. Populations of this plant are pervasive throughout the watershed. Its presence was recorded at 82% of the lakes. The other non-native wetland plant observed in the Ten Mile River Basin is the common reed grass. The two non-native wetland species were co-located at five lakes (south basin of Falls Pond in North Attleborough, Fuller Pond in Plainville, Ten Mile Reservation Pond in Attleboro/Pawtucket, RI, Wetherells Pond in Plainville, and Whitings Pond in North Attleborough).

TEN MILE RIVER BASIN
1997 DEP-DWM WATER QUALITY ASSESSMENT REPORT

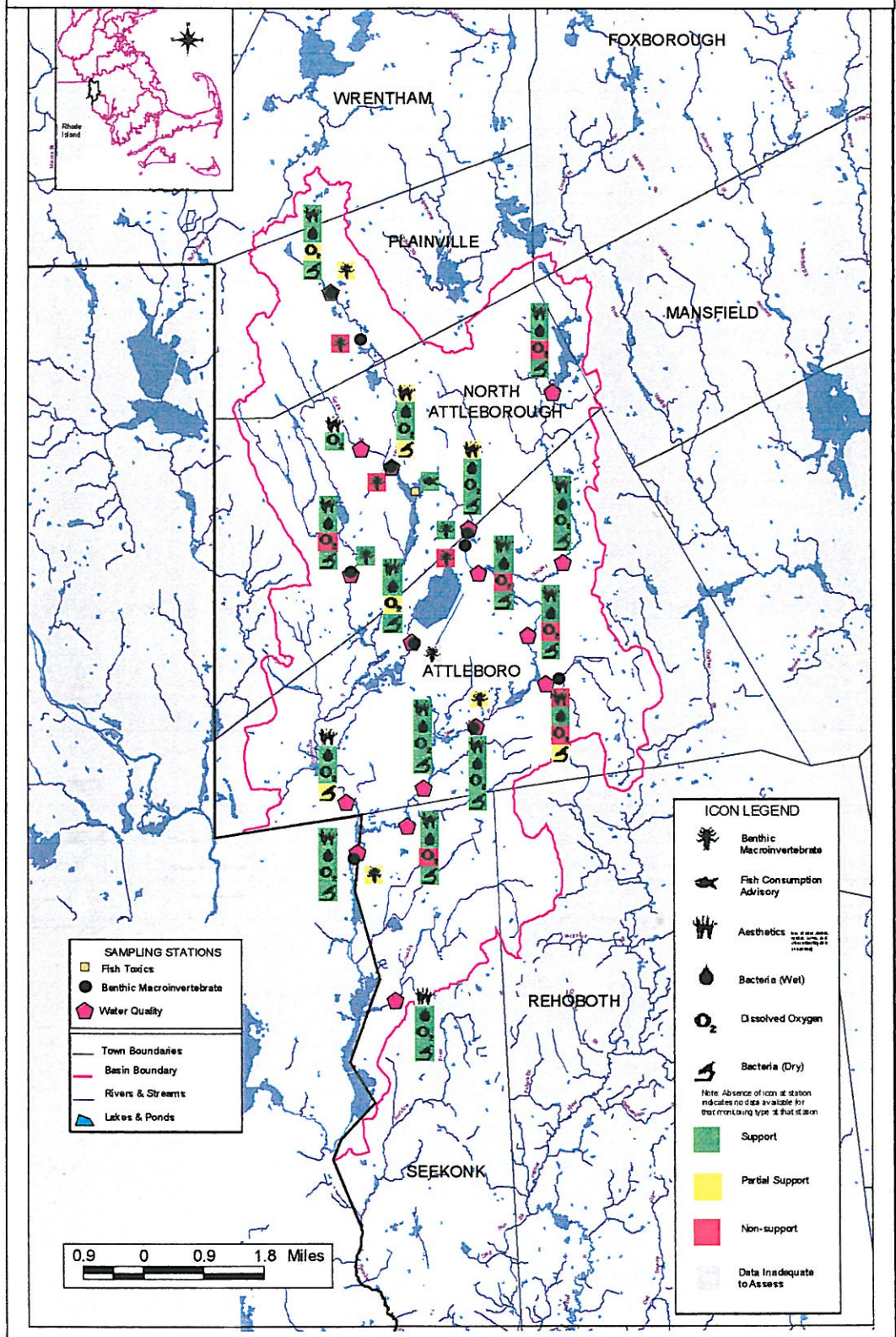


Figure 1. 1997 DEP DWM water quality, macroinvertebrate, and fish toxics monitoring station data summary in the Ten Mile River Basin.

INTRODUCTION

The Massachusetts Watershed Initiative is a collaborative effort between state and federal environmental agencies, citizens, non-profit groups, businesses and industries in the watershed. The mission is to improve water quality conditions and to provide a framework under which the restoration and/or protection of the basin's natural resources can be achieved. Implementation of this project is underway in a process known as the "Watershed Approach". The five-year cycle of the Watershed Approach, as illustrated in Figure 2, provides the management structure to carry out the mission. This report presents the assessment of current water quality conditions in the Ten Mile River Basin. The assessment is based on information that has been researched and developed through the first three years (information gathering, monitoring, and assessment) of the five-year cycle by the Department of Environmental Protection (DEP) as part of its federal mandate under the Federal Water Pollution Control Act (commonly known as the Clean Water Act).

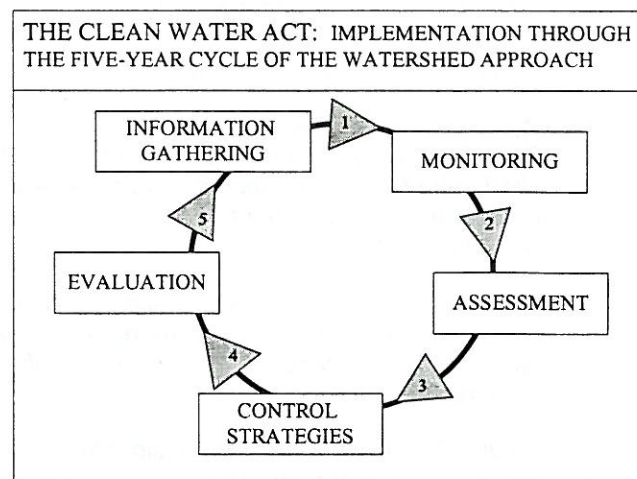


Figure 2 Clean Water Act Implementation Cycle

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this goal, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act, DEP must submit a statewide report every two years to the EPA, which describes the status of water quality in the Commonwealth. The 305(b) statewide report is based on the compilation of the Commonwealth's 27 watershed assessment reports. The 305(b) report compiles data from a variety of sources, and provides an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain. Reporting on the status of the water quality conditions follows a standardized process described in the assessment methodology. This process involves the analyzing of biological, habitat, physical/chemical, and/or toxicity data and other information to assess the degree of use support, and identify causes and sources of impairment. The Ten Mile River Basin 1997 Water Quality Assessment Report is an integral component of this 305(b) reporting process.

ASSESSMENT METHODOLOGY

WATER QUALITY CLASSIFICATION

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MADEP 1996). These regulations undergo public review every three years. These surface waters are segmented and each segment is assigned to one of the six classes described below:

Inland Water Classes

1. *Class A – These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORW's) under 314 CMR 4.04(3).*
2. *Class B – These waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural*

uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

3. *Class C – These waters are designated as a habitat for fish, other aquatic life and wildlife, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.*

Coastal and Marine Classes

4. *Class SA – These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for primary and secondary recreation. In approved areas they shall be suitable for shellfish harvesting without depuration (Open Shellfishing Areas). These waters shall have excellent aesthetic value.*
5. *Class SB – These waters are designated as a habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting with depuration (Restricted Shellfishing Areas). These waters shall have consistently good aesthetic value.*
6. *Class SC – These waters are designated as a habitat for fish, other aquatic life, and wildlife and for secondary contact recreation. They shall also be suitable for certain industrial cooling and process uses. These waters shall have good aesthetic value.*

The CWA Section 305(b) water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. In so doing, the States report on waterbodies within the context of meeting their designated uses (described above in each class). Each class is identified by the most sensitive, and therefore governing, water uses to be achieved and protected. These uses include: Aquatic Life, Fish Consumption, Drinking Water, Primary and Secondary Contact Recreation, Shellfishing and Aesthetics. Three subclasses of Aquatic Life are also designated in the standards: Cold Water Fishery (capable of sustaining a year-round population of cold water aquatic life such as trout), Warm Water Fishery (waters which are not capable of sustaining a year-round population of cold water aquatic life), and Marine Fishery (suitable for sustaining marine flora and fauna).

A summary of the state water quality standards (Table 3) prescribes minimum water quality criteria to sustain the designated uses. Furthermore these standards describe the hydrological conditions at which water quality criteria must be met (MA DEP 1996). In rivers and streams, the lowest flow conditions at and above which criteria must be met is the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In artificially regulated waters, the lowest flow conditions at which criteria must be met is the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow which has been agreed upon. In coastal and marine waters and for lakes and ponds the most severe hydrological condition is determined by DEP on a case by case basis.

The availability of appropriate and reliable scientific data and technical information is fundamental to the 305(b) reporting process. It is EPA policy (EPA Order 5360.1 CHG 1) that any organization performing work for or on behalf of EPA establish a Quality System to support the development, review, approval, implementation, and assessment of data collection operations. To this end, DEP describes its Quality System in an EPA-approved Quality Management Plan (QMP) to ensure that environmental data collected or compiled by the Agency are of known and documented quality and are suitable for their intended use. For external sources of information, DEP requires all of the following: 1) an appropriate *Quality Assurance Project Plan* including a QA/QC plan, 2) use of a state certified lab (certified in the applicable analysis), 3) data management QA/QC be described, and 4) the information be documented in a citable report.

Table 3. Summary of Massachusetts Surface Water Quality Standards (MADEP 1996). Note: *Italics* are direct quotations.

| | |
|-------------------------|---|
| Dissolved Oxygen | <p><u>Class A, BCWF*, SA</u>: ≥ 6.0 mg/L and $\geq 75\%$ saturation unless background conditions are lower</p> <p><u>Class BWWF**, SB</u>: ≥ 5.0 mg/L and $\geq 60\%$ saturation unless background conditions are lower</p> <p><u>Class C</u>: Not ≤ 5.0 mg/L for more than 16 of any 24-hour period and not ≤ 3.0 mg/L anytime unless background conditions are lower; levels cannot be lowered below 50% saturation due to a discharge</p> <p><u>Class SC</u>: Not ≤ 5.0 mg/L for more than 16 of any 24-hour period and not ≤ 4.0 mg/L anytime unless background conditions are lower; and 50% saturation; levels cannot be lowered below 50% saturation due to a discharge</p> |
| Temperature | <p><u>Class A</u>: $\leq 68^\circ\text{F}$ (20°C) and $\Delta 1.5^\circ\text{F}$ (0.8°C) for Cold Water and $\leq 83^\circ\text{F}$ (28.3°C) and $\Delta 1.5^\circ\text{F}$ (0.8°C) for Warm Water</p> <p><u>Class BCWF</u>: $\leq 68^\circ\text{F}$ (20°C) and $\Delta 3^\circ\text{F}$ (1.7°C) due to a discharge</p> <p><u>Class BWWF</u>: $\leq 83^\circ\text{F}$ (28.3°C) and $\Delta 3^\circ\text{F}$ (1.7°C) in lakes, $\Delta 5^\circ\text{F}$ (2.8°C) in rivers</p> <p><u>Class C, SC</u>: $\leq 85^\circ\text{F}$ (29.4°C) nor $\Delta 5^\circ\text{F}$ (2.8°C) due to a discharge</p> <p><u>Class SA</u>: $\leq 85^\circ\text{F}$ (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and $\Delta 1.5^\circ\text{F}$ (0.8°C)</p> <p><u>Class SB</u>: $\leq 85^\circ\text{F}$ (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and $\Delta 1.5^\circ\text{F}$ (0.8°C) between July through September and $\Delta 4.0^\circ\text{F}$ (2.2°C) between October through June</p> |
| pH | <p><u>Class A, BCWF, BWWF</u>: 6.5 – 8.3 and $\Delta 0.5$ outside the background range.</p> <p><u>Class C</u>: 6.5 – 9.0 and $\Delta 1.0$ outside the naturally occurring range.</p> <p><u>Class SA, SB</u>: 6.5 – 8.5 and $\Delta 0.2$ outside the normally occurring range.</p> <p><u>Class SC</u>: 6.5 – 9.0 and $\Delta 0.5$ outside the naturally occurring range.</p> |
| Fecal Coliform Bacteria | <p><u>Class A</u>: an arithmetic mean of < 20 organisms /100 ml in any representative set of samples and $< 10\%$ of the samples > 100 organisms/100 ml.</p> <p><u>Class B</u>: a geometric mean of < 200 organisms /100 ml in any representative set of samples and $< 10\%$ of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.)</p> <p><u>Class C</u>: a geometric mean of < 1000 organisms /100ml, and $< 10\%$ of the samples > 2000 organisms/100 ml.</p> <p><u>Class SA</u>: approved Open Shellfish Areas: a geometric mean (MPN method) of < 14 organisms/100 ml and $< 10\%$ of the samples > 43 organisms/100 ml (MPN method).</p> <p>Waters not designated for shellfishing: $< a$ geometric mean of 200 organisms in any representative set of samples, and $< 10\%$ of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.)</p> <p><u>Class SB</u>: approved Restricted Shellfish Areas: $< a$ fecal coliform median or geometric mean (MPN method) of 88 organisms/100 ml and $< 10\%$ of the samples > 260 organisms /100 ml (MPN method).</p> <p>Waters not designated for shellfishing: $< a$ geometric mean of 200 organisms in any representative set of samples, and $< 10\%$ of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.)</p> <p><u>Class SC</u>: $< a$ geometric mean of 1000 organisms/100 ml and $< 10\%$ of the samples > 2000 organisms/100ml.</p> |
| Solids | <p><u>All Classes</u>: These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.</p> |
| Color and Turbidity | <p><u>All Classes</u>: These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.</p> |
| Oil & Grease | <p><u>Class A, SA</u>: Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.</p> <p><u>Class SA</u>: Waters shall be free from oil and grease and petrochemicals.</p> <p><u>Class B, C, SB, SC</u>: Waters shall be free from oil and grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.</p> |
| Taste and Odor | <p><u>Class A, SA</u>: None other than of natural origin.</p> <p><u>Class B, C, SB, SC</u>: None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.</p> |
| Aesthetics | <p><u>All Classes</u>: All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.</p> |
| Toxic Pollutants ~ | <p><u>All Classes</u>: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife... The division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established.</p> |
| Nutrients | <p>Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.</p> |

*Class BCWF = Class B Cold Water Fishery, ** Class BWWF = Class B Warm Water Fishery, Δ criterion (referring to a change from ambient) is applied to the effects of a permitted discharge. ~ USEPA. 19 November 1999. Federal Register Document. [Online]. United States Environmental Protection Agency. <http://www.epa.gov/fedrgstr/EPA-WATER/1998/December/Day-10/w30272.htm>.

EPA provides guidelines to the States for making their use support determinations (EPA 1997). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Each designated use within a given segment is individually assessed as 1) **support**, 2) **partial support**, or 3) **non support**. The term *threatened* is used when the use is fully supported but may not support the use within two years because of adverse pollution trends or anticipated sources of pollution. When too little current data/information exists or no reliable data are available the use is **not assessed**. Although data/information older than five years are usually considered "historical" and used for descriptive purposes, they can be utilized in the use support determination providing they are known to reflect the current conditions. While the water quality standards (Table 3) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance in the literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993 by D. Persaud, R. Jaagumagi and A. Hayton).

Designated Uses

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected. Each of these uses is briefly described below (MA DEP 1996):

- **AQUATIC LIFE** - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna. Three subclasses of aquatic life are also designated in the standards for freshwater bodies; *Cold Water Fishery* - capable of sustaining a year-round population of cold water aquatic life such as trout, *Warm Water Fishery* - waters which are not capable of sustaining a year-round population of cold water aquatic life, and *Marine Fishery* - suitable for sustaining marine flora and fauna.
- **FISH CONSUMPTION** - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or shellfish or for the recreational use of fish, shellfish, other aquatic life or wildlife for human consumption.
- **DRINKING WATER** - used to denote those waters used as a source of public drinking water. They may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).
- **PRIMARY CONTACT RECREATION** - suitable for any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.
- **SECONDARY CONTACT RECREATION** - suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities.
- **AESTHETICS** - all surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.
- **AGRICULTURAL AND INDUSTRIAL** - suitable for irrigation or other agricultural process water and for compatible industrial cooling and process water.
- **SHELLFISH HARVESTING** (in SA and SB segments) – Class SA waters in approved areas (Open Shellfish Areas) shellfish harvested without depuration shall be suitable for consumption; Class SB waters in approved areas (Restricted Shellfish Areas) shellfish harvested with depuration shall be suitable for consumption.

The guidance used to assess each designated use follows.