2001

Taunton River Watershed 2001 Water Quality Assessment Report

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TAUNTON RIVER WATERSHED
2001 WATER QUALITY ASSESSMENT REPORT

COMMONWEALTH OF MASSACHUSETTS
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TAUNTON RIVER WATERSHED

WATER QUALITY ASSESSMENT REPORT

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Division of Watershed Management
Worcester, Massachusetts

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Coordination of local, state and federal agencies and private organizations is fundamental to the success of the Massachusetts watershed management approach.

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State

- Massachusetts Department of Environmental Protection (MA DEP)
  - Bureau of Strategic Policy and Technology, Wall Experiment Station (WES)
  - Bureau of Resource Protection (BRP)
  - Bureau of Waste Prevention (BWP)
  - Bureau of Waste Site Cleanup (BWSC)
- Massachusetts Department of Public Health (MA DPH)
- Massachusetts Department of Fish and Game (MA DFG)
  (Formerly the Department of Fisheries, Wildlife, and Environmental Law Enforcement - DFWELE)
  - Division of Fisheries and Wildlife (MDFW)
  - Division of Marine Fisheries (DMF)
- Massachusetts Department of Conservation and Recreation (MA DCR)
  (Formerly the Department of Environmental Management - MA DEM)

Federal

- United States Environmental Protection Agency (EPA)
- United States Geological Survey (USGS)
  - Water Resources Division

Regional

- Taunton River Watershed Alliance (TRWA)
- Stream teams (Forge River in Raynham, Matfield River in West Bridgewater, Nemasket River in Middleborough, Winnetuxet River in Halifax and Town River in Bridgewater, and one on the mainstem Taunton River)

Cover photo: Taunton River in Northern Fall River, MA.
Photo credit: Courtesy of A. Sergeev.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
ADB	Assessment Database
BPJ	Best professional judgment
BMP	Best management practices
BRP	Bureau of Resource Protection
CMR	Code of Massachusetts Regulations
CSO	Combined sewer overflow
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
DWM	Division of Watershed Management
EPA	United States Environmental Protection Agency
HPC	Hatheway and Patterson Company
LC_{50}	Lethal concentration to 50% of the test organisms
L-EL	Low effect level
MA DCR	Massachusetts Department of Conservation and Recreation (formerly the Department of Environmental Management)
MA DEP	Massachusetts Department of Environmental Protection
MA DFG	Department of Fish and Game (formerly the Department of Fisheries, Wildlife and Environmental Law Enforcement)
MassGIS	Massachusetts Geographic Information System
MDFW	Massachusetts Division of Fisheries and Wildlife
MA DPH	Massachusetts Department of Public Health
MDL	Method Detection Limit
NAS/NAE	National Academy of Sciences/National Academy of Engineers
NAWQA	National Water-Quality Assessment
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	Nonpoint source pollution
ORS	Office of Research and Standards
PALIS	Pond and Lake Information System
PCB	Polychlorinated biphenyls
POTW	Publicly Owned Treatment Works
PWS	public water supply
QAPP	Quality Assurance Project Plan
RBP	Rapid bioassessment protocol
S-EL	Severe effect level
SWQS	Surface Water Quality Standards
TMDL	Total maximum daily load
TOXTD	MA DEP DWM Toxicity Testing Database
TRWA	Taunton River Watershed Alliance
USGS	United States Geological Survey
WAL	Water Access Laboratory (Bridgewater State College)
WBID	Waterbody Identification Code
WBS	Waterbody System Database
WMA	Water Management Act
WPAF	Water Pollution Abatement Facility
WPCF	Water Pollution Control Facility
WWTF	Wastewater treatment facility
WWTP	Wastewater treatment plant

LIST OF UNITS

CFS	cubic feet per second
CFU	colony forming unit
GPD	gallons per minute
mg/kg	milligram per kilogram
MGD	million gallons per day
mg/L	milligram per liter
MPN	most probable number
MW	megawatt
ng	nanogram
NTU	nephelometric turbidity units
ppb	parts per billion
ppm	parts per million
SU	standard units
TEQ/kg	toxic equivalents per kilogram
µg/kg	microgram per kilogram
µg/l	microgram per liter
µS/cm	microsiemens per centimeter

TABLE OF FISH SCIENTIFIC NAMES

Common name	*Scientific name*	Common name	*Scientific name*
American eel	*Anguilla rostrata*	Golden shiner	*Notemigonus crysoleucas*
Banded sunfish	*Enneacanthus obesus*	Largemouth bass	*Micropterus salmoides*
Black crappie	*Pomoxis nigromaculatus*	Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*	Redfin pickerel	Esox americanus americanus
Brook trout	*Salvelinus fontinalis*	Swamp Darter	*Etheostoma fusiforme*
Brown bullhead	*Ameiurus nebulosus*	Tessellated Darter	Etheostoma olmstedi
Chain pickerel	*Esox niger*	White perch	*Morone americana*
Creek chubsucker	*Erimyzon oblongus*	White sucker	*Catostomus commersoni*
Fallfish	*Semotilus corporalis*	Yellow perch	*Perca flavescens*

EXECUTIVE SUMMARY
TAUNTON RIVER WATERSHED 2001
WATER QUALITY ASSESSMENT REPORT

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which surface waters in the Commonwealth shall be protected. This assessment report presents a summary of current water quality data and information used to assess the status of the designated uses as defined in the SWQS for the Taunton River Watershed. The designated uses, where applicable, include: *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary* and *Secondary Contact Recreation* and *Aesthetics*. The assessment of current water quality conditions provides a determination of whether or not each designated use of a particular water body is ***supported*** or ***impaired***. When too little current data/information exists or no quality-assured data are available, the use is ***not assessed***. However, if there is some indication of water quality impairment which is not considered to be naturally occurring, the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed rivers and lakes are currently ***unassessed***. The status of the designated uses of these waters has never been reported to the United States Environmental Protection Agency (EPA) in the Commonwealth's Summary of Water Quality Report (305(b) Report) nor is information on these waters maintained by the Massachusetts Department of Environmental Protection in the Water Body System (WBS) or Assessment Database (ADB). This report provides basic information that can be used to focus resource protection and remediation activities later in the watershed management planning process.

There are a total of 35 named and one unnamed freshwater rivers, streams, or brooks (the term "rivers" will hereafter be used to include all) represented by 51 river segments (including estuary segments) that are presented in this report. These include the Taunton River, Winnetuxet River, Sawmill Brook, Cotley River, Forge River, Cobb Brook, Segreganset River, Muddy Cove Brook, Lovett Brook, Salisbury Brook, Trout Brook, Salisbury Plain River, Beaver brooks, Meadow Brook, Shumatuscacant River, Poor Meadow Brook, Satucket River, Matfield River, Queset Brook, Cowesset Brook, Hockomock River, Town River, Mulberry Meadow Brook, Canoe River, Snake River, Mill River, Robinson Brook, Rumford River, Wading River, Threemile River, Nemasket River, Cedar Swamp River, Assonet River and Rattlesnake Brook. They account for approximately 63% (222.4 miles of an estimated 350.6 named river miles). The one unnamed tributary is 4.0 river miles. The remaining rivers are small and are currently *unassessed*. This report also includes information on 4.86 square miles of coastal and marine waters and on 98 of the 208 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) that have been assigned a Pond and Lake Identification System (PALIS) number in the Taunton River Watershed. The 98 lakes included in this report represent 88% of the total lake acreage (11,059 of 12,517 acres) in the Taunton River Watershed.

AQUATIC LIFE USE

The *Aquatic Life Use* is supported when suitable habitat (including water quality) is available for sustaining a native, naturally diverse, community of aquatic flora and fauna. Impairment of the *Aquatic Life Use* may result from anthropogenic stressors that include point and/or nonpoint source(s) of pollution and hydrologic modification. The status of the *Aquatic Life Use* in the Taunton River Watershed is as follows.

Aquatic Life Use Assessment

Rivers
(total length included in report – 226.4 miles)
Support – 86.1 miles
Impaired – 32.3 miles
Not Assessed – 108 miles

Coastal and Marine Waters
(total area included in report – 4.86 square miles)
Support – 0.29 miles
Impaired – 2.65 miles
Not Assessed – 1.92 miles

Lakes
(total area included in report – 11,059 acres)
Impaired – 5,247 acres
Not Assessed – 5,812 acres

Aquatic Life Use Summary – Rivers and Coastal and Marine Waters (Figure 1)

As illustrated in Figure 1, fifty-two (52)% of the freshwater river segments and sixty (60%) of the coastal and marine waters included in this report are assessed as either support or impaired for the *Aquatic Life Use.* A 20.4 mile portion of the Taunton River is assessed as supporting the *Aquatic Life Use* and all or portions of eleven freshwater segments in the watershed, totaling 65.7 river miles, are also assessed as supporting the *Aquatic Life Use.* These waterbodies include: a 3.6 mile portion of Shumatuscacant River (MA62-33), Satucket River (MA62-10), Canoe River (MA62-27), a 3

mile portion of Rumford River (MA62-39), Wading River (MA62-49), Threemile River (MA62-56), Nemasket River (MA62-25), a 1.2 mile portion of an unnamed tributary (MA62-42), Cedar Swamp River (MA62-44), Assonet River (MA62-19), and Rattlesnake Brook (MA62-45). The *Aquatic Life Use* is impaired for the following freshwater waterbodies: Segreganset River (MA62-53 and MA62-54), a 0.4 mile portion of Salisbury Brook (MA62-08), Salisbury Plain River (MA62-06), a 4.9 mile portion of Shumatuscacant River (MA62-33), Matfield River (MA62-32), Robinson Brook (MA62-14), a 5.0 mile portion of Rumford River (MA62-39), and a 2.80 mile portion of an unnamed tributary (MA62-42). One of the primary known causes of impairment is impacts to the benthic macroinvertebrate communities. Other habitat quality degradation and low dissolved oxygen were also documented causes. Known sources of impairment include municipal point source discharges and streambank modification/destabilization. Additional suspected sources include: municipal separate storm sewers, highway/road/bridge runoff in urbanized areas, loss of riparian habitat, cranberry bog operations, and impacts from hydrostructure flow regulation/modification.

Two estuary segments are impaired for the *Aquatic Life Use*: a 2.65 square mile segment of the Taunton River (MA62-04) and a 0.002 square mile unnamed tributary (MA62-48). Causes of impairment include industrial thermal discharges, anthropogenic substrate and flow regime alterations, and habitat, biota alterations. Where known, sources of impairment include channel erosion/incision from upstream hydromodification, impacts from hydrostructure flow regulation/modification, and industrial thermal discharges. Additional suspected sources include: cooling water intake operations, municipal storm sewer systems, combined sewer overflow (CSOs), municipal point source discharges, highway and bridge runoff, and chlorine.

The remaining 108.0 river miles (48%) and 1.92 square miles of coastal and marine waters (40%) are currently not assessed for the *Aquatic Life Use*.

Aquatic Life Use Summary – Lakes (Figure 1)

Few lakes in the Taunton River Watershed have been surveyed recently for variables used to assess the status of the *Aquatic Life Use* (i.e., dissolved oxygen (DO), pH, nutrients, macrophytes and plankton/chlorophyll *a*). Without these data none of the lakes in the Taunton River Watershed are assessed as supporting the *Aquatic Life Use*. The *Aquatic Life Use* is assessed as impaired for forty-three lakes (5,247 lake acres) based on the presence of non-native macrophytes (Figure 1). Monponsett Pond west basin (MA62119) and Watson Pond (MA62205) are also impaired because of elevated phosphorus levels and Sabbatia Lake (MA62166) is also impaired because of low dissolved oxygen/saturation. The remaining 55 lakes (5,812 lake acres) in the Taunton River Watershed are not assessed for the *Aquatic Life Use*.

FISH CONSUMPTION USE

The *Fish Consumption Use* is supported when there are no pollutants present that result in concentrations unacceptable for human consumption in edible portions (as opposed to whole fish - see *Aquatic Life Use*) of fish, other aquatic life or wildlife. The assessment of the *Fish Consumption Use* is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MA DPH), Bureau of Environmental Health Assessment (MA DPH 2004). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species poses a health risk for human consumption; hence the *Fish Consumption Use* is assessed as impaired in these waters. In July 2001 MA DPH issued new consumer advisories on fish consumption and mercury contamination (MA DPH 2001). Because of the statewide advisory no waters can be assessed as support for the *Fish Consumption Use.* These waters default to "not assessed". The statewide advisory reads as follows:

> The MA DPH "is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish: shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MA DPH 2001)." Additionally, MA DPH "is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which

may have higher levels of mercury (MA DPH 2001)." MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

The status of the *Fish Consumption Use* in the Taunton River Watershed is as follows.

Fish Consumption Use Summary - Rivers and Coastal and Marine Waters (Figure 2)

MA DPH issued a site-specific fish consumption advisory for the lower 5.0 mile reach of the Rumford River (MA62-39) due to elevated dioxin and pesticides levels in fish tissue as a result of contamination from the Hatheway & Patterson Company Superfund site. However, the upper 3.0 mile reach of this segment of the Rumford River is not assessed for the *Fish Consumption Use*. There are currently no other site-specific MA DPH-issued fish consumption advisories for any other rivers or coastal and marine segments in the Taunton River Watershed. The remaining rivers and all of the coastal and marine waters in the watershed default to not assessed for the *Fish Consumption Use* because of the statewide advisory.

Fish Consumption Use Summary – Lakes (Figure 2)

Six lakes, representing a total of 983 acres, are assessed as impaired for the *Fish Consumption Use* because of either mercury contamination or dioxin/pesticide contamination. The waterbodies impaired due to dioxin/pesticide contamination include Cabot Pond (MA62029), Fulton Pond (MA62075), Hodges Pond (MA62091), and Norton Reservoir (MA62134). The dioxin/pesticide contamination is associated with the Hatheway & Patterson Company Superfund site. The waterbodies impaired due to mercury contamination are Monponsett Pond – east basin (MA62218), and Somerset Reservoir (MA62174). The source of mercury is unknown although atmospheric deposition is suspected. The remaining 92 lakes representing 10,076 acres are not assessed for the *Fish Consumption Use.*

***Fish Consumption Use* Assessment**

Rivers
(total length included in report – 226.4 miles)
Impaired – 5 miles
Not Assessed – 221.4 miles

Coastal and Marine Waters
(total area included in report – 4.86 square miles)
Not Assessed – 4.86 square miles

Lakes
(total area included in report – 11,059 acres)
Impaired – 983 acres
Not Assessed – 10,076 acres

DRINKING WATER USE

The term *Drinking Water Use* has been used to indicate sources of public drinking water. While this use is not assessed in this report, the state provides general guidance on drinking water source protection of both surface water and groundwater sources (available at http://www.mass.gov/dep/brp/dws/dwshome.htm). These waters are subject to stringent regulation in accordance with the Massachusetts Drinking Water Regulations. Massachusetts Department of Environmental Protection's (MA DEP) Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act. DWP has also initiated work on its Source Water Assessment Program (SWAP), which requires that the Commonwealth delineate protection areas for all public ground and surface water sources, inventory land uses that may present potential threats to drinking water quality in these areas, determine the susceptibility of water supplies to contamination from these sources, and publicize the results.

Public water suppliers monitor their finished water (tap water) for major categories of both naturally-occurring and man-made contaminants such as: microbiological, inorganic, organic, pesticides, herbicides and radioactive contaminants. Specific information on community drinking water sources including SWAP activities and drinking water quality information are updated and distributed annually by the public water system to its customers in a "Consumer Confidence Report". These reports are available from the public water system.

SHELLFISH HARVESTING USE

The *Shellfish Harvesting Use* is assessed as support when shellfish harvested from Approved (Class SA or SB) or Conditionally Approved (Class SB) Shellfish Growing Areas are suitable for consumption without depuration and when shellfish harvested from Restricted (Class SB) Shellfish Growing Areas are suitable for consumption with depuration. The Division of Marine Fisheries (DMF) classifies shellfishing areas in the Taunton River Watershed. The *Shellfish Harvesting Use* for this report was assessed using the DMF shellfishing closure list dated 1 July 2000 and published on Massachusetts Geographic Information System (MassGIS) in October 2000 (http://www.mass.gov/mgis/dsga.htm) and updated classification information provided by DMF. All of the coastal and marine waters included in this report are impaired for the *Shellfish Harvesting Use* because of elevated bacteria (Sawyer 2003).

***Shellfish Harvesting Use* Assessment**

Coastal and Marine Waters
(total area included in report – 4.86 square miles)
Impaired – 4.86 square miles

PRIMARY & SECONDARY CONTACT RECREATIONAL* AND *AESTHETIC USES

The *Primary Contact Recreational Use* is supported when conditions are suitable (fecal coliform bacteria densities, pH, temperature, turbidity and aesthetics meet the Massachusetts Surface Water Quality Standards and/or the MA DPH Bathing Beaches State Sanitary Code and/or guidance) for any recreational or other water-related activity during which there is prolonged and intimate contact with the water and there exists a significant risk of ingestion. Activities include, but are not limited to wading, swimming, diving, surfing, water skiing, and windsurfing. The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational 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. For lakes macrophyte cover and/or transparency (Secchi disk depth) data are also assessed to evaluate the status of the recreational uses. The *Aesthetics Use* is supported 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 status of the *Primary & Secondary Contact Recreational* and *Aesthetics uses* in the Taunton River Watershed is as follows.

Primary & Secondary Contact Recreational and Aesthetics uses Summary – Rivers and Coastal and Marine Waters (Figures 3 and 4)

Twenty-four (24)% of the freshwater river segments included in this report are assessed as either support or impaired for the *Primary* and *Secondary Contact Recreational uses.* Four freshwater river segments, Satucket River (MA62-10), an unnamed tributary to Cedar Swamp River (MA62-42), Cedar Swamp River (MA62-44), and a segment of the Assonet River (MA62-19), totaling 15.8 river miles, are assessed as supporting the *Primary Contact Recreational Use.* In addition to these four river segments, Meadow Brook (MA62-38) and Shumatuscacant River (MA62-33) are assessed as supporting for the *Secondary Contact Recreational Use* (totaling 30.3 river miles). *The Primary Contact Recreational Use* is impaired for 38.6 river miles (17%) and the *Secondary Contact Recreational Use* is impaired for 24.1 river miles (11%) in the Taunton River Watershed. These freshwater river segments include Salisbury Brook (MA62-08), Trout Brook (MA62-07), Salisbury Plain River (MA62-05 and MA62-06), Beaver Brook (MA62-09), Meadow Brook (MA62-38) – *Primary Contact Recreational Use* only,

***Primary Contact Recreational Use* Assessment**
Rivers
(total length included in report – 226.4 miles)
Support – 15.8 miles
Impaired – 38.6 miles
Not Assessed – 172 miles

***Secondary Contact Recreational Use* Assessment**
Rivers
(total length included in report – 226.4 miles)
Support – 30.3 miles
Impaired – 24.1 miles
Not Assessed – 172 miles

***Aesthetics Use* Assessment**
Rivers
(total length included in report – 226.4 miles)
Support – 124.9 miles
Impaired – 10.3 miles
Not Assessed – 91.2 miles

Shumatuscacant River (MA62-33) – *Primary Contact Recreational Use* only, and the Matfield River (MA62-32). All of these impaired segments are located within the Matfield River subwatershed. The primary cause of impairment is elevated fecal coliform bacteria. Excess algal growth, in-stream turbidity, odor, and trash/debris are also problematic. The only known sources of impairment are municipal point source discharges. Additional suspected sources include: municipal separate storm sewers, highway/road/bridge runoff in urbanized areas, and illicit connections/hookups to storm sewers.

The majority of the river miles fifty-five (55%) are assessed as support for the *Aesthetics Use.* Only 10.3 river miles, three segments, are assessed as impaired. These include a 1.3 mile portion of Trout Brook (MA62-07), Salisbury Plain River (MA62-06), and Matfield River (MA62-32). The primary causes of impairment are odor and turbidity. The only known sources of impairment are municipal point source discharges. Additional suspected sources include: municipal separate storm sewers, highway/road/bridge runoff in urbanized areas and illicit connections/hookups to storm sewers. The remaining 91.2 river miles are not assessed for the *Aesthetics Use.*

All of the coastal and marine water areas in this report are currently not assessed for the *Primary* & *Secondary Contact Recreational* and *Aesthetics uses* due to the lack of current bacteria data and field observations.

Primary & Secondary Contact Recreational and Aesthetics uses Summary – Lakes (Figures 3 and 4)

The *Primary* and *Secondary Contact Recreational* uses are assessed as support in eight lakes (Clear Pond, Cooper Pond, Island Grove Pond, Johns Pond, Long Pond, Middle Pond, Monponsett Pond – east basin, and Tispaquin Pond), totaling 2,229 acres and representing 21% of the freshwater lake acreage included in this report. The *Recreational* and *Aesthetic* uses are assessed as impaired in six lakes (Ames Long Pond, Monponsett Pond – west basin, Sabbatia Lake, Sassaquin Pond, Watson Pond, and West Meadow Pond), totaling 854 acres (8% of the freshwater lake acreage). Ames Long Pond, Sabbatia Lake, and West Meadow Pond were assessed as impaired because of the high percentage of biovolume occupied by non-native aquatic macrophytes. Monponsett Pond east basin and Watson Pond are assessed as impaired because of low Secchi disk transparency and excessive algal growth. Sassaquin Pond is assessed as impaired due to aesthetically objectionable conditions (filamentous algae, sewage odors) and because of the frequent and prolonged beach closures/postings. The *Recreational* uses for the remaining 84 lakes in the Taunton River Watershed, representing 7,906 acres, are not assessed because of a lack of bacteria, transparency and in-lake survey data. The *Aesthetics Use* for the 92 remaining lakes representing 10,205 acres are also not assessed because of a lack of transparency and in-lake survey data.

***Primary Contact Recreation Use* Assessment**
Lakes
(total area included in report – 11,059 acres)
Support – 2,299 acres
Impaired – 854 acres
Not Assessed – 7,906 acres

***Secondary Contact Recreation Use* Assessment**
Lakes
(total area included in report – 11,059 acres)
Support – 2,299 acres
Impaired – 854 acres
Not Assessed – 7,906 acres

***Aesthetics Use* Assessment**
Lakes
(total area included in report – 11,059 acres)
Support – 0 acres
Impaired – 854 acres
Not Assessed – 10,205 acres

RECOMMENDATIONS

In addition to specific issues for the individual segments, the evaluation of current water quality conditions in the Taunton River Watershed has revealed the need for the following.

- Monitor bacteria levels to document effectiveness of bacteria source reduction activities associated with sewer collection improvements, Title V (septic system) improvements/upgrades, treatment of stormwater discharges, sewering and/or Phase II community stormwater management programs to assess the status of the *Primary* and *Secondary Contact Recreation* uses.

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

- Continue to conduct water quality monitoring to better evaluate the status of the *Aquatic Life Use.* At a minimum continuous dissolved oxygen, temperature, pH and total phosphorus data should be collected and biological (benthic macroinvertebrate, habitat assessment, and fish population) sampling should be conducted.

- Conduct shoreline surveys to assess the *Aesthetics Use*.

- Keep all National Pollutant Discharge Elimination System (NPDES) permits current and compliant within the watershed.

- The TRWA and Bridgewater State Water Access Laboratory (WAL) should continue to conduct water quality monitoring at their established sampling stations in the Taunton River Watershed to meet their sampling objectives. For the TRWA and WAL data to be utilized by MassDEP in making water quality assessments, the TRWA and WAL should work with MA DEP to meet the following requirements 1) an approved and appropriate *Quality Assurance Project Plan* including a laboratory Quality Assurance /Quality Control (QA/QC) plan and 2) sample data, QA/QC and other pertinent sample handling information documented in a citable report.

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Figure 1. *Aquatic Life Use* - Rivers, Estuaries and Lakes

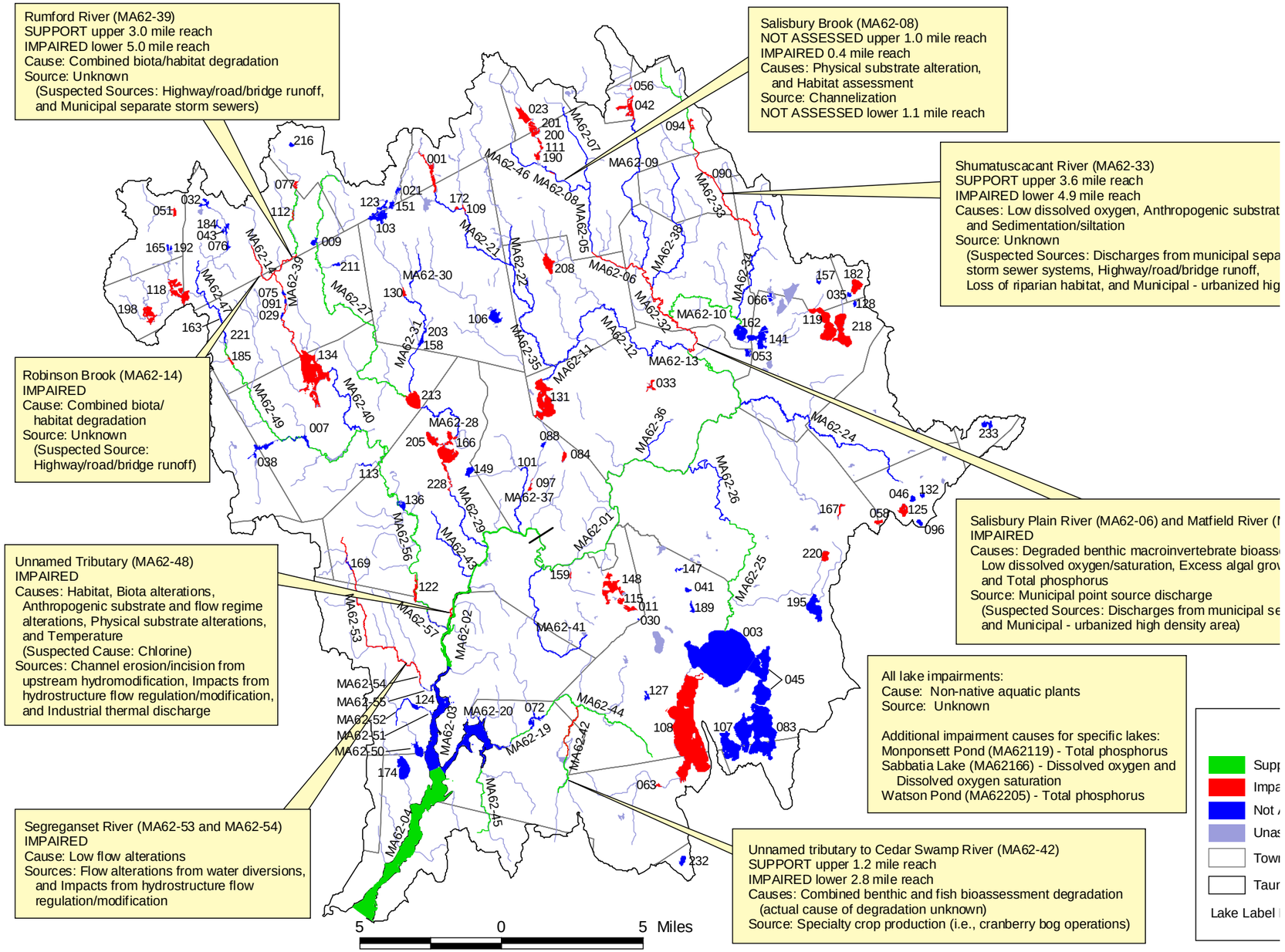

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Figure 2. *Fish Consumption Use* - Rivers, Estuaries and Lakes

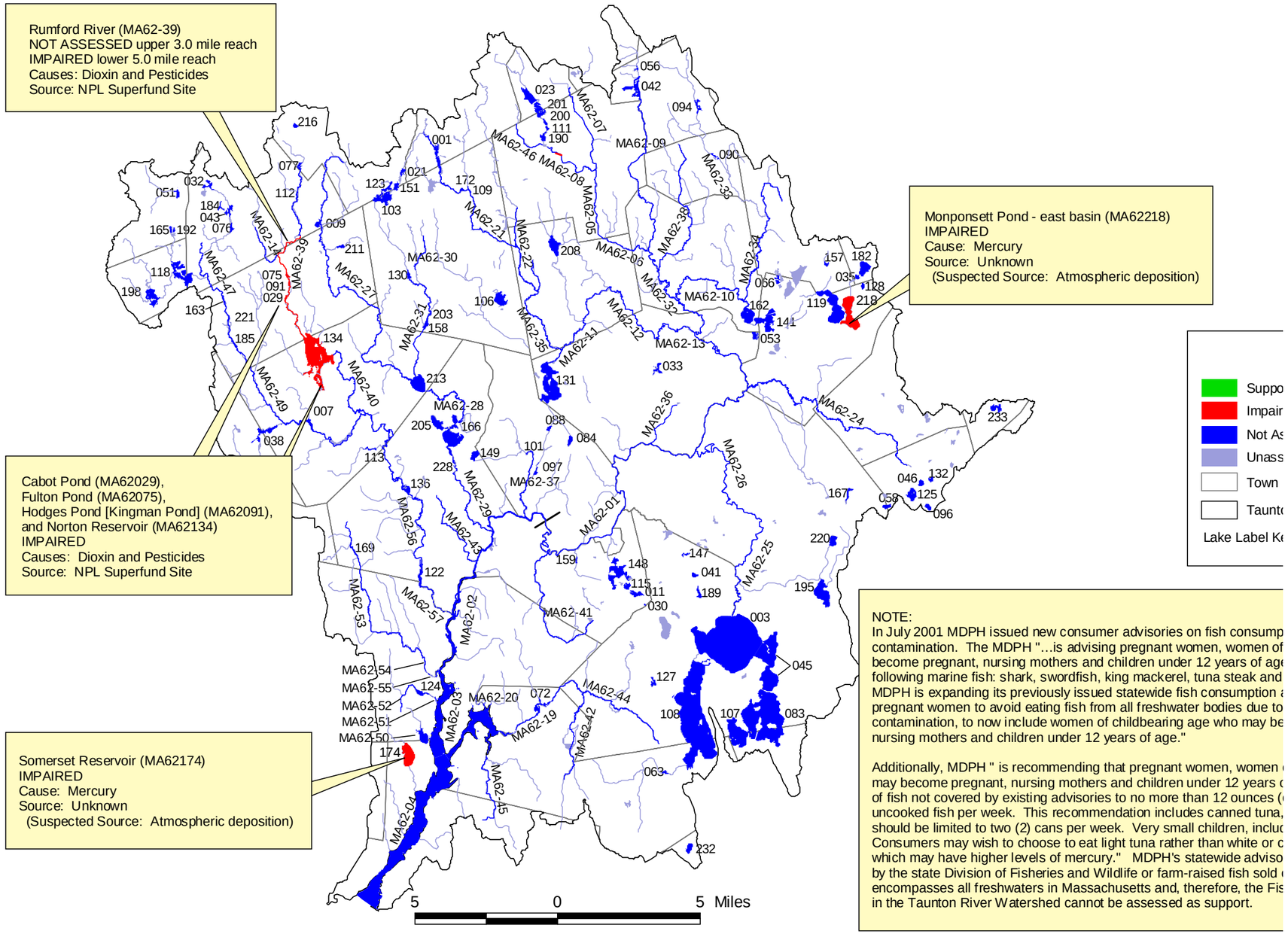

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Figure 3. *Primary* and *Secondary Contact Recreational* uses - Rivers, Estuaries and Lakes

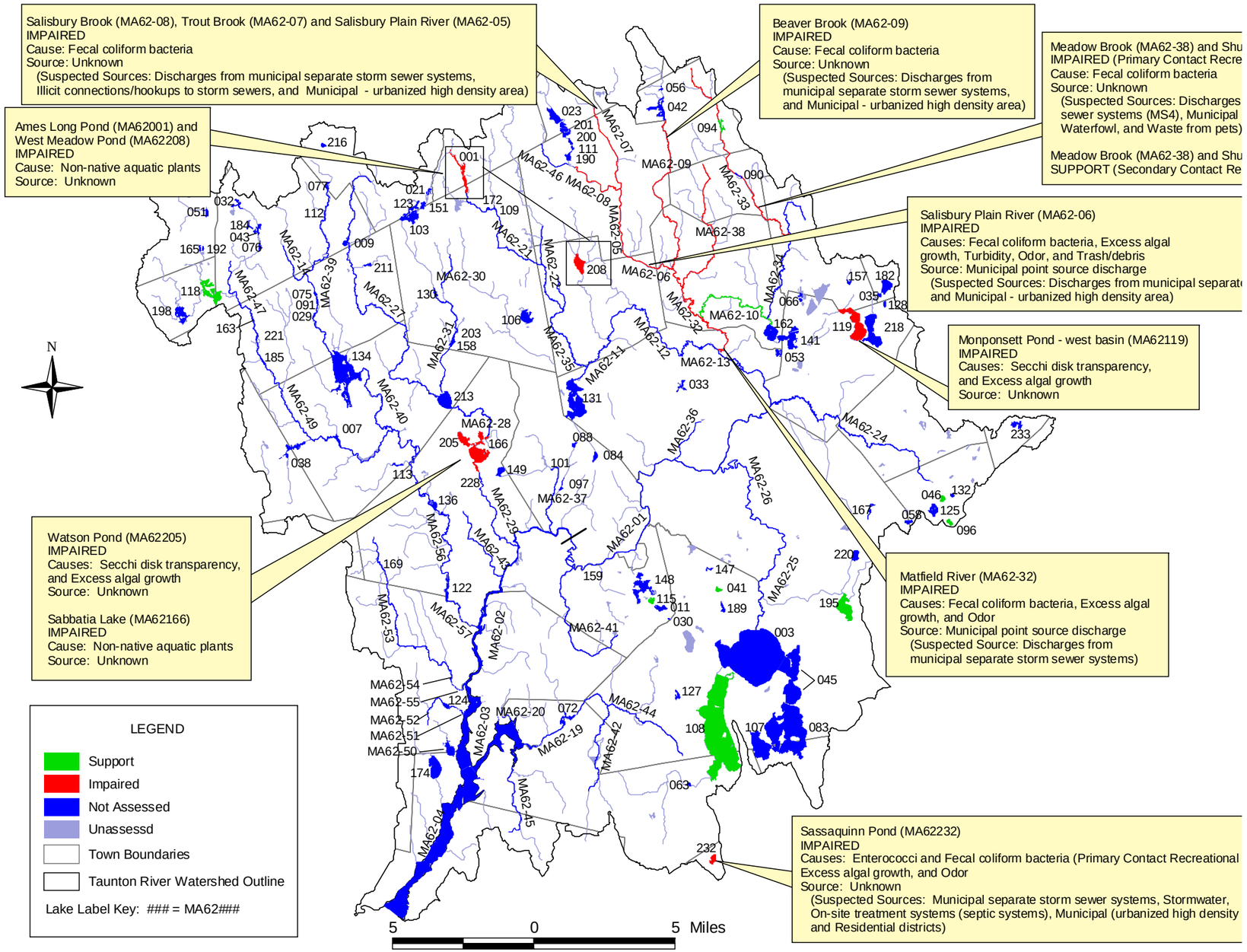

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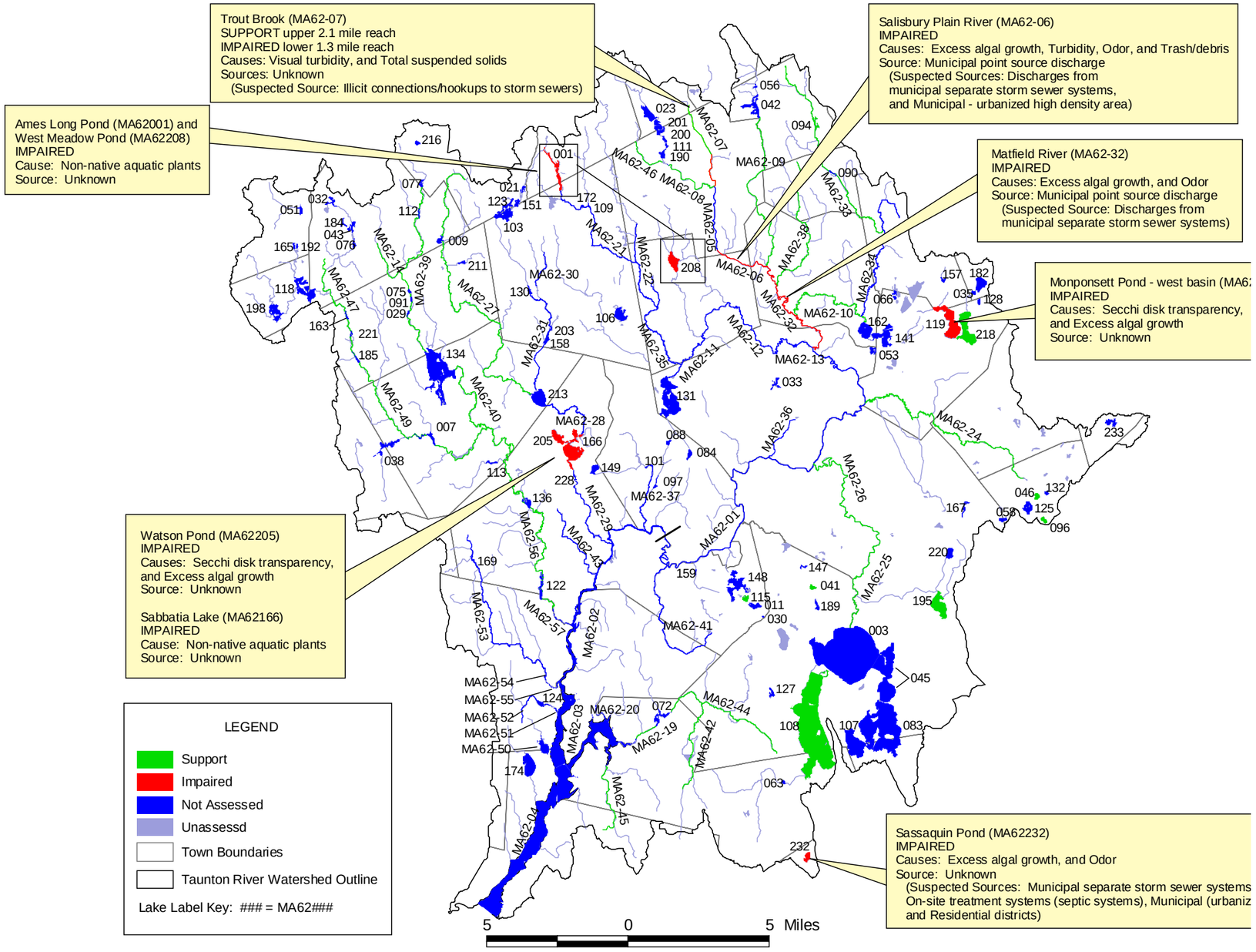
Figure 4. *Aesthetics Use*- Rivers, Estuaries and Lakes



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INTRODUCTION

The Massachusetts watershed approach is a collaborative effort between state and federal environmental agencies, municipal 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 watershed's natural resources can be achieved. Figure 5 illustrates the management structure to carry out the mission. This report presents the current assessment of water quality conditions in the Taunton River Watershed. The water quality assessments are based on information that has been researched and developed by the Massachusetts Department of Environmental Protection (MA DEP) through the first three years (information gathering, monitoring, and assessment) of the five-year cycle in partial fulfillment of MA DEP's federal mandate to report on the status of the Commonwealth's waters under the Federal Water Pollution Control Act (commonly known as the Clean Water Act).

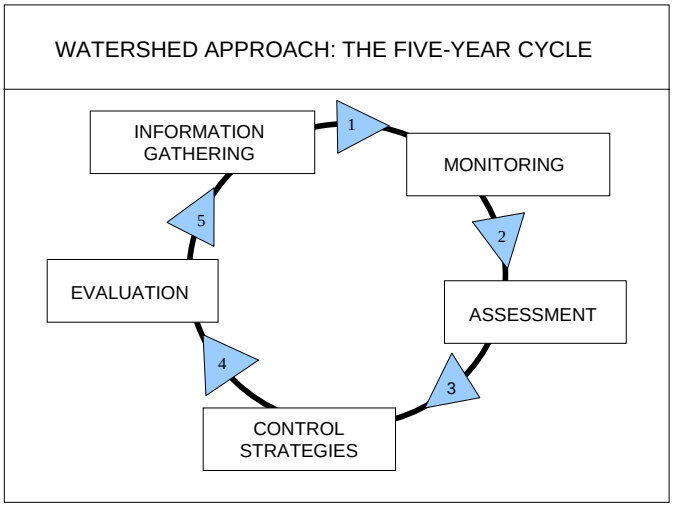


Figure 5. Five-year cycle of the Watershed Approach

The goal 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 objective 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 United States 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, every two years MassDEP must submit to the EPA a statewide report, which describes the status of water quality in the Commonwealth. Up until 2002 this was accomplished as a statewide summary of water quality (the 305(b) Report). States are also required to submit, under Section 303(d) of the CWA, a List of Impaired Waters requiring a total maximum daily load (TMDL) calculation. In 2002, however, EPA required the states to combine elements of the statewide 305(b) Report and the Section 303(d) List of Impaired Waters into one "Integrated List of Waters" (Integrated List). This statewide list is based on the compilation of information for the Commonwealth's 27 watersheds. Massachusetts has opted to write individual watershed water quality assessment reports and use them as the supporting documentation for the Integrated List. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. Instream biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions. This analysis follows a standardized process described below (Assessment Methodology). Once the use assessments have been completed, the segments are categorized for the Integrated List.

ASSESSMENT METHODOLOGY

WATER QUALITY CLASSIFICATION

The Massachusetts SWQS 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 (MassDEP 1996a). These regulations should undergo public review every three years. The surface waters are segmented and each segment is assigned to one of the six classes described below. Each class is identified by the most sensitive and, therefore, governing water uses to be achieved and protected. Surface waters may be suitable for other beneficial uses but shall be regulated by the Department of Environmental Protection to protect and enhance the designated uses.

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 (ORWs) under 314 Code of Massachusetts Regulations (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). These uses include: *Aquatic Life, Fish Consumption, Drinking Water, Primary Contact Recreation, Secondary Contact Recreation, Shellfish Harvesting* and *Aesthetics*. Two 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) and Warm Water Fishery (waters that are not capable of sustaining a year-round population of cold water aquatic life).

The SWQS, summarized in Table 1, prescribes minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MA MASSDEP 1996a). In rivers the lowest flow conditions at and above which aquatic life criteria must be applied are 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 aquatic life criteria

must be applied are the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow that has been agreed upon. In coastal and marine waters and for lakes the most severe hydrological condition for which the aquatic life criteria must be applied shall be determined by MASSDEP 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 MassDEP describes its Quality System in an EPA-approved Quality Management Plan to ensure that environmental data collected or compiled by MassDEP are of known and documented quality and are suitable for their intended use. For external sources of information, MassDEP requires 1) an approved and appropriate *Quality Assurance Project Plan* including a laboratory Quality Assurance /Quality Control (QA/QC) plan, 2) use of a state certified lab (or as otherwise approved by MASSDEP for a particular analysis), and 3) sample data, QA/QC and other pertinent sample handling information are documented in a citable report.

EPA provides guidelines to the States for making their use support determinations (EPA 1997 and 2002, Grubbs and Wayland III 2000 and Wayland III 2001). 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. Although data/information older than five years are usually considered "historical" and used only for descriptive purposes, they can be utilized in the use support determination provided they are known to reflect the current conditions. While the Water Quality Standards (Table 1) 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). Excursions from criteria due solely to "naturally occurring" conditions (e.g., low pH in some areas) do not constitute violations of the standards.

Each designated use within a given segment is individually assessed as ***support*** or ***impaired***. When too little current data/information exists or no reliable data are available the use is ***not assessed***. In this report, however, if there is some indication that water quality impairment may exist, which is not "naturally occurring", the use is identified with an "Alert Status". Detailed guidance for assessing the status of each use follows in the Designated Uses Section of this report. It is important to note that not all waters are assessed. Many small and/or unnamed ponds, rivers, and estuaries are currently ***unassessed***; the status of their designated uses has never been reported to EPA in the Commonwealth's 305(b) Report or the Integrated List of Waters nor is information on these waters maintained in the WBS or the new ADB.

Table 1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996a and MA DPH 2002a).

Dissolved Oxygen	Class A, Class B Cold Water Fishery (BCWF), and Class SA: ≥6.0 mg/L and ≥75% saturation unless background conditions are lower Class B Warm Water Fishery (BWWF) and Class SB: ≥5.0 mg/L and ≥60% saturation unless background conditions are lower Class C: 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 Class SC: 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
Temperature	Class A: ≤68°F (20°C) and Δ1.5°F (0.8°C) for Cold Water and ≤83°F (28.3°C) and Δ1.5°F (0.8°C) for Warm Water. Class BCWF: ≤68°F (20°C) and Δ3°F (1.7°C) due to a discharge Class BWWF: ≤83°F (28.3°C) and Δ3°F (1.7°C) in lakes, Δ5°F (2.8°C) in rivers Class C and Class SC: ≤85°F (29.4°C) nor Δ5°F (2.8°C) due to a discharge Class SA: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) Class SB: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) between July through September and Δ4.0°F (2.2°C) between October through June
pH	Class A, Class BCWF and Class BWWF: 6.5 - 8.3 SU and Δ0.5 outside the background range. Class C: 6.5 - 9.0 SU and Δ1.0 outside the naturally occurring range. Class SA and Class SB: 6.5 - 8.5SU and Δ0.2 outside the normally occurring range. Class SC: 6.5 - 9.0 SU and Δ0.5 outside the naturally occurring range.
Solids	All Classes: *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.*
Color and Turbidity	All Classes: *These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.*
Oil and Grease	Class A and Class SA: *Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.* Class SA: *Waters shall be free from oil and grease and petrochemicals.* Class B, Class C, Class SB and Class SC: *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.*
Taste and Odor	Class A and Class SA: *None other than of natural origin.* Class B, Class C, Class SB and Class SC: *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.*
Aesthetics	All Classes: *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.*
Toxic Pollutants	All Classes: *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*.
Nutrients	*Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.*

Note: *Italics are direct quotations.*

Δ criterion (referring to a change from natural background conditions) is applied to the effects of a permitted discharge.

Table 1 (Continued). Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996a and MA DPH 2002a)

Bacteria (MassDEP 1996 and MA DPH 2002) Class A criteria apply to the *Drinking Water Use*. Class B and SB criteria apply to *Primary Contact Recreation Use* while Class C and SC criteria apply to *Secondary Contact Recreation Use*.	Class A: • Fecal coliform bacteria: An arithmetic mean of <20 cfu/100 mls in any representative set of samples and <10% of the samples >100 cfu/100 mls. Class B: • At public bathing beaches, as defined by MA DPH, where *E. coli* is the chosen indicator: No single *E. coli* sample shall exceed 235 *E. coli* /100 mls and the geometric mean of the most recent five *E. coli* samples within the same bathing season shall not exceed 126 *E. coli* / 100 mls. • At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 61 *Enterococci* /100 mls and the geometric mean of the most recent five *Enterococci* samples within same bathing season shall not exceed 33 *Enterococci* /100 mls. • Current standards for other waters (not designated as bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 mls in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 mls. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class C: • Fecal coliform bacteria: Shall not exceed a geometric mean of 1000 cfu/100 mls, nor shall 10% of the samples exceed 2000 cfu/100 mls. Class SA: • Fecal coliform bacteria: Waters approved for open shellfishing shall not exceed a geometric mean (most probable number (MPN) method) of 14 MPN/100 mls, nor shall more than 10% of the samples exceed 43 MPN/100 mls. • At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 mls and the geometric mean of the five most recent *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 mls. • Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 mls in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 mls. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class SB: • Fecal coliform bacteria: In waters approved for restricted shellfish, a fecal coliform median or geometric mean (MPN method) of <88 MPN/100 mls and <10% of the samples >260 MPN/100 mls. • At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 mls and the geometric mean of the most recent five *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 mls. • Current standards for other waters (not designated as shellfishing areas or public bathing beaches), where fecal coliform bacteria are the chosen indicator: Waters shall not exceed a geometric mean of 200 cfu/100 mls in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 mls. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) Class SC: • Fecal coliform bacteria: Shall not exceed a geometric mean of 1000 cfu/100 mls, nor shall 10% of the samples exceed 2000 cfu/100 mls.

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 (MassDEP 1996a).

- *AQUATIC LIFE* - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna. Two 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, and *Warm Water Fishery* - waters that are not capable of sustaining a year-round population of cold water aquatic life.
- *FISH CONSUMPTION* - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, 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).
- *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.
- *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.

The guidance used to assess the *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary Contact Recreation, Secondary Contact Recreation* and *Aesthetics* uses follows.

AQUATIC LIFE USE

This use is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna. The results of biological (and habitat), toxicological, and chemical data are integrated to assess this use. The nature, frequency, and precision of the MassDEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases. The following chart provides an overview of the guidance used to assess the status (support or impaired) of the *Aquatic Life Use.*

Variable	***Support*** Data available clearly indicates support or minor modification of the biological community. Excursions from chemical criteria (Table 1) not frequent or prolonged and may be tolerated if the biosurvey results demonstrate support.	***Impaired*** There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.
BIOLOGY		
Rapid Bioassessment Protocol (RBP) III*	Non/Slightly impacted	Moderately or Severely Impacted
Fish Community	Best Professional Judgment (BPJ)	BPJ
Habitat and Flow	BPJ	Dewatered streambed due to artificial regulation or channel alteration, BPJ
Eelgrass Bed Habitat (Howes et al. 2002)	No/minimal loss, BPJ	Moderate/severe loss, BPJ
Macrophytes	BPJ	Exotic species present, BPJ
Plankton/Periphyton	No/infrequent algal blooms	Frequent and/or prolonged algal blooms
TOXICITY TESTS**		
Water Column/Ambient	≥75% survival either 48 hr or 7-day exposure	<75% survival either 48 hr or 7-day exposure
Sediment	≥75% survival	<75% survival
CHEMISTRY-WATER**		
DO/percent saturation (MassDEP 1996a, EPA 1997)	Infrequent excursion from criteria (Table 1), BPJ (minimum of three samples representing critical period)	Frequent and/or prolonged excursion from criteria [river and shallow lakes: exceedences >10% of measurements; deep lakes (with hypolimnion): exceedences in the hypolimnetic area >10% of the surface area].
pH (MassDEP 1996a, EPA 1999)	Infrequent excursion from criteria (Table 1)	Criteria exceeded >10% of measurements.
Temperature (MassDEP 1996a, EPA 1997)	Infrequent excursion from criteria (Table 1)[1]	Criteria exceeded >10% of measurements.
Toxic Pollutants (MassDEP 1996a, EPA 1999) Ammonia-N (MassDEP 1996a, EPA 1999) Chlorine (MassDEP 1996a, EPA 1999)	Infrequent excursion from criteria (Table 1) Ammonia is pH and temperature dependent[2] 0.011 mg/L (freshwater) or 0.0075 mg/L (saltwater) total residual chlorine (TRC)[3]	Frequent and/or prolonged excursion from criteria (exceeded >10% of measurements).
CHEMISTRY-SEDIMENT**		
Toxic Pollutants (Persaud et al. 1993)	Concentrations ≤ Low Effect Level (L-EL), BPJ	Concentrations ≥ Severe Effect Level (S-EL)[4], BPJ
CHEMISTRY-TISSUE		
PCB – whole fish (Coles 1998)	≤500 μg/kg wet weight	BPJ
DDT (Environment Canada 1999)	≤14.0 μg/kg wet weight	BPJ
PCB in aquatic tissue (Environment Canada 1999)	≤0.79 ng TEQ/kg wet weight	BPJ

* rapid bioassessment protocol (RBP) II analysis may be considered for assessment decision on a case-by-case basis, **For identification of impairment, one or more of the following variables may be used to identify possible causes/sources of impairment: NPDES facility compliance with whole effluent toxicity test and other limits, turbidity and suspended solids data, nutrient (nitrogen and phosphorus) data for water column/sediments. [1]Maximum daily mean T in a month (minimum six measurements evenly distributed over 24-hours) less than criterion. [2] Saltwater is temperature dependent only. [3] The minimum quantification level for TRC is 0.05 mg/L. [4]For the purpose of this report, the S-EL for total polychlorinated biphenyl compounds (PCB) in sediment (which varies with Total Organic Carbon (TOC) content) with 1% TOC is 5.3 ppm while a sediment sample with 10% TOC is 53 ppm.

Note: National Academy of Sciences/National Academy of Engineering (NAS/NAE) guideline for maximum organochlorine concentrations (i.e., total PCB) in fish tissue for the protection of fish-eating wildlife is 500μg/kg wet weight (ppb, not lipid-normalized). PCB data (tissue) in this report are presented in μg/kg wet weight (ppb) and are not lipid-normalized to allow for direct comparison to the NAS/NAE guideline.

FISH CONSUMPTION USE

Pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption. The assessment of this use is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MA DPH), Bureau of Environmental Health Assessment (MA DPH 2004). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption. Hence, the Fish Consumption Use is assessed as non-support in these waters.

In July 2001MA DPH issued new consumer advisories on fish consumption and mercury (Hg) contamination (MA DPH 2001).

1. The MA DPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MA DPH 2001)."
2. Additionally, MA DPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury (MA DPH 2001)."

Other statewide advisories that MA DPH has previously issued and are still in effect are as follows (MA DPH 2001):

1. Due to concerns about chemical contamination, primarily from polychlorinated biphenyl compounds (PCB) and other contaminants, no individual should consume lobster tomalley from any source. Lobster tomalley is the soft green substance found in the tail and body section of the lobster.
2. Pregnant and breastfeeding women and those who are considering becoming pregnant should not eat bluefish due to concerns about PCB contamination in this species.

The following is an overview of EPA's guidance used to assess the status (support or impaired) of the *Fish Consumption Use*. Because of the statewide advisory no waters can be assessed as support for the *Fish Consumption Use*. Therefore, if no site-specific advisory is in place, the *Fish Consumption Use* is not assessed.

Variable	***Support*** No restrictions or bans in effect	***Impaired*** There is a "no consumption" advisory or ban in effect for the general population or a sub-population for one or more fish species or there is a commercial fishing ban in effect
MA DPH Fish Consumption Advisory List (MA DPH 2004, MA DPH 2001)	Not applicable, precluded by statewide advisory (Hg)	Waterbody on MA DPH Fish Consumption Advisory List

Note: MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

DRINKING WATER USE

The term *Drinking Water Use* denotes those waters used as a source of public drinking water. These waters may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). They are designated for protection as Outstanding Resource Waters in 314 CMR 4.04(3). MassDEP's Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act (SDWA). Except for suppliers with surface water sources for which a waiver from filtration has been granted (these systems also monitor surface water quality) all public drinking water supplies are monitored as finished water (tap water). Monitoring includes the major categories of contaminants established in the SDWA: bacteria, volatile and synthetic organic compounds, inorganic compounds and radionuclides. The DWP maintains current drinking supply monitoring data. The status of the supplies is currently reported to MassDEP and EPA by the suppliers on an annual basis in the form of a consumer confidence report (http://yosemite.epa.gov/ogwdw/ccr.nsf/Massachusetts). Below is EPA's guidance to assess the status (support or impaired) of the drinking water use.

Variable	***Support*** No closures or advisories (no contaminants with confirmed exceedences of maximum contaminant levels, conventional treatment is adequate to maintain the supply).	***Impaired*** Has one or more advisories or more than conventional treatment is required or has a contamination-based closure of the water supply.
Drinking Water Program (DWP) Evaluation	See note below	See note below

Note: While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at and from the Taunton River Watershed's public water suppliers.

SHELLFISH HARVESTING USE

This use is assessed using information from the Department of Fisheries, Wildlife and Environmental Law Enforcement's Division of Marine Fisheries (DMF). A designated shellfish growing area is an area of potential shellfish habitat. Growing areas are managed with respect to shellfish harvest for direct human consumption and comprise at least one or more classification areas. The classification areas are the management units, which range from being approved to prohibited (described below) with respect to shellfish harvest. Shellfish areas under management closures are *not assessed.* Not enough testing has been done in these areas to determine whether or not they are fit for shellfish harvest, so they are closed for the harvest of shellfish.

Variable	***Support*** SA Waters—Approved[1] SB Waters— Approved[1], Conditionally Approved[2] or Restricted[3]	***Impaired*** SA Waters— Conditionally Approved[2], Restricted[3], Conditionally Restricted[4], or Prohibited[5] SB Waters—Conditionally Restricted[4] or Prohibited[5]
DMF Shellfish Project Classification Area Information (MA DFG 2000)	Reported by DMF	Reported by DMF

NOTE: Designated shellfish growing areas may be viewed using the MassGIS datalayer available from MassGIS at http://www.state.ma.us/mgis/dsga.htm. This coverage currently reflects classification areas as of July 1, 2000.

[1] **Approved** - "...open for harvest of shellfish for direct human consumption subject to local rules and regulations..." An approved area is open all the time and closes only due to hurricanes or other major coastwide events.

[2] **Conditionally Approved** - "...subject to intermittent microbiological pollution..." During the time the area is open, it is "...for harvest of shellfish for direct human consumption subject to local rules and regulations…" A conditionally approved area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, shellfish harvested are treated as from an approved area.

[3] **Restricted** - area contains a "limited degree of pollution." It is open for "harvest of shellfish with depuration subject to local rules and state regulations" or for the relay of shellfish. A restricted area is used by DMF for the relay of shellfish to a less contaminated area.

[4] **Conditionally Restricted** - "...subject to intermittent microbiological pollution..." During the time area is restricted, it is only open for "the harvest of shellfish with depuration subject to local rules and state regulations." A conditionally restricted area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, only soft-shell clams may be harvested by specially licensed diggers (Master/Subordinate Diggers) and transported to the DMF Shellfish Purification Plant for depuration (purification).

[5] **Prohibited -** Closed for harvest of shellfish.

PRIMARY CONTACT RECREATION USE

This use is suitable for any recreational or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water during the primary contact recreation season (1 April to 15 October). These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The chart below provides an overview of the guidance used to assess the status (support or impaired) of the *Primary Contact Recreation Use*. Excursions from criteria due to natural conditions are not considered impairment of the use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria and/or formal bathing area closures, or severe aesthetic conditions that preclude the use
Bacteria (MassDEP 1996a and MA DPH 2002a)	At "public bathing beach" areas: Formal beach postings/advisories neither frequent nor prolonged during the swimming season (the number of days posted or closed cannot exceed 10% during the locally operated swimming season). Other waters: Samples* collected during the primary contact season must meet criteria (Table 1). Shellfish Growing Area classified as "Approved" by DMF.	At "public bathing beach" areas: Formal beach closures/postings >10% of time during swimming season (the number of days posted or closed exceeds 10% during the locally operated swimming season). Other waters: Samples* collected during the primary contact season do not meet the criteria (Table 1).
Aesthetics (MassDEP 1996a) - *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* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth $\geq$1.2 meters ($\geq$ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

* Data sets to be evaluated for assessment purposes must be representative of a sampling location (minimum of five samples per station recommended) over the course of the primary contact season. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use. An impairment decision will not be based on a single sample (i.e., the geometric mean of five samples is <200 colony forming unit (cfu)/100mL but one of the five samples exceeds 400 cfu/100mL). The method detection limit (MDL) will be used in the calculation of the geometric mean when data are reported as less than the MDL (e.g. use 20 cfu/100mL if the result is reported as <20 cfu/100mL). Those data reported as too numerous to count (TNTC) will not be used in the geometric mean calculation; however, frequency of TNTC sample results should be presented.

SECONDARY CONTACT RECREATION USE

This use is 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. Following is an overview of the guidance used to assess the status (support or impaired) of the *Secondary Contact Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use
Fecal Coliform Bacteria (MassDEP 1996a)	Other waters: Samples* collected must meet the Class C or SC criteria (see Table 1).	Other waters: Samples* collected do not meet the Class C or SC criteria (see Table 1).
Aesthetics (MassDEP 1996a) - *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* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged*, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged*, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

*Data sets to be evaluated for assessment purposes must be representative of a sampling location (minimum of five samples per station recommended) over time. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use.

AESTHETICS USE

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. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support or impaired) of the *Aesthetics Use*.

Variable	***Support*** Narrative "free from" criteria met	***Impaired*** Objectionable conditions frequent and/or prolonged
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

TAUNTON RIVER WATERSHED DESCRIPTION AND CLASSIFICATION

DESCRIPTION

The Taunton River Watershed is the second largest river watershed in Massachusetts with a drainage area of 562 square miles contained wholly within Massachusetts boundaries. Located in southeastern Massachusetts, the watershed encompasses all or portions of 40 cities and towns. The Taunton River Watershed has the flat to low hilly topography typical of eastern Massachusetts watersheds shaped by glaciation. The Taunton River has one of the flattest courses in the state, falling approximately 21 feet over its length. This level terrain creates extensive wetlands throughout the watershed. The watershed contains over 94 square miles of wetlands, 12,883 acres of lakes, and some of the most productive cranberry bogs in the country. Hockomock Swamp, located in the north-central portion of the watershed, is the largest vegetated freshwater wetland system in the state.

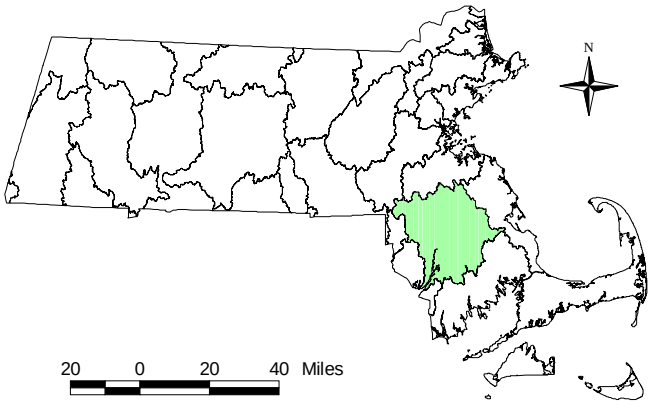


Figure 6. Location of Taunton River Watershed

There are two Areas of Environmental Concern (ACECs) in the Taunton River Watershed, the Hockomock Swamp and the Canoe River Aquifer (Snake River, Watson Pond, and Lake Sabbatia). The Hockomock Swamp is located in the towns of Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater. The Canoe River Aquifer is located in the towns of Easton, Foxborough, Mansfield, Norton, Sharon, and Taunton.

The Hockomock Swamp ACEC was officially designated on 10 February 1990. Its associated wetlands and water bodies comprise the largest vegetated freshwater wetland system in Massachusetts (MA DCR 2005). The boundaries of the Hockomock Swamp ACEC include approximately 16,950 acres in the southeastern part of the state. The wetlands act as a huge water reservoir and serve as the headwaters for the Town River, which flows into the Taunton River. The wetlands and floodplains are connected hydrologically with an extensive underlying system of medium- and high-yield aquifers. It is also the location of at least 13 rare and endangered species. According to the Massachusetts Historical Commission, the archaeological sites in the vicinity of this wetland complex are known to span a period of 9000 years. The potential quality and significance of these archaeological resources are enormous. The Division of Fisheries and Wildlife (DFW) owns approximately 5000 acres of the Hockomock Swamp within all six communities. The Hockomock Swamp Wildlife Management Area provides public access to the swamp and to several recreational areas. Additional public and nonprofit lands are located within the ACEC.

The 17,200-acre Canoe River Aquifer ACEC was officially designated on 18 May 1991. The Canoe River Aquifer ACEC is characterized by an extensive system of surface waters, wetlands, floodplains and high-yield aquifers. The aquifers are recharged with water percolating through the permeable soils of the area and provide high-quality drinking water to over 66,000 people in four of the towns located within the ACEC. There are ten municipal wells located in the ACEC and numerous private wells that draw from the aquifers. More than a hundred rivers, brooks, streams and creeks and the extensive wetlands and floodplains support a rich and diverse habitat for wildlife. The upland portions of the area are a mix of open fields, deep woods, transitional woodlands, and over a thousand acres of productive farmland and cranberry bogs. There are occurrences of rare and endangered species, and increasingly rare Atlantic White Cedar swamps. The open space of the ACEC also includes approximately 3,500 acres of municipal and nonprofit conservation and recreational lands (MA DCR 2005).

The major issue in the Taunton River Watershed is dealing with the current and projected growth due to proposed transportation links. At this time over half the watershed is forested, recreational, and open land, while approximately 20 percent of the watershed area is residential.

The cities of Brockton and Taunton rely on surface water for drinking water needs, while the other watershed communities rely almost exclusively on groundwater resources. MassDEP's Water Management Program, which regulates surface and ground water withdrawals in excess of an average of 100,000 gpd (gallons per day), has issued 30 permits and 139 registrations (for withdrawals in existence prior to 1986) in the Taunton River Watershed. Additional applications are under review for new sources of public drinking water supplies and development of cranberry bogs.

Streamflow in the Taunton River fluctuates slowly due to the wetland areas, underlying stratified drift, and the flat gradient. Flow is measured continuously at four US Geological Survey (USGS) gaging stations: the Wading River near Norton, the Threemile River at North Dighton, the Segreganset River near Dighton, and the Taunton River at Bridgewater. On average, Taunton River streamflow is highest in March and lowest in August. The Taunton River and many of its tributaries (subwatersheds) have relatively strong low flows under natural conditions, due primarily to the stratified drift deposits that underlie much of the watershed (approximately 62%). These deposits store and yield groundwater to streamflow between precipitation events.

The confluence of the Salisbury Plain River and Beaver Brook in East Bridgewater marks the beginning of the Matfield River. The Matfield River and its tributaries drain 77 square miles of the northeast portion of the Taunton River Watershed. The outflow from Lake Nippenicket joins the Hockomock River to form the Town River. The Matfield River joins the Town River in the impounded waters at the head of the Taunton River. With the exception of this major dam, the Taunton River flows without physical obstruction to Mount Hope Bay. The terrain is relatively level, so the river is slow moving with only a few short sections of rapids. The freshwater portion maintains a fairly uniform cross-section with a width of about 80 feet. The Taunton River flows southeasterly through Bridgewater and then turns southwest, forming the Bridgewater-Halifax and Bridgewater-Middleborough town boundaries. Along this section the Taunton River receives flow from two tributaries, the Winnetuxet and Nemasket Rivers.

The Winnetuxet River drains portions of Carver, Plympton, Halifax and Middleborough, while the Nemasket River flows through Lakeville and Middleborough. After being joined by these two tributaries, the Taunton River flows generally in a southwesterly direction, forming the boundaries between Raynham and Middleborough and then Raynham and Taunton. The Cotley River is a small tributary which joins the freshwater portion of the Taunton River in Taunton. In East Taunton the river becomes tidal, with tide waters from Mount Hope Bay reaching more than 18 miles upstream. In the city of Taunton, the river turns south and maintains its relatively narrow channel-like appearance. The Mill River enters the estuary in Taunton. The Mill River flows from Lake Sabbatia which is fed by the Snake River as it exits from Winnecunnet Pond. Winnecunnet Pond is fed by the Canoe River and Mulberry Meadow Brook.

Downstream from the Threemile River confluence, the Taunton widens into a broad tidal estuary. The Threemile River is formed at the confluence of the Wading and Rumford Rivers in the northwest section of the Taunton River Watershed and has a drainage area of 84.5 square miles. The lower two miles of the Threemile River are tidal. Another small tributary, the Segreganset River, joins the Taunton River estuary in Dighton. The Assonet River is the last major tributary to empty into the Taunton River Estuary. The freshwater portion of the Assonet flows through Lakeville and Freetown. The lower Assonet forms a broad estuarine finger of the Taunton River.

CLASSIFICATION

Consistent with the National Goal Uses of "fishable and swimmable waters", the classification of waters in the Taunton Watershed according to the SWQS, include the following (MassDEP 1996a):

"Class A – These waters are designated as a source of public water supply. To the extent compatible with its 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 (ORWs) under 314 CMR 4.04(3)" (Rojko *et al.* 1995).

Class A Public Water Supplies in the Taunton River Watershed

- Assawompset Pond, source to outlet in Lakeville and those tributaries thereto
- Great Quittacas Pond, source to outlet in Lakeville and those tributaries thereto
- Little Quittacas Pond, source to outlet in Lakeville and those tributaries thereto
- Long Pond, source to outlet in Lakeville and those tributaries thereto
- Pocksha Pond, source to outlet in Lakeville and those tributaries thereto
- Somerset Reservoir, source to outlet in Somerset and those tributaries thereto
- Monponsett Pond, source to outlet in Halifax and those tributaries thereto
- Elders Pond, source to outlet in Lakeville and those tributaries thereto
- Brockton Reservoir (Avon Reservoir, Salisbury Brook Reservoir) source to outlet in Avon and those tributaries thereto
- Segreganset River, from a wetland north of Glebe Street in Taunton to the pumping station in Dighton

"Class B – These waters are designated as 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."

Class B Warm Water Fisheries in the Taunton River Watershed

- Taunton River, Source to Route 24 Bridge
- Salisbury Plain & Matfield Rivers, Brockton STP to confluence
- Town River, Bridgewater STP to confluence
- Nemasket River, Middleborough STP to confluence
- Saw Mill Brook, Entire length
- Mill Brook, Wittenton Street to confluence
- Threemile River, Source to confluence
- Wading River, From Chartley Brook to confluence

"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. "

Class SB in the Taunton River Watershed (other restrictions as noted)

- Taunton River, Route 24 Bridge to mouth, Shellfishing (R) and CSO

The Massachusetts Surface Water Quality Standards contain antidegradation provisions (314 CMR 4.04) to maintain existing uses and the level of water quality necessary to protect those uses. As part of these provisions, waters with exceptional socio-economic, recreational, ecological and/or aesthetic values are designed as Outstanding Resource Waters (ORWs) (Rojko *et al.* 1995). ORWs include vernal pools, certified as such by the Natural Heritage Program of the Massachusetts Division of Fisheries and Wildlife, and all designated Class A Public Water Supplies (PWS). Other waters designated as ORWs may include those found in National Parks, State Forests and Parks, and Areas of Critical Environmental Concern (ACECs) designated by the Secretary of Environmental Affairs and those protected by special legislation (MA DEM 1993). Wetlands which border these ORWs are designated ORWs to the boundary of the defined area.

ORWs have more stringent requirements than other waters because the existing use is so exceptional, or the perceived risk of harm is such that no lowering of water quality is permissible. Generally, new or increased discharges of pollutants are prohibited for wastewater and stormwater. The discharge of dredge or fill material to a certified vernal pool and within 500 feet of a water supply reservoir is prohibited unless a variance is granted under 314 CMR 9.00 (401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging and Dredged Material Disposal in Waters of the United States within

the Commonwealth). The discharge of dredged or fill material into other ORWs is permitted for certain specified projects only after an alternatives analysis and minimization and mitigation of adverse impacts.

Unlisted waters in the Taunton Watershed not otherwise designated in the SWQS, are designated *Class B, High Quality Waters* for inland waters and *Class SA, High Quality Waters* for coastal and marine waters. According to the SWQS, where fisheries designations are necessary, they shall be made on a case-by-case basis.

SOURCES OF INFORMATION

Multiple local, state and federal agencies provided information used in this water quality assessment of the Taunton River Watershed. Within the Massachusetts Department of Environmental Protection (MassDEP) information was obtained from three programmatic bureaus: Bureau of Resource Protection (BRP, see below), Bureau of Waste Prevention (industrial wastewater discharge information) and the Bureau of Waste Site Cleanup (hazardous waste site cleanup information). Specifically, water quality (Appendices A and B), lake survey data (Appendix C), habitat assessment and biological data (Appendices D and E), toxics in fish flesh data (Appendix F), and the results of periphyton sampling (Appendix H) were provided by MassDEP BRP Division of Waterhed Management Watershed Planning Program. Water withdrawal and wastewater discharge permit information (Water Management Act and National Pollutant Discharge Elimination System) were provided by the DWM Watershed Permitting Program and the MassDEP Southeast Regional Office (Appendix G). [Note: The BRP DWM Drinking Water Program evaluates the status of the *Drinking Water Use* and this information is therefore not provided in this assessment report.] Projects funded through various MassDEP grant and loan programs also provide valuable information that may be used in the water quality assessment report. A summary of these projects for the Taunton River Watershed is provided in Appendix I.

Other state agencies contributing information to this report include: the Massachusetts Department of Public Health (MA DPH), the Department of Fish and Game (MA DFG), formerly the Department of Fisheries, Wildlife, and Environmental Law Enforcement or MDFW and the Division of Marine Fisheries (DMF), and the MA Department of Conservation and Recreation (MA DCR), formerly the Department of Environmental Management or MA DEM. Federal agencies contributing include the EPA and USGS.

A New England Coastal Basin (NECB) Mercury Study was also initiated by USGS in 1999 when the results of their National Mercury Pilot Study showed some of the highest mercury concentrations in the country were in the NECB study area (USGS 2003). The dominant source of mercury identified in the NECB study area was atmospheric deposition. In collaboration with the USGS Toxics Substances Hydrology Program (an extension of the National Mercury Pilot Study), Urban Land Use Gradient Study - part of the National Water-Quality Assessment (NAWQA) Program - and the MassDEP Merrimack Valley Fish Study, USGS collected sediment, water, and/or fish tissue for total and/or methyl mercury analysis from 22 streams north of Boston in 1999 and 30 sites in the NECB in 2000. The Wading River in Norton and the Matfield River in East Bridgewater were sampled by USGS between October 1999 and September 2001.

ENSR International conducted an investigation to evaluate instream site-specific copper criteria for streams in the Taunton River Watershed and for three municipal treatment plants (Mansfield WPAF, the Middleborough WWTP and the Bridgewater WWTF) discharging to the Taunton River and its tributaries. Water quality sampling was conducted during March, May, July, August and September of 2001 (ENSR 2002). The study was prompted by the concern that many dischargers in the Taunton River watershed have NPDES permits with very low concentration limits for copper and these limits have been proven to be difficult or impossible to meet on a consistent basis. Additionally, there was a concern that the copper criterion currently in place is overly protective to aquatic organisms.

In August 2001 the Massachusetts “Beach Bill” was enacted by the legislature and signed by the Governor (MGL. C111. S5S). This act created minimum standards for public bathing waters adjacent to any public or semi-public bathing beach in the Commonwealth. A “public bathing beach” is defined as a beach open to the general public whether or not any entry fee is charged that permits access to bathing waters. A “semi-public bathing beach” is defined as a bathing beach used in connection with a hotel,

motel, trailer park, campground, apartment house, condominium, country club, youth club, school, camp, or similar establishment where the primary purpose of the establishment is not the operation of the bathing beach and where admission to the use of the bathing beach is included in the fee paid for use of the premises. A semi-public bathing beach shall also include a bathing beach operated and maintained solely for the use of members and guests of an organization that maintains such bathing beach. Under the Beach Bill, the Massachusetts Department of Public Health (MA DPH) was directed to establish minimum uniform water quality standards for coastal and inland beach waters and determining the frequency and location of testing, reporting requirements, and requirements for notifying the public of threats to human health or safety. *105 CMR 445.000: Minimum Standards for Bathing Beaches (State Sanitary Code, Chapter VII)* outlines MA DPH's guidelines for the Beach Bill. Additionally, under the Beach Bill and MA DPH guidelines, local boards of health and state agencies are responsible for collecting samples from public beaches using testing procedures consistent with the American Public Health Association's *Standard Methods for Examination of Water and Waste Water* or methods approved by EPA. Operators of semi-public beaches are responsible for the costs of testing their beaches. Results of testing, monitoring, and analysis of public and semi-public beaches must be submitted in an annual report to MA DPH by 31 October of each year (MA DPH 2002b).

The National Shellfish Sanitation Program (NSSP) includes federal and state governments cooperatively administering a battery of public health regulations designed to assure the sanitary integrity of shellfish and shellfish products (ISSC 2000). A key regulatory role assigned to coastal states by the NSSP is shellfish classification. According to methods, procedures and standards set forth in the NSSP *Guide For The Control Of Molluscan Shellfish*, a designated state agency must determine whether shellfish from coastal growing waters are safe or may be made safe for human consumption. The determination is based, in large part, upon the presence of fecal coliform bacteria within the growing waters. In September 2003 the Massachusetts Department of Marine Fisheries (DMF) prohibited all shellfish growing areas in the Taunton River Watershed due to elevated fecal coliform concentrations (Sawyer 2003).

In Massachusetts the DMF Shellfish Management Program maintains information used to classify (e.g., approved, conditionally approved, prohibited, etc.) their shellfish management areas (MA DFG 2000). These classifications are subsequently used to regulate the harvesting of various shellfish.

DMF achieves public health protection as a result of their sanitary surveys of shellfish growing areas to determine each area's suitability as shellfish sources for human consumption. The principal components included in a sanitary survey include: 1) an evaluation of pollution sources that may affect an area; 2) evaluation of hydrographic and meteorological characteristics that may affect distribution of pollutants; and 3) an assessment of water quality. These surveys also include shellfish species identification, habitat location, relative abundance and documentation of related fisheries (Kennedy 2001). Supplementary analysis may be required for naturally occurring pathogens (e.g., *Vibrio* sp.), marine biotoxins (e.g., Paralytic Shellfish Poisoning) and hazardous wastes in growing areas with a known history of contamination by these harmful substances.

Each growing area must have a complete sanitary survey every twelve years, a triennial evaluation every three years and an annual review in order to maintain a classification, which allows shellfish harvesting (MA DFG 2002). Minimum requirements for sanitary surveys, triennial evaluations, annual reviews and annual water quality monitoring are established by the Interstate Shellfish Sanitation Conference (ISSC) and set forth in the NSSP. Each year water samples are collected at 2,320 stations in 294 growing areas in Massachusetts's coastal waters at a minimum frequency of five times while open to harvesting. Water and shellfish samples are tested for fecal coliform bacteria at two *Marine Fisheries* laboratories located in Gloucester and Pocasset using a Most Probable Number method for classification purposes and a membrane filtration technique (usually M-tec) for pollution source identification. A growing area classification may be downgraded and management plans amended, based on the findings of annual and triennial reviews (Kennedy 2001). Classification upgrades can only be made based on the findings of a full sanitary survey.

The following types of NPDES surface water discharges occur in the Taunton River Watershed (Appendix G, Tables G1, G2, and G3).

Municipal and Sanitary Wastewater Treatment Plants

- Avon Custom Mixing Services, Inc. (MA0026883) discharges to Trout Brook (Segment MA62-07).
- Bridgewater Wastewater Treatment Plant (WWTP) (MA0100641) discharges to Town River (Segment MA62-13).
- Brockton Advanced Water Reclamation Facility (MA0101010) discharges to Salisbury Plain River (Segment MA62-06).
- Dighton-Rehoboth Regional School District (MA0022586) discharges to unnamed tributary to Segregansett River (Segment MA62-53).
- East Bridgewater Public Schools (MA0022446) discharges to unnamed tributary to Matfield River (Segment MA62-32).
- Mansfield WPAF (MA0101702) discharges to Threemile River (Segment MA62-56).
- MCI Bridgewater Water Pollution Control Facility (WPCF) (MA0102237) discharges to Sawmill Brook (Segment MA62-36). Middleborough WWTP (MA0101591) discharges to Nemasket River (Segment MA62-26).
- Oak Point Retirement Community (MA0032433) discharges to Taunton River (Segment MA62-01).
- Somerset WPCF (MA0100676) discharges to Taunton River (Segment MA62-04).
- Taunton WWTP (MA0100897) discharges to Taunton River (Segment MA62-02).
- Town of West Bridgewater - Howard School (MA010753) discharges to Town River (Segment MA62-11).
- Town of West Bridgewater - Rose L. MacDonald School (MA01012061) discharges to West Meadow Brook to Town River (Segment MA62-11).
- Wheaton College (MA0026182) discharges to Rumford River (Segment MA62-40).

Industrial discharges

- BIW Cable Systems, Inc. discharges process wastewater and non-contact cooling water to Threemile River (Segment MA62-56).
- Shell Oil Company, Fall River (MA0004871) discharges oil and grease to Taunton River (Segment MA62-04).
- Somerset Power LLC (MA0001856) discharges treated wastewater, condenser cooling water, and stormwater to Taunton River (Segment MA62-04).
- Taunton Municipal Lighting Plant (MA0002241) discharges cooling water and stormwater to Taunton River (Segment MA62-02).
- Tweave, Inc. (MA0005355) discharges treated process wastewater to Wading River (Segment MA62-49).

Municipal Public Drinking Water Treatment Plants

- Abington/Rockland Joint Water Works (MAG640009) discharges to wetland adjacent to Shumatusacant River (Segment MA62-33).
- Richmond Park WTP (MAG640008) discharges Turkey Swamp that flows into Palmer Mill Brook then flows to Winnetuxet River (Segment MA62-24).

Industrial non-process discharges

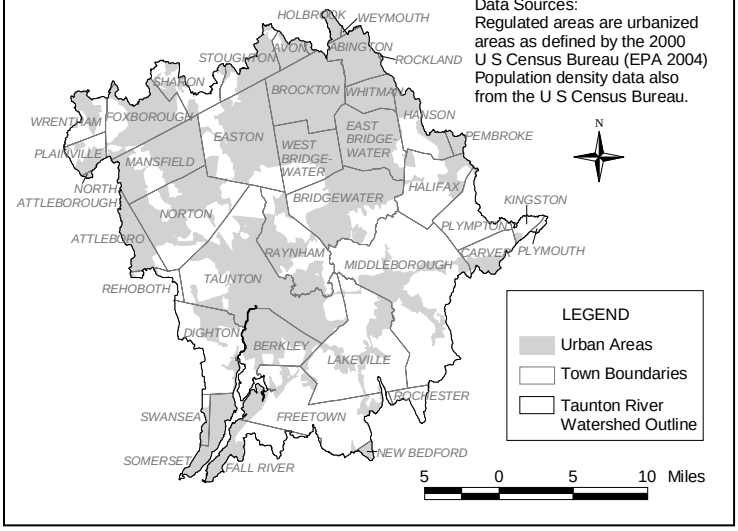
- Several industries have general permits issued to the facilities by EPA for the discharge of non-contact cooling water and stormwater. While these discharges are authorized and controlled under general permits, the associated impacts from these facilities are minimal and do not get significant review from MassDEP.

General Stormwater Phase I and Phase II discharges

- *Phase I* - In 1987 Congress amended the Clean Water Act to require EPA to establish phased NPDES requirements for stormwater discharges. As part of Phase I certain categories of stormwater discharges associated with industrial activity and for discharges from municipal separate storm sewer systems located in municipalities with a population of 100,000 or more were required to submit permit applications. In the Taunton River Watershed, many facilities have submitted NOIs for coverage under the Multi-Sector General Permit (See Appendix G, Table G4 for a listing of these facilities and location). Currently the Multi-Sector General Permit published in the Federal Register on 30 October 2000 (which replaced the 1995 permit) will expire in 2005. A Notice of Intent must be submitted by the permittees to maintain coverage for the next permit cycle.
- *Phase II* – The NPDES Phase II General Permit program also requires NPDES permit coverage for stormwater discharges from small municipal separate storm sewer systems (MS4s) and

construction activity disturbing one acre or more of land in a mapped "urbanized area" defined and delineated by the US Bureau of Census in 2000 http://www.epa.gov/npdes/pubs/fact2-2.pdf. Large and medium MS4s were permitted during Phase I of the NPDES Stormwater Program. Under EPA's Phase II program the definition of "municipal" includes Massachusetts communities, U.S. military installations, state or federal owned facilities such as hospitals, prison complexes, state colleges or universities and state highways. An MS4 is a system that: discharges at one or more point sources; is a separate storm sewer system (not designed to carry combined stormwater and sanitary waste water); is operated by a public body; discharges to the Waters of the United States or to another MS4; and, is located in an "*Urbanized Area*". The NPDES Phase II General Permit requires operators of regulated MS4s to develop and implement a stormwater management program that prevents harmful pollutants from being washed or dumped directly into the storm sewer system, which is subsequently discharged into local waterbodies. Certain Massachusetts communities were automatically designated (either in full or part) by the Phase II Rule based on the urbanized area delineations from the 2000 U.S. Census.

Figure 7. Urbanized Areas in the Taunton River Watershed



As a result of the census mapping, all 40 communities in the Taunton River Watershed were located either totally or partially in the regulated Urbanized Area: Abington, Attleboro, Avon, Berkley, Bridgewater, Brockton, Carver, Dighton, East Bridgewater, Easton, Fall River, Foxborough, Freetown, Halifax, Hanson, Holbrook, Kingston, Lakeville, Mansfield, Middleborough, New Bedford, North Attleborough, Norton, Pembroke, Plainville, Plymouth, Raynham, Rehoboth, Rockland, Sharon, Somerset, Stoughton, Swansea, Taunton, Walpole, West Bridgewater, Weymouth, Whitman and Wrentham (Figure 7). The Town of Plympton was granted a waiver from the program by US EPA. The communities applied to EPA and MassDEP for coverage under the Phase II stormwater general permit, issued on 1 May 2003. Municipalities that are totally regulated must implement the requirements of the Phase II permit in the entire town, while communities that are partially regulated need to comply with the Phase II permit only in the mapped Urbanized Areas (see http://www.epa.gov/region01/npdes/stormwater/ma.html for detailed maps for each community and copies of the Notices of Intent). Stormwater general permits were issued jointly by EPA and MassDEP after administrative review by EPA. A thorough review of the communities' stormwater management program will be completed by EPA in coordination with MassDEP during the five year permit term. Annual reports will be submitted to EPA and MassDEP by the permittees on May 1st in years 2004 through 2008 (inclusive). Phase II stormwater general permits will expire on 1 May 2008 (Domizio 2004).

NPDES Toxicity Testing Discharge Monitoring Reports (DMRs)

Sixteen of the permittees in the Taunton River Watershed have submitted toxicity testing reports to EPA and MassDEP as required by their NPDES permit. Data from these toxicity reports are maintained by DWM in a database entitled "Toxicity Testing Data – TOXTD". Information from these reports includes; survival of test organisms exposed to ambient river water (used for dilution water), physicochemical analysis (e.g., hardness alkalinity, pH, total suspended solids) of dilution water, and the whole effluent toxicity test results. Data reported by the facilities were reviewed and summarized for use in the assessment of current water quality conditions in the Taunton River Watershed. These include:

Avon Custom Mixing Services, Inc. (MA0026883) August 2004

Bridgewater Wastewater Treatment Facility (MA0100641) October 1998 to August 2004

Brockton Advanced Water Reclamation Facility (MA0101010) November 1999 to August 2004
C. A. Richardson, Inc. (MA0001805) March 1995 to February 2000
Foxborough Company (Highland Plant) (MA0004103) March 1997 to March 1999
Howard School Wastewater Facility (MA0101753) November 2004
Mansfield Water Pollution Abatement Facility (MA0101702) December 2000 to August 2004
MCI Bridgewater Water Pollution Control Facility (MA0102237) January 1999 to July 2004
Middleborough Wastewater Treatment Plant (MA0101591) October 2000 to August 2004
Oak Point Retirement Community, Middleborough (MA0032433) July 1999 to July 2004
Rose L. MacDonald School Wastewater Facility (MA0102061) November 2004
Somerset Power LLC and Somerset Operations, Inc., (MA0001856) April 1995 to April 2004
Somerset Water Pollution Control Facility (MA0100676) July 1999 to August 2004
Taunton Wastewater Treatment Plant (MA0100897) October 1996 to August 2004
Texas Instruments, Inc. (MA0001791) October 1996 to October 1999
Tweave, Inc. (MA0005355) September 2000 to August 2004

A list of registered and permitted Water Management Act (WMA) withdrawals (both public water suppliers and other industrial users) is provided in Appendix G, Table G5 (LeVangie 2002). Registration and permit files (both public water suppliers and other industrial users) were reviewed to determine where stream segments might be affected by water withdrawal activities. The information is summarized in the segments where the withdrawals occur.

In addition to state and federal agencies, regional and local groups provide information for the watershed management process which may be used to indicate areas of both high and degraded water quality, and causes and sources of contamination. The Taunton River Watershed Alliance (TRWA) is a non-profit alliance of concerned individuals, businesses, and organizations dedicated to protecting and restoring the Taunton River Watershed – its tributaries, wetlands, floodplains, river corridors and wildlife. TRWA conducts water quality monitoring at sites along the Taunton River and its tributaries with volunteers playing a critical role in water quality sampling. In 1998 USFilter entered into a twenty-year contract with the City of Taunton to operate and maintain their wastewater treatment plant and manage and administer a pollution prevention program which includes collaborating with the TRWA for their volunteer monitoring program (Domingos 2003b). This work has led to the correction of pollution problems on the Taunton River and its tributaries. Monitoring data are also forwarded to the City of Taunton Department of Public Works and have been critical in pinpointing areas where sewage outbreaks have occurred. EPA and MassDEP reviewed a draft Quality Assurance Project Plan (QAPP) for TRWA generated data in 2001. However, a final QAPP has not been approved and their data are not quality-assured. For the purpose of this report data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources. Where TRWA identified water quality problems not otherwise documented by quality-assured data the issue was identified with an Alert Status in this report.

Since 1999 Dr. Kevin Curry of the Bridgewater State College Watershed Access Lab (WAL) has been monitoring significant tributaries to the upper Taunton River (Matfield, Town, Raven and Nemasket Rivers) to determine both their water quality and contribution of nutrients to the Taunton River. In 2004 the Taunton River Wild and Scenic Study Committee contributed funding in order to expand the study to additional tributaries (Cotley, Mill and Threemile Rivers) in the upper watershed on a rotating schedule each month from June through September. For the purpose of this report data reported by WAL were reviewed for consistency with other quality-assured data sources. Where WAL identified water quality problems not otherwise documented by quality-assured data the issue was identified with an Alert Status in this report.

On October 2, 1968 the Wild and Scenic Rivers Act was signed into law. The Act established a process for building a legacy of protected rivers. Only 2.5% of all rivers in the United States have been identified as potential candidates for a Wild and Scenic designation. Of those only a tiny fraction have even received official consideration through a congressionally authorized study. The Upper Taunton River in Southeastern Massachusetts is one of these rivers (Taunton 2003). The Wild & Scenic study process typically requires three years from launch to completion. The National Parks Service and the Department of the Interior administered the Taunton River Study Bill which was signed by President Clinton in October of 2000. From the outset of the study period, the National Park Service staff work closely with

representatives of local and state governments, river conservation groups, regional planning agencies and other concerned citizens, brought together to form an advisory committee. Together, this study team guides the process, determining whether the river meets the criteria for designation. More importantly, they develop a conservation plan to protect the river's free-flowing character and significant resources. The plan relies on state and local land use requirements and nonfederal land acquisition to achieve river conservation goals. A Wild and Scenic designation blocks construction of any new federal dams or water resource projects that would harm the free-flow of the river or any of the values for which it was designated (Taunton 2003).

The Department of Fish and Game's Adopt-A-Stream program working with the Wild and Scenic staff and local partners, started six Stream Teams in the Taunton River Watershed. Five stream teams are on tributary streams (Forge River in Raynham, Matfield River in West Bridgewater, Nemasket River in Middleborough, Winnetuxet River in Halifax and Town River in Bridgewater) and one is on the mainstem of the river in Somerset. The Stream Teams were organized by Wild and Scenic staff and were led by local steering committees. Each Stream Team conducted a Shoreline Survey of their areas. The Adopt-A-Stream program provided training and technical assistance to each group and facilitation for the development of each group's action plan and report. Information from the shoreline survey reports on the Nemasket, Forge, and Winnetuxet Rivers are included in this report (MA DFG 2004).

The Taunton River Stewardship Program, established in 1996 to promote the preservation of the upper Taunton River corridor and its major tributaries as an intact resource, has been instrumental in helping to facilitate land protection efforts along the corridor over the past six years. Thanks to the combined efforts of the Stewardship Program's partners, including the Towns of Bridgewater, Halifax, Middleborough, and Raynham, the City of Taunton, the Massachusetts Division of Fisheries and Wildlife, The Wildlands Trust of Southeastern Massachusetts, the Natural Resources Trust of Bridgewater, SRPEDD, and other contributors (notably the Massachusetts Department of Environmental Management), 695 acres have been protected in the towns of Bridgewater, Halifax, Middleborough, and Raynham. The Upper Taunton River Greenway, the focus of the Wild and Scenic Study, stretches for 22-1/2 miles from the confluence of the Town and the Matfield Rivers in Bridgewater to where the Forge River meets the Taunton River near the Taunton/Raynham town lines (Taunton 2003).

The ESS Group, Inc. produced a report, *Matfield and Salisbury Plain River Watersheds Nonpoint Source Pollution Assessment Report and Management Plan*, at the request of local, state, regional, and federal stakeholders participating in the ongoing watershed planning process. The project was funded under the Massachusetts Watershed Initiative (MWI), a former program of the Massachusetts Executive Office of Environmental Affairs (EOEA) and was administered through MassDEP (ESS 2003). The project was designed to identify significant and potential sources of Nonpoint Source Pollution (NPS), prioritize these sources and design a management plan with recommendations for specific actions to protect and improve water quality and enhance recreational opportunities. The project study area included some or all of the following eight municipalities: Abington, Avon, Brockton, Bridgewater, East Bridgewater, West Bridgewater, Holbrook and Whitman.

Additionally, MassDEP provides funding for various grant and loan programs that provide valuable information that may be used in the water quality assessment report. A summary of these projects for the Taunton River Watershed is provided in Appendix I.

MASSACHUSETTS YEAR 2002 INTEGRATED LIST OF WATERS

Section 305(b) of the CWA defines the process whereby states monitor and assess the quality of their surface and groundwater and report on the status of those waters every two years. Section 303(d) of the CWA requires states to periodically identify and list those waterbodies for which existing controls on point and nonpoint sources of pollutants are not stringent enough to attain or maintain compliance with applicable surface water quality standards. Through the year 2000 the MassDEP fulfilled the 305(b) and 303(d) reporting requirements in two completely separate documents. In 2001 the EPA released guidance that provided states with the option of preparing a single Integrated List of Waters to be submitted in 2002 that would meet the reporting requirements of both Sections 305(b) and 303(d) of the CWA.

The Massachusetts Year 2002 Integrated List of Waters was published by the MassDEP in September 2003 (MassDEP 2003). In that report each waterbody segment was placed in one of five major categories. Category 1 included those waters that were meeting all designated uses. No Massachusetts waters were listed in Category 1 because a state-wide health advisory pertaining to the consumption of fish precludes any waters from being in full support of the fish consumption use. Waters listed in Category 2 were found to support some of the uses for which they were assessed but other uses were not assessed. Category 3 contained those waters for which insufficient or no information was available to assess any uses.

Waters exhibiting impairment for one or more uses were placed in either Category 4 (impaired but not requiring TMDLs) or Category 5 (impaired and requiring one or more TMDLs) according to the EPA guidance. Category 4 was further divided into three sub-categories – 4A, 4B and 4C – depending upon the reason that TMDLs were not needed. Category 4A included waters for which the required TMDL(s) had already been completed and approved by the EPA. However, since segments could only appear in one category waters that had an approved TMDL for some pollutants, but not others, remained in Category 5. Category 4B was to include waters for which other pollution control requirements were reasonably expected to result in the attainment of the designated use before the next listing cycle (i.e., 2004). Because of the uncertainty related to making predictions about conditions in the future the MassDEP made a decision not to utilize Category 4B in the 2002 Integrated List. Finally, waters impaired by factors, such as flow modification or habitat alteration, that are not subjected to TMDL calculations because the impairment is not related to one or more pollutants were included in Category 4C.

TOTAL MAXIMUM DAILY LOADS (TMDLs)

While the EPA's guidance for the preparation of the Integrated List provides an overall framework for a five-part list of waters, the development, submittal, and review of Category 5 is subject to the prevailing regulation governing the implementation of Section 303(d) of the CWA and, so, this category was approved as the Massachusetts 2002 303(d) List by the EPA on October 1, 2003. States must develop TMDLs for each of the waterbodies in Category 5 and establish pollution control strategies to restore these waters to meet water quality standards. A TMDL is the greatest amount of a pollutant that a waterbody can accept and still meet water quality standards. Further information on the 303(d) List and the TMDL Program is available on the MassDEP website at: http://www.mass.gov/dep/brp/wm/tmdls.htm. Table 2 identifies those waterbodies in the Taunton River Watershed that were included on this list.

Table 2. Massachusetts Year 2002 Integrated List of Waters – Category 5 "Waters Requiring a TMDL" in the Taunton River Watershed (MassDEP 2003).

River or Estuary (Description)	Waterbody Identification Code (WBID)	Cause of Impairment
Assonet River (From Tisdale Dam north of Route 79/Elm Street intersection, Freetown to the confluence with the Taunton River, Freetown)	MA62-20	Pathogens
Matfield River (Confluence of Beaver Brook and Salisbury Plain River, East Bridgewater to confluence with Town River and Taunton River, Bridgewater)	MA62-32	Pathogens
Rumford River (Outlet Gavins Pond, to confluence with Wading and Threemile Rivers, Norton)	MA62-15	Pesticides, organic enrichment/low DO, pathogens
Salisbury Brook (Outlet Cross Pond to confluence with Trout Brook, Brockton)	MA62-08	Siltation, pathogens
Salisbury Plain River (Confluence of Trout Brook and Salisbury Brook, Brockton to Brockton WWTP)	MA62-05	Siltation, other habitat alterations, pathogens, suspended solids
Salisbury Plain River (Brockton WWTP, Brockton to confluence with Beaver Brook and Matfield River, East Bridgewater)	MA62-06	Cause unknown, pathogens
Taunton River (Route 24 Bridge, Taunton to Berkley Bridge, Dighton/Berkley)	MA62-02	Pathogens
Taunton River (Berkley Bridge to Fall River/Freetown/Somerset boundary)	MA62-03	Organic enrichment/low DO, pathogens
Taunton River (Fall River/Freetown/Somerset boundary to mouth at Braga Bridge, Somerset/Fall River)	MA62-04	Organic enrichment/low DO, pathogens

Threemile River (Confluence of Wading and Rumford Rivers, Norton to confluence with Taunton River, Dighton)	MA62-16	Pathogens
Trout Brook (Source northeast of Argyle Avenue and west of Conrail Line, Avon to the confluence with the Salisbury Plain River, Brockton)	MA62-07	Siltation, organic enrichment/low DO, pathogens
Wading River (Source in wetland, north of West Street, Foxborough to confluence with Rumford River, Norton)	MA62-17	Cause unknown, organic enrichment/low DO, pathogens

Table 2 (cont). Massachusetts Year 2002 Integrated List of Waters – Category 5 "Waters Requiring a TMDL" (MassDEP 2003).

Lake, Location	Waterbody Identification Code (WBID)	Cause of Impairment
Ames Long Pond, Stoughton/Easton	MA62001	Noxious aquatic plants, turbidity, exotic species
Big Bearhole Pond, Taunton	MA62011	Organic enrichment/low DO, noxious aquatic plants, exotic species
Cabot Pond, Mansfield	MA62029	Pesticides
Cain Pond, Taunton	MA62030	Organic enrichment/low DO, turbidity
Cocasset Lake, Foxborough	MA62043	Turbidity
Fulton Pond, Mansfield	MA62075	Pesticides
Hobart Pond, Whitman	MA62090	Turbidity, exotic species
Hodges Pond (Kingman Pond), Mansfield	MA62091	Pesticides
Island Grove Pond, Abington	MA62094	Noxious aquatic plants, turbidity, exotic species
Monponsett Pond, Halifax/Hanson	MA62119	Turbidity, exotic species
Monponsett Pond, Halifax	MA62218	Metals
Muddy Cove Brook Pond, Dighton	MA62124	Noxious aquatic plants, turbidity
Norton Reservoir, Norton/Mansfield	MA62134	Pesticides, nutrients, noxious aquatic plants, turbidity, exotic species
Segreganset River Ponds, Taunton	MA62169	Noxious aquatic plants, turbidity
Somerset Reservoir, Somerset	MA62174	Metals
Stetson Pond, Pembroke	MA62182	Nutrients, organic enrichment/low DO, exotic species
Watson Pond, Taunton	MA62205	Nutrients, organic enrichment/low DO, exotic species, turbidity, noxious aquatic plants
Woods Pond, Middleborough	MA62220	Turbidity, exotic species

RIVERS AND ESTUARIES

MassDEP is required to produce a TMDL for various causes of impairment including pesticides, siltation, suspended solids, and organic enrichment/low DO. This work has not been specifically scheduled yet. Pathogens are also listed as a cause of impairment but the statewide TMDL being developed by the EPA for pathogens may be applied to those waterbodies. Additional data will need to be collected to determine whether or not those segments are impaired because of organic enrichment/low DO result from natural conditions prior to pursuing the need for a TMDL. For those segments impaired by siltation and/or suspended solids, TMDLs will be developed subsequent to establishing scientifically based target goals (Isaac 2005).

The Southeastern Regional Planning and Economic Development District (SRPEDD), in collaboration with the University of Massachusetts' School of Marine Science and Technology (SMAST), is conducting a water quality monitoring program in Mt. Hope Bay and Taunton River sub-watersheds consistent with the Massachusetts Estuaries Project (MEP) water quality data requirements (Appendix I). Data from this sampling effort will be used to develop a Total Maximum Daily Nitrogen Load for Mt. Hope Bay. Sampling stations will include locations around Mt. Hope Bay and locations on several tributaries (Taunton River, Three mile River, Segreganset River, Assonet River, and Quequechan River) flowing into Mt. Hope Bay. Gauging stations are established on these tributaries and flow data collected monthly for one year to construct rating curves. Water quality samples are collected weekly at each gauging station and analyzed for: total nitrogen

(nitrate + nitrite nitrogen, ammonia nitrogen, dissolved organic nitrogen, particulate organic nitrogen), total phosphorus, orthophosphate, particulate carbon and nitrogen and TSS (in 2005).

LAKES

Of the 18 lakes listed as impaired, 13 are impaired by nutrient-related impairments (i.e., noxious aquatic plant, turbidity, nutrients, and/or organic enrichment/low DO). A nutrient TMDL will be developed for these lakes. Since four of these lakes (Monponsett ponds east and west basins, Stetson Pond, and Woods Pond) are downstream from cranberry bogs, the TMDLs for them will be based in part on the results of a University of Massachusetts Cranberry Experiment Station S 319 study of phosphorus export from cranberry bogs which should be completed in June 2005 (Appendix I, Project 01-12/319). The TMDLs for these ponds will be developed after June 2005 as time permits (Mattson 2005).

There are two lakes, East Monponsett Pond (Halifax) and Somerset Reservoir (Somerset) in the Taunton River Watershed for which MA DPH has issued site-specific fish consumption advisories due to elevated levels of mercury.

Additionally, MA DPH has issued site-specific fish consumption advisories for the Rumford River downstream from Glue Factory Pond Dam and for four lakes (Fulton, Kingman, & Cabot ponds; Norton Reservoir) because of dioxins and pesticides (MA DPH 2004). The Rumford River and Cabot, Fulton, and Hodges ponds and the Norton Reservoir are all in Category 5 because of "pesticide" impairment. These waterbodies all have a MA DPH advisory to eat no fish for the portion of the Rumford River between Glue Factory Pond dam in Foxborough and Norton Reservoir in Mansfield (including Fulton, Kingman and Cabot ponds). The MA DPH advisory was issued due to elevated dioxin and pesticides levels in fish tissue as a result of contamination from the Hatheway and Patterson Company (HPC) site, a former wood preserving facility, which ceased operation in 1993. Additional information is needed to complete a Remedial Investigation for this site.

OBJECTIVES

This report summarizes information generated in the Taunton River Watershed through *Year 1* (information gathering in 2000) and *Year 2* (environmental monitoring in 2001) activities established in the "Five-Year Cycle" of the Watershed Initiative. Data collected by DWM are provided in Appendices A and B of this report. Together with other sources of information (identified in each segment assessment) these data were used to assess the status of water quality conditions of rivers, estuaries and lakes in the Taunton River Watershed in accordance with EPA's and MassDEP's use assessment methods. Not all waters in the Taunton River Watershed are included in the MassDEP/EPA WBS database or this report.

The objectives of this water quality assessment report are to:

1. evaluate whether or not surface waters in the Taunton River Watershed, defined as segments in the WBS database, currently support their designated uses (i.e., meet surface water quality standards);
2. identify water withdrawals (habitat quality/water quantity) and/or major point (wastewater discharges) and nonpoint (land-use practices, stormwater discharges, etc.) sources of pollution that may impair water quality conditions;
3. identify the presence or absence of any non-native macrophytes in lakes;
4. identify waters (or segments) of concern that require additional data to fully assess water quality conditions;
5. recommend additional monitoring needs and/or remediation actions in order to better determine the level of impairment or to improve/restore water quality; and
6. provide information for use in development of a watershed action plan for the Taunton River Watershed.

REPORT FORMAT

RIVER, MARINE AND LAKE SEGMENTS

The river and marine segments assessed in the Taunton River Watershed are presented within their respective subwatershed section (mainstem Taunton River, Other Tributaries, Matfield River, Town River, Mill River, Threemile River, Nemasket River and Assonet River subwatersheds) and are formatted as shown in the text box below. The assessed lakes, identified with their WBID code numbers, are listed alphabetically in the Lake Assessment section of this report.

Segment identification

Name, waterbody identification number (WBID), location, size, and classification.

Sources of information: coding system (waterbody identification number, e.g., MA62-01, used by MA DEP to reference the segments in databases such as 305(b) and 303(d), the Massachusetts SWQS (MA DEP 1996), and other descriptive information.

Segment description

Major land-use estimates (the top three uses for the recharge area and % impervious cover) and other descriptive information.

Sources of information: descriptive information from USGS topographical maps, base geographic data from MassGIS, land use statistics from a geographic information system (GIS) analysis using the MassGIS land use coverage developed at a scale of 1:25,000 and based on aerial photographs taken in 1999 (UMass Amherst 1999).

Cranberry Bog Cultivation:

For the purpose of this report water use for cranberry cultivation within the recharge area has been estimated by using a volume of 10 acre-feet of water per acre of bog per year (1 acre-foot = 325,900 gallons). The acreage of cranberry bog within the recharge area has been estimated by using the Cranberry Bog category of the MassGIS Land-Use data layer. The figure of 10 acre-feet of water per acre of bog per year is based on a study conducted by the Cape Cod Cranberry Growers Association for the Massachusetts Water Management Act Program. It should be noted that this figure is used for "old style" bogs, those bogs that do not employ best management practices (BMPs) for conserving water. Most bogs constructed today, and many renovated older bogs, use BMPs, such as laser leveling, on-site reservoirs, tailwater recovery, etc., which result in reduced water usage (between 5 and 6 acre-feet of water per acre of bog per year). Therefore, the estimate of water usage within the subwatershed for cranberry cultivation is a conservative number (O'Shea 2002).

Subwatershed and/or Segment locator maps

Subwatershed map, major river location(s), segment origin and termination points, and segment drainage area (gray shaded).

Sources of information: MassGIS data layers (stream segments and quadrangle maps from MassGIS 2002).

Water withdrawals and wastewater discharge permit information

Water withdrawal and NPDES wastewater discharge summaries.

Sources of information: WMA Database Printout (LeVangie 2002) and open permit files located in the MA DEP Offices in Boston, Lakeville, and Worcester (MA DEP 2005).

Use assessment

Aquatic Life, Fish Consumption, Shellfishing, Primary Contact Recreation, Secondary Contact Recreations, and Aesthetics.

Sources of information include: MA DEP DWM 2001 survey data (Appendices A, C, D, F, and H) and MA DEP DWM Toxicity Testing Database (TOXTD). The MA DPH Freshwater Fish Consumption Advisory Lists (MA DPH 2001 and MA DPH 2004) were used to assess the *Fish Consumption Use*. The DMF shellfish status was used to assess the *Shellfishing Use* (Sawyer 2003). Where other sources of information were used to assess designated uses, citations are included.

[Note: Although the *Drinking Water Use* itself was not assessed in this water quality assessment report, the Class A waters were identified.]

Summary

Use summary table (uses, status, causes and sources of impairment).

Recommendations

Additional monitoring and implementation needs.

MAINSTEM TAUNTON RIVER

The Taunton River is formed by the confluence of the Matfield and Town rivers in Bridgewater and follows an approximately 40-mile course to Mount Hope Bay. The Mainstem Taunton River flows through the communities of Bridgewater, Raynham, Taunton, Dighton, Berkley, Fall River, Freetown and Somerset and includes the following four segments (Figure 8):

Taunton River (Segment MA62-01)
Taunton River (Segment MA62-02)
Taunton River (Segment MA62-03)
Taunton River (Segment MA62-04)

Land along the Mainstem Taunton River is mostly undeveloped with approximately 50% of the land in forest and 25% in residential use. The impervious cover is all less than 10% indicating that there is a low potential for adverse water quality impacts from impervious surface water runoff. Because the watershed topography is flat to low hilly, the Taunton River has one of the flattest courses in Massachusetts. Streamflow fluctuates slowly due to the low gradient, extensive wetland areas and underlying stratified drift. There are only a few short sections of rapids along the river. The absence of dams make it an important anadromous fish run by allowing fish species to reach their native spawning grounds (Nemasket River Stream Team 2003).

The Taunton River Stewardship Program, established in 1996 to promote the preservation of the upper Taunton River corridor and its major tributaries as an intact resource, has been instrumental in helping to facilitate land protection efforts along the corridor over the past six years. Thanks to the combined efforts of the Stewardship Program's partners, including the Towns of Bridgewater, Halifax, Middleborough, and Raynham, the City of Taunton, the Massachusetts Division of Fisheries and Wildlife, The Wildlands Trust of Southeastern Massachusetts, the Natural Resources Trust of Bridgewater, SRPEDD, and other contributors (notably the Massachusetts Department of Environmental Management), 695 acres have been protected in the towns of Bridgewater, Halifax, Middleborough, and Raynham.

The Taunton River has been proposed for a Wild and Scenic designation under the National Parks Service and the Department of the Interior. A study team comprised of representatives from local and state governments, river conservation groups, regional planning agencies and other concerned citizens has been formed. Through this process a conservation plan to protect the river's free-flowing character and significant resources will be developed.

Segment MA62-01 of the Taunton River is classified in the Surface Water Quality Standards as a Class B, Warm Water Fishery. The lower downstream portions are classified as Class SB and are identified as impacted by the discharge of CSOs. All three downstream segments of the Taunton River have been placed on the Massachusetts Year 2002 Integrated List of Waters – Category 5 as not meeting Water Quality Standards for pollutants such as pathogens and organic enrichment/low dissolved oxygen. The DMF Shellfish Status Report of 2003 indicates that shellfish harvesting is prohibited in all growing areas within these downstream segments of the Taunton River.

Three facilities have WMA permits with authorized surface and groundwater withdrawals totaling 3.27 million gallons per day (MGD). Of these three facilities, the largest withdrawal at 3.03 MGD is for the municipal public water source. The USGS has noted that flow in the upper segment of the Taunton River is affected by diversions to and from the basin for municipal water supplies.

The Taunton River receives discharges from six facilities permitted through the NPDES program, which include four municipal major, one industrial major and two minor NPDES permits. Both the Taunton Wastewater Treatment Plant and the City of Fall River are authorized to discharge stormwater/wastewater from combined sewer outfalls. Both facilities have taken steps to address pollution from the combined sewer outfalls. The Taunton WWTP completed upgrades to its system in 2001/2002 and the City of Fall River has developed a three-phase program under a management plan to deal with combined sewer overflows. Additionally, there are numerous Multi-sector General Stormwater Permits for facilities in the communities of Bridgewater, Raynham, Dighton, Berkley, Somerset, Taunton

and Fall River. These communities and the Town of Freetown are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

Water quality data were collected at three sites on the Taunton River during the ENSR International study. As part of the NAWQA Program the USGS also conducted monthly water quality sampling at one site. Additionally, the TRWA conducts water quality sampling at three sites and the Bridgewater State WAL does water quality monitoring at one site. Results indicated elevated phosphorus concentrations, somewhat low dissolved oxygen and % saturation levels and elevated levels of bacteria.

To summarize the detailed assessments that follow this section, the *Aquatic Life Use* is assessed as support in Segments MA62-01 and MA62-02 and as impaired in Segment MA 62-04 due to a reduced abundance and diversity of fish. The Shellfish Harvesting Use is assessed as impaired in all three downstream segments due to elevated bacteria counts. None of the other uses (Primary Contact and Secondary Contact Recreation and Aesthetics) have enough information to make assessments so they are not assessed.

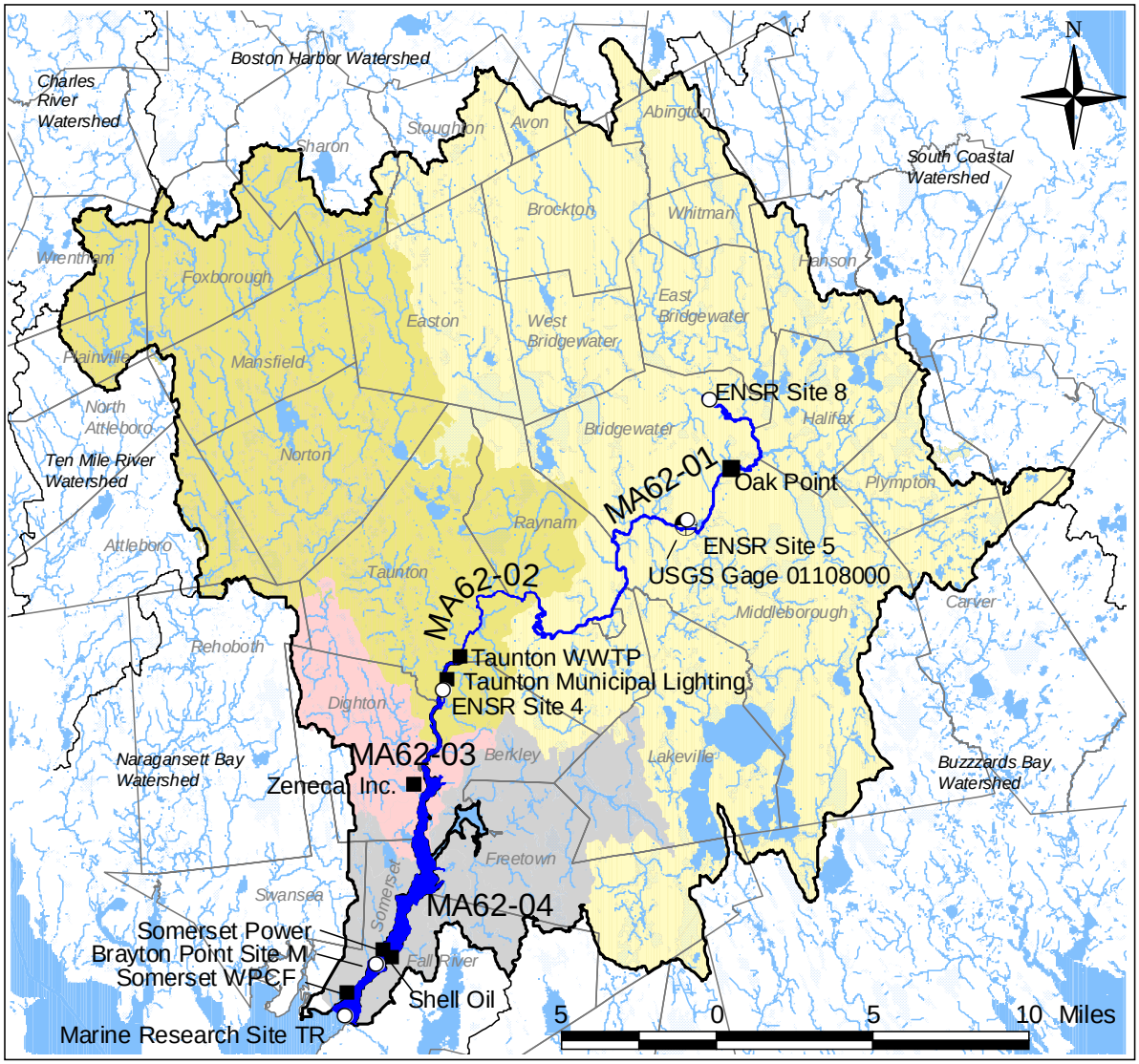


Figure 8. Taunton River Watershed

TAUNTON RIVER (SEGMENT MA62-01)

Location: Confluence of Town and Matfield rivers, Bridgewater to Route 24 bridge, Taunton/Raynham.
Segment Length: 20.4 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 302.3 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....48.2%
Open land 9.0%
Residential 22.1%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

There is one site awaiting a NPL decision located in this subwatershed. The site description was excerpted from the EPA website (EPA 2005b).

> The Middleborough Rockland Inc. property was operated by Rockland as a dye manufacturing facility from 1966 to 1982. The facility manufactured "dye assist" products for the textile industry. Allegedly, wastes from manufacturing processes were disposed of within a former lagoon, former filter beds, the septic system, and floor drains in one of the buildings. Analytical results of groundwater samples collected from the property in 1989 indicated the presence of 12 volatile organic compounds (VOCs). In 1993 drinking water samples were taken from a nearby private well and no VOCs were detected, therefore no impacts to nearby groundwater drinking supplies are known or suspected. Stormwater runoff from the property flows west to the on-site wetlands, and eventually towards the Purchade Brook and the Taunton River. In 1968 an investigation of wastewater discharged from the property determined that the Purchade Brook had a pH of 3.2, and sediment samples taken from the brook indicated the presence of two semivolatile organic compounds and two polycyclic aromatic hydrocarbons. Based on this investigation the impact is attributable to Rockland property. The Rockland property is classified by MassDEP as a Tier IA site and is currently in Phase II of the five-phase Massachusetts Contingency Plan.

MDFW has proposed that Basset, Puddingshear, Spring and Otis Pratt brooks, which are all tributaries to this segment of the Taunton River, be listed in the next revision of the SWQS as a cold water fisheries (Richards 2003b).

It should be noted that MDFW conducted fish population sampling with a backpack shocker at three additional tributaries to this segment in July – September 2002. Samples were collected from one station along Dean Brook, near Dean Street, Raynham (Station 727). A total of two fish, both red fin pickerel, were collected. Sampling was also conducted in Dam Lot Brook near Warren Street, Raynham (Station 731). A total of 17 fish, representing four species, were collected. American eel dominated the sample. Other species included chain pickerel, largemouth bass, and tessellated darter. Sampling of Snows Brook near Vernon Street, Bridgewater (Station 725) resulted in the collection of 17 fish, representing three species. The sample was dominated by tesselated darter (Richards 2003a).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 4,762 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 13.04 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Olde Scotland Links Golf Course, Town of Bridgewater	9P442504203	NA	01G	0.14 perm
Middleborough Water Supply*	9P42518201	42518203	4182000-09G	1.53 reg 1.50 perm Total – 3.03
Poquoy Brook Golf Course	NA	42514601	01S	0.10 reg

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

Oak Point Retirement Community (Oak Point) in Middleborough is authorized (MA0032433 in August 2004) to discharge, via outfall #001, 0.185 MGD (average monthly flow) of treated effluent to the Taunton River. This tertiary treatment facility incorporates rotating biological contactors to treat domestic wastewater and to perform nitrification for ammonia-nitrogen reduction (no limit in permit). Soda ash is added as an alkalinity supplement for nitrification. The highest concentration of NH_3-N in the effluent between July 1999 and July 2004 was 0.3 milligram per liter (mg/L) (TOXTD database). Total phosphorus (TP) reduction (1 mg/l TP average monthly April 1 to October 31) by design, will be accomplished by chemical addition using polyaluminum chloride (PAC). The pH of the effluent between July 1999 and July 2004 ranged from 6.6 to 7.2 SU (n=22) (TOXTD database). The facility utilizes ultraviolet light (UV) for annual disinfection (Hallisey 2005). The facility's recently issued permit requires whole effluent toxicity testing (lethal concentration to 50% of the test organisms (LC_{50}) ≥100% effluent limit) with a monitoring frequency of one time/year, using *Ceriodaphnia dubia* and *Pimephales promelas*, as opposed to quarterly testing requirements in the previous permit.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

The USGS maintains one gaging station (01108000) on the mainstem Taunton River near Titicut Road, Bridgewater. The gage has been in operation since 1926. The mean annual flow of the Taunton River at this gage (drainage area is 258 square miles) is 471 cubic feet per second (cfs) (Socolow *et al.* 2003). The USGS remarks for this gage note flow affected by diversions to and from the basin for municipal supplies and the flow is regulated by reservoirs. Prior to 1975 flow was also regulated by power plants upstream (Socolow *et al.* 2003).

Toxicity

Ambient

The Oak Point staff collected ambient water from the Taunton River adjacent to Auburn Street, Middleborough approximately 0.8 miles upstream from Outfall #001 for use as dilution water in their whole effluent toxicity tests (Hallisey 2005). Between July 1999 and July 2004 survival of *Ceriodaphnia dubia* and *Pimephales promelas* exposed (48 hours) to river water ranged from 75 to 100% (n=20).

Effluent

Between July 1999 and July 2004, acute whole effluent toxicity tests were conducted on the Oak Point effluent using *Ceriodaphnia dubia* (n=19 valid tests) and *Pimephales promelas* (n=20). The effluent did not exhibit any acute toxicity (LC_{50}'s were all >100% effluent).

Chemistry – water

As part of their site-specific copper criteria development study, ENSR conducted sampling at two stations in this segment of the Taunton River: at the upper end of this segment near Plymouth Street (Route 104), Bridgewater (Site 8) and off Titicut Street, Bridgewater (Site 5) (ENSR 2002).

The Oak Point staff collected ambient water from the Taunton River adjacent to Auburn Street, Middleborough approximately 0.8 miles upstream from Outfall #001 for use as dilution water in their whole effluent toxicity tests between July 1999 and July 2004. Data from the facility's whole effluent toxicity test reports are maintained in the TOXTD database by DWM.

The USGS has conducted water quality sampling in this segment of the Taunton River at their gaging station (01108000) near Titicut Street, Bridgewater. The data from 19 surveys collected from June 1998 through August 2002 are summarized below (Socolow *et al*. 1999, Socolow *et al*. 2000, Socolow *et al.* 2001, Socolow *et al.* 2002, and Socolow *et al*. 2003).

Sampling of the Taunton River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near Green Street Bridge, Middleborough/Bridgewater (Sampling Station TNT-158). Although a draft Quality Assurance Project Plan (QAPP) was reviewed by MassDEP in 2001, a final QAPP for the TRWA has not been approved so

their data are not quality-assured. For the purpose of this report data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources.

The Bridgewater State WAL conducts water quality sampling in the Taunton River at Titicut Street, Bridgewater (Curry 2005). Between June and September 2004 the Taunton River was sampled six times using a Hydrolab® minisonde to collect data on temperature, pH and DO through a 22-hour period. Additionally, WAL took nutrient samples (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen) every hour using a Sigma 900 automated sampler with samples for every other hour used for analysis. A QAPP for the WAL has not been approved by MassDEP so their data are not quality-assured. For the purpose of this report data reported by WAL for 2004 were reviewed for consistency with other quality-assured data sources.

The following is a summary of the sampling results for the above-mentioned datasets.

Dissolved Oxygen and % Saturation
The DO near Plymouth Street (Route 104), Bridgewater (Site 8) was not less than 6.2 mg/L or 72.1% saturation.
DO near Titicut Street, Bridgewater reported by USGS ranged from 4.3 to 12 mg/L and saturations between 48 and 98%. Two of the 19 DO measurements were less than 5.0 mg/L and three of the saturation values were less than 60%. ENSR (2002) reported DOs at Site 5 (Titicut Street) between 5.28 and 12.37 mg/L and saturations ranging from 62 to 96.7%. It should be noted that none of these measurements were taken pre-dawn.
TRWA results did not indicate any violations of the water quality standard for DO at the Green Street Bridge, Middleborough/Bridgewater (Station TNT-158).
During its hourly Hydrolab® sampling in 2004 WAL did not report any DO measurements <5.0 mg/L.

Temperature
The maximum temperature at Site 8 was 23.7°C
The maximum temperature near Titicut Street, Bridgewater reported by both ENSR and USGS was 24.5°C.
Temperatures reported by TRWA (Station TNT-158) were consistent with the above and did not exceed 25°C.
Hourly Hydrolab® temperature measurements by WAL did not exceed 28.3°C during its 2004 sampling.

pH and Alkalinity
The pH near Plymouth Street (Route 104), Bridgewater (Site 8) ranged between 6.4 and 7.1 SU. Only one measurement was <6.5 SU. Alkalinity measurements were 23 and 25 mg/L as $CaCO_3$.
The pH measurements from samples collected approximately 0.8 miles upstream from Outfall #001 between July 1999 and July 2004 ranged from 6.0 to 7.1 SU with six of the 22 measurements <6.5 SU. Alkalinity ranged from <10 to 48 mg/L (n=22) (TOXTD database).
At the USGS site instream pH ranged from 6.0 to 7.6 SU with 5 of the 19 measurements (26%) less than 6.5 SU.
The pH near Titicut Street, Bridgewater (Site 5) ranged between 6.5 and 7.4 SU.
The pH near the Green Street Bridge, Middleborough/Bridgewater (Station TNT-158) reported by TRWA was consistent with the upstream locations.
Hourly Hydrolab® measurements for pH taken by WAL also were within the ranges reported above with some readings at or below 6.5 SU.

Specific conductance
Specific conductance ranged from 250 to 447 µS/cm at Site 8.
Specific conductance from samples collected approximately 0.8 miles upstream from Outfall #001 between July 1999 and July 2004 ranged from 89 to 398 µmhos/cm (n=22) (TOXTD database).
Specific conductance reported by ENSR ranged from 183 to 315 µS/cm near Titicut Street (Site 5). USGS results ranged from 118 to 432 µS/cm.

Hardness
Hardness of the river reported by ENSR at Site 8 was 46 and 52 mg/L as $CaCO_3$.

Hardness from samples collected approximately 0.8 miles upstream from Outfall #001 between July 1999 and July 2004 ranged from 11 to 84 mg/l (n=22)(TOXTD database). Seven of the 22 measurements were <25 mg/L.
Hardness reported by USGS at their gage near Titicut Street ranged from 27 to 65 mg/L as $CaCO_3$ (n= 5).

Turbidity
Turbidity reported by ENSR ranged from 3.93 to 7.40 nephelometric turbidity units (NTU) at Site 8 and between 2.66 and 6.30 NTU at Site 5.

Ammonia-Nitrogen
Ammonia-nitrogen concentrations reported by ENSR at Site 8 were both <1.0 mg/L.
The ammonia-nitrogen values reported from samples collected in the Taunton River approximately 0.8 miles upstream from Outfall #001 between July 1999 and July 2004 ranged from <0.05 (nine measurements were reported as less than the method detection levels of either 0.05 or 0.1 mg/L) to 2.33 mg/L (n=22) (TOXTD database).
Detectable concentrations of ammonia-nitrogen reported by USGS ranged from 0.026 to 0.85 mg/L (n=18).

All of these measurements were below 2.63 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 7.6 SU and temperature of 26°C) (EPA 1999a).

Total phosphorus
Total phosphorus concentrations reported by USGS ranged from 0.101 to 0.28 mg/L (n=16).
Similar results were reported by TRWA near the Green Street Bridge, Middleborough/Bridgewater (Station TNT-158).
Values obtained by WAL for total phosphorous were also within this range.

Total Residual Chlorine (TRC)
TRC was <0.05 mg/L at Site 8 on both sampling dates.
TRC measurements from samples collected approximately 0.8 miles upstream from Outfall #001 between July 1999 and July 2004 were all <0.05 mg/L (n=22) (TOXTD database).

Copper
Between 15 March and 19 September 2001, dissolved copper concentrations reported by ENSR ranged from 2.5 to 4.00 μg/L at Site 8 and between 0.83 and 4.40 μg/L at Site 5 (n=5 measurements at each site) (ENSR 2002). The total dissolved copper concentrations near Titicut Street reported by USGS ranged from 1.4 to 3.3 μg/L (n=13). Only one of the five measurements reported by ENSR at each of their sampling sites and one of the 13 measurements reported by USGS exceeded the current EPA water quality criterion of 3 μg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

The *Aquatic Life Use* is assessed as support for this segment of the Taunton River based primarily on the good survival of test organisms exposed to the river water, the water quality data and best professional judgement. Although instream biological data (response type indicators of in-stream water quality conditions) were not available, occasionally low dissolved oxygen/saturation (not representing pre-dawn conditions) and elevated total phosphorus concentrations were documented and therefore, this use is identified with an Alert Status.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION
Fecal coliform and *E. coli* bacteria samples were collected by USGS at their gaging station (01108000) in Bridgewater, MA (Socolow *et al*. 1999, Socolow *et al*. 2000, Socolow *et al.* 2001, Socolow *et al.* 2002, and Socolow *et al*. 2003). The fecal coliform bacteria counts ranged from 29 to 5,900 cfu/100 mL (n=17). Of the 14 samples collected during the primary contact season, the geometric mean was 134 cfu/100 mL, however, two of the 14 samples (14%) exceeded 400 cfu/100 mL. The geometric mean for all of the fecal coliform bacteria samples collected (n=17) was 169 cfu/100 mL. Only one sample exceeded 2,000 cfu/100 mL.

TRWA reported similar fecal coliform bacteria results for the river at the Green Street Bridge, Middleborough/Bridgewater (sampling station TNT-158).

Given the length of this segment of the Taunton River, too limited data are available (poor spatial coverage) to assess the status of the *Primary* and *Secondary Contact Recreational* uses. The *Primary Contact Recreational Use* is identified with an Alert Status however, given the problems identified in the Matfield River just upstream from this segment.

Taunton River (MA62-01) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*"Alert Status" issues identified, see details in the use assessment section

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) adequate to evaluate the status of the *Aquatic Life Use* in this segment of the Taunton River bracketing potential sources of pollution (e.g., discharges, major tributaries, developments).

Conduct bacteria sampling with sufficient spatial coverage to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

NPDES permits should be updated with appropriate limits and monitoring requirements including consideration of site-specific copper criterion.

MDFW has proposed that Basset, Puddingshear, Spring and Otis Pratt brooks, which are all tributaries to this segment of the Taunton River, be protected as cold water fishery habitat. Additional monitoring of the fish population, dissolved oxygen, and temperature is needed to evaluate MDFW's proposal to list this stream as a cold water fishery in the next revision of the Surface Water Quality Standards.

The TRWA and WAL should continue to conduct water quality monitoring at their established sampling sites in this segment of the Taunton River to meet their sampling objectives. In order for the MassDEP to utilize the TRWA and WAL data for water quality assessment reporting purposes, the TRWA and WAL should work with MassDEP to meet its quality assurance/quality control requirements.

TAUNTON RIVER (SEGMENT MA62-02)

Location: Route 24 Bridge, Taunton/Raynham to Berkley Bridge, Dighton/Berkley.
Segment Size: 0.29 square miles
Classification: Class SB, Shellfishing (R), CSO

The drainage area of this segment is approximately 457.6 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....49.3%
Open land 8.4%
Residential 23.4%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 as not meeting water quality standards for pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLES G1, G2 AND G3)

There are 5,504 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 49.14 MGD. However, 4,762 acres of this cranberry acreage are located in the subwatershed for Segment MA62-01 upstream from this subwatershed.

Bay State Gas, a natural gas/propane distribution facility, was authorized under the NPDES General Permit to discharge non-contact cooling water into the Taunton River. This permit (No. MAG250040) was issued December 1, 2000 and this discharge was eliminated effective March 26, 2004.

The City of Taunton is authorized (NPDES permit MA0100897 issued in March 2001) to discharge from the Taunton Wastewater Treatment Plant (WWTP) via Outfall #001 an average monthly flow of 8.4 MGD of treated industrial and sanitary wastewater and stormwater to the Taunton River. This conventional activated sludge facility conducts seasonal nitrification for ammonia-nitrogen reduction (1 mg/l NH_3-N average monthly June 1 to September 30). The concentration of NH_3-N in the effluent between January 1996 and August 2004 ranged from <0.05 to 16.04 mg/L (n=36) (TOXTD database). The pH of the effluent between January 1996 and August 2004 ranged from 6.66 to 7.61 SU (n=36) with the exception of one test event (6.37 SU, April 1997) (TOXTD database). The facility utilizes sodium hypochlorite for disinfection and sodium bisulfite for dechlorination (TRC limit = 0.046 mg/L average monthly and 0.08 mg/L maximum daily) (Domingos 2005). The TRC values of the effluent between January 1996 and August 2004 were all <0.05 mg/L (n=36) (TOXTD database). The facility's whole effluent toxicity limits (both the September 1995 and March 2001 permits) are $LC_{50} \geq 100\%$ and C-NOEC $\geq$ 24% with a monitoring frequency of four times/year using *Ceriodaphnia dubia*. *Pimephales promelas* were also tested as part of the 1995 permit. During wet weather the permittee is also authorized to discharge stormwater/wastewater from combined sewer outfall #004 (West Water Street south of Fifth).

The Taunton Municipal Lighting Plant (TMLP) is a municipally owned 135 Mega Watt steam electric power generating facility. The TMLP Cleary-Flood Station has two generating units (8 and 9). Water is withdrawn directly from the Taunton River (approximately 38.1 MGD instantaneous maximum flow rate) at an intake structure adjacent to the main power generation building for use as cooling water. Unit 8, completed in 1966, employs a once-through cooling water system which can generate approximately 25MW. Typically, when in operation the unit is online for approximately 11 hours/generation event during peak demand periods (summer and winter). Unit 9, which began operation in 1975, is a combined cycle system, which can generate a total of 110 MW. Typically, when in operation the unit is online for approximately 13 hours/generation event during peak demand periods (summer and winter). NPDES permit# MA0002241 was issued to the facility in September 1994, however, in December 1994 the EPA reinstated the conditions of the April 1988 permit. The facility is authorized to discharge via the following outfalls (upstream to downstream):

Outfall #005 – Discharge of trash rack spray nozzles (64 nozzles with an instantaneous flow of 0.165 MGD) operated continuously during the fall and periodically through the rest of the year to keep leaves from accumulating on the trash racks to this segment of the Taunton River.
Outfall #004 – Discharge of approximately 0.013 MGD of traveling screen backwash water (only operated on days when plant is operated) to this segment of the Taunton River.
Outfall #003 –0.50 MGD maximum daily (0.35 MGD average monthly), of blowdown from Unit 9 cooling tower (83°F maximum daily) which is chlorinated daily (2 hours/day when operating) (TRC limit 0.1 mg/L) to this segment of the mainstem Taunton River.

Two additional outfalls are discharged into an unnamed tributary (see segment MA62-48) which runs adjacent to the Taunton River for approximately 2000' prior to flowing into this segment of the Taunton River.

As part of the NPDES permit renewal process, no intake or discharge effects to finfish populations in the Taunton River were projected to occur as a result of the operation of the TMLP (Earth Tech 2002). Therefore no 316(b) studies were required or conducted for this facility.

The Town of Dighton received funding in 2003 from the Clean Water SRF to identify areas of the community where existing on-site sewage disposal systems are inadequate for wastewater disposal and to develop recommendations for wastewater management to protect groundwater and surface waters including the Taunton River.

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Ambient

The Taunton WWTP staff collected water from the Taunton River at the Plain Street Bridge for use as dilution water in their facility's whole effluent toxicity tests (Domingos 2005). Between October 1996 and August 2004 (n=30 tests), survival of *Ceriodaphnia dubia* exposed (7 days) to river water ranged from 10 to 100%. Survival was $\geq$ 80% except for three test events (July 1997, July 1999 and February 2002 with survivals of 70, 10, and 70%, respectively) (TOXTD database). Between October 1996 and January 2001(n=16 tests), survival of *Pimephales promelas* exposed (7 days) to river water ranged from 57 to 97%. Survival was $\geq$ 77% in all but two test events (October 1997 and January 1998 with survivals of 70 and 57%, respectively) (TOXTD database).

Effluent

Between October 1996 and August 2004, a total of 29 valid whole effluent toxicity tests using *Ceriodaphnia dubia* were conducted on the Taunton WWTP effluent. The LC_{50} results were all >100% with the exception of three tests (July 1998, May 2001, May 2003 with LC_{50}'s of 34.6, 66, and 85.4%, respectively). The C-NOEC results ranged from 6.25 to 100% (n=29 valid tests). The C-NOEC results did not meet the limit of 24% in four of the 29 test events (TOXTD database), but all of the tests conducted since July 2000 have met the permit limit of 24%. Between October 1996 and January 2001, a total of 16 whole effluent toxicity tests were conducted using *Pimephales promelas*. The LC_{50} results were all > 100%. The C-NOEC results were all 100% except for one test event (<6.25% July 1997) (TOXTD database).

Chemistry – water

Sampling of the Taunton River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA at three locations in this segment of the Taunton River: near Longmeadow Road Bridge, Taunton (Station TNT-050); near Plain Street, Taunton (Station TNT-043); and near Center Street (Berkley Bridge), Berkley (station TNT-000). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. For the purpose of this report data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources.

The Taunton WWTP staff collected water from the Taunton River at the Plain Street Bridge for use as dilution water in the facility's whole effluent toxicity tests. Data from these reports, between January 1996 and August 2004, are maintained in the TOXTD database by DWM and are also summarized below.

As part of their site-specific copper criteria development study, ENSR conducted sampling (n=5) at one station in this segment of the Taunton River off Railroad Avenue, Taunton (Site 4 - upstream from the confluence with the Threemile River) (ENSR 2002).

Dissolved Oxygen and % Saturation
Measurements for DO at Site 4 ranged from 6.26 and 12.67 mg/L and saturations from 74.0 to 92.5%. All measurements met water quality standards (>5.0 mg/L and 60% saturation), however, it should be noted that measurements at Site 4 do not represent worst-case (pre-dawn) conditions. A similar range for DO was recorded at the TRWA sites with all measurements meeting the water quality standard.

Temperature
The maximum temperature recorded at Site 4 was 23.7°C. Temperature measurements taken at the TRWA sites did not exceed 26°C.

pH and Alkalinity
The pH of the Taunton River collected near the Plain Street Bridge between January 1996 and August 2004 ranged from 6.4 to 7.5 SU with 1 of the 36 measurements <6.5 SU. Alkalinity ranged from <10 to 46 mg/L (n=35) (TOXTD database).
Of the five measurements taken at Site 4, only one was slightly below 6.5 SU at 6.4 SU and the highest measurement was 7.8 SU.
Measurements taken at the TRWA sites indicated numerous readings below 6.5 SU.

Hardness
Hardness of the Taunton River, collected near the Plain Street Bridge between January 1996 and August 2004, ranged from 19 to 79 mg/L with seven of the 36 measurements $\leq$25 mg/L (TOXTD database).

Specific Conductance
The specific conductivity of the Taunton River collected near the Plain Street Bridge between January 1996 and August 2004, ranged from 117 to 469 µmho/cm (n=36) (TOXTD database).
At Site 4 the range for specific conductance was 206 to 335 µS/cm.

Turbidity
Turbidity at Site 4 ranged from 3.84 to 12.4 NTU.

Suspended solids
The suspended solids of the Taunton River, collected near the Plain Street Bridge between January 1996 and August 2004, ranged from <10 to 22 mg/L (n=36) (TOXTD database).
Measurements for suspended solids at the TRWA sites were generally lower than the above range.

TRC
TRC measurements (n=36) of the Taunton River, collected near the Plain Street Bridge between January 1996 and August 2004, were all <0.05 mg/L (TOXTD database).

Ammonia-nitrogen
The ammonia-nitrogen concentrations of the Taunton River, collected near the Plain Street Bridge between January 1996 and August 2004, ranged from <0.05 to 0.85 mg/L (n=36) (TOXTD database). All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999a).

Total Phosphorus
The TRWA reported high phosphorus levels at their sampling station near Plain Street, Taunton (Station TNT-043) in May 2002 (Domingos 2003a).

Copper
Between 15 March and 19 September 2001 dissolved copper concentrations reported by ENSR ranged from 0.23 to 5.70 µg/L (n=5) (ENSR 2002). Two of the measurements exceeded the current EPA water

quality criterion of 3 μg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

Although instream biological data (response type indicators of instream water quality conditions) were not available, the *Aquatic Life Use* is assessed as support for this segment of the Taunton River based primarily on the good survival of test organisms (particularly during the more recent testing), limited water quality data and best professional judgment.

SHELLFISH HARVESTING

The DMF Shellfish Status Report of 2003 indicates that area MHB2.2 is prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Taunton River because of elevated bacteria counts.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

Sampling of the Taunton River (bacteria) is conducted on a monthly basis by TRWA at three locations in this segment of the Taunton River: near Longmeadow Road Bridge, Taunton (Station TNT-050); near Plain Street, Taunton (Station TNT-043); and near Center Street (Berkley Bridge), Berkley (Station TNT-000). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured.

The TRWA reported high fecal coliform levels at their Plain Street, Taunton sampling station (TNT-043) in May 2002. The TRWA found that high coliform counts intermittently occurred at this station (Domingos 2003a).

The Taunton WWTP has a combined sewer outfall #004 (West Water Street south of Fifth), Taunton. Prior to upgrades completed in 2001/2002, the CSO activated on a regular basis. A summary of the overflow events over the last several years can be summarized as follows (Shepard 2005):

In 2000 there were 24 overflow events that discharged between 0.022 to 3.79 MG (no total).
In 2001 there were only four events -- total discharged 0.913 MG.
In 2002 there were no overflow events.
In 2003 there were two events – total discharge 3.59 MG (one event August 8/9 discharged 3.545 MG intermittently over 16 hour period).
In 2004 there was one event – total discharge of 0.073 MG.

The *Primary* and *Secondary Contact Recreational* uses are not assessed for this segment of the Taunton River due to a lack of quality-assured bacteria data but is identified with an alert status due to high levels of bacteria reported by TRWA sampling. Too limited data are available to assess the status of the *Aesthetics* use.

Taunton River (MA62-02) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Sources: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, CSO and septic systems)
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) adequate to evaluate the status of the *Aquatic Life Use* in this segment of the Taunton River bracketing potential sources of pollution.

Continue to evaluate NPDES facilities to determine compliance with permit limits and need for enforcement if deemed necessary.

The City of Taunton (NPDES MA0100897) should develop and implement a long-term control plan for their CSO.

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA should continue to conduct water quality monitoring at its established sampling site in this segment of the Taunton River to meet its sampling objectives. In order for the MassDEP to utilize the TRWA data for water quality assessment reporting purposes, the TRWA should work with MassDEP to meet its Quality Assurance/Quality Control requirements.

TAUNTON RIVER (SEGMENT MA62-03)

Location: Berkley Bridge, Dighton/Berkley to confluence with Assonet River at a line from Sandy Point, Somerset northeasterly to the southwestern tip of Assonet Neck, Berkley.
Segment Size: 0.92 square miles
Classification: Class SB, Shellfishing (R), CSO

The drainage area of this segment is approximately 480.1 square miles. Land-use estimates (top three) for the subwatershed:

Forest 50.1%
Residential 23.0%
Open land 8.3%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 as not meeting water quality criteria for organic enrichment/low DO and pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G4)

There are 5,505 acres of land which are classified in the land-use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 49.15 MGD. However, 5,504 acres of this cranberry acreage are located in the subwatershed for Segments MA62-01 and MA62-02 upstream from this subwatershed.

Zeneca, Inc. (formerly ICI Americas, Inc.) used to discharge to Muddy Cove Brook (NPDES MA0005291) but the discharge was moved to the Taunton River via Outfall 011A in 1992 (permit revision signed in June 1992). The facility was engaged in the manufacturing of textile dyestuffs and other organic chemicals. Manufacturing operations of the site ceased in 1995. Wastewater was generated as a result of facility decommissioning and RCRA Corrective Action (Zeneca 2000). This permit was terminated by EPA in November 2003. The facility is currently discharging stormwater under a multisector general stormwater permit (MAR05B053) via Outfall 011S to Muddy Cove Brook. The company needs to reapply for a new multisector general stormwater permit.

USE ASSESSMENT

SHELLFISH HARVESTING

The DMF Shellfish Status Report of 2003 indicates that all growing areas within this segment (MHB2.1 and MHB2.2) are prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Taunton River because of elevated bacteria counts.

Taunton River (MA62-03) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, CSO, septic systems and marina/boating pumpout releases)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct appropriate monitoring to evaluate the status of the *Aquatic Life Use* in this segment of the Taunton River.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

TAUNTON RIVER (SEGMENT MA62-04)

Location: Confluence with Assonet River at a line from Sandy Point, Somerset northeasterly to the southwestern tip of Assonet Neck, Berkley to mouth at Braga Bridge, Somerset/Fall River.
Segment Size: 2.65 square miles
Classification: Class SB, Shellfishing (R), CSO

The drainage area of this segment is approximately 528.9 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....51.0%
Residential.....22.7%
Open land.....8.2%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 as not meeting water quality criteria for organic enrichment/low DO and pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLES G1, G2, AND G3)

There are 5,917 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 52.83 MGD. However, 5,505 acres of this cranberry acreage are located in the subwatershed for segments MA62-01, MA62-02, and MA62-03 uptream from this subwatershed.

Somerset Power LLC and Somerset Operations, Inc. (Somerset Power) formerly Montaup Electric Company-Somerset Station, has the ownership of the originally issued permit (MA0001856 issued in September 1994) and transferred effective April 1998) to operate a 112 MW once-through cooling water coal-fired electric power generating station along this segment of the Taunton River. Water from the Taunton River is withdrawn via an intake channel and Somerset Power is authorized to discharge via the following outfalls to the Taunton River:

- Outfall #007 – Condenser cooling water from Unit 6 - 142 MGD average monthly, 200 MGD maximum daily, maximum temperature 100°F.
- Outfall #002 – Treated wastewater (boiler blowdown, seal water, bottom ash, sluicewater, floor drains, equipment drains, generation wastes, coal pile runoff, belt filter wash and filter backwash) - 0.126 MGD average monthly, 0.145 MGD maximum daily with $LC_{50} \geq 50\%$, monitored 2 times a year
- Outfall #002a – Treated wastewater (outfall 002 plus additional chemical cleaning waste) - 0.215 MGD average monthly, 0.270 MGD maximum daily.

Somerset Power is also authorized to discharge (via outfalls SD1-5, 006, and 013-017) stormwater runoff to the Taunton River. As part of this permit the facility must develop a Stormwater Pollution Prevention Plan. As the stormwater runoff outfalls are consolidated into three areas the permittee has requested that one representative outfall from each area be permitted for testing requirements (outfalls # SD1, 013, and 016). Numerous internal outfalls discharge a variety of wastewater substances from many different sources, which are treated at the on-site wastewater treatment plant. Some of the sources of wastewater that are treated on-site include: boiler blow down, seal water, bottom ash, floor drains, water softener, generated chemical cleaning and metal wastes, coal pile runoff, belt filter wash, and filter back wash. The facility is also authorized to discharge intake screen backwash water and fish sluice water to the Taunton River via outfalls # 020, 021, and 022.

The pH of the facility's Outfall #002 effluent between April 1995 and April 2004 ranged from 6.3 to 8.1 SU with only one measurement of the 18 (October 2000) <6.5 SU (TOXTD database). The TRC concentrations of the effluent between April 1995 and April 2004 ranged from <0.02 to 0.08 mg/L (n=17). The concentration of ammonia-nitrogen in the effluent ranged from <0.07 to 4.9 mg/L with the exception of one measurement (11.8 mg/L in April 2003) (n=18) (TOXTD database). The facility's acute whole effluent toxicity limits are $LC_{50} \geq 50\%$ with a monitoring frequency of two times/year using *Mysidopsis bahia* and *Menidia beryllina*.

An NPDES permit, originally issued to the Shell Oil Company for their bulk storage and distribution terminal, to discharge via Outfall 001 into this segment of the Taunton River (NPDES permit #MA0004871) was issued November 1978. Although a more recent permit has not been issued, several

permit reapplication packages were submitted and the original permit has been administratively continued. Currently the Fall River Marine Terminal LLC is submitting DMRs for this permit (Kaegael 2005). Former permit holders appear to include Shell Oil Company, Jay Cashman, Inc. and Shell Fall River Terminal. According to the permit reapplication submitted in 1994, groundwater remediation wastewater, stormwater, and contact water were being discharged to this segment of the Taunton River from this site. This is the site of a proposed Liquified Natural Gas (LNG) terminal.

The Town of Somerset is authorized to discharge (NPDES permit MA0100676 issued in May 2004) from the Town of Somerset WPCF an average monthly flow of 4.2 MGD of treated effluent to the Taunton River via Outfall #001. This conventional activated sludge secondary treatment facility treats municipal wastewater and has continued a nitrogen monitoring program (NH_3-N, TKN, NO_2-N, NO_3-N). The NH_3-N concentrations in the effluent between July 1999 and August 2004 ranged from 1.3 to 25.0 mg/L (n=21) (TOXTD database). The pH of the effluent between July 1999 and August 2004 ranged from 5.80 to 6.97 SU (n=21) with 7 of the 21 test events <6.5 SU (TOXTD database). The facility utilizes gaseous chlorine for disinfection and sodium bisulfite for dechlorination (TRC limit = 0.2 mg/L average monthly and 0.3 mg/L maximum daily) (Garcia 2004). The TRC measurements of the effluent (n=21) between July 1999 and August 2004 ranged from <0.02 to 0.70 mg/L with the exception of one measurement (17 mg/L, July 2002 test event) (TOXTD database). Two of the 21 measurements exceeded 0.3 mg/L. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ with a monitoring frequency of four times/year using *Menidia beryllina*.

The City of Fall River is authorized (NPDES permit MA0100382) to discharge Combined Sewer Overflow (CSO) via four outfalls to this segment of the Taunton River. The outfalls are located along the eastern shore of the river (north to south) in Fall River as follows:

Outfall 014 at the Shell Oil Terminal Dock, Alton Street
Outfall 013 at Cove Street
Outfall 011 at President Ave/ Bicentennial Park
Outfall 010 at Davol Street#1and#2, City Pier

In 1984 the City began their long-term CSO planning process. The CSO management plans have been evolving since that time. In 1992 a deep-tunnel storage and treatment system was recommended to reduce CSO discharges to less than four untreated discharge events per year at one extreme outfall location in Mount Hope Bay. The following has been conducted as part of the three-phase program (Burns 2005):

Phase I-- upgrade the WWTP*:* In 2000 the City's NPDES permit authorized an increased capacity at the plant (from 50 to 106 MGD) to coincide with the completion of the WWTP upgrade.

Phase II --a CSO Tunnel*:* Since 2000 a "south and central tunnel" has been constructed to increase storage capacity of the system. Part of Phase II is the "north tunnel". The schedule calls for an interim evaluation prior to proceeding with the north tunnel and Phase III. However, a modified tunnel plan has been offered due to the known unfavorable site conditions that were found making the "north tunnel" less effective/feasible. Because of this situation, it is likely that a number of CSO discharges to this segment of the Taunton River will be upgraded to receive treatment (screening and chlorination/dechlorination).

Phase III --partial (sewer and catchbasin) separation program*.*

USE ASSESSMENT

AQUATIC LIFE

Biology

As part of their NPDES permit renewal process, Somerset Power was required to conduct entrainment and impingement studies to evaluate potential effects of the intake on fish. Estimates of equivalent adult losses for various important resident species of fish entrained and impinged at the Somerset Station were prepared based on monitoring data collected between February 2001 and June 2002 (Table 3) (Normandeau Associates 2004). Mean and upper 95% confidence limits (C.L.) were estimated using intake flows from the current permit and for the newly requested permit limits. A technical review of these investigations by MassDEP DWM staff is summarized below.

Table 3. Summary of Estimated Equivalent Adult Losses of Selected Species Entrained and Impinged at the Somerset Station Intake (Normandeau Associates 2004).

Species and age	Based on Current Permit Limits:		Based on Requested Permit Limits:	
	Mean	Upper (95%) C.L.	Mean	Upper (95%) C.L
Alewife (Age-2)	43,502	133,847	84,553	260,160
Atlantic Silverside (Age-1)	686,269	1,391,942	1,333,862	2,705,465
Cunner (Age-4)	37,811	77,256	49,959	102,083
Tautog (Age-4)	4,476	9,931	8,699	19,307
Winter Flounder (Age-3)	13,037	20,383	25,339	39,619

Although some of the losses appear high, without knowledge of the current population size for the species above in the Taunton River it is impossible to develop an estimate of the current or projected impact of the facility on specific fish populations in the Taunton River. There are no projected population-level effects on phytoplankton, zooplankton, or benthos in the Taunton River from the intake.

Adverse impacts associated with the Somerset Station Intake include the following:

Impinged fish are washed off screens at high-pressure velocity (80 psi).

Chlorine is injected upstream from traveling screens to control biofouling. Impinged fish may be exposed to toxic concentrations of TRC.

After being impinged on the screens, chlorinated and washed off the screens at high pressure, fish are dropped several feet into the return trough that is channeled into a return sluice flowing into the river about 60 feet downstream from the intake. The potential for re-entrainment is high due to the nearness of the fish-return to the intake. Additionally, when the tide is out, it is probable that many of the fish are eaten by avian or piscine predators waiting at the discharge.

As part of Brayton Point's hydrological and biological monitoring program required by their NPDES permit, one site (Station M), located near Breeds Cove, is sampled in this segment of the Taunton River (USGenNE 2004a and 2004b). Since 1980 Otter Trawl sampling has been conducted on a monthly basis just upstream from the Braga Bridge (Station TR) along this segment by Marine Research, Inc. as part of the Brayton Point Station NDPES permit. The sampling reach is approximately 1,143 m in length. Between 1980 and 2003 the overall number of fish and number of species at this station has declined substantially (Scherer 2005a). According to USGen New England, Inc. (formerly New England Power Company), there has been a shift in Narragansett Bay's fish species assemblage from a demersal assemblage to a more pelagic one, although they report that overall number of fish (biomass) in Narragansett Bay has remained the same. Unlike Narragansett Bay, however, Mt. Hope Bay [and the lower Taunton River] has experienced this same shift and a reduction in overall abundance (USGenNE 2001).

Toxicity

Ambient

New England Bioassay, Inc. (NEB) collected water from the Taunton River approximately 50 to 100 yards south of the "Dark Area" (on-site area) down river from outfall #002 for use as dilution water in the Somerset Power whole effluent toxicity tests (Czorny 2005). Between April 1995 and April 2004, survival of *M. bahia* exposed (48 hours) to the river water was $\geq$ 95% (n=18). Between April 1995 and April 1997, survival of *M. beryllina* (n=5 test events) was also $\geq$ 95%.

The Somerset WPCF staff collected water from the Taunton River [approximately 100 feet upstream or downstream from their outfall (tide dependent)] for use as dilution water in their whole effluent toxicity tests (Garcia 2004). Between July 1999 and August 2004, survival rates of *M. beryllina* exposed (48 hrs.) to river water (n=21 test events) were all $\geq$ 90% except for one measurement [75% in the October 2000 test event (TOXTD database)].

Effluent

Acute whole effluent toxicity tests were conducted on the Somerset Power effluent (outfall #002) using *M. bahia* between April 1995 and April 2004 and using *Menidia beryllina* between April 1995 and April 1997. The effluent did not exhibit any acute toxicity (LC_{50}s were all >100% effluent).

A total of 20 valid toxicity tests (20 out of 21) were conducted on the Somerset WPCF effluent between July 1999 and August 2004 using *M. beryllina*. The LC_{50}s were all >100% so the effluent did not exhibit acute toxicity.

Chemistry water

As part of their NPDES permit renewal process, Somerset Power was required to conduct additional thermal studies to document potential impacts of the Station's cooling water discharge.

New England Bioassay Company collected water from the Taunton River approximately 50 to 100 yards south of the Dark Area (on-site area) down river from outfall #002. Data from the Somerset Power facility's whole effluent toxicity tests reports, between April 1995 and April 2004, are maintained in the TOXTD database by DWM and are summarized below.

The Somerset WPCF staff collected water from the Taunton River [approximately 100 feet upstream or downstream from their outfall (tide dependent)] for use as dilution water in their whole effluent toxicity tests (Garcia 2004). The data from the facility's whole effluent toxicity test reports between July 1999 and August 2004, maintained in the TOXTD database by DWM, are summarized below.

Mid-depth and bottom water temperatures and bottom dissolved oxygen concentrations are measured by Marine Research, Inc. using either a Hydrolab® Surveyor III or YSI 600 meter as part of their trawl sampling effort for the Brayton Point Station's biological monitoring program required by the Stations' NPDES permit (MA0003654). Their DO and temperature sampling data for the Taunton River upstream from the Braga Bridge (Station TR) are summarized below (Scherer 2005b, USGenNE 2004a and 2004b).

Dissolved oxygen

Of the 56 bottom DO measurements reported (August 1997 to December 2003) in the river near the Braga Bridge (Station TR) five were below 5.0 mg/L.

Temperature

Nearfield and farfield thermal surveys were conducted for the Somerset Power Station in the fall 2001 and winter, spring and summer 2002 (Normandeau Associates 2003). No population-level impacts were predicted. Except at slack tide, the thermal plume was not expected to increase river temperatures in more than 25% of the width of the river.

The maximum temperature reported in the river near the Braga Bridge (Station TR) was 25°C in 2002 and 23.9°C in 2003 (USGenNE 2004a and 2004b, respectively).

pH and alkalinity

The pH measurements of the Taunton River samples collected near the Dark Area between April 1995 and April 2004 ranged from 6.9 to 8.7 SU (n=18). Alkalinity ranged from 38 to 95 mg/L (n=18). The pH collected near the Somerset WPCF facility between July 1999 and August 2004 ranged from 6.9 to 7.8 SU (n=21) (TOXTD database).

Ammonia-nitrogen

The maximum ammonia-nitrogen concentration of samples collected near the Dark Area between April 1995 and April 2004 was 0.22 mg/L (n=18). The ammonia-nitrogen concentrations of the Taunton River collected near the Somerset WPCF facility between July 1999 and August 2004 ranged from <0.10 to 6.50 mg/L (n=21) (TOXTD database). Because of the lack of salinity data, no comparisons were made to a salt water ammonia criterion.

TRC

The TRC measurements (n=18) of samples collected near the Dark Area between April 1995 and April 2004 did not exceed 0.05 mg/L. The TRC concentrations collected near the Somerset WPCF facility, excluding the four results reported as <0.2 mg/L between July 1999 and August 2004, ranged between <0.02 to 0.06 mg/L (TOXTD database). Only one of the 17 TRC measurements was >0.05 mg/L.

Chemistry-tissue

Since 1993 quahogs (*Mercenaria mercenaria*) have been collected in April, July and October (sampling occasionally delayed slightly due to weather constraints) at one site (Station M) in the Taunton River located in the vicinity of Breeds Cove (downstream from the Somerset Power Station) as part of Brayton Point's NPDES permit requirements. Tissue samples were prepared and analyzed for 13 heavy metals. The mean concentrations of heavy metals in quahog tissue for this sampling location are reported in the Brayton Point Station 2003 Annual Report (USGenNE 2004b). The mean concentration of total mercury in quahog tissue collected in October/November (end of growing season) between 1993 and 2003 at Station M ranged from 0.02 to 0.24 ppm wet weight (USGenNE 2004b).

The *Aquatic Life Use* is assessed as impaired for this segment of the Taunton River due to the substantial decline in both the abundance and diversity of fish as documented by USGenNE and others. While there are a number of theories as to the cause of these reductions, the actual causes/sources are unproven. Overfishing, nonpoint source pollution/watershed development, power plant operations, climate change (warming) most likely all contribute to the current conditions with regard to fisheries.

SHELLFISH HARVESTING

The DMF Shellfish Status Report of 2003 indicates that all growing areas within this segment (MHB2.1, MHB2.3, and MHB2.4) are prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Taunton River because of elevated bacteria counts.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS

There is a semi-public saltwater beach at Village Waterfront Park along this segment of the Taunton River in Somerset (along the western shore in the northern portion of this segment, across the river from the jetty at the Fall River/Freetown line). No bacteria, Secchi disk transparency data or posting information for this beach have been reported (MA DPH 2003).

The Town of Somerset operates a town beach, Pierce Beach, along this segment of the Taunton River. The beach is tested weekly for bacteria. In 2002 no postings were reported (MA DPH 2003). According to the Board of Health, the beach was posted twice for a total of four days in 2003 and was posted for three separate days in 2004 (Somerset BOH 2005).

There is a semi-public saltwater beach, Branton Beach along this segment in Somerset (along the western shore in the most southern portion of the segment near the Somerset WPCF). No closures have been reported for this beach (MA DPH 2003).

During wet weather the City of Fall River currently discharges stormwater/wastewater from four combined sewer outfalls to this segment of the Taunton River.

Too limited data are available (poor spatial coverage) to assess the status of the *Primary* and *Secondary Contact Recreational* uses for this segment of the Taunton River. These uses are identified with an alert status because of the CSO discharges.

Taunton River (MA62-04) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Reduced abundance and diversity of fish Source: Unknown (Suspected Sources: Cooling water intakes, industrial thermal discharges, municipal storm sewer systems, CSO, municipal point source discharges, and highway and bridge runoff.)
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, CSO, septic systems, and marina/boating pumpout releases)
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Ensure that all NPDES permits are current and in compliance. Permits should further address fisheries issues, as appropriate.

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.1, MHB2.3, and MHB2.4.

Conduct bacteria sampling to evaluate effectiveness of point and nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

MassDEP and EPA should work with the power plants in the lower Taunton River Watershed to develop fish population estimates in order to better evaluate the impacts related to impingement and entrainment of fish, eggs, and larvae.

Somerset Power

Chlorine is added to control biofouling and is injected upstream from traveling screens in the screenwell at a rate such that the 0.1 limit will be met in the discharge. Because Unit 6 intake is only 2/3 of the discharge, fish in the screenwell will be exposed to TRC >0.1 mg/L; impinged fish may experience much higher levels. The technical advisory committee reviewing the operations at this facility should consider moving the chlorine injection point downstream of the traveling screens.

In 2000 when an on-site visit was conducted, the facility had only a high-pressure (~80 psi) screen wash which would be lethal to many impinged fish. A low-pressure wash should be added ahead of the high pressure wash so that impinged fish can be removed with little or no injury.

The fish return system needs to be altered to lessen potential injury after impingement.

Overflow runoff from the coal pile should be treated prior to discharge to the Taunton River.

Work with the Brayton Point Station Technical Advisory Committee to improve availability/access (electronic or web site) to water quality and biological monitoring data collected from individual stations in

the Taunton River as part of the Brayton Point Station's NPDES permit. Currently much of these data are pooled to evaluate conditions in Mt. Hope Bay so isolating data from a particular station is not possible.

OTHER TRIBUTARIES

Other tributaries located throughout the Taunton River watershed include the following:

Winnetuxet River (Segment MA62-24)
Sawmill Brook (Segment MA62-36)
Cotley River (Segment MA62-41)
Forge River (Segment MA62-37)
Cobb Brook (Segment MA62-43)
Unnamed tributary (Segment MA62-48)
Segreganset River (Segment MA62-53)
Segreganset River (Segment MA62-54)
Segreganset River (Segment MA62-55)
Muddy Cove Brook (Segment MA62-52)
Muddy Cove Brook (Segment MA62-51)
Broad Cove (Segment MA62-50)

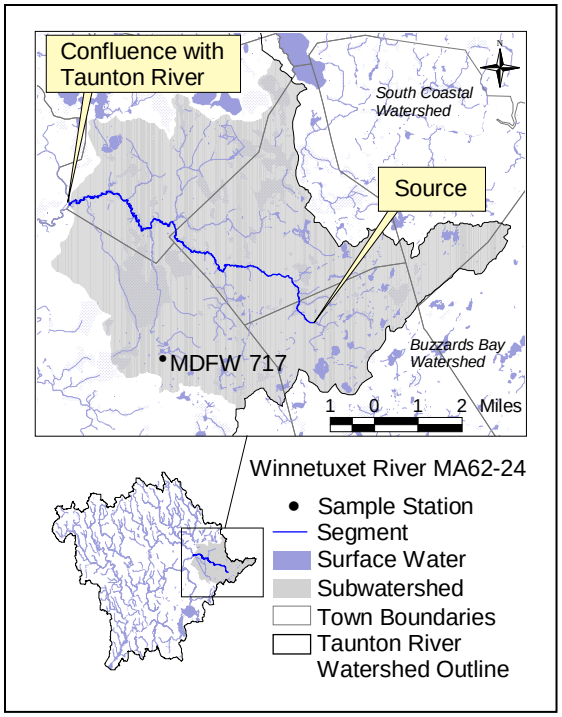
The majority of land use in these tributaries is forested, followed by residential with lesser amounts in open space and agricultural areas. The exception to this is Cobb Brook, which is highly residential and has an impervious area of 19.8%, suggesting that water quality may be impacted by impervious surface water runoff. The Forge and Cotley Rivers have impervious areas of 11.8 and 10.5%, respectively, suggesting that there may be some impacts to water quality from impervious surface water runoff. The impervious area in the other tributaries is generally less than 10% indicating there is a low potential for adverse water quality impacts from direct surface runoff. Some of the highest amounts of agricultural land in the Taunton River Watershed are found in Broad Cove, Sawmill Brook, Muddy Cove, Cotley River and Segreganset River subwatersheds.

Numerous Multi-sector General Stormwater Permits have been issued for facilities located in the watersheds of these tributaries. The communities of Carver, Plympton, Middleborough, Bridgewater, Raynham, Taunton, Dighton and Halifax are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

The *Aquatic Life Use* is assessed as impaired for two segments of these tributaries. In the Segreganset River (Segment MA 62-53) it is assessed as impaired due to low and no flow conditions that frequently occur during the summer and fall months of the year. In the unnamed tributary (Segment MA62-48) the *Aquatic Life Use* is assessed as impaired due to habitat degradation and impacts to the benthic and fish communities. Because of elevated fecal coliform concentrations in the Segreganset River, Muddy Cove and Broad Cove, DMF has classified these shellfish growing areas as prohibited and thus the shellfish use is assessed as impaired. Due to the fact that there was either too limited data or the data were not quality-assured, the majority of the other designated uses in these tributaries are not assessed.

WINNETUXET RIVER (SEGMENT MA62-24)

Location: From the outlet of a small, unnamed pond near Cole Mill in Carver to the confluence with the Taunton River in Halifax.
Segment Length: 11.8 miles
Classification: Class B



The drainage area of this segment is approximately 40.7 square miles. Land-use estimates (top three) for the subwatershed:

Forest 54.1%
Open land 13.9%
Residential 13.7%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Muddy Pond (MA62233), Johns Pond (MA62096), North Center Street Pond (MA62132), Cooper Pond (MA62046), Muddy Pond (MA62125), Fuller Street Pond (MA62234), and Savery Pond (MA62167) are in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 2,224 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 19.86 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Country Club Halifax	NA	42511803	Well #1 Irrigation pond	0.23
Halifax Water Department	9P42511801	42511801	4118000-01G 4118000-02G 4118000-03G	0.35 reg 0.33 perm Total – 0.68
Middleborough Water Supply*	9P42518201	42518203	4182000-08G	1.53 reg 1.50 perm Total – 3.03

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The Richmond Park Water Treatment Plant, located off Plymouth Street in Halifax, was issued an NPDES permit (#MAG640008) in July 2002 to discharge treated filter backwash water into Turkey Swamp. This wetland area is adjacent to Palmer Mill Brook that flows into the Winnetuxet River. This permit is due to expire in November 2005.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

A shoreline survey along the Winnetuxet River documented that the banks are thickly vegetated and wildlife is abundant. A stand of loosestrife was observed near the Plympton/Halifax line. One section of the Winnetuxet River has been designated a Core Habitat site by the MDFW's Massachusetts Natural Heritage & Rare Endangered Species & Wildlife Program (Winnetuxet River Stream Team 2003).

Biology
MDFW conducted fish population sampling at one tributary to this segment in August 2002. Samples were collected from one station along Raven Brook, near Plympton Street, Middleborough (Station 717) using a backpack shocker. Three brook trout (multiple age classes) were collected (Richards 2003a). As a result of these findings, MDFW has proposed that Raven Brook be listed in the next revision of the SWQS as a cold water fishery.

Chemistry – water
The Bridgewater State WAL collected water quality samples in Raven Brook which is a tributary to the Winnetuxet River (Curry 2005). Between June and September 2004, Raven Brook was sampled six times near Wood Street, Halifax using automatic samplers to collect temperature, pH and DO data through a 22-hour period. Additionally, nutrient samples (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen) were taken every hour using a Sigma 900 automated sampler with samples for every other hour used for analysis. WAL found consistently low levels of DO as well as low pH levels. Very low levels of nutrients were also consistently measured. A QAPP for the WAL has not been approved by MassDEP so their data are not quality-assured.

Too limited data are available, so the *Aquatic Life Use* for the Winnetuxet River is not assessed.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
The Winnetuxet River Shoreline Survey Report (2003) noted that although the river water was dark in color, it appeared to be free from major pollution. There were no strong odors, nor did the water surface exhibit any sheens or foamy conditions. Areas of litter, particularly near bridges, were noted in the upstream portions of the river.

The *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support since with the exception of isolated areas of trash and debris near bridges, no other objectionable aesthetic conditions were identified in the Winnetuxet River.

Winnetuxet River (MA62-24) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

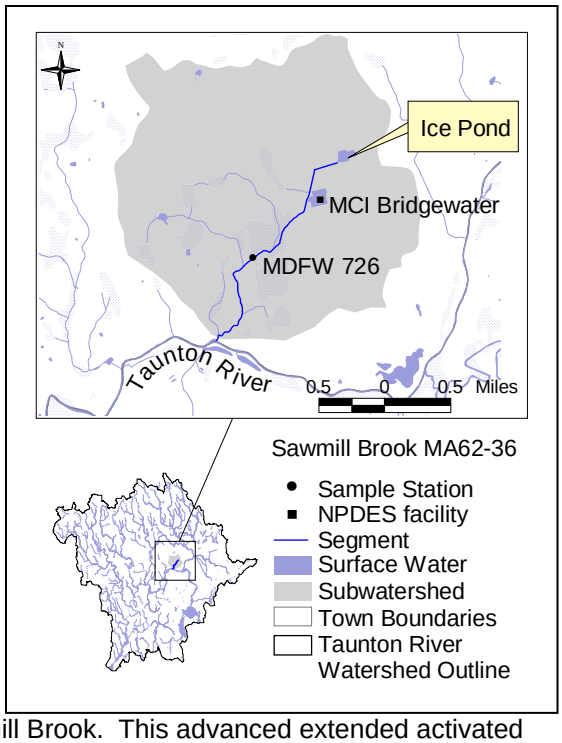
RECOMMENDATIONS
The Winnetuxet River Stream Team should continue in its efforts to preserve the Winnetuxet River. Recommendations identified in the Winnetuxet River Shoreline Survey and Action Plan should be reviewed and implemented, as appropriate.

Water quality monitoring (e.g., in-site monitoring and benthic macroinvertebrate sampling) should be conducted to bracket potential sources of pollution and to evaluate the status of the *Aquatic Life Use*.

MDFW has proposed that Raven Brook, a tributary to the Winnetuxet River, be protected as cold water fishery habitat. Additional monitoring of the fish population, dissolved oxygen, and temperature is needed to evaluate MDFW's proposal to list this stream as a cold water fishery in the next revision of the Surface Water Quality Standards.

SAWMILL BROOK (SEGMENT MA62-36)

Location: Outlet of Ice Pond, Bridgewater to confluence with Taunton River, Bridgewater.
Segment Length: 1.9 miles
Classification: Class B, Warm Water Fishery



The drainage area of this segment is approximately 3.9 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....45.9%
Residential.....20.1%
Agriculture.....16.6%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G2)

There are no WMA regulated water withdrawals in this subwatershed.

The MCI Bridgewater Water Pollution Control Facility (WPCF) is authorized (MA0102237 issued in September 1998) to discharge a flow of 0.55 MGD (average monthly) of treated sanitary wastewater via Outfall #001 to the Sawmill Brook. This advanced extended activated sludge treatment facility treats municipal wastewater from the prison. Nitrification is performed for ammonia-nitrogen reduction (2 mg/l NH_3-N average monthly May 1 to October 31). The NH_3-N concentrations of the effluent between January 1999 and July 2004 were all <0.1 mg/L (n=22) (TOXTD database). This facility incorporates effluent sand filtration by physical means. The facility utilizes sodium hypochlorite for disinfection and sodium bisulfite for dechlorination (TRC limit = 0.014 mg/L average monthly, 0.024 mg/L maximum daily). The TRC measurements of the effluent between January 1999 and July 2004 were all <0.03 mg/L (n=19) (TOXTD database). The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC ≥81% with a monitoring frequency of four times/year using *Ceriodaphnia dubia*.

USE ASSESSMENT

AQUATIC LIFE

Biology

MDFW conducted fish population sampling at one location along this segment, north of Route 28 and Route 18, Bridgewater (Station 726) using a backpack shocker in August 2002. A total of 18 fish, representing six species were collected. The sample was dominated by American eel and redfin pickerel while an individual each of tesselated darter, pumpkinseed, largemouth bass, and bluegill were collected (Richards 2003a). With the exception of one tessellated darter, the fish community was comprised of macrohabitat generalists. Both redfin pickerel and American eel (two most dominant species) are common in slow-moving wetland dominated streams. Bluegill, largemouth bass and pumpkinseed may have originated in the impoundment (Ice Pond) at the upstream end of this segment.

Toxicity

Ambient

The MCI Bridgewater staff collected water from Sawmill Brook approximately 20-25 feet upstream from Outfall #001 for use as dilution water in their whole effluent toxicity tests (Dubois 2004). Between January 1999 and July 2004, survival of *Ceriodaphnia dubia* exposed (7-day) to river water (n=23 test events) was 100% (TOXTD database).

Effluent
A total of 23 modified acute and chronic whole effluent toxicity tests using *Ceriodaphnia dubia* were conducted on the MCI Bridgewater effluent between January 1999 and July 2004. The effluent did not exhibit any acute toxicity (LC_{50}'s were all >100% effluent) and the C-NOEC results ranged from 81 to 100% effluent.

Chemistry water
The MCI Bridgewater staff collected ambient water from the Sawmill Brook, approximately 20-25 feet upstream for Outfall #001, for use as dilution water in the whole effluent toxicity tests between January 1999 and July 2004 (Dubois 2004). Data from these reports, which are maintained by DWM in the TOXTD database, are summarized below.

Ammonia-nitrogen
The ammonia-nitrogen concentrations were all below the reported detection limits (0.03 or 0.1 mg/L) (n=22). All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999a).

TRC
TRC measurements were all below the minimum quantification level of 0.05 mg/L (n=19).

Hardness
Hardness ranged from 35 to 52 mg/l (n=18).

Specific conductance
Specific conductance ranged from 220 to 470 μmhos/cm (n=18).

The water quality data available for Sawmill Brook, upstream from the MCI Bridgewater discharge, does not indicate any water quality degradation. However, too limited data are available for the brook downstream from the discharge, so the *Aquatic Life Use* is not assessed.

Sawmill Brook (MA62-36) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Sawmill Brook bracketing potential sources of pollution (e.g., discharge, cranberry bogs, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance of the MCI Bridgewater WPCF effluent with their permit limits and other special conditions of the permit.

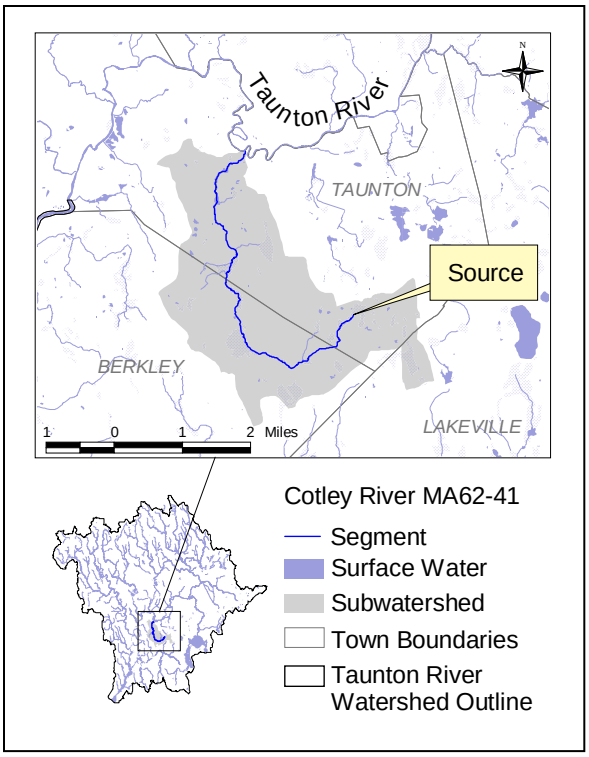
COTLEY RIVER (SEGMENT MA62-41)

Location: Headwaters near cranberry bog south off Seekell Street, Taunton (thru Barstows Pond) to the confluence with the Taunton River, Taunton
Segment Length: 5.9 miles
Classification: B

The drainage area of this segment is approximately 7.6 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....59.0%
Residential.....15.7%
Agriculture.....7.5%

The impervious cover area for this subwatershed is 10.5%.



WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 83 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.74 MGD.

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

Sampling of the Cotely River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near Middleborough Avenue, Taunton (Station COT-004). The TRWA reported that DO at the Cotley River sample site was below 5.0 mg/L in September 2002 (Domingos 2003a). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured.

The Bridgewater State WAL collected water quality samples in the Cotley River near Middleboro Avenue, Taunton once a month in June, July and August 2004 (Curry 2004). Grab samples were collected for nutrients (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen). A Hydrolab® minisonde was used to obtain instantaneous measurement of pH, dissolved oxygen, temperature and specific conductance. The WAL indicated that water quality standards were generally met for pH, DO and temperature. A QAPP for the WAL has not been approved by MassDEP and their data are not quality-assured.

Since the available data on the Cotely River is not quality-assured, the designated uses for the Cotley River are not assessed.

Cotley River (MA62-41) Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

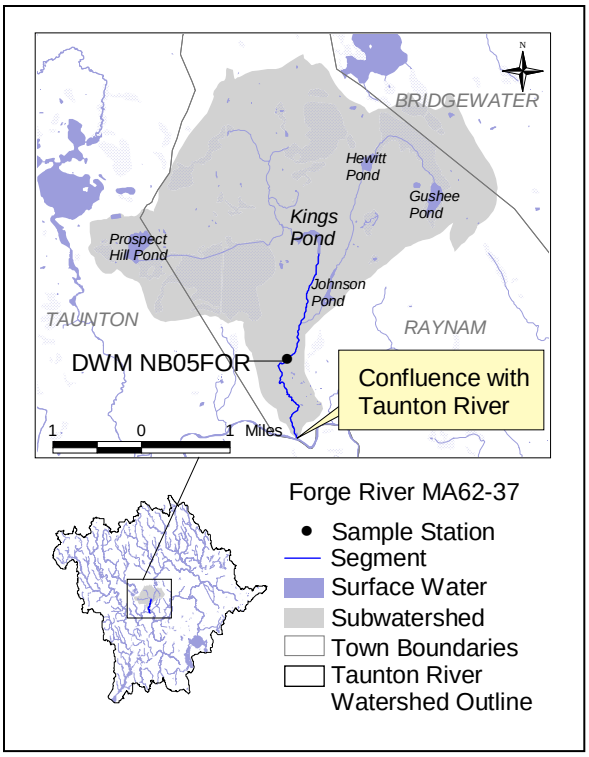
Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in the Cotley River bracketing potential sources of pollution (e.g., cranberry bog operations, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA and WAL should continue to conduct water quality monitoring at their established sampling sites on the Cotley River to meet their sampling objectives. In order for the MassDEP to utilize the TRWA and WAL data for water quality assessment reporting purposes, the TRWA and WAL should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

FORGE RIVER (SEGMENT MA62-37)

Location: Outlet of Kings Pond, Raynham to confluence with Taunton River, Raynham.
Segment Length: 2.5 miles
Classification: Class B



The drainage area of this segment is approximately 9.3 square miles. Land-use estimates (top three) for the subwatershed:

Forest 43.7%
Residential 22.8%
Open land 7.7%

The impervious cover area for this subwatershed is 11.8%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Hewitt Pond (MA62088), Gushee Pond (MA62084), Johnson Pond (MA62097), Prospect Hill Pond (MA62149), and Kings Pond (MA62101) are in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 6 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.05 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Raynham Center Water District*	9P42524501	42524502	4245000-01G 4245000-07G 4245000-09G	0.40 reg 0.42 perm Total – 0.82
North Raynham Water District	9P442524502	42524501	4245002-01G 4245002-03G 4245002-04G 4245002-05G 4245002-06G	0.32 reg 0.0 perm Total – 0.32

* Indicates system-wide withdrawal

Based on the available information there are no NPDES discharges in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

As part of the Biocriteria Development Project DWM conducted a habitat assessment, benthic macroinvertebrate and fish population sampling of the Forge River near South Main Street (Route 104), Raynham (Station NB05FOR) in September/October 1996 (MassDEP 1996b and Appendix I). *In-situ* measurements (DO, % saturation, pH, temperature and conductivity) were also recorded (Appendix B).

Habitat and Flow

The total habitat assessment score for the Forge River near South Main Street (Route 104), Raynham (Station NB05FOR) in September/October 1996 was 136/200. Habitat was limited by embeddedness, sediment deposition, and riparian zone/bank stability (MassDEP 1996b).

Biology

DWM and Fugro East, Inc. biologists conducted fish population sampling (7 October 1996) on the Forge River near South Main Street (Route 104-Station NB05FOR), Raynham as part of the Biocriteria Development Project. Six species were collected including, American eel (*Anguilla rostrata*) and tesselated darter (*Etheostoma olmstedi*), pumpkinseed, bluegill, fallfish and one brook trout (MassDEP 1996b). A replicate reach was also sampled downstream from Route 104. Two additional species, an individual each of white sucker and largemouth bass, were captured. Although overall numbers were low, communities were similar at both sampling locations. Approximately 50% of the fish collected were fluvial specialists/dependants, mostly fallfish and tessellated darter. An individual brook trout and one white sucker make up the remainder of this group.

No recent data are available so the *Aquatic Life Use* is currently not assessed.

AESTHETICS

The Forge River Stream Team surveyed the lower section of the Forge River (downstream from the confluence of the unnamed tributary downstream from Johnson's Pond) near Raynham center (Forge River Stream Team 2003). The river was described as being tea-colored. With the exception of trash and debris (shopping carts, tires and bottles) and a colorful slick (undetermined as to whether it was natural or petroleum based), no other objectionable conditions (odors, turbidity) were noted.

No aesthetic quality degradation (odors, turbidity, oil, grease, etc.) was identified by DWM biologists in the Forge River near South Main Street (Route 104-Station NB05FOR) in September/October 1996 (MassDEP 1996b).

Too limited data are available so the *Aesthetics Use* is not assessed. It is identified with an Alert Status because of the trash and debris noted by the Forge River Stream Team.

Forge River (MA62-37) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics*
				
NOT ASSESSED				

*"Alert Status" issues identified, see details in the use assessment section.

RECOMMENDATIONS

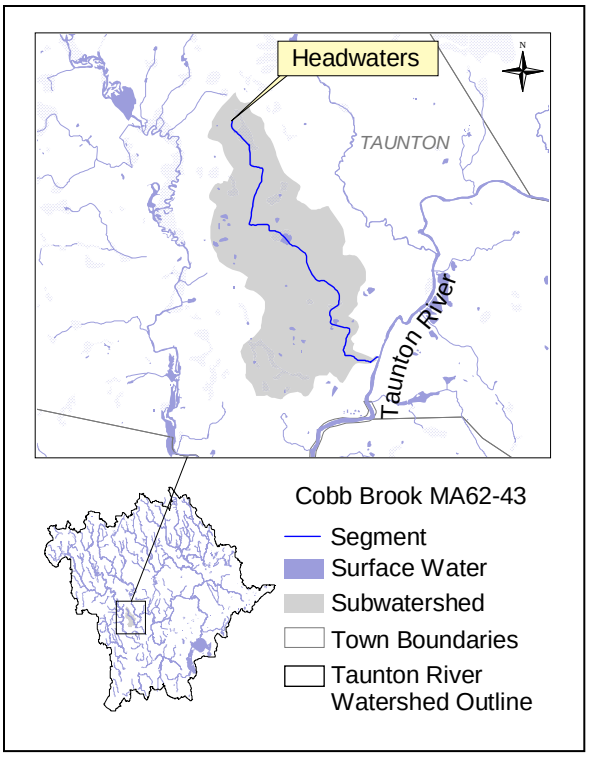
Conduct additional monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in the Forge River bracketing potential sources of pollution.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The Forge River Stream Team should continue in its efforts to assess the condition of the Forge River. Recommendations identified in the Forge River Shoreline Survey Report and Action Plan should be reviewed and implemented, as appropriate.

COBB BROOK (SEGMENT MA62-43)

Location: Headwaters south of Dunbar Street (in Crapo Bog), Taunton to confluence with the Taunton River, Taunton.
Segment Length: 3.5 miles
Classification: B



The drainage area of this segment is approximately 2.5 square miles. Land-use estimates (top three) for the subwatershed:

Residential 61.3%
Forest 24.8%
Open land 7.5%

The impervious cover area for this subwatershed is 19.8%.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA regulated withdrawals and NPDES dischargers in this subwatershed.

USE ASSESSMENT

Sampling of Cobb Brook (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near General Cobb Street, Taunton (Station COB-013) and near West Water Street, Taunton (Station COB-000). The TRWA reported high phosphorus and fecal coliform levels at their sampling station near General Cobb Street, Taunton (COB-013) in May 2002. The TRWA found that high coliform counts occurred at this station and at Station COB-000 intermittently throughout 2002 (Domingos 2003a). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. Therefore, the designated uses for Cobb Brook are not assessed.

Cobb Brook (MA62-43) Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
NOT ASSESSED				

RECOMMENDATIONS

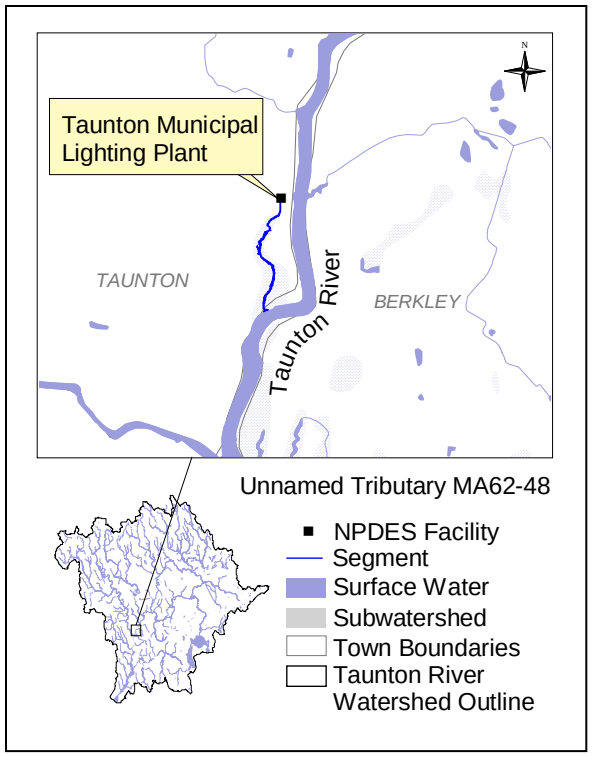
Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Cobb Brook bracketing potential sources of pollution (e.g., development).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA should continue to conduct water quality monitoring at its established sampling site on Cobb Brook to meet its sampling objectives. In order for the MassDEP to utilize the TRWA data for water quality assessment reporting purposes, the TRWA should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

UNNAMED TRIBUTARY (SEGMENT MA62-48)

Location: Channel from Taunton Municipal Lighting Plant, Taunton to confluence with Taunton River, Taunton.
Segment Size: 0.002 square miles
Classification: Class SA (Proposed SB)



Based on information from a 1963 U.S. Geological Survey map of the area, this channel was originally a wetland; i.e., no channel or stream was apparently present prior to the Taunton Municipal Lighting Plant (TMLP) facility being built. Thus, the channel was either dug or formed from the force of the discharge. The channel is now considered to be a "tidal creek".

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G2)

Based on the available information there are no WMA withdrawals in this segment.

The Taunton Municipal Lighting Plant (TMLP) is a municipally owned 135 MW steam electric power generating facility. The TMLP Cleary-Flood Station has two generating units (8 and 9). Water is withdrawn directly from the Taunton River (approximately 38.1 MGD instantaneous maximum flow rate) at an intake structure adjacent to the main power generation building for use as cooling water. Unit 8, completed in 1966, employs a once-through cooling water system which can generate approximately 25 MW. Typically, when in operation, the unit is online for approximately 11 hours/generation event during peak demand periods (summer and winter). Unit 9, which began operation in 1975, is a combined cycle system, which can generate a total of 110 MW. Typically, when in operation, the unit is online for approximately 13 hours/generation event during peak demand periods (summer and winter). The facility is authorized (NPDES permit# MA0002241 issued September 1994, but in December 1994 the EPA reinstated the conditions of the April 1988 permit) to discharge via the following outfalls (upstream to downstream) into this tidal creek, which runs adjacent to the Taunton River for approximately 2000' prior to flowing into the Taunton River:

- Outfall #001 –39.5 MGD maximum daily of once through condenser cooling water (90°F daily maximum) from Unit 8 which is chlorinated daily (2 hours/day when operating) with sodium hypochlorite (TRC limit 0.02 mg/L).
- Outfall #002 –0.45 MGD maximum daily (0.260 MGD average monthly) of boiler blowdown, gland seal leakoff, neutralized demineralizer regeneration wastewater, and carbon filter backwash from both Unit 8 and 9, and auxiliary equipment (90°F daily maximum).

Stormwater is also discharged via several outfalls with monitoring requirements of two times/year for pH & oil and grease.

A draft permit is expected to be developed in 2005.

USE ASSESSMENT

AQUATIC LIFE

As part of their NPDES permit renewal process, TMLP was required to conduct additional biological and water quality studies to fulfill requirements of Section 316(a) and (b) of the Clean Water Act (Murphy 2001 and EarthTech 2002). The investigation was developed to address the following three items: thermal effects from the Unit 8 discharge on the aquatic flora and fauna that would be expected to exist in the channel in the absence of the discharge, representative intertidal areas upstream and downstream from the mouth of the channel in order to assess the extent to which the biotic community within the channel has changed, and possible modification to the TMLPs intake structure fish return system (EarthTech and

Marine Research 2004). These studies were initiated in June 2002 and were completed in July 2003. A technical review of these investigations by MassDEP DWM staff is summarized below.

Habitat and Flow

The physical characteristics of the tidal creek to which the effluent is discharged were compared to two other tidal creeks in the area. Basic findings of the report (EastchTech and Marine Research 2004) are as follows: 1) flow rate in the tidal creek receiving the discharge is about 217 times greater than natural flow without the discharge; 2) scouring of benthic substrates, erosion of channel banks, deepening of channel were evident and silt and sand were probably scoured from the area - coarse sand predominated when the survey was conducted. By comparison benthic substrates of neighboring creeks had a much greater component of mud and silt. Dilution of the effluent was negligible when Unit 8 was discharging. Most fish appeared to be pushed out of the tidal creek when the discharge was in operation.

Biology

Flora and fauna of the segment were compared to two other tidal creeks in the area. Diversity and evenness of benthic samples from the discharge channel were about half that found in each of two reference creeks but the number of organisms/square meter was 1.5 to 2x greater in the discharge channel when compared to the reference creeks. This was primarily due to the fact that the oligochaete population in the channel was about 2-3x that of the reference creeks. The species of oligochaetes found were not identified to species level.

Benthic differences were more pronounced in June and less as pronounced in September. Two fish, American eel and naked gobie were found in reference creek “baskets” that were put in place to sample fish. No fish were found in the discharge channel baskets. The total number of banded killifish counted in the reference creeks over all survey dates was 3600; the total in the test creek (discharge creek) was 97 although 33% more collections were made in the test creek. Fish collections in the discharge channel were made before (n=54 events), during (n=9 events) and after (n=34 events) a thermal discharge took place. Current velocity was cited as probable cause of impact, although chlorine effects were not evaluated.

White perch were much more abundant in reference creeks than in the test creek. Low numbers of perch were thought to be caused by increased velocity and heat. Discharge temperatures exceeded lethal levels in some cases.

During discharge events the number of bluegills found in the discharge creek was much lower than those found in reference creeks. Effects were thought to be caused by increased velocity and heat. In addition, during discharge events the number of largemouth bass in the discharge creek was about one-third to one-quarter the population size when the discharge was not in operation. Effects were thought to be due to velocity and heat.

Yellow perch were found in small numbers at all sites. However, when found, they were typically present in higher numbers in the reference creeks.

Threespine sticklebacks were found in high numbers in one reference creek but in low numbers in the other reference creek and the discharge channel. Temperatures in the discharge channel during August and September, 2002 exceeded lethal levels for sticklebacks, so mortality would have been expected during discharge events in those months.

Hogchokers were found in high numbers (about 36 individuals) in one of the reference creeks during one sampling period, but were typically absent at other times and absent from the other reference creek. They were especially absent from the discharge creek. Temperatures in the discharge at times exceeded lethal levels recorded for this fish.

Chemistry - water

Temperatures in the discharge creek were essentially the same as the discharge when it was in operation. Potential for thermally-induced acute or chronic toxicity to fish in the creek exists.

Whether or not TRC concentrations in the TMLP discharge would cause exceedences of acute and/or chronic water quality criteria are not known at this time.

The *Aquatic Life Use* is assessed as impaired for this unnamed tributary to the Taunton River as a result of habitat degradation/alteration, elevated temperatures, and adverse impacts to the benthic and fish communities. The source of the impairment is the result of the discharge and operation of the TMLP.

Unnamed tributary (MA62-48) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Habitat, biota alterations, anthropogenic substrate and flow regime alterations, physical substrate alterations and temperature (Suspected Cause: Chlorine) Source: Channel erosion/incision from upstream hydromodification, impacts from hydrostructure flow regulation/modification and industrial thermal discharge
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

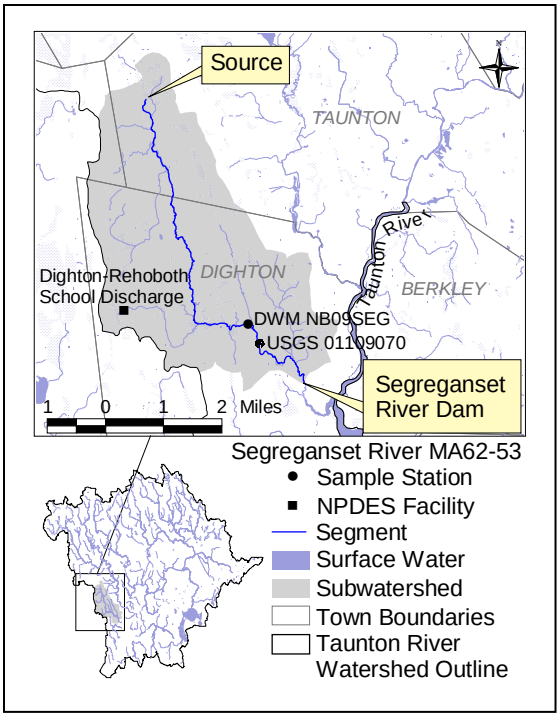
Given the impacts documented to this tidal creek, the possibility of replacing the once-through cooling water discharge with a closed-loop system (i.e., cooling tower) should be evaluated. Off-site mitigation of impacts should be required if the once-through cooling water discharge is not eliminated. In the interim the NPDES permit for TMLP should be reissued with appropriate limits and monitoring requirements. The permit should include the following requirements:

Reduce volume and annual thermal load to this waterbody.
Dechlorination or alternative biofouling controls should be implemented.
Instream monitoring for temperature, biological, and habitat quality should be required.
The actual need to operate this facility should be documented.

An investigation of the fish community should be conducted regarding any impacts related to the cooling water intake and discharge. This should include recommendations for mitigation including an evaluation of fish exclusion barriers.

SEGREGANSET RIVER (SEGMENT MA62-53)

Location: Source in wetland north of Glebe Street, Taunton through the Segreganset River Ponds to the Segreganset River Dam, Dighton.
Segment Length: 7.9 miles
Classification: Proposed Class A
(This segment was formerly part of segment MA62-18)



The drainage area of this segment is approximately 13.5 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....72.3%
Residential.....13.8%
Agriculture.....6.2%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62-18 is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Segreganset River Pond (MA62169) is in the Lake Assessment section of this report.

A USGS gaging station (01109070) on the Segreganset River in Dighton, MA, has been in operation since July 1966. The drainage area at the gage is 10.6 square miles. The USGS remarks for this gage note occasional regulation by ponds upstream and diversion upstream for Dighton Water District. The average mean flow at this gage over the period of record (1966 to present) is 22 cfs (Socolow *et al.* 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Dighton Water District	NA	42507601	4076000-04G 4076000-05G	0.37 reg
Somerset Water Department*	9P42527301	42527301	4273000-02S	2.81 reg 1.61 perm Total – 4.42
Segreganset Country Club	9P42529303	NA	Unknown	0.12 perm

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The Dighton-Rehoboth Regional School District is authorized to discharge 0.01 MGD of treated wastewater via Outfall # 001 to an unnamed tributary to this segment of the Segreganset River (NPDES permit # MA0022586 issued October 1987). A new permit is being developed for this facility.

USE ASSESSMENT

AQUATIC LIFE

As part of the Biocriteria Development Project, DWM conducted a habitat assessment and benthic macroinvertebrate sampling of the Segreganset River near Briggs Street, Dighton (Station NB09SEG) in October 1996 (MassDEP 1996b and Appendix I).

Habitat and Flow

The total habitat assessment score for the Segreganset River near Briggs Street, Dighton (Station NB09SEG) in October 1996 was 148/200. Habitat was limited most by limited epifaunal substrate and fish cover, limited velocity/depth combinations (all considered only marginal), sediment deposition, and riparian zone/bank stability (MassDEP 1996b).

No flow (0.0 cfs) was reported by USGS at their gage on the Segreganset River between 8 July and 15 September in 1999 (a drought year) and 23 to 29 July and 1 August to 16 September in 2002 (Socolow et al. 2000 and 2003).

The *Aquatic Life Use* is assessed as impaired in this segment of the Segreganset River because of the low and no flow conditions that frequently occur during the summer and fall months of the year.

Segreganset River (MA62-53) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low flow alterations Sources: Flow alterations from water diversions and impacts from hydrostructure flow regulation/modification
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to:

- evaluate impacts to the Segreganset River from potential sources of pollution (e.g., golf course, developments, water withdrawals),
- document impairments caused by low flow conditions, and
- to better assess the status of the *Aquatic Life Use*.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Consideration should be given to developing a water budget and safe yield determination for the Segreganset River.

Dams on the Segreganset River should be evaluated for the potential for their removal.

SEGREGANSET RIVER (SEGMENT MA62-54)

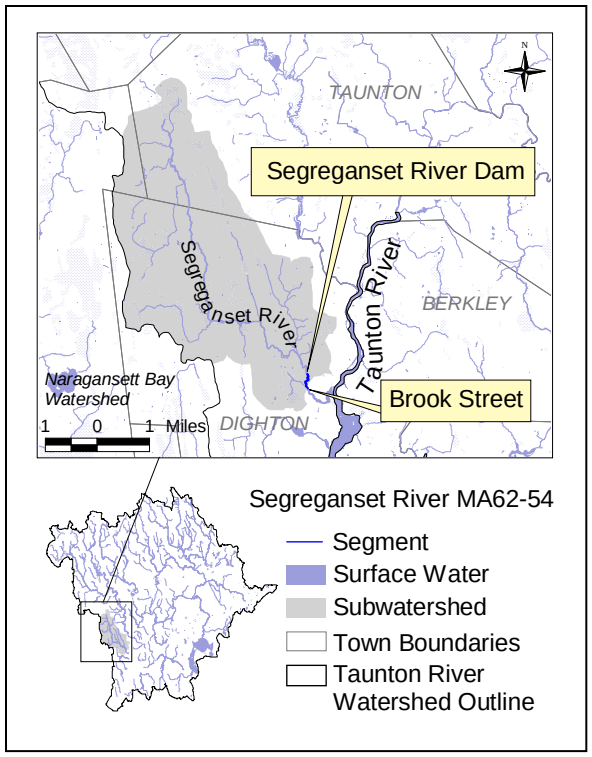
Location: From Segreganset River Dam, Dighton to approximately 250 feet north of Brook Street, Dighton.
Segment Length: 0.4 miles
Classification: Class B
(This segment was formerly part of Segment MA62-18)

The drainage area of this segment is approximately 14.3 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....71.5%
Residential.....13.6%
Agriculture.....6.4%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62-18 is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).



WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA regulated withdrawals or NPDES discharges along this segment of the Segreganset River.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

No flow (0.0 cfs) was reported by USGS at their gage on the Segreganset River between 8 July and 15 September 1999 and 23 to 29 July and 1 August to 16 September 2002 (Socolow et al. 2000 and 2003). Furthermore, water can be taken from the Segreganset River at the Somerset Water Department's intake near the Segreganset River Dam.

The *Aquatic Life Use* is assessed as impaired in this segment of the Segreganset River because of the low and no flow conditions that frequently occur during the summer and fall months of the year.

Segreganset River (MA62-54) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low flow alterations Sources: Flow alterations from water diversions and impacts from hydrostructure flow regulation/modification
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to:

- evaluate impacts to the Segreganset River from potential sources of pollution (e.g., golf course, developments, water withdrawals),
- document impairments caused by low flow conditions, and
- better assess the status of the *Aquatic Life Use*.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

SEGREGANSET RIVER (SEGMENT MA62-55)

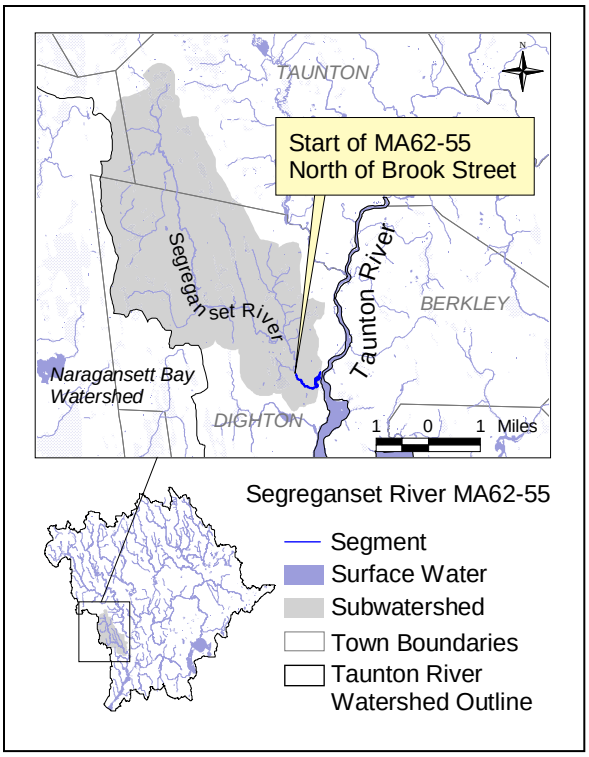
Location: From approximately 250 feet north of Brook Street, Dighton to confluence with the Taunton River, Dighton.
Segment Length: 0.02 square miles
Classification: Class SA (proposed SB, Shellfishing Restricted)
(This segment was formerly part of Segment MA62-18)

The drainage area of this segment is approximately 14.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....70.3%
Residential.....13.9%
Agriculture.....6.8%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62-18 is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).



WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA regulated withdrawals or NPDES discharges along this segment of the Segreganset River.

USE ASSESSMENT

SHELLFISHING

The DMF Shellfish Status Report of 2003 indicates that area MHB2.2 is prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Segreganset River because of elevated bacteria counts.

Segreganset River (MA62-55) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Source: Discharges from municipal separate storm sewer systems)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Segreganset River from potential sources of pollution (e.g., developments) and to better assess the status of the *Aquatic Life Use*.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

MUDDY COVE BROOK (SEGMENT MA62-52)

Location: Source south of Hart Street, Dighton through Muddy Cove Brook Pond to outlet of small impoundment behind 333 Main Street (Zeneca, Inc.), Dighton.
Segment Length: 2.0 miles
Classification: Class B
(Formerly part of Segment MA62-23.)

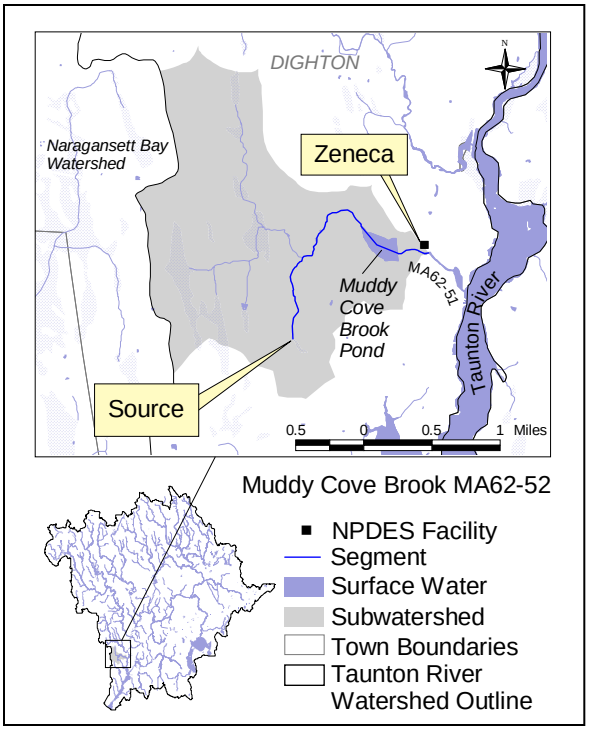
The drainage area of this segment is approximately 2.9 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....71.8%
Agriculture.....12.8%
Residential.....7.1%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62-23 is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Muddy Cove Brook Pond (MA62124) is in the Lake Assessment section of this report.



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Somerset Water Department*	9P42527301	42527301	4273000-05G	2.81 reg 1.61 perm Total – 4.42
Zeneca Inc.	NA	42507603	01G 01S	1.19 reg

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G2)

Zeneca, Inc. (formerly ICI Americas, Inc.) used to discharge non-contact cooling water, stormwater runoff, and/or steam condensate via several outfalls to this segment of Muddy Cove Brook (NPDES MA0005291). The facility was engaged in the manufacturing of textile dyestuffs and other organic chemicals. Manufacturing operations ceased in 1995. The discharges from the outfalls along this segment of Muddy Cove Brook have been eliminated with the exception of stormwater runoff (Zeneca 2000). EPA terminated the individual wastewater NPDES permit in November 2003. The need for the facility to apply for coverage for stormwater discharges to this segment of Muddy Cove Brook needs to be determined.

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Ambient

Water was collected from Muddy Cove Brook downstream from Main Street, Dighton near the inlet to Muddy Cove Brook Pond for use as dilution water in the facility's whole effluent acute toxicity tests for their stormwater outfalls (02S, 03S, 005, and 06S) which discharge to this segment of Muddy Cove Brook. Survival (48-hour exposure) of *Ceriodaphnia dubia* and *Pimephales promelas* was not less than 85 and 75%, respectively, in any of the tests conducted between November 1999 and October 2002.

Effluent
Acute toxicity tests have been conducted on four stormwater outfalls (02S, 03S, 005, and 06S) which discharge to this segment of Muddy Cove Brook. Six tests were conducted on outfalls 02S and 06S and eight tests were conducted on outfalls 03S and 005 between November 1999 and October 2002 using *Ceriodaphnia dubia* and *Pimephales promelas* as test organisms. No acute toxicity (i.e., $LC_{50} \geq 100\%$ effluent) was detected by either test organism in any of the tests conducted.

Too limited data are available so the *Aquatic Life Use* is not assessed.

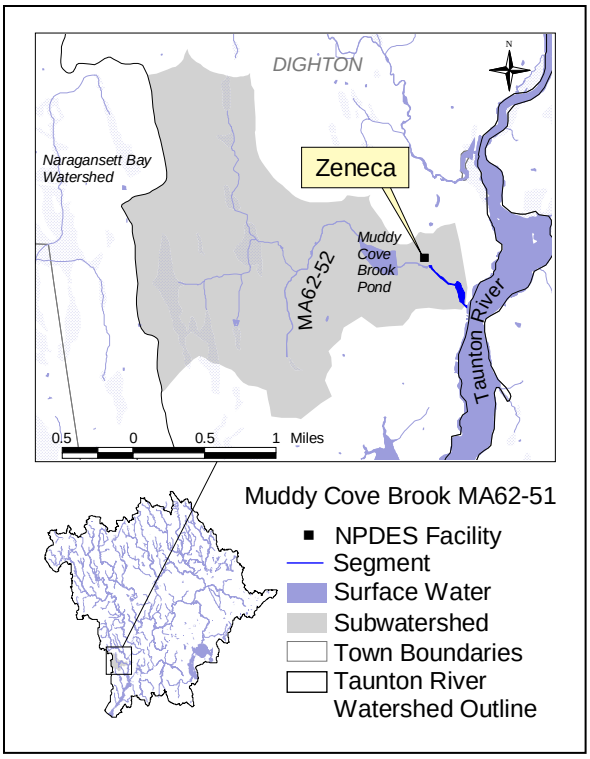
Muddy Cove Brook (MA62-52) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
The Town of Dighton should implement recommendations for wastewater management to protect groundwater and surface waters that are made in the 2003 SRF Comprehensive Wastewater Management Project.

MUDDY COVE BROOK (SEGMENT MA62-51)

Location: From outlet of small impoundment behind 333 Main Street (Zeneca, Inc.), Dighton to confluence with Taunton River, Dighton.
Segment Length: 0.01 square miles
Classification: SA
(Formerly part of Segment MA62-23)



The drainage area of this segment is approximately 3.0 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....69.8%
Agriculture.....12.5%
Residential.....8.6%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62-23 is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLES G2 AND G4)

Based on available information there are no WMA regulated withdrawals in this subwatershed.

Zeneca, Inc. (formerly ICI Americas, Inc.) used to discharge treated wastewater to this segment of Muddy Cove Brook (NPDES MA0005291) but in 1992 the discharge was moved to the Taunton River via outfall 011A (permit revision signed in June 1992 – see Segment MA62-03). The facility was engaged in the manufacturing of textile dyestuffs and other organic chemicals. Manufacturing operations of the site ceased in 1995. Wastewater generated was a result of facility decommissioning and RCRA Corrective Action, which was discharged via outfall 011A to the Taunton River (Segment MA62-03) (Zeneca 2000). EPA terminated the individual NPDES permit in November 2003. The facility was discharging stormwater under a multisector general stormwater permit (MAR05B053) via Outfall 011S to this segment of Muddy Cove Brook. However, the permit has expired and the company needs to reapply for a new multisector general stormwater permit.

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Effluent

Acute toxicity tests have been conducted on stormwater from Outfall 011S. A total of eight tests were conducted between November 1999 and October 2002 using *Ceriodaphnia dubia* and *Pimephales promelas* as test organisms. No acute toxicity was detected by either test organism.

Too limited data are available so the *Aquatic Life Use* is not assessed.

SHELLFISHING

The DMF Shellfish Status Report of 2003 indicates that area MHB2.2 is prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of Muddy Cove Brook because of elevated bacteria counts.

Muddy Cove Brook (MA62-51) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems and septic systems)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Zeneca, Inc. is required to reapply for a new multisector general stormwater permit.

BROAD COVE (SEGMENT MA62-50)

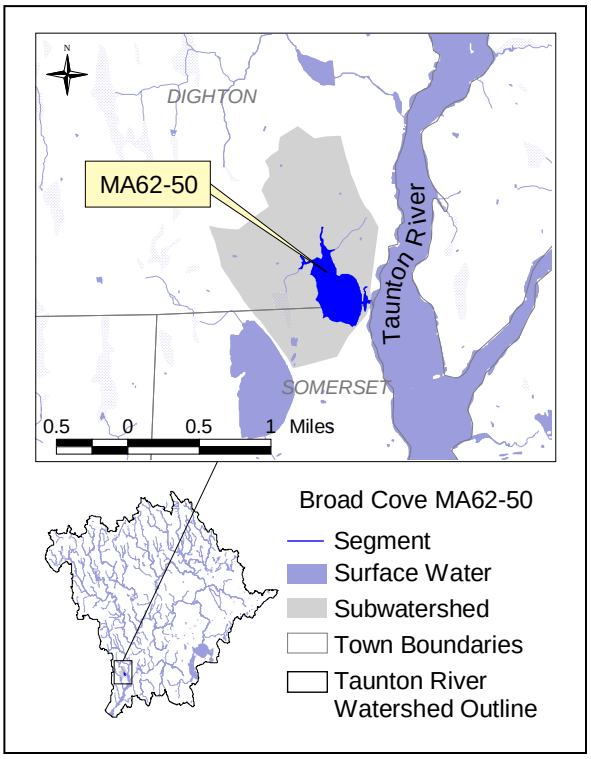
Location: Somerset/Dighton
Segment Size: 0.13 square miles
Classification: Class SA
(Formerly reported as Segment MA62022)

The drainage area of this segment is approximately 1.1 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....39.7%
Agriculture.....18.3%
Residential.....17.1%

The impervious cover area for this subwatershed is less than 10%.

Segment MA62022 is on the Massachusetts Year 2002 Integrated List of Waters – Category 2 (MassDEP 2003).



WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY

There are no WMA withdrawals or NPDES discharges in this segment.

USE ASSESSMENT

SHELLFISH HARVESTING

The DMF Shellfish Status Report of 2003 indicates that all growing areas within this segment (MHB2.2) are prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for Broad Cove because of elevated bacteria counts.

Broad Cove (MA62-50) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Source: Discharges from municipal separate storm sewer systems)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

MATFIELD RIVER SUBWATERSHED

The Matfield River and its tributaries drain 77 square miles of the northeast portion of the Taunton River Basin. This subwatershed contains some of the most densely developed areas of the state. The following segments are included in the Matfield River subwatershed (Figure 9):

Lovett Brook (Segment MA62-46)
Salisbury Brook (Segment MA62-08)
Trout Brook (Segment MA62-07)
Salisbury Plain River (Segment MA62-05)
Salisbury Plain River (Segment MA62-06)
Beaver Brook (Segment MA62-09)
Meadow Brook (Segment MA62-38)
Shumatuscacant River (Segment MA62-33)
Poor Meadow Brook (Segment MA62-34)
Satucket River (Segment MA62-10)
Matfield River (Segment MA62-32)

In the northwest section of this subwatershed, Lovett Brook has its headwaters in Brockton and flows south joining Salisbury Brook. Salisbury Brook continues in a southeast direction joining with Trout Brook near downtown Brockton to form the Salisbury Plain River. The Salisbury Plain River flows in a southerly direction through highly urbanized portions of Brockton before heading east to form the Matfield River at its confluence with Beaver Brook in East Bridgewater. Meadow Brook has its origins in Whitman and joins the Matfield River in East Bridgewater.

The northeastern section of the Matfield River subwatershed is drained by the 8.5-mile Shumatuscacant River, which runs through the towns of Abington and Whitman and joins Poor Meadow Brook in Hanson. Poor Meadow Brook then flow south westerly to Robbins Pond. The Satucket River originates in Robbins Pond in Bridgewater and meanders in a generally westerly direction before joining the Matfield River in East Bridgewater.

The land use in the western portion of the Matfield River subwatershed (Lovett, Salisbury, and Trout Brooks and Salisbury Plain River) is primarily residential followed by forest and some commercial and open space areas. This portion of the Matfield River contains some of the highest concentration of impervious area in the Taunton River watershed with impervious cover values all greater than 25.6%. This indicates that there is the potential for water quality to be impacted by impervious surface water runoff. In the central and eastern portions of the Matfield River Subwatershed (Beaver, Meadow and Poor Meadow Brooks and Shumatuscacant, Satucket and Matfield Rivers) the dominant land use is forest followed by residential and some open area. This includes 1008 acres of land which are classified in the Land-Use theme as cranberry bog (UMass Amherst 1999). The impervious area values are all less than 12.8% indicating there is a low to moderate potential for adverse water quality impacts from impervious surface water runoff.

Of the eleven segments in the Matfield subwatershed, five are on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting Water Quality Criteria. There is one site, the East Bridgewater Murray-Carver Landfill, in the Satucket River segment awaiting a NPL decision.

Of the eleven facilities permitted under the WMA, seven are municipal public water supply sources. Authorized surface and groundwater withdrawals total 10.56 MGD. Water use for the cranberry bog areas in the Matfield and Satucket River segments is considerably more, estimated at 17.74 MGD (UMass Amherst 1999).

There are four minor NPDES permitted facilities in this subwatershed and one major municipal wastewater discharge facility, the Brockton Advanced Water Reclamation Facility which receives wastewater from approximately 20 industrial users. Low dissolved oxygen/saturation and elevated total phosphorus concentrations instream are associated with the Brockton Advanced Water Reclamation Facility discharge. Both acute and chronic toxicity in the effluent are also of concern impacting the

Salisbury Plain and Matfield Rivers. Additionally, numerous Multi-sector General Stormwater Permits have been issued for facilities in this subwatershed. The communities of Bridgewater, East Bridgewater, West Bridgewater, Whitman, Hanson, Abington, Brockton, Avon, Stoughton and Holbrook are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

The Matfield and Salisbury Plain River Watersheds NPS Assessment study, conducted by ESS, Inc., was initiated in 2002 at the request of local and state stakeholders. The primary goals of the project were to identify sources of NPS pollution and recommend actions to protect and improve water quality. Many of the river and stream segments in the NPS study were found to have impaired water and habitat quality due to extensive development, a lack of stream-side vegetation, and minimal stormwater detention or other treatment (ESS 2003). Additionally, DWM conducted water quality sampling at three sites on the Satucket River, USGS sampled one site on the Matfield River and the Bridgewater State WAL also sampled one site on the Matfield River.

Due to the lack of instream biological data, most segments in the Matfield River subwatershed are not assessed for the *Aquatic Life Use*. Nevertheless, this use is identified with an Alert Status in most of these segments because of concerns over habitat degradation, sedimentation, channel alterations, elevated total phosphorus concentrations, and low dissolved oxygen/saturation concentrations. The Matfield River and portions of Salisbury Brook, Salisbury Plain River and the Shumatuscacant River are assessed as impaired for the *Aquatic Life Use* due to habitat degradation and impacted macroinvertebrate communities. Because of elevated bacteria levels, most segments are assessed as impaired for the *Primary and Secondary Contact Recreation* uses. Objectionable conditions in some segments caused the *Aesthetics* use to be assessed as impaired.

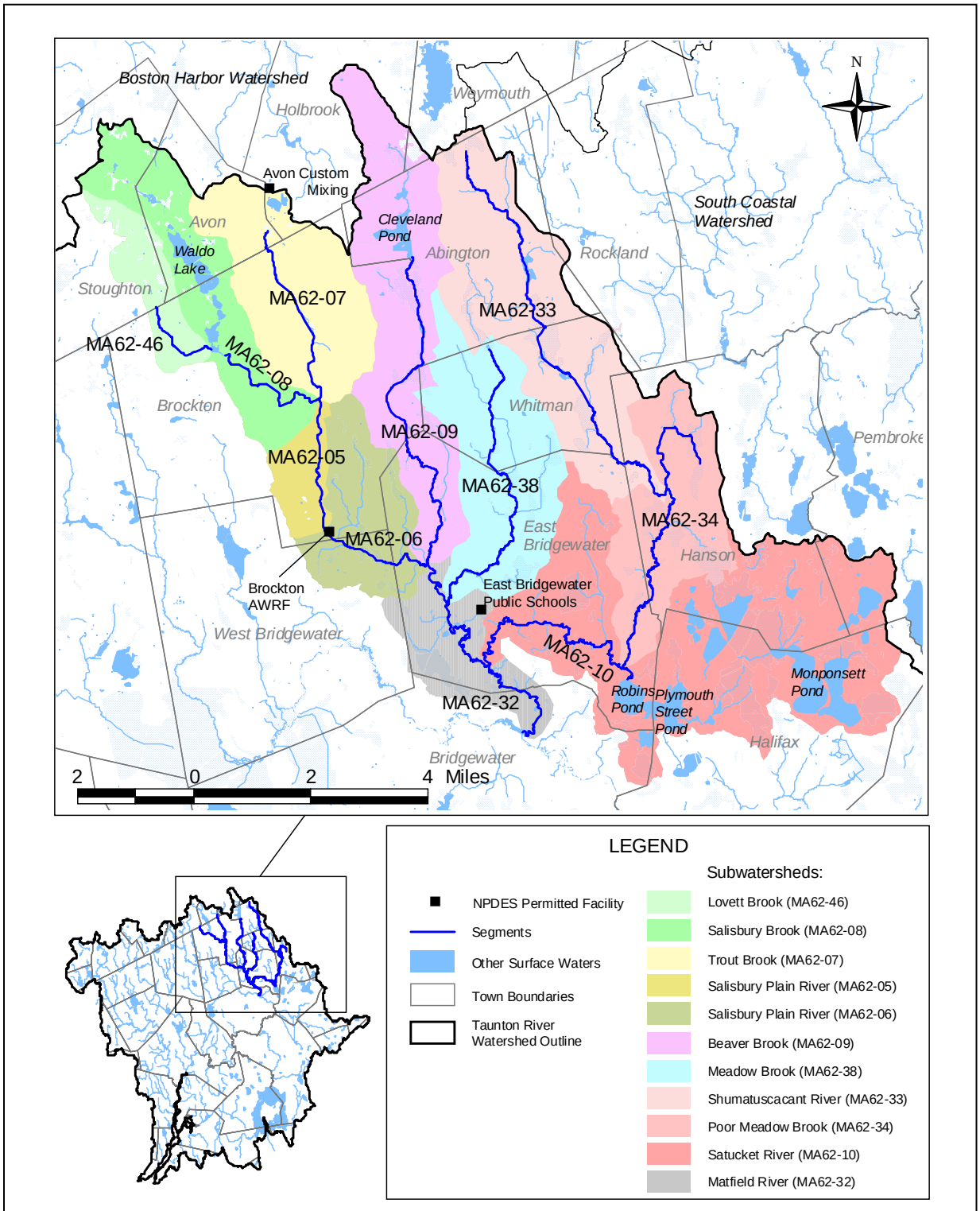
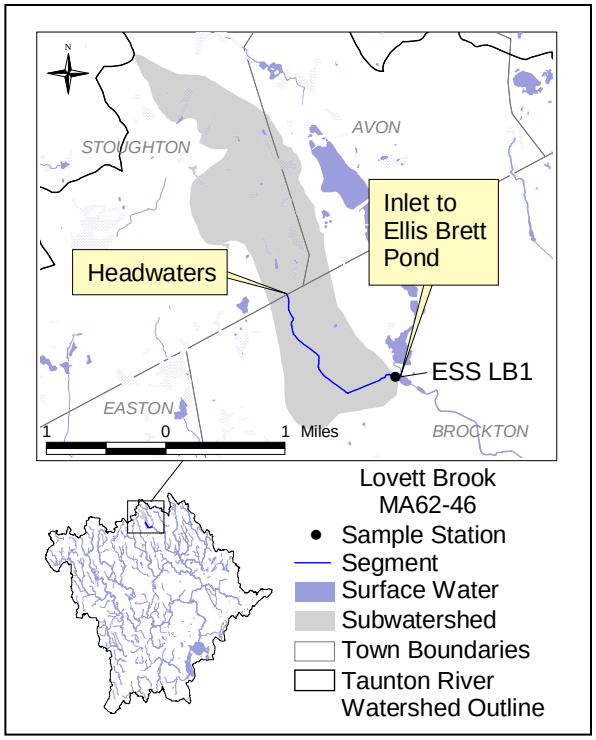


Figure 9. Matfield River Subwatershed

LOVETT BROOK (SEGMENT MA62-46)

Location: Headwaters north of Oak Street, Brockton to inlet Ellis Brett Pond, Brockton.
Segment Length: 1.5 miles
Classification: B



The drainage area of this segment is approximately 2.2 square miles. Land-use estimates (top three) for the subwatershed:

Residential.....37.0%
Forest.....27.5%
Commercial.....12.1%

The impervious cover area for this subwatershed is 29.3%.

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA withdrawals or NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

Using MassDEP guidelines, ESS conducted a habitat assessment in Lovett Brook near D.W. Field Park Drive, Brockton (Station LB1) during the summer of 2002. The overall habitat assessment score was 136/200. Instream cover for fish and epifaunal substrate was somewhat limited as was channel flow status and velocity/depth combinations. The riparian zone width on both banks was also impacted (ESS 2003).

Chemistry – water

Between August and November 2002, ESS conducted water quality monitoring in Lovett Brook near D.W. Field Park Drive, Brockton (Station LB1) as part of their NPS study. Results of these surveys are summarized as follows (ESS 2003).

Dissolved Oxygen and % Saturation

Dissolved oxygen in Lovett Brook near D.W. Field Park Drive, Brockton (Station LB1) ranged from 6.2 to 7.7 mg/L with saturations between 69.3 and 74.7%. It should be noted that these data do not represent pre-dawn sampling conditions.

Temperature

The maximum temperature recorded in Lovett Brook was 22.4°C.

pH

The pH ranged from 6.6 to 7.6 SU.

Specific Conductance

Specific conductance ranged from 227.7 to 706.0 µmhos/cm with the highest measurement during the dry weather survey (1 August 2002).

Total Suspended Solids (TSS)

The highest concentration of TSS measured in Lovett Brook was 12 mg/L (n=3).

Total Kjeldahl Nitrogen (TKN)

The concentration of TKN in Lovett Brook ranged from 0.5 to 1.3 mg/L (n=3).

Total Phosphorus
Total phosphorus concentrations ranged from 0.02 to 0.15 mg/L. Two of the three measurements were ≥ 0.05 mg/L and were collected during wet weather sampling conditions.

The *Aquatic Life Use* is not assessed for Lovett Brook as a result of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use in this urbanized subwatershed is identified with an Alert Status because of habitat degradation (result of sedimentation) and slightly elevated total phosphorus concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Both fecal coliform and *E.coli* bacteria were collected by ESS from Lovett Brook near D.W. Field Park Drive, Brockton (Station LB1) between August and November 2002. The fecal coliform bacteria counts were 180, 900 and 12,000 cfu/100 mL (geometric mean = 1,248 cfu/100 mL) while the *E. Coli* bacteria counts ranged from 180 to 10,000 cfu/100 mL (ESS 2003). It should be noted that both elevated bacteria counts were associated with wet weather sampling conditions.

No objectionable oils, odors, or other conditions were identified by ESS at their sampling location in Lovett Brook during their habitat assessment survey (ESS 2003).

Too limited data are available so the *Primary* and *Secondary Contact Recreational* uses are not assessed. However, these uses are identified with an Alert Status because of elevated bacteria counts associated with wet weather sampling conditions. The *Aesthetics Use* is assessed as support based on observations reported by ESS.

Lovett Brook (MA62-46) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		SUPPORT

* Alert Status issues identified, see details in use assessment

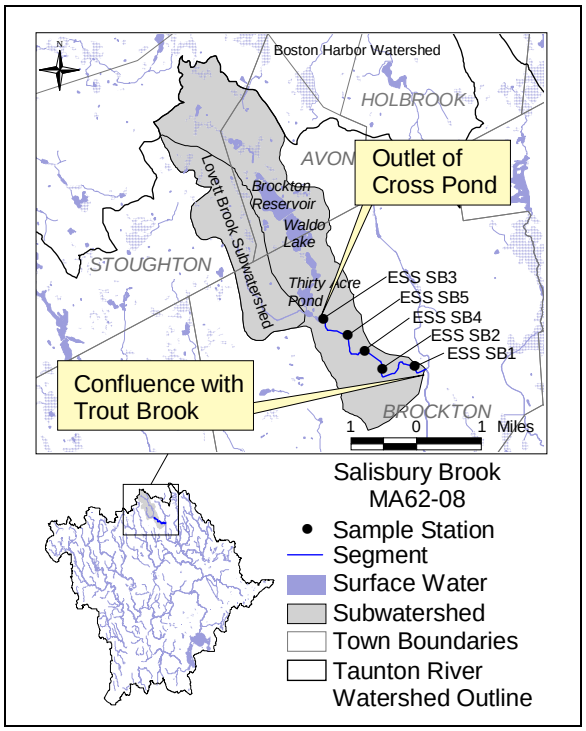
RECOMMENDATIONS
Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct biological monitoring in Lovett Brook to evaluate the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate the effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

SALISBURY BROOK (SEGMENT MA62-08)

Location: From the outlet of Cross Pond, Brockton to the confluence with Trout Brook forming the Salisbury Plain River, Brockton.
Segment Length: 2.5 miles
Classification: Class B



The drainage area of this segment is approximately 8.2 square miles. Land-use estimates (top three) for the subwatershed:

Residential 36.2%
Forest 27.5%
Industrial 10.5%

The impervious cover area for this subwatershed is 30.6%.

The use assessments for Brockton Reservoir (MA62023), Waldo Lake (MA62201), Upper Porter Pond (MA62200), Lower Porter Pond (MA62111), Thirty Acre Pond (MA62190), and Cross Pond (MA62052) are in the Lake Assessment section of this report.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality criteria for siltation and pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA regulated withdrawals and no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

ESS conducted habitat evaluations at five sites along Salisbury Brook in June/July 2002 (ESS 2003). The stations (upstream to downstream) were located at Elmwood Avenue (Station SB3), near Belmont Avenue (Station SB5), near Montgomery Street (Station SB4), near Chester Street (Station SB2) and near Otis Street (Station SB1). The habitat assessment scores were generally low ranging from 59 to 136/200. Channel flow status and bank stability were the only habitat variables that consistently scored in the suboptimal range at all five sites evaluated. Instream habitat in this brook was limited as a direct result of development (poor instream cover, significant channel alteration, some sediment deposition and little to no riparian zones) (ESS 2003). It should also be noted that the brook is channelized underground between Stations SB4 and SB2.

Chemistry – water

Between June and November 2002, five stations were sampled by ESS along this segment of Salisbury Brook as part of their NPS study. Results of these surveys are can be summarized as follows (ESS 2003):

SB3 - Elmwood Avenue, Brockton (n=5 sampling events)
SB5 - near Belmont Avenue, Brockton (n=3 sampling events)
SB4 - near Montgomery Street, Brockton (n=3 sampling events)
SB2 - near Chester Street, Brockton (n=5 sampling events), and
SB1 - near Otis Street, Brockton (n=5 sampling events)

Dissolved Oxygen and % Saturation

The concentration of dissolved oxygen at the five stations monitored ranged from 2.1 to 8.3 mg/L with five of the 18 measurements <5.0 mg/L (all measurements were taken during the day). Percent saturation

ranged from 22.4 to 91.6 and five of the 18 measurements were less than 60% saturation. The lowest DOs were measured during the August survey.

Temperature
The highest temperature measured in Salisbury Brook was 23.5°C (S tation SB4) on 1 August 2002.

pH
The pH in Salisbury Brook ranged from 6.3 to 7.8 SU at the five stations monitored. Only one of the 21 measurements was less than 6.5 SU.

Specific Conductance
Specific conductance ranged from 256.9 to 561.0 µmhos/cm (n=21).

TSS
The TSS concentrations ranged from <1 to 68 mg/L at the five stations sampled in Salisbury Brook. Two of the 21 samples exceeded 25 mg/L (one at SB3 and one at SB1).

TKN
The concentration of TKN ranged from 0.2 to 3.0 mg/L (n=21).

Total Phosphorus
Total phosphorus concentrations ranged from 0.02 to 0.54 mg/L. Six of the 21 measurements were ≤0.05 mg/L.

A 0.4 mile reach of Salisbury Brook is impaired because of physical alteration (underground and culverted) that results in a reduction of habitat available for aquatic life. The remaining portions of Salisbury Brook are not assessed for the *Aquatic Life Use* due to the lack of instream biological data (response type indicators of in-stream water quality conditions). This use is identified with an Alert Status, however, because of concerns over habitat degradation: poor instream cover, significant channel alteration, sediment deposition, little to no riparian zones, and, elevated total phosphorus concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
ESS collected fecal coliform and *E. coli* samples at four sampling stations in Salisbury Brook between June and November 2002 during both dry and wet weather events. From upstream to downstream these stations can be summarized as follows (ESS 2003):

SB3 - Elmwood Avenue, Brockton
SB5 - near Belmont Avenue, Brockton
SB4 - near Montgomery Street, Brockton
SB2 - near Chester Street, Brockton
SB1 - near Otis Street, Brockton

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
SB3	70 – 10,000*	933	70 – 10,000	913	5
*60% of the samples collected during the primary contact season exceeded 400 cfu/100 mL and 40% exceeded 2,000 cfu/100 mL.					
SB5	1,400 - 20,000*	NA	1,400 - 20,000	NA	3
* Both samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					
SB4	310 – 13,000*	NA	<100 – 11,000	NA	3
*One of the two samples collected during the primary contact season exceeded 2,000 cfu/100mL.					
SB2	2,700 - 44,000*	13,035	2,400 - 42,000	11,667	5
All of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					
SB1	1,700 – 20,000	5,930	800 – 18,000	3,941	5
*80% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					

No objectionable oils, odors, or other conditions were identified by ESS at any of the five sampling locations in Salisbury Brook with the exception of trash and debris in Salisbury Brook near Chester Street (Station SB2) (ESS 2003).

The *Primary* and *Secondary Contact Recreational* uses are assessed as impaired because of elevated bacteria counts. The *Aesthetics Use* is assessed as support.

Salisbury Brook (MA62-08) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED upper 1.0 mile reach* IMPAIRED 0.4 mile reach Causes: Physical substrate alteration and habitat assessment Source: Channelization NOT ASSESSED lower 1.1 mile reach*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Secondary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Aesthetics		SUPPORT

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to Salisbury Brook from potential sources of pollution and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

TROUT BROOK (SEGMENT MA62-07)

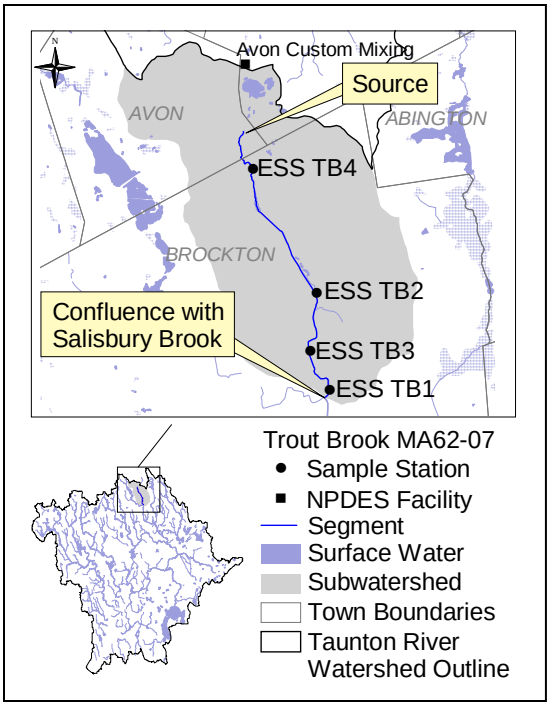
Location: Source northeast of Argyle Avenue and west of Conrail Line, Avon to the confluence with the Salisbury Brook forming the Salisbury Plain River, Brockton.
Segment Length: 3.4 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 6.9 square miles. Land-use estimates (top three) for the subwatershed:

Residential 59.2%
Forest 13.9%
Open land 12.2%

The impervious cover area for this subwatershed is 25.6%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality criteria for siltation, organic enrichment/low DO, and pathogens (MassDEP 2003).



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Avon Water Department	9P42501801	42501801	4018000-01G 4018000-02G 4018000-03G 4018000-04G 4018000-05G 4018000-06G	0.45 reg 0.16 perm Total – 0.61

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

Avon Custom Mixing Services, Inc., a manufacturer of elastometric compounds (rubber products), is authorized to discharge from its facility, Division of Chase and Sons, to Trout Brook. Although the NPDES permit #MA0026883 was issued November 2001, the company appealed the permit. Their permit appeal was denied in August 2002. Under the conditions of their permit, the facility is authorized to discharge 0.0015 MGD of treated sanitary effluent from its wastewater treatment facility and 0.15 MGD of combined non-contact cooling water and stormwater discharge from Outfall 002. Whole effluent toxicity limits are C-NOEC>21% and LC_{50}>100% with a monitoring frequency of four times a year using both *Ceriodaphnia dubia* and *Pimephales promelas*. According to MassDEP Northeast Regional Office, the facility has occasional violations of their fecal coliform bacteria and ammonia limits (Ahsan 2005).

The former Hybripac Inc. in Avon was issued an emergency exclusion for their groundwater remediation project in 1997, which is no longer in effect (Pellerin 1997).

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

ESS conducted instream habitat evaluations at four sites along Trout Brook in June/July 2002. The stations (upstream to downstream) were located at Studley Avenue, off of North Montello Street, Brockton (Station TB4); near East Ashland Street, Brockton (Station TB2); near Court Street, Brockton (Station TB3); and near Crescent Street (Route 27), Brockton (Station TB1). The habitat assessment scores were generally low ranging from 86 to 114/200. Channel flow status was the only habitat variable that

consistently scored in the suboptimal range at all four sites evaluated. Instream habitat in this brook was limited as a direct result of development, poor instream cover, significant channel alteration, some sediment deposition, moderately unstable banks and little to no riparian zones (ESS 2003).

Toxicity

Effluent

One modified acute and chronic whole effluent toxicity test was conducted on the Avon Custom Mixing, Inc. treated sanitary effluent (Outfall #001) using both *Ceriodaphnia dubia* and *Pimephales promelas*. No acute or chronic toxicity to either test organism was detected in the August 2004 test. No other whole effluent toxicity testing reports have been submitted to MassDEP.

Chemistry – water

Between June and November 2002, the following four stations were sampled by ESS along this segment of Trout Brook as part of their NPS study (ESS 2003).

TB4 – Studley Avenue, off of North Montello Street, Brockton (n=3 sampling events).
TB2 – East Ashland Street, Brockton (n=5 sampling events).
TB3 – Court Street, Brockton (n=3 sampling events).
TB1 – Crescent Street (Route 27), Brockton (n=5 sampling events).

Results of these surveys are summarized below).

Dissolved Oxygen and % Saturation

The concentration of dissolved oxygen at the four stations monitored (day surveys only) ranged from 2.6 to 7.9 mg/L with eight of the fourteen measurements <5.0 mg/L. Percent saturation ranged from 30.8 to 85.9 and 11 of the 14 measurements were less than 60% saturation.

Temperature

The highest temperature measured in Trout Brook was 28.8°C (Station TB4) on the 1 August 2002.

pH

The pH in Trout Brook ranged from 6.0 to 7.8 SU at the four stations monitored. Only three of the 16 measurements were less than 6.5 SU.

Specific Conductance

Specific conductance ranged from 134.4 to 481.0 µmhos/cm (n=16).

TSS

The TSS concentrations ranged from 2.0 to 27 mg/L at the four stations sampled in Trout Brook. It should be noted that the highest concentrations (23 to 27 mg/L) were measured in the lower reach of the brook near Court Street and Crescent Street (Stations TB3 and TB1).

TKN

The concentration of TKN ranged from 0.3 to 2.6 mg/L (n=16).

Total Phosphorus

Total phosphorus concentrations ranged from 0.04 to 0.20 mg/L, however, it should be noted that the highest concentrations were consistently measured in the lower reach of the brook near Court Street and Crescent Street (stations TB3 and TB1). Only one of the 16 measurements was <0.05 mg/L.

The *Aquatic Life Use* is not assessed for Trout Brook as a result of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use in this urbanized subwatershed is identified with an Alert Status because of habitat degradation, low dissolved oxygen/saturation and elevated total phosphorus concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS

Fecal coliform and *E. coli* samples were collected at four sampling stations in Trout Brook between June and November 2002 during both dry and wet weather events. From upstream to downstream these stations are summarized as follows (ESS 2003):

TB4 – Studley Avenue, off of North Montello Street, Brockton
TB2 – East Ashland Street, Brockton
TB3 – Court Street, Brockton
TB1 – Crescent Street (Route 27), Brockton

Samples were also collected from three tributaries to Trout Brook (Stations SEB1 and SEB2 on Searles Brook, Station MAB1 on Malfardar Brook, and Stations CB1 and CB2 on Cary Brook).

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
TB4	1,100 – 9,600*	NA	1,000 – 8,400	NA	3
*Both samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					
TB2	120 and 16,000*	1,829	70 and 10,000	1,344	5
*60% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					
TB3	4,200 – 48,000*	NA	4,000 – 22,000	NA	3
*All of the samples collected during the primary contact season exceeded 2,000 cfu/100mL.					
TB1	1,200 - 64,000*	8,020	1,200 - 55,000	6,643	5
*80% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.					

NB: Elevated bacteria counts in Trout Brook are representative of both dry and wet weather sampling conditions. Elevated bacteria counts were also documented in the three tributaries (ESS 2003).

No objectionable oils, odors, or other objectionable conditions were identified by ESS at the two most upstream sampling locations in Trout Brook (Station TB4) near Studley Avenue, off of North Montello Street, and near East Ashland Street, Brockton (Station TB2). Further downstream, however, near Court Street, Brockton (Station TB3), sewage and chemical odors were noted and the water column was described as opaque. No objectionable conditions (odors, oils, other deposits) were noted by ESS at the most downstream sampling location in Trout Brook near Crescent Street (Route 27), Brockton (Station TB1) (ESS 2003).

The *Primary* and *Secondary Contact Recreational* uses are assessed as impaired because of elevated bacteria counts. The *Aesthetics Use* is assessed as support upstream from East Ashland Street (upper 2.1 mile reach) but is assessed as impaired downstream from East Ashland Street (lower 1.3 mile reach) because of objectionable conditions reported by ESS.

Trout Brook (MA62-07) Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Secondary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Aesthetics		SUPPORT upper 2.1 mile reach IMPAIRED lower 1.3 mile reach Causes: Visual turbidity and total suspended solids Sources: Unknown (Suspected Source: Illicit connections/hookups to storm sewers)

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to Trout Brook from potential sources of pollution and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

SALISBURY PLAIN RIVER (SEGMENT MA62-05)

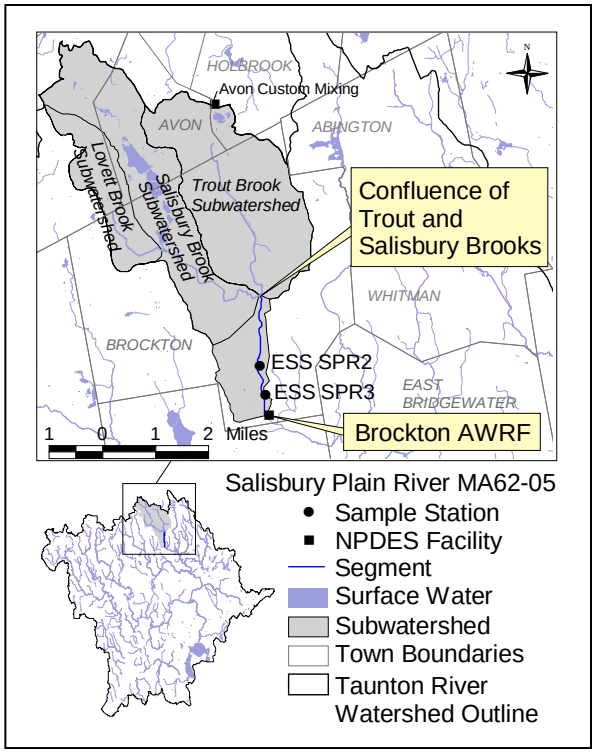
Location: From the confluence of Trout and Salisbury brooks, Brockton to the Brockton AWRF discharge, Brockton.
Segment Length: 2.4 miles
Classification: Class B

The drainage area of this segment is approximately 16.8 square miles. Land-use estimates (top three) for the subwatershed:

Residential 47.9%
Forest 20.1%
Open land 8.9%

The impervious cover area for this subwatershed is 29.6%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality criteria for siltation, pathogens, suspended solids, and other habitat alterations (MassDEP 2003).



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Brockton DPW Water Division	9P42504401	42504402	01G	0.04 reg 0.83 perm 0.87 total
Churchill Linen Service	V42504401	NA	01G	0.09 reg

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

ESS conducted habitat evaluations at two sites along this segment of the Salisbury Plain River near Plain Street, Brockton (Station SPR2) and near #1690 Main Street, Brockton (Station SPR3) in June/July 2002. The overall habitat assessment scores were 113 and 98/200, respectively. The instream habitat near Plain Street was limited by lack of velocity/depth combinations and limited riffle areas. Channel alteration was evident and the riparian vegetative width and bank stability were also somewhat limited. Embeddedness/sediment deposition, limited riffle areas, and lack of velocity/depth combinations and bank stability contributed to the lower habitat assessment score of the river near #1690 Main Street (ESS 2003).

Biology

In July 1996 DWM conducted a Rapid Bioassessment Protocol (RBP) II benthic macroinvertebrate survey in this segment of the Salisbury Plain River (Station TR02) upstream from the Brockton WWTP, Brockton. The results of this survey can be found in Appendix E.

Chemistry – water

Between June and November 2002 water quality sampling was conducted by ESS at two sites in this segment of the Salisbury Plain River as part of the ESS NPS study. The most upstream station was

located near Plain Street, Brockton (Station SPR2) while the downstream station was located behind #1690 Main Street (Station SPR3) (ESS 2003). The results of this survey are summarized below.

Dissolved Oxygen and % Saturation
DO measurements ranged from 4.0 to 7.9 mg/L at Station SPR2 with percent saturations ranging from 45 to 86.9%. Of the three measurements taken (day surveys only) in the river at Station SPR3 DOs ranged from 3.3 to 7.0 mg/L with saturations ranging from 42.2 to 68.2%. Of the seven measurements taken, three were below 5.0 mg/L and 60% saturation.

Temperature
The maximum temperature recorded in the Salisbury Plain River was 28.5°C (station SPR3 in August 2002).

pH
The pH ranged from 6.5 to 7.6 SU in this segment of the Salisbury Plain River.

Specific Conductance
Specific conductance ranged from 199.9 to 470.0 µmhos/cm in this segment of the Salisbury Plain River.

TSS
TSS concentrations measured in this segment of the Salisbury Plain River ranged from 1.0 to 12.0 mg/L at both sampling stations (n=8).

TKN
TKN ranged from 0.3 to 1.4 mg/L (n=8).

Total Phosphorus
Total phosphorus concentrations ranged from 0.04 to 0.17 mg/L and two of the eight measurements were <0.05 mg/L.

The *Aquatic Life Use* is not assessed for this segment of the Salisbury Plain River because of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use is identified with an Alert Status, however, because of habitat degradation, low dissolved oxygen/saturation and slightly elevated total phosphorus concentrations in this urbanized subwatershed.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
As part of the ESS NPS study, both fecal coliform and *E. coli* bacteria were collected between June and November 2002. The most upstream station was located near Plain Street, Brockton (Station SPR2) while the downstream station was located behind #1690 Main Street (Station SPR3) (ESS 2003). These data are summarized below.

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)*	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
SPR2	2,000 – 20,000*	5,168	900 – 13,000	3,572	5
*100% samples collected during the primary contact season exceeded 2,000 cfu/100mL					
SPR3	2,300 - 5,800*	NA	2,000 - 5,000	NA	3
*Both samples collected during the primary contact season exceeded 2,000 cfu/100mL					

NB: It should be noted that these results represent both wet and dry weather sampling conditions.

With the exception of turbidity being noted by ESS in the Salisbury Plain River near #1690 Main Street (Station SPR3), no other objectionable conditions (i.e., odors, colors, deposits) were documented (ESS 2003). No information was provided on objectionable conditions such as trash and debris in this urbanized subwatershed.

This segment of the Salisbury Plain River is assessed as impaired for both the *Primary* and *Secondary Contact Recreational* uses because of elevated levels of bacteria during both wet and dry weather sampling conditions. The *Aesthetics Use* is not assessed.

Salisbury Plain River (MA62-05) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Secondary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))
Aesthetics		NOT ASSESSED

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Salisbury Plain River from potential sources of pollution and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

SALISBURY PLAIN RIVER (SEGMENT MA62-06)

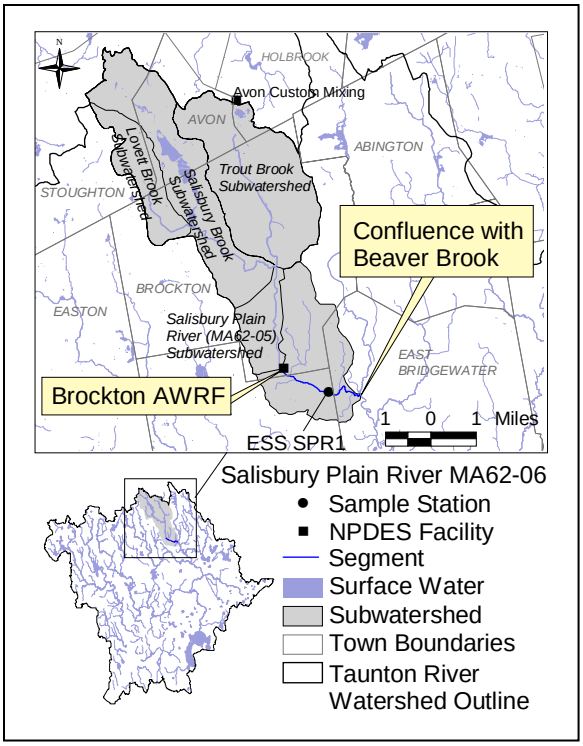
Location: From the Brockton ARWF discharge, Brockton to the confluence with Beaver Brook forming the Matfield River, East Bridgewater.
Segment Length: 2.3 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 21.3 square miles. Land-use estimates (top three) for the subwatershed:

Residential 45.7%
Forest 24.5%
Open land 9.3%

The impervious cover area for this subwatershed is 25.7%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality criteria for pathogens and causes unknown (MassDEP 2003).



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
West Bridgewater Water Department*	9P42532201	42532201	4322000-01G 4322000-02G 4322000-04G 4322000-05G	0.73 reg 0.08 perm Total – 0.81

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G1)

The City of Brockton is authorized to discharge treated sanitary and industrial wastewater (no flow limit in permit) via Outfall #001 from the Brockton Advanced Water Reclamation Facility into the Salisbury Plain River (NPDES permit# MA0101010 issued May 2005). This advanced activated sludge facility incorporates nitrification for ammonia-nitrogen reduction (1 mg/l NH_3-N average monthly June 1 to October 31). The ammonia-nitrogen concentrations listed in the facility's whole effluent toxicity test reports between November 1999 and August 2004 ranged from <0.10 to 16.33 mg/L (n=29). Total phosphorus (TP) reduction is accomplished by chemical addition (1 mg/l TP average monthly May 1 to October 31). The pH measurements listed in the facility's whole effluent toxicity test reports between November 1999 and August 2004 ranged from 6.92 to 7.62 SU (n=30). The facility utilizes sodium hypochlorite for seasonal disinfection and sulfur dioxide for dechlorination (TRC limit = 0.011 mg/L average monthly April 1 to October 31, 0.019 mg/L maximum daily) (Norton 2004). The TRC measurements listed in the facility's whole effluent toxicity test reports between November 1999 and August 2004 were all <0.05 mg/L (n=30). The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC ≥98% with a monitoring frequency of six times/year using *Ceriodaphnia dubia*.

The City of Brockton has received funding through the 2003 SRF program to rehabilitate its aging collection system and its treatment facility. The project objective is to eliminate the environmental and public health issues associated with the Sewer System overflows and discharge violations at the treatment facility. Contract #1 will implement the recommended improvements in the July 2000 WWTF Project Evaluation Report, while Contract #2 will implement improvements in the August 2000 city wide sewer system evaluation report. The Brockton WWTP in 2004 has begun a 3-phase facility-wide upgrade

that is projected to take 6 years. Proposed in the upgrade are additional advanced treatment processes such as biological nutrient reduction (BNR) for total nitrogen reduction and multipoint chemical addition for total phosphorus reduction. A new draft permit is under review and does contain significant lower limits for nitrogen and phosphorus (Norton 2004).

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In August 2001 DWM evaluated habitat conditions in this segment of the Salisbury Plain River near Belmont Street, West Bridgewater (station TR03). The habitat assessment score was 168/200. Riparian zone disruption and erosion along the right bank affected the score negatively. Filamentous green algae covered approximately 50% of the reach (Appendix D). DWM also sampled this site in the Salisbury Plain River in July 1996 (Appendix E).

ESS documented similar conditions during their habitat evaluation of the Salisbury Plain River near Belmont Street, West Bridgewater (Station SPR1) in June 2002. Their overall score was 160/200 (ESS 2003).

Biology

The results of DWM's RBP III analysis of the benthic community in the Salisbury Plain River (Station TR03) was "moderately impacted" compared to the Canoe River (TR01) reference station (Appendix D). DWM biologists concluded that water quality degradation was related to organic enrichment and low dissolved oxygen. RBP II results from the 1996 survey can be found in Appendix E.

Toxicity

Effluent

A total of 30 toxicity tests were conducted on the Brockton WWTP effluent (Outfall #001) between November 1999 and August 2004 using *Ceriodaphnia dubia*. The effluent did not exhibit acute toxicity in 24 of the 30 tests. The LC_{50}s of the six acutely toxic tests ranged from 35.4 to 99.9% effluent. Several (n=3) of the chronic tests were invalid (did not meet test acceptability criterion). Of the 27 valid tests, the C-NOEC results ranged from <6.25 to 100% and 12 of the 27 tests (44%) were less than 98% effluent.

Chemistry – water

Between June and August 2002 ESS conducted water quality sampling on five occasions at one station in this segment of the Salisbury Plain River near Belmont Street, West Bridgewater (Station SPR1) as part of the ESS NPS study. These results are presented below.

Dissolved Oxygen and % Saturation

All four measurements of DO were <5.0 mg/L and 60% ranging from 1.9 to 4.4 mg/L and 23.5 to 50.1%, respectively.

Temperature

The maximum temperature was 22.8°C (n=5).

pH

The pH ranged from 6.7 to 7.4 SU.

Specific Conductance

Specific conductance ranged from 323.5 to 652.0 µmhos/cm.

TSS

The concentration of TSS ranged from 1.0 to 9.0 mg/L (n=5).

TKN

TKN ranged from 0.9 to 4.4 mg/L.

Total Phosphorus
Total phosphorus concentrations ranged from 0.16 to 0.37 mg/L (n=5).

The *Aquatic Life Use* is assessed as impaired for this segment of the Salisbury Plain River based primarily on the results of the benthic macroinvertebrate community analysis and the limited water quality data. Low dissolved oxygen/saturation and elevated total phosphorus concentrations were both documented and are associated with the Brockton Advanced Water Reclamation Facility discharge and nonpoint source pollution in this urbanized subwatershed. Acute and chronic toxicity in the Brockton Advanced Water Reclamation Facility effluent are also of concern.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Both fecal coliform and *E. coli* bacteria samples were collected by ESS from the Salisbury Plain River in this segment of the Salisbury Plain River near Belmont Street, West Bridgewater (Station SPR1) between June and August 2002 (ESS 2003). These data are summarized below.

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100mL)	Geometric Mean (cfu/100mL)	*E. Coli* bacteria data range (cfu/100mL)	Geometric Mean (cfu/100mL)
SPR1	65 – 14,000*	632	62 – 14,000	626
*80% of the samples collected were $\leq$ 400 cfu/100mL but only one of the five samples exceeded 2,000 cfu/100mL.				

It should be noted that these results represent both wet and dry weather sampling conditions.

Sewage odors, turbidity, filamentous green algae and trash/construction materials were observed in the Salisbury Plain River near Belmont Street, West Bridgewater by both DWM and ESS staff in 2001 and 2002 (MassDEP 2001a and ESS 2003).

The *Primary Contact Recreational Use* is assessed as impaired because of elevated bacteria counts. The *Secondary Contact Recreational* and *Aesthetics* uses are also assessed as impaired because of the objectionable conditions (odors, turbidity, filamentous green algae and trash and debris). These uses are impaired as a result of the Brockton Advanced Water Reclamation Facility discharge and nonpoint source pollution in this urbanized subwatershed.

Salisbury Plain River (MA62-06) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Causes: Degraded benthic macroinvertebrate bioassessment, low dissolved oxygen/saturation, excess algal growth, and total phosphorus Source: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Causes: Fecal coliform bacteria, excess algal growth, turbidity, odor, and trash/debris Sources: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Secondary Contact		IMPAIRED Causes: Fecal coliform bacteria, excess algal growth, turbidity, odor, and trash/debris Sources: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Aesthetics		IMPAIRED Causes: Excess algal growth, turbidity, odor, and trash/debris Sources: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Continue to conduct monitoring (biological, habitat and water quality) to evaluate conditions in the Salisbury Plain River resulting from the upgrade of the Brockton Advanced Water Reclamation Facility.

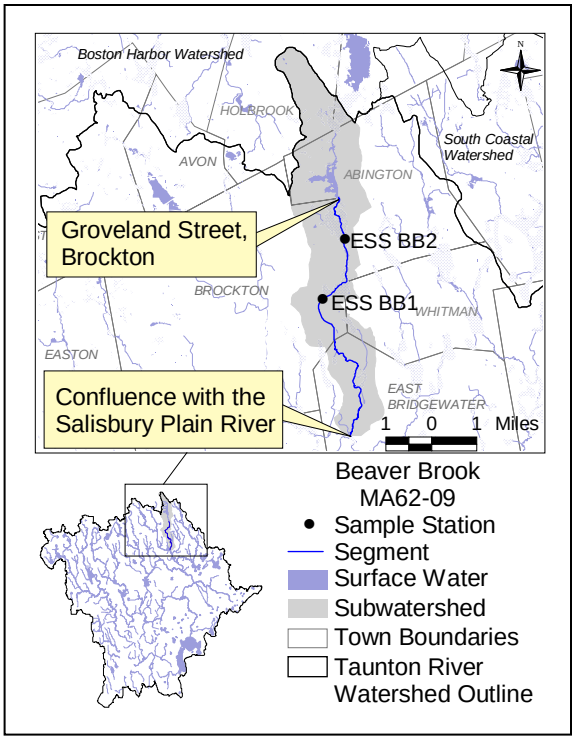
Water quality monitoring is also recommended to evaluate other potential sources of pollution to this segment of the Salisbury Plain River and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to evaluate the Brockton Advanced Water Reclamation Facility NPDES discharge permit and update with appropriate limits and monitoring requirements. A toxicity identification/toxicity reduction evaluation should also be required if acute/chronic toxicity continues to be problematic.

BEAVER BROOK (SEGMENT MA62-09)

Location: Outlet Cleveland Pond, Abington to the confluence with the Salisbury Plain River (forming Matfield River), East Bridgewater.
Segment Length: 6.8 miles
Classification: Class B



The drainage area of this segment is approximately 9.4 square miles. Land-use estimates (top three) for the subwatershed:

Forest 49.6%
Residential 28.4%
Open land 10.2%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Cushing Pond (MA62056) and Cleveland Pond (MA62042) are in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL SUMMARY AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA withdrawals or NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

Using MassDEP guidelines, ESS conducted habitat assessments on two reaches along Beaver Brook: East Ashland/Groveland Street, Brockton/Abington (Station BB2) and near Crescent Street (Route 27), Brockton (Station BB1) during the summer of 2002. At the upstream location (Station BB2) the overall assessment score was 136/200. Instream cover for fish was somewhat limited. Embeddedness, marginal epifaunal substrate, and limited velocity/depth combinations were also noted (ESS 2003).
Further downstream near Crescent Street (Route 27), Brockton (Station BB1) the instream habitat was even more degraded (score 98/200). Here, in addition to the problems noted at the upstream sampling reach, channel alteration and sediment deposition problems were also identified. It should also be noted that one reach in the upper portion of Beaver Brook (upstream from Cleveland Pond) was also sampled by ESS (ESS 2003).

Chemistry – water

Between June and September 2002, two stations were sampled (five surveys per station) by ESS along this segment of Beaver Brook as part of their NPS study. Results of these surveys on the following stations are summarized below (ESS 2003):

BB2 - East Ashland/Groveland Street, Brockton/Abington.
BB1 - Crescent Street (Route 27), Brockton.

Although not discussed here ESS also sampled a station in Beaver Brook upstream from Cleveland Pond near Plymouth Street, Holbrook (Station BB3).

Dissolved Oxygen and % Saturation

Dissolved oxygen in Beaver Brook near Groveland Street (Station BB2) ranged from 3.6 to 5.8 mg/L with two measurements < 5.0 mg/L (day surveys only). The saturation ranged from 37.5% to 64% (2 of 5 measurements were less than 60% saturation. It should be noted that these data do not represent pre-dawn sampling conditions. Further downstream the dissolved oxygen concentrations ranged from 2.0 to 6.9 mg/L with saturations between 21.9 and 77.8%. Two of four measurements were <5.0 mg/L and three of four saturations were <60%.

Temperature
The maximum temperature recorded in this segment of Beaver Brook was 21.9°C.

pH
The pH ranged from 6.4 to 7.4 SU in this segment of Beaver Brook and only one of 10 measurements was <6.5 SU.

Specific Conductance
Specific conductance ranged from 163.0 to 400.0 µmhos/cm at the two sampling stations monitored in this segment of Beaver Brook.

TSS
The highest concentration of TSS measured in this segment of Beaver Brook was 10 mg/L (n=10).

TKN
The concentration of TKN in Beaver Brook at both ESS sampling locations ranged from 0.3 to 1.4 mg/L (n=10). Slightly higher concentrations were found in the river near East Ashland/Groveland Street, Brockton/Abington (station BB2).

Total Phosphorus
Total phosphorus concentrations ranged from 0.04 to 0.08 mg/L (n=10). Half of the measurements were $\geq$ 0.05 mg/L.

The *Aquatic Life Use* is not assessed for this segment of Beaver Brook because of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use is identified with an Alert Status, however, because of concerns over habitat degradation resulting from sedimentation and slightly elevated total phosphorus concentrations in this urbanized subwatershed. Whether or not low dissolved oxygen/saturation results from anthropogenic influences or from natural conditions (wetland influences) is unknown.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Both fecal coliform and *E.coli* bacteria were collected by ESS at two stations in this segment of Beaver Brook between June and September 2002. The sampling locations were near East Ashland/Groveland Street, Brockton/Abington (Station BB2) and near Crescent Street (Route 27), Brockton (Station BB1). ESS also sampled a station in Beaver Brook upstream from Cleveland Pond near Plymouth Street, Holbrook (Station BB3) in the upper part of this subwatershed. The data can be summarized as follows:

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
BB2	12 – 9,600*	823	10 – 9,400	756	5
*60% samples exceeded 2,000 cfu/100mL (counts ranging from 4,800 to 9,600 cfu/100mL)					
BB1	120 – 2,300*	539	80 – 2,200	358	5
*60% samples exceeded 400 cfu/100mL and one sample exceeded 2,000 cfu/100mL					
BB3	140 – 16,000*	2,027	140 – 13,000	1,772	5
*60% samples exceeded 2,000 cfu/100mL					

It should be noted that all elevated bacteria counts were associated with wet weather sampling conditions.

No objectionable oils, odors, or other objectionable conditions were identified by ESS at the two sampling locations in Beaver Brook during their habitat assessment surveys (ESS 2003).

The *Primary* and *Secondary Contact Recreational* uses are assessed as impaired because of elevated bacteria counts associated with wet weather sampling conditions. The *Aesthetics Use* is assessed as support based on observations reported by ESS.

Beaver Brook (MA62-09) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Secondary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Aesthetics		SUPPORT

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct biological monitoring in Beaver Brook to evaluate the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Conduct instream water quality monitoring to determine if low DO is naturally occurring (influence from wetlands).

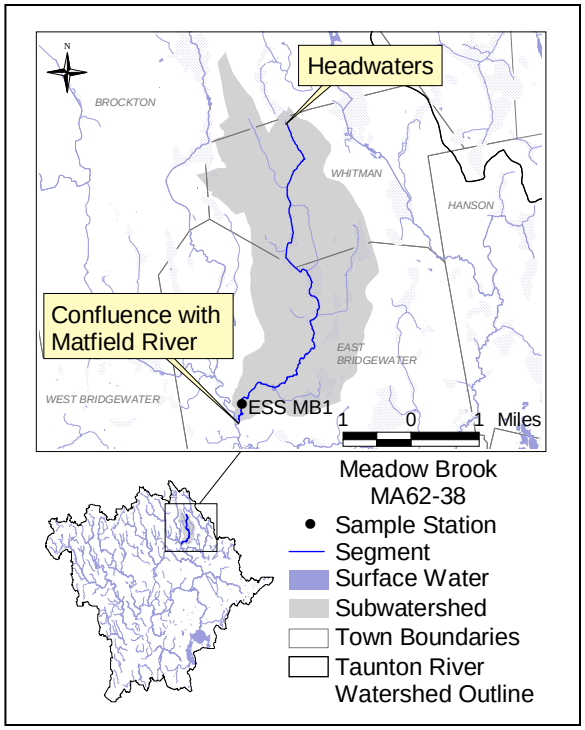
MEADOW BROOK (SEGMENT MA62-38)

Location: Headwaters north of Pine Street, Whitman (through Forge Pond, East Bridgewater) to the confluence with the Matfield River, East Bridgewater.
Segment Length: 6.0
Classification: Class B

The drainage area of this segment is approximately 7.5 square miles. Land-use estimates (top three) for the subwatershed:

Forest 46.1%
Residential 32.7%
Open land 7.3%

The impervious cover area for this subwatershed is 11.5%.



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (S = surface)	Authorized Withdrawal (MGD)
Cameron Woodward Sod Farm*	NA	42508301	C-3S	0.24 reg

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The Foxborough Company (Highland Plant) located in East Bridgewater, a manufacturer of printed circuit boards, formally held a NPDES permit (MA0004103 issued in September 1990) and was authorized to discharge (via Outfall #001) a flow of 0.12 MGD (average monthly) of process wastewater and treated sanitary waste to Meadow Brook. In February 1993 EPA withdrew the 1990 permit that was under appeal and held The Foxborough Company to all the requirements of the permit issued in March 1985 (Stein 1993). In June 2003 a transfer of ownership (NPDES permit MA0004103) originally issued to Invensys Systems (formerly known as The Foxborough Company) to Equity Industrial GHEB Limited Partnership (Equity Industrial) took place (Janson 2003). The facility's whole effluent toxicity limits were $LC_{50} \geq 100\%$ and a C-NOEC$\geq$100% with a monitoring frequency of four times/year using *Ceriodaphnia dubia* and *Pimephales promelas*. The pH of the effluent between March 1997 and March 1999 ranged from 6.2 to 7.5 SU (n=14) with two test events (June and September 1998) below 6.5 SU (TOXTD database). The TRC concentrations were all <0.05 mg/L (n=14). The maximum ammonia-nitrogen concentration of the effluent between March 1997 and March 1999 was 12.00 mg/L (n=14) (TOXTD database). Since March 1999 an existing 18,000-gallon tank is pumped by a commercial hauler and sent off-site to be treated (Janson 2003).

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

Using MassDEP guidelines, ESS conducted a habitat assessment on Meadow Brook at West Union Street (Station MB1) during the summer of 2002. The overall assessment score was 159/200. Habitat was limited by limited velocity/depth combinations and limited riffle areas (ESS 2003).

Toxicity

Ambient

Water from Meadow Brook was collected upstream from Highland Street for use as dilution water in the Foxborough Company's whole effluent toxicity test between March 1997 and March 1999. Survival of *Daphnia pulex* exposed (48-hour) to the river water ranged from 5 to 100%. Survival was less than 75% during two of the eight test events (June and July 1998) (TOXTD database). When too little water was in the brook, laboratory water was used as dilution water (six test events between March 1997 and March 1999).

Effluent

The Foxborough Company's effluent exhibited acute toxicity to *Daphnia pulex* in 10 of the 14 tests conducted between March 1997 and March 1999 with LC50s ranging from <6.25 to 70.7% effluent. The LC50's of the other four tests were >100% effluent (TOXTD database).

Chemistry – water

Water from Meadow Brook was collected upstream from Highland Street for use as dilution water in the Foxborough Company's whole effluent toxicity test between March 1997 and July 1998. Data from these toxicity test reports are maintained in the TOXTD database by DWM and are also summarized below.

Between June and August 2002 ESS sampled near the mouth of Meadow Brook (n=5) near West Union Street, East Bridgewater (Station MB1) as part of the ESS NPS study. Results of the water quality testing are presented below.

Dissolved Oxygen and % Saturation

The DO near the mouth of Meadow Brook (Station MB1) ranged from 5.1 to 7.0 mg/L with saturations ranging from 55.9 to 79.1%. These data do not represent pre-dawn conditions.

Temperature

Temperatures near the mouth of the brook (Station MB1) ranged from 16.9 and 24.1°C.

Hardness:

Hardness of Meadow Brook ranged from 20 to 46 mg/L with only 1 (June 1998) of the 8 test results <25 mg/L (TOXTD database).

pH

The pH of Meadow Brook ranged from 6 to 6.7SU with 5 of the 8 measurements <6.5 SU. Alkalinity ranged from 7.5 to 18 mg/L (n=8) (TOXTD database). The pH near the mouth of the brook (Station MB1) ranged from 6.9 to 7.5 SU.

Specific Conductance:

The specific conductivity of Meadow Brook ranged from 161 to 693 µmho/cm (n=8) (TOXTD database). Near the mouth of the brook (Station MB1), specific conductivity ranged from 345.9 to 605.0 µmhos/cm.

TRC

The TRC measurements (n=8) of Meadow Brook were all ≤0.05 mg/L (TOXTD database).

TSS

TSS concentrations near the mouth of the brook (Station MB1) ranged from <1 to 5.0 mg/L.

TKN

Concentrations of TKN near the mouth of the brook (Station MB1) ranged from 0.3 to 1.1 mg/L.

Total Phosphorus

The total phosphorus concentrations near the mouth of Meadow Brook (Station MB1) ranged from 0.07 to 0.09 mg/L.

The *Aquatic Life Use* is not assessed for this segment of Meadow Brook because no instream biological data were collected (response type indicators of in-stream water quality conditions).

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
As part of the ESS NPS study, both fecal coliform and *E. coli* bacteria were collected (n=5) near the mouth of Meadow Brook near West Union Street, East Bridgewater (Station MB1) between June and August 2002. The fecal coliform bacteria counts ranged from 190 to 1,600 cfu/100mL (geometric mean = 552 cfu/100 mL) and *E. Coli* bacteria counts were similar. Three of five samples exceeded 400 cfu/100 mL. The highest bacteria counts were representative of wet weather conditions (ESS 2003).

No objectionable odors, oils, deposits or other conditions were noted in Meadow Brook near West Union Street (Station MB1) during the ESS habitat assessment survey (ESS 2003).

Meadow Brook is assessed as impaired for the *Primary Contact Recreation Use* because of elevated bacteria counts and as support for the *Secondary Contact Recreational* and *Aesthetics* uses.

Meadow Brook (MA62-38) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, municipal (urbanized high density area), waterfowl and waste from pets)
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS
Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Ensure that all NPDES permits are current and in compliance.

Conduct monitoring (biological, habitat, instream toxicity and/or water quality sampling) to evaluate conditions in Meadow Brook and to assess the status of the *Aquatic Life Use*.

SHUMATUSCACANT RIVER (SEGMENT MA62-33)

Location: From a wetland just west of Vineyard Road, Abington to the confluence with Poor Meadow Brook, Hanson.
Segment Length: 8.5 miles
Classification: Class B

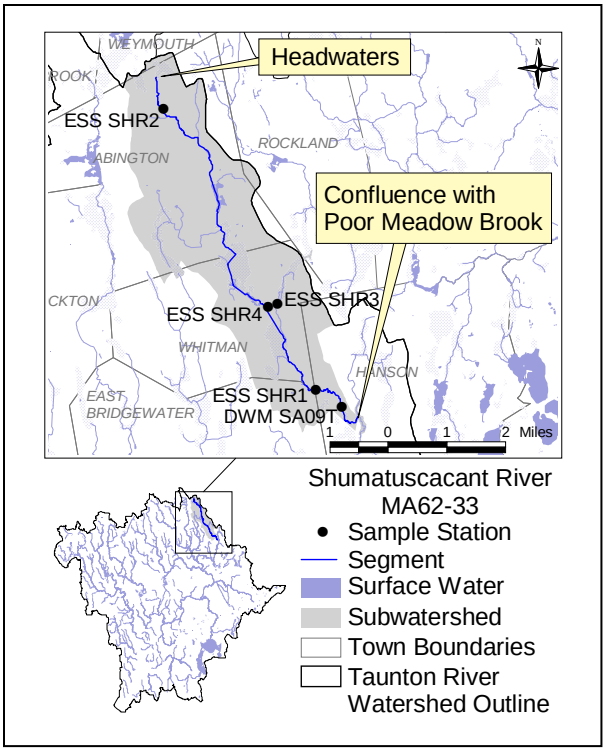
The drainage area of this segment is approximately 10.4 square miles. Land-use estimates (top three) for the subwatershed:

Forest 39.5%
Residential 37.2%
Open land 10.3%

The impervious cover area for this subwatershed is 11.4%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Island Grove Pond (MA62094) and Hobart Pond (MA62090) are in the Lake Assessment section of this report.



WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Abington/Rockland Joint Water Works (Myers Avenue Water Treatment Plant)	NA	42525101	4001000-01G 4001000-02G 4001000-03G 4001000-04G	0.46 reg
Ridder Farm Incorporated	NA	42533801	01S 02S	0.09 reg

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The Abington/Rockland Joint Water Works (Myers Avenue Water Treatment Plant) was issued an NPDES permit (#MAG640009) in April 2001 to discharge treated filter backwash water into a wetland adjacent to the Shumatuscacant River.

Whitman Metal Products Division, which formerly discharged to this segment under their NPDES permit (MA0036919), was connected to the Brockton municipal sewerage system in 1991.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

Using MassDEP guidelines, an ESS NPS study performed habitat assessments at three sites along the Shumatuscacant River during the summer of 2002 (ESS 2003). From upstream to downstream these stations can be summarized as follows.

Station SHR2 - near Summer Street, Abington: At the most upstream, sampling station, the habitat assessment score was 123/200. This sampling station was located downstream from the Island Grove Impoundment of the Shumatuscacant River and was also downstream from an urbanized section of Abington. Marginal fish cover and epifaunal substrate, sediment deposition and embeddedness, poor bank stability, and limited velocity/depth combinations limited instream habitat most.

Station SHR4 - near South Avenue, Whitman: Instream habitat in the river scored only 89/200. Sediment deposition/embedness was problematic (sand and silt comprised the majority of the substrates--90%) and fish cover was also marginal. The lack of velocity/depth combinations also affected the overall habitat assessment score. This sampling station was located downstream from the Hobart Pond Impoundment, urbanized areas of Whitman and the Myers Avenue Water Treatment Plant discharge.

Instream habitat in an unnamed tributary to the Shumatuscacant River (Station SHR3) at South Avenue, Whitman, was also evaluated by ESS. The habitat assessment score was 85/200. The same conditions as the Shumatuscacant River near South Avenue (SHR4) were found.

Station SHR1 - Franklin Street, Whitman/Hanson: At this most downstream sampling station the habitat score was 143/200 and was limited by channel alteration and the velocity/depth combinations.

Chemistry – water

During the months of June through September 2002, the three sampling stations described above were monitored along the Shumatuscacant River as part of the ESS NPS study (ESS 2003). The water quality data are presented below.

Temperature

With the exception of one elevated temperature in the river near South Avenue, Whitman (30.1°C in August 2002), none of the other 12 measurements exceeded 24.4°C. The highest temperature measurement taken in the unnamed tributary (Station SHR3) was 23.9°C.

Dissolved Oxygen and % Saturation

DO and saturation in the Shumatuscacant River at the most upstream sampling location (SHR2) were all >5.0 mg/L and 60% saturation ranging from 6.2 to 7.8 mg/L and 66.1 to 91.5%, respectively (n=5). Further downstream (Station SHR4), however, DO's measured between 4.9 mg/L and 7.3 mg/L with saturations between 62.0 and 65.2%. At the most downstream station (SHR1) four of the five measurements were below 5.0 mg/L (data ranged from 4.0 to 6.7 mg/). Saturation was also below 60% on four of the five sampling dates (range from 47.0 to 78.4%). These data do not represent worse-case (pre-dawn) sampling conditions.

Of the three sampling events in the unnamed tributary (Station SHR3), the DO was below 5.0 mg/L twice (2.8 and 4.9 mg/L) and was 5.9 mg/L in September. Saturation was below 60% (43.6 and 33.8%) on two occasions and was 65.0% in September.

pH

Instream pH measurements ranged between 7.1 to 7.8 SU (n=13). One of the three pH measurements in the unnamed tributary was less than 6.5 SU (6.1 SU).

Specific Conductance

The specific conductance in the Shumatuscacant River ranged between 331.6 and 501.0 µmhos/cm (n=13). Specific conductance in the unnamed tributary ranged from 109.0 to 693.0 µmhos/cm (n=3).

TSS

The maximum TSS concentration reported by ESS for the Shumatuscacant River was 9.0 mg/L (n=13). The highest TSS concentration in the unnamed tributary was 6.7 mg/L.

TKN

Concentrations of TKN in the Shumatuscacant River ranged between 0.3 and 1.8 mg/L (n=13). Concentrations were lowest at the most upstream sampling station (SRH2). The concentrations of TKN in the unnamed tributary ranged from 0.1 and 1.9 mg/L (n=3).

Total Phosphorus
Total phosphorus concentrations in the Shumatuscacant River ranged between 0.04 and 0.11 mg/L (n=13). A total of seven of the 13 samples exceeded 0.05 mg/L. The higher concentrations were measured at the most downstream sampling station (SHR1). The TP concentrations in the unnamed tributary ranged from 0.03 to 0.12 mg/L (n=3).

The *Aquatic Life Use* is assessed as support for the upper 3.6 mile reach of the Shumatuscacant River based primarily on optimal instream habitat conditions and the water quality. Downstream from the Abington/Rockland Water Works discharge (the lower 4.9 mile reach), the *Aquatic Life Use* is assessed as impaired based on instream habitat quality degradation and low dissolved oxygen concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Fecal coliform and *E. coli* samples were collected at three sampling stations in the Shumatuscacant River between June and November 2002 during both dry and wet weather events. From upstream to downstream these stations are summarized below (ESS 2003).

Station SHR2 - near Summer Street, Abington,
Station SHR4 - near South Avenue, Whitman and
Station SHR1 - Franklin Street, Whitman/Hanson.

Samples were also collected from an unnamed tributary (Station SHR3) at South Avenue, Whitman.

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
SHR2	200 – 3,000	563	180 – 1,400	464	5
40% of the samples exceeded 400 cfu/100 mL and one of the five samples exceeded 2,000 cfu/100mL					
SHR4	100 and 4,000	NA	100 and 3,900	NA	3
One of two samples collected during the primary contact season exceeded 400 cfu/100 mL. One of three samples exceeded 2,000 cfu/100mL					
SHR1	6 – 6,500	163	6 – 5,000	85	5
40% of the samples exceeded 400 cfu/100 mL and one of the five samples exceeded 2,000 cfu/100mL					
SHR3	150 and 60,000	NA	150 and 21,000	NA	3
One of two samples collected during the primary contact season exceeded 400 cfu/100 mL. Two of three samples exceeded 2,000 cfu/100 mL.					

The highest counts at all three Shumatuscacant River stations were representative of wet weather sampling conditions.

In 2001 DWM conducted bacteria sampling in the Shumatuscacant River at West Washington Street, Hanson (SA09T). On 24 July 2001 the fecal coliform count was 32 cfu/100mL and the *E. coli* bacteria count was 37cfu/100 mL (Appendix A).

No objectionable odors, deposits, oils or other objectionable conditions were noted by ESS at any of the three sampling stations in the Shumatuscacant River during the habitat assessment surveys in July 2002. A small tributary near station SHR4 was noted to have metal and other debris and the bottom of the streambed was covered with a bright orange coating (ESS 2003).

The *Primary Contact Recreational Use* is assessed as impaired because of elevated fecal coliform bacteria counts. The *Secondary Contact Recreational Use* is assessed as support but is identified with an Alert Status. The *Aesthetics Use* is assessed as support based on field observations reported by ESS.

Shumatuscacant River (MA62-33) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT upper 3.6 mile reach IMPAIRED lower 4.9 mile reach Cause: Low dissolved oxygen, anthropogenic substrate alterations and sedimentation/siltation Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, highway/road/bridge runoff, loss of riparian habitat and municipal (urbanized high density area))
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, municipal (urbanized high density area), waterfowl and waste from pets)
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT

*Alert status issues identified, see details in use assessment section

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

An investigation of the Abington/Rockland Joint Water Works (Myers Avenue Water Treatment Plant) should be conducted to monitor the facility's discharge and to determine if the habitat in the Shumatuscacant River is being impacted by the discharge.

Monitoring (biological, habitat quality, and water chemistry) should be conducted to better assess the status of the *Aquatic Life Use*.

Ensure that all NPDES permits are current and in compliance.

POOR MEADOW BROOK (SEGMENT MA62-34)

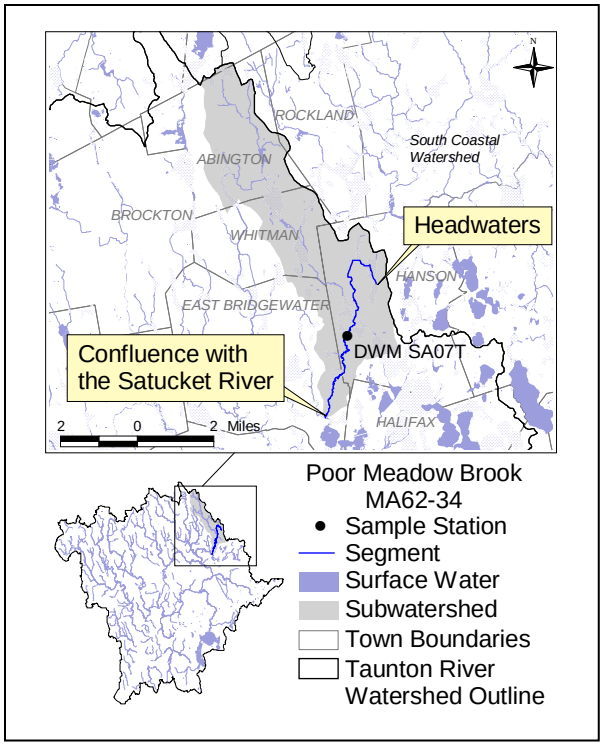
Location: From a wetland near County Street, Hanson to the confluence with the Satucket River, East Bridgewater.
Segment Length: 6.9 miles
Classification: Class B

The drainage area of this segment is approximately 16.5 square miles. Land-use estimates (top three) for the subwatershed:

Forest 47.5%
Residential 30.7%
Open land 8.1%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).



WMA WATER WITHDRAWAL SUMMARY
(APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Hanson Water Department	9P42512301	42512301	4123000-01G 4123000-03G 4123000-04G 4123000-05G	0.51 reg 0.27 perm Total – 0.78
East Bridgewater Water Department*[1]	9P42508301	42508304	4083000-02G 4083000-03G	0.85 reg 0.36 perm Total – 1.21
Cameron Woodard Sod Farm*	NA	42508301	C-2S	0.24 reg

* Indicates system-wide withdrawal
[1] The East Bridgewater Water Department received a notice of noncompliance from MassDEP in April 2003 due to failure to file for 5-year review of their permit. The issues were resolved in 2004 and their permit was renewed in May 2004 (Drake 2004).

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT
PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
DWM collected a bacteria sample from Poor Meadow Brook at Main Street, Hanson (Station SA07T). On 24 July 2001 the fecal coliform count was 65 cfu/100mL and the *E. coli* bacteria count was 40 cfu/100 mL (Appendix A). No objectionable conditions were observed by DWM sampling crews (MassDEP 2001).

Too limited data are available, so the *Recreational* and *Aesthetic* uses for Poor Meadow Brook are not assessed.

Poor Meadow Brook (MA62-34) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct additional bacteria sampling to evaluate the status of the *Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

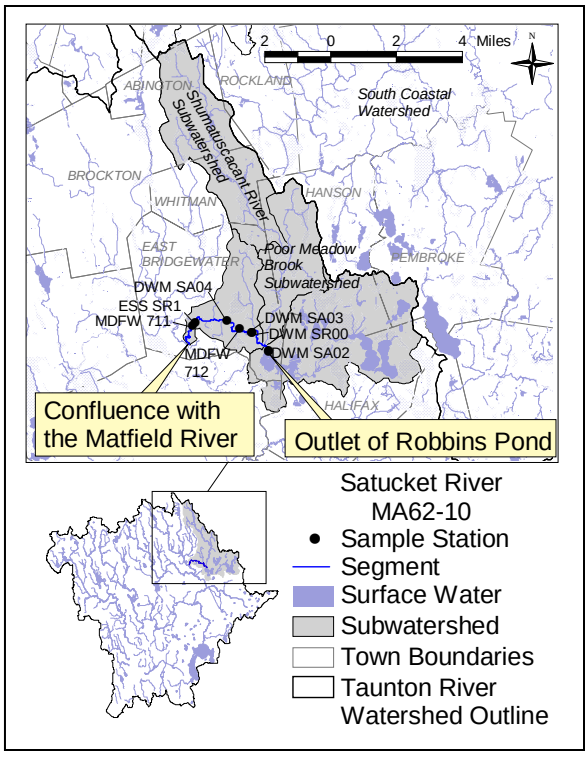
SATUCKET RIVER (SEGMENT MA62-10)

Location: From the outlet of Robbins Pond, East Bridgewater to the confluence with the Matfield River, East Bridgewater.
Segment Length: 5.6 miles
Classification: Class B

The drainage area of this segment is approximately 34.9 square miles. Land-use estimates (top three) for the subwatershed:

Forest 43.8%
Residential 27.4%
Open land 10.4%

The impervious cover area for this subwatershed is less than 10%.



This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Stetson Pond (MA62182), Muddy Pond (MA62126), Chaffin Reservoir (MA62035), Reservoir (MA62157), Monponsett Pond East basin (MA62218), Monponsett Pond West Basin (MA62119), Elm Street Pond (MA62066), Plymouth Street Pond (MA62141), Cross Street Pond (MA62053) and Robbins Pond (MA62162) are in the Lake Assessment section of this report.

There is one site awaiting a NPL decision located in this subwatershed. The site description was excerpted from the EPA website (EPA 2005c):

East Bridgewater Murray-Carver Landfill
From 1842-1992 the property was used by several businesses that manufactured cotton gins and cottonseed processing equipment. The former landfill on the property was allegedly used to dispose of wastes generated on the property, including potentially hazardous waste. Soil samples collected from the landfill and leaching fields in 1990 indicated the presence of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and inorganic elements. Samples taken from on-site groundwater monitoring wells in 1993 indicated the presence of VOCs and inorganic elements. The landfill could be contributing to the contamination of the Satucket River, as sediment samples collected from the river in 1995 indicated the presence of several SVOCs, pesticides and inorganic elements, some of which were also detected in the landfill. However, there are additional sites that may be the source(s) of contamination of the Satucket River. The property has no status under the Massachusetts Contingency plan, and is not an active site under MassDEP.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no NPDES dischargers in this subwatershed. There are 1,008 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 9.0 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
East Bridgewater Water Department*, [1]	9P42508301	42508304	4083000-01G 4083000-04G	0.85 reg 0.36 perm Total – 1.21
Cameron Woodward Sod Farm*	NA	42508301	C-1S	0.24 reg

* Indicates system-wide withdrawal
[1] The East Bridgewater Water Department received a notice of noncompliance in April 2003 due to failure to file for 5-year review of their permit. The issues were resolved in 2004 and their permit was renewed in May 2004 (Drake 2004).

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In 2001 extremely low water levels were observed by DWM sampling crews in the Satucket River near the outlet of Robbins Pond (MassDEP 2001b).

In August 2001 DWM conducted a qualitative assessment of habitat in the Satucket River, upstream from Washington Street, East Bridgewater (Station SR00). DWM conducted only a qualitative assessment of habitat and biological integrity at SR00 because soft substrates and imperceptible current velocity made comparisons to the more lotic Canoe River reference station inappropriate. While the soft mud substrates that comprised most of the stream bottom provided only marginal epifaunal habitat, a variety of snags, submerged logs, and deep pool areas provided excellent fish habitat. Velocity/depth combinations were also limited. Both stream banks were well vegetated and stabilized with shrubs and grasses. The habitat assessment score was 155/200 (Appendix D).

Using MassDEP guidelines, an ESS NPS study performed a habitat assessment on the Satucket River at Plymouth Street (Route 106), East Bridgewater (Station SR1) during the summer of 2002. The overall assessment score was 103/200. Instream cover for fish was marginal. Embeddedness and sediment deposition were also problematic. In addition bank stability and bank vegetative protection were especially poor (ESS 2003).

Biology

In August 2001 a benthic survey conducted by DWM in the Satucket River, upstream from Washington Street, East Bridgewater (Station SR00) documented that the macroinvertebrate assemblage displayed good trophic structure with almost every feeding guild represented. Due to the qualitative nature of the biosurvey conducted at SR00, an assessment of biological condition based on the RBP III criteria could not be made. However, the macroinvertebrate community did not appear to suggest the presence of gross organic pollution in this portion of the Satucket River (Appendix D).

MDFW conducted fish population sampling at one location along this segment - at the Route 106 Bridge, East Bridgewater (Station 711) - using a backpack shocker in July 2002. A total of 87 fish, representing ten species, were collected. The sample was dominated by bluegill. Other species present, in order of abundance, included American eel; pumpkinseed; white sucker; brown bullhead; chain pickerel; golden shiner; and an individual each of redfin pickerel, tessellated darter, and yellow perch (Richards 2003a). The sample was comprised primarily of tolerant and moderately-tolerant macrohabitat generalists, except for the white sucker and an individual tessellated darter (both fluvial dependant/specialists).

MDFW also sampled fish at one unnamed tributary to this segment in July 2002. Fish were collected from one station (712) along Elias Latham Way, Bridgewater - using a backpack shocker. Five redfin pickerel were collected (Richards 2003a).

Chemistry – water

DWM conducted water quality sampling at three sites on the Satucket River between July and September 2001 (Appendix A):

SA02 - Outlet of Robbins Pond at Pond Street, Bridgewater (n=5 *in-situ* measurements, 3 water quality sampling events).

SA03 - Upstream at Washington Street, East Bridgewater (n=5 *in-situ* measurements, 3 water quality sampling events).

SA04 - Bridge Street, East Bridgewater (n=6 *in-situ* measurements, 3 water quality sampling events).

Between June and September 2002 ESS monitored one station (SR1) in the Satucket River at Plymouth Street, East Bridgewater on five occasions as part of the ESS NPS study (ESS 2003).

The sampling results for the above sites are summarized below.

Dissolved Oxygen and % Saturation
In 2001 both predawn and daytime DO measurements in the Satucket River at SA02 ranged from 7.0 to 9.6 mg/L with saturations from 83 to 117%. DOs in the river at SA03 and SA04 were much lower in July and August (all ≤ 5 mg/L and saturations were ≤ 60%) but were higher in September. At Station SR1 dissolved oxygen concentrations reported by ESS in the summer of 2002 ranged from 6.7 to 8.3 mg/L with saturations ranging from 82.2 to 104.2%.

Temperature
In the summer of 2001, temperature measurements in the river at SA02 exceeded 28°C on two of five occasions (30.0 and 33.0°C were recorded in July and August 2001, respectively). A maximum temperature of 28.8°C was recorded at SA03 in August 2001 and a maximum of 28.5°C was recorded at SA04 in July. In the summer of 2002, temperature measurements at Station SR1 ranged from 21.5 to 26.7°C.

pH and Alkalinity
Of the five pH measurements taken at SA02 during 2001, two (40%) were ≤ 6.5 SU while all of the pH measurements at SA03 and SA04 ≤ 6.5 SU (ranging from 6.2 to 6.5). At Station SR1 the pH of the river in the summer of 2002 ranged from 7.1 to 7.8 SU. The alkalinities were all <14 mg/L although the lowest measurement were at SA02.

Hardness
Hardness consistently measured 14 mg/L at SA02 but was slightly higher downstream (ranging from 23 to 30 mg/L at SA03 and SA04).

Specific Conductance
Specific conductance ranged from 98.5 to 107 µmhos/cm in the river at SA02. Higher levels were recorded at SA03 ranging from 168 to 176 µmhos/cm and at SA04 with a range of 176 to 210 µmhos/cm. The range of specific conductance reported by ESS at Station SR1 was 196.7 to 279.0 µmhos/cm.

Chloride
Values ranged from 22 to 43 mg/L at Stations SA02, SA03, and SA04.

TSS
With the exception of two measurements (16.0 and 21.0 mg/L which were both measured during wet weather conditions by ESS at Station SR1), the maximum TSS concentration in the river was 4.0 mg/L (n=14).

TKN
At Station SR1 TKN ranged from 0.4 to 0.6 mg/L during wet weather sampling and was 0.5 and 0.8 mg/L during dry weather sampling.

Nitrate and Nitrite-Nitrogen
All results at SA02 were <0.06 mg/L. Higher concentrations were found at SA03 varying between 0.16 and 0.22 mg/L. The highest concentrations were at SA04 ranging from 0.28 to 0.81 mg/L.

Ammonia-Nitrogen
At SA02, SA03 and SA04 levels of ammonia-nitrogen were all <0.02 mg/L. All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999).

Total Phosphorus
The concentration of total phosphorus at all stations sampled in the Satucket River ranged from 0.06 to 0.17 mg/L.

The *Aquatic Life Use* is assessed as support for the Satucket River based primarily on best professional judgment of the biological sampling information. Although the fish community is comprised of macrohabitat generalists, it is consistent with those normally found in low gradient, wetland-dominated streams. This use is identified with an Alert Status, however, because of high instream temperatures, the low water levels noted near the outlet of Robbins Pond, habitat degradation in the river near Plymouth Street, East Bridgewater and the somewhat elevated total phosphorus concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS

Bacteria samples were collected by DWM at three sites on the Satucket River in July and September 2001 (Appendix A):

SA02 - Outlet of Robbins Pond at Pond Street, Bridgewater (n=2).
SA03 - Upstream at Washington Street, East Bridgewater (n=2).
SA04 - Bridge Street, Bridgewater (n=2).

DWM also collected a bacteria sample in July 2001 in Black Brook, a tributary to the Satucket River at Crescent Street, East Bridgewater (Station SA10T). It should be mentioned that cows were identified as potential nonpoint sources of pollution in this subwatershed (ESS 2003).

DWM 2001 bacteria data

Station	Fecal Coliform data (cfu/100mL)	*E. Coli* bacteria data (cfu/100mL)	*Enterococci* data (cfu/100mL)
SA02	<2 and 5	<2 and 5	<5 and 5
SA03	50 and 130	24 and 40	65 and 81
SA04	29 and 95	<5 and 65	43 and 60
SA10T	4,000	1,000	1,000

As part of the ESS NPS study, both fecal coliform and *E. coli* bacteria were collected from the Satucket River near Plymouth Street, East Bridgewater (Station SR1). Samples were collected on five occasions between June and September 2002. Both fecal coliform and *E. coli* bacteria counts ranged from 2 to 2,000 (geometric mean of 65 and 63 cfu/100 mL, respectively). The highest counts were representative of wet weather sampling conditions (ESS 2003). Only one of the five counts was > 400 cfu/100 mL.

With the exception of some trash/debris near road crossings, no objectionable deposits, odors, and oils were noted by DWM biologists and/or DWM and ESS survey crews in the Satucket River (MassDEP 2001b and ESS 2003).

The *Primary* and *Secondary Contact Recreational* and *Aesthetics* uses are assessed as support for the Satucket River based on low fecal coliform bacteria counts and observations by field sampling crews.

Satucket River (MA62-10) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT*
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

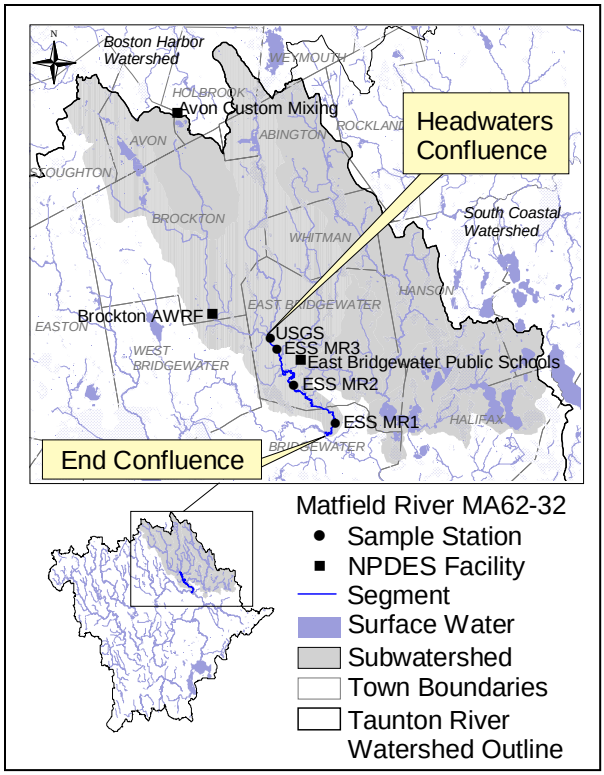
Conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Satucket River from potential sources of pollution to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

MATFIELD RIVER (SEGMENT MA62-32)

Location: Confluence of Beaver Brook and the Salisbury Plain River, East Bridgewater to the confluence with the Town River and the Taunton River, Bridgewater.
Segment Length: 6.7 miles
Classification: Class B, Warm Water Fishery



The drainage area of this segment is approximately 76.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest 39.4%
Residential 33.2%
Open land 9.8%

The impervious cover area for this subwatershed is 12.8%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters - Category 5 for not meeting water quality criteria for pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 1,008 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 9.0 MGD. This cranberry acreage is entirely within the subwatershed for the Satucket River (Segment MA62-10), which is the upper portion of this larger subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
C.N. Smith Farm, Inc.	NA	42508306	01S	0.1 reg
Bridgewater Water Department*	9P42504201	42504201	4042000-02G 4042000-05G 4042000-09G 4042000-10G	1.66 reg 0.74 perm Total – 2.40
East Bridgewater Water Department *,**	9P42508301	42508304	4083000-05G	0.85 reg 0.36 perm Total – 1.21

* Indicates system-wide withdrawal

** The East Bridgewater Water Department received a notice of noncompliance from the MassDEP in April 2003 due to failure to file for 5-year review of their permit. The issues were resolved in 2004 and their permit was renewed in May 2004 (Drake 2004).

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The East Bridgewater Public Schools are authorized (NPDES permit #MA0022446) to discharge 0.012 MGD of treated effluent via Outfall #001 to an unnamed tributary to the Matfield River. The permit was recently reissued (June 2004). The facility is required to conduct modified acute (first 48-hour results of chronic test) and chronic whole effluent toxicity tests using both *Ceriodaphnia dubia* and *Pimephales promelas*. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq 100\%$ with a monitoring frequency of six times/year using *Ceriodaphnia dubia*. Their TRC limits are 0.011mg/L (average monthly) and 0.019 mg/L (maximum daily). Their total phosphorus limit is 1 mg/l (average monthly).

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

ESS conducted instream habitat evaluations at three sites along the Matfield River in June 2002. The conditions at each of the three sites (upstream to downstream) are as follows (ESS 2003):

- Matfield River near West Union Street, East Bridgewater (Station MR3), had an overall assessment score of 170/200. Here velocity/depth combinations limited the overall score. The waterbody was wide, deep and slow moving so riffles and runs were virtually nonexistent.
- Matfield River near Route 18/Route 106 intersections, East Bridgewater (Station MR2). The overall habitat assessment score was 149/200. The section of the river was limited by the lack of riffle areas, velocity/depth combinations and bank stability.
- Matfield River near High Street, Bridgewater (Station MR1). The overall habitat assessment score was 118/200. The section of the river was limited most by the lack of velocity/depth combinations, limited riffle areas, embeddedness and bank stability.

Chemistry – water

USGS conducted water quality sampling (n=8) in the Matfield River near North Central Street, East Bridgewater as a part of its NECB mercury study between April 2000 and September 2001 (Socolow *et al*. 2001 and 2002).

Between June and September 2002, ESS conducted water quality monitoring on five occasions at three sites along the Matfield River as part of the ESS NPS study – near West Union Street in East Bridgewater (Station MR3), near Route 18/Route 106 intersections in East Bridgewater (Station MR2) and near High Street in Bridgewater (Station MR1) (ESS 2003).

The Bridgewater State WAL collected water quality samples in the Matfield River near High Street, Bridgewater (Curry 2004). Between June and September 2004 the Matfield River was sampled six times using automatic samplers to collect data on temperature, pH and DO through a 22-hour period. Additionally, nutrient samples (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen) were taken every hour using a Sigma® 900 automated sampler with samples for every other hour used for analysis. A QAPP for the WAL has not been approved by MassDEP and their data are not quality-assured. For the purpose of this report data reported by WAL for 2004 were reviewed for consistency with other quality-assured data sources.

These data are summarized below.

Dissolved Oxygen and % Saturation

DO in the Matfield River reported by USGS ranged from 3.5 to 10.2 mg/L with only one of the eight measurements <5.0 mg/L (9 August 2000). It should be noted that these data do not represent worse-case (pre-dawn) conditions.

The concentration of dissolved oxygen at the three stations monitored by ESS ranged from 3.0 to 5.7 mg/L with eight of the fourteen measurements <5.0 mg/L. Percent saturation ranged from 34.6 to 63.8 with ten of the 14 measurements were less than 60% saturation.

During its hourly Hydrolab® sampling in 2004 WAL did not find any DO measurements <5.0 mg/L.

Temperature

The maximum temperature of the Matfield River reported by USGS was 23.3°C. The highest temperature of the river recorded by ESS was 24.9°C. Hourly Hydrolab® measurements for temperature by WAL did not exceed 28.3°C during its 2004 sampling.

pH

The pH of the Matfield River reported by USGS ranged from 6.5 to 7.0 SU. The pH of the river reported by ESS ranged from 6.6 to 7.5 SU. A very similar range for pH was reported by WAL in their 2004 hourly Hydrolab® sampling.

Specific Conductance
Specific conductance of the Matfield River reported by USGS ranged from 113 to 593 µmhos/cm. ESS reported a range of specific conductance between 255.0 to 649.0 µmhos/cm.
Turbidity
Turbidity in the Matfield River reported by USGS ranged from 0.7 to 4.9 NTU.

TSS
The concentration of TSS in the Matfield River ranged from <1 to 30 mg/L (n=15) at the three locations sampled by ESS. Only one of the 15 results exceeded 25 mg/L.

Ammonia-nitrogen
The concentration of ammonia-nitrogen in the Matfield River reported by USGS ranged from 0.191 to 2.54 mg/L (n=7). All but the highest measurement were below chronic instream criterion for ammonia of 2.53 mg/L NH_3-N at pH of 7.5 SU and temperature of 24.9°C (EPA 1999).

TKN
TKN results reported by ESS for the Matfield River ranged from 0.6 to 7.0 mg/L (n=15).

Total Phosphorus
The total phosphorus concentrations in the Matfield River reported by USGS ranged from 0.109 to 0.905 mg/L (n=7). Total phosphorus concentrations reported by ESS for the Matfield River ranged from 0.13 to 0.35 mg/L. Concentrations were noted to decrease from upstream to downstream. The concentration range for total phosphorus reported by WAL was similar.

Mercury
The concentrations of total and methyl mercury samples from the water column of the Matfield River reported by USGS (samples collected on 17 April and 9 August 2000) ranged between 2.99 and 7.92 and 0.056 and 3.232 ng/L, respectively (USGS 2003).

Chemistry – sediment
USGS collected sediment from the Matfield River near North Central Street in East Bridgewater in August 2000 as part of their Toxics Substances Hydrology Program (an extension of the National Mercury Pilot Study) and the Urban Land Use Gradient Study (part of the NAWQA Program). The sediment was analyzed for total and methyl mercury with concentrations of 431.3 and 4.89 ng/g dry weight, respectively. The total mercury concentration exceeded the L-EL guideline but did not exceed the severe effect level (S-EL) guideline (USGS 2003).

The *Aquatic Life Use* is assessed as impaired for the Matfield River based on water quality data and best professional judgment. Although instream biological data (response type indicators of in-stream water quality conditions) were not available, conditions (i.e., low dissolved oxygen/saturation and elevated total phosphorus concentrations) were similar to those documented in the Salisbury Plain River which was found to be impacted by the Brockton Advanced Water Reclamation Facility discharge and nonpoint source pollution.

FISH CONSUMPTION
Fish toxics monitoring for PCB and selected metals was conducted in the Matfield River from the Bridge Street section as part of the MassDEP Matfield River Survey in 1989 (MassDEP 1992). No site-specific advisory was issued based on the results of this sampling so the *Fish Consumption Use* is not assessed.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Both fecal coliform and *E. coli* bacteria were collected by ESS between June and September 2002 at three sites along the Matfield River as part of the ESS NPS study – near West Union Street in East Bridgewater (Station MR3), near Route 18/Route 106 intersections in East Bridgewater (Station MR2) and near High Street in Bridgewater (Station MR1) (ESS 2003). These data are presented as follows.

ESS 2003 bacteria data

Station	Fecal Coliform data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	*E. Coli* bacteria data range (cfu/100 mL)	Geometric Mean (cfu/100 mL)	Number of Samples
MR3	55 – 3,900*	490	51 – 3,700	465	5
* 80% of the samples exceeded 400 cfu/100mL and one sample exceeded 2000 cfu/100mL					
MR2	110 – 18,000	1,287	110 – 5,000	967	5
* 60% of the samples exceeded 400 cfu/100mL and two samples exceeded 2000 cfu/100mL					
MR1	43 – 2,300	383	40 – 2,200	292	5
* 40% of the samples exceeded 400 cfu/100mL and two samples exceeded 2000 cfu/100mL					

Sewage odors and large amounts of macrophytes and algae were noted by ESS (2003) at all three stations sampled along the Matfield River.

The *Primary* and *Secondary Contact Recreational* and *Aesthetics* uses are all assessed as impaired. The recreational uses are impaired because of elevated bacteria counts and the objectionable odors and large amounts of macrophytes and algae. The degraded conditions in the Matfield River likely result from the Brockton Advanced Water Reclamation Facility discharge and other sources of pollution.

Matfield River (MA62-32) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Degraded benthic macroinvertebrate bioassessment, low dissolved oxygen/saturation, total phosphorus Source: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems and municipal (urbanized high density area))
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Fecal coliform bacteria, excess algal growth and odor Source: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems)
Secondary Contact		IMPAIRED Cause: Fecal coliform bacteria, excess algal growth, odor Source: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems)
Aesthetics		IMPAIRED Cause: Excess algal growth and odor Source: Municipal point source discharge (Suspected Sources: Discharges from municipal separate storm sewer systems)

RECOMMENDATIONS

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Evaluate results of the East Bridgewater Public Schools (NPDES permit #MA0022446) whole effluent toxicity tests.

Continue to conduct monitoring (biological, habitat and water quality) to evaluate conditions from point and nonpoint source pollution in the Matfield River and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions and to assess the status of the *Recreational* uses.

The WAL should continue to conduct water quality monitoring at its established sampling site in the Matfield River to meet its sampling objectives. In order for the MassDEP to utilize the WAL data for water quality assessment reporting purposes, the WAL should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

TOWN RIVER SUBWATERSHED

The northwest section of the Town River subwatershed is drained by Queset Brook beginning at the outlet of Ames Long Pond in Easton to the confluence with Coweeset Brook in West Bridgewater. Coweeset Brook then flows south and joins the Hockomock River in West Bridgewater. The Hockomock River continues flowing south and joins the Town River near the Bridgewater/West Bridgewater town line. The Town River is formed from the outflow of Lake Nippenicket, which flows north through the Hockomock Swamp Wildlife Management Area. After leaving this extensive wetland area it continues to the northeast and then takes a southerly direction. Shortly after Route 18 the Town River meanders north then to the east widening out at its confluence with the Matfield and Taunton Rivers in Bridgewater. The Town River subwatershed includes the following segments (Figure 10):

Queset Brook (Segment MA62-21)
Coweeset Brook (Segment MA62-22)
Hockomock River (Segment MA62-35)
Town River (Segment MA62-11)
Town River (Segment MA62-12)
Town River (Segment MA62-13)

This subwatershed contains Hockomock Swamp which along with its associated wetlands and water bodies comprises one of the largest vegetated freshwater wetland systems in Massachusetts. The Hockomock Swamp was designated as an ACEC in 1990 and includes the Hockomock River, Town River, Lake Nippenicket, Coweeset Brook and Little Cedar Swamp Pond (MA DCR 2005).

The land use in the Town River subwatershed is primarily forest followed by residential, open space and agricultural areas. This includes approximately 59 acres of cranberry bogs located in the Hockomock River watershed and its tributaries, Coweeset and Queset Brooks. Several golf and country clubs are sited in the Town and Hockomock River watersheds. The impervious area is generally less than 10% indicating there is a low potential for adverse water quality impacts from impervious surface water runoff. The exceptions to this are the lower portion of the Town River (Segment MA62-13) and the Coweeset River with 11 and 12.9% impervious cover, respectively. These values suggest that water quality may be impacted.

Of the nine facilities permitted under the WMA, five are municipal public water supply sources. Authorized surface and groundwater withdrawals total 8.08 MGD. Additionally, it is estimated that water use for the cranberry bog areas is 0.54 MGD.

There are only three NPDES discharges in this subwatershed; all within the Town River segments. The Bridgewater Wastewater Treatment Facility contributes the most flow as a major NPDES wastewater discharge facility while the other two are schools which are classified as minor NPDES wastewater facilities. Additionally, there are numerous Multi-sector General Stormwater Permits particularly for facilities in the communities of Bridgewater and Brockton. The communities of Bridgewater, West Bridgewater, Brockton, Easton and Stoughton are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

Some water quality data were collected at two sites on the Town River during the ENSR Copper study and the Bridgewater State WAL conducts water quality sampling at one site on the Town River. Due to the fact that the data was either limited or not quality-assured, none of the designated uses in the Town River subwatershed are assessed.

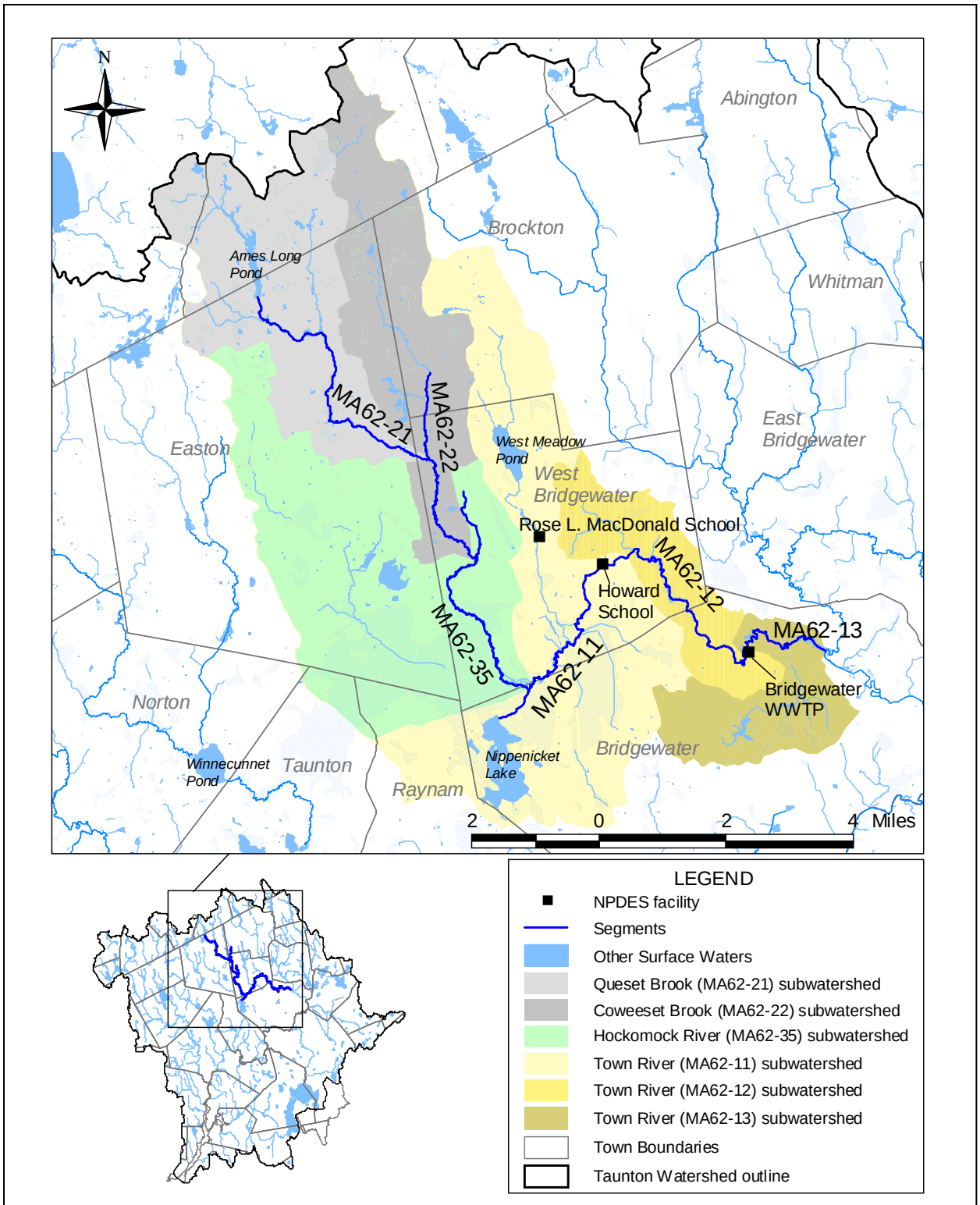


Figure 10. Town River Subwatershed

QUESET BROOK (SEGMENT MA62-21)

Location: From the outlet of Ames Long Pond, Easton to the confluence with Coweeset Brook, West Bridgewater.
Segment Length: 5.1 miles
Classification: Class B

The drainage area of this segment is approximately 10.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....47.3%
Residential.....33.2%
Agriculture.....5.7%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Ames Long Pond (MA62001), Shovelshop Pond (MA62172), and Longwater Pond (MA62109) are in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 4 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.04 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Easton Water Department*	9P42508801	42508801	4088000-01G 4088000-02G 4088000-04G	1.44 reg 1.01 perm Total – 2.45
Stoughton DPW Water Division	9P42528501	42528502	4285000-02G 4285000-03G 4285000-04G	1.14 reg 0.13 perm Total – 1.27

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

No recent water quality data are available for Queset Brook and therefore, all uses are not assessed.

Queset Brook (MA62-21) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Queset Brook bracketing potential sources of pollution (e.g., cranberry bog operations, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the Primary and Secondary Contact Recreational uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Conduct a hydrologic evaluation/assessment to determine if there are any impacts to Queset Brook from the numerous groundwater withdrawals.

COWEESET BROOK (SEGMENT MA62-22)

Location: Source, southwest of Route 24/Belmont Street interchange, Brockton to confluence with the Hockomock River, West Bridgewater.
Segment Length: 3.9 miles
Classification: Class B

The drainage area of this segment is approximately 19.1 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....43.2%
Residential.....30.3%
Open land.....7.9%

The impervious cover area for this subwatershed is 12.9%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The Hockomock Swamp was designated an ACEC in 1990 and includes Coweeset Brook and Little Cedar Swamp Pond (MA DCR 2005).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 4 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.04 MGD. This cranberry acreage is entirely within the subwatershed for Queset Brook (Segment MA62-21), which is the upper portion of this larger subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Stoughton DPW Water Division	9P42528501	42528502	4285000-07G	1.14 reg 0.13 perm Total – 1.27

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

No recent water quality data are available for Coweeset River and therefore, all uses are not assessed.

Coweeset River (MA62-22) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Coweeset River bracketing potential sources of pollution (e.g., cranberry bog operations, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permit (9P42528501).

HOCKOMOCK RIVER (SEGMENT MA62-35)

Location: Source, west of Route 24 and north of the Old Railroad Grade, West Bridgewater to confluence with the Town River, Bridgewater.
Segment Length: 5.1 miles
Classification: Class B

The drainage area of this segment is approximately 34.4 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....51.2%
Residential.....23.8%
Open land.....7.7%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Little Cedar Swamp Pond (MA62106) is in the Lake Assessment section of this report.

The Hockomock Swamp was designated an ACEC in 1990 and includes the Hockomock River (MA DCR 2005).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 55 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.5 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
West Bridgewater Water Department*	9P42532201	42532201	4322000-03G	0.73 reg 0.08 perm Total – 0.81
Easton Country Club	NA	42508802	01S	0.07 reg
Pine Oaks Golf Course	NA	V42508803	01S	0.02 reg
Raynham Center Water District*	9P42524501	42524502	4245000-02G 4245000-03G 4245000-04G 4245000-05G 4245000-06G 4245000-08G	0.40 reg 0.42 perm Total – 0.82

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Biology

In July 2002 MDFW conducted fish population sampling using a backpack shocker in Hockomock River upstream from Maple Street, West Bridgewater (Station 716). A total of 21 fish, representing two species, were collected from this site. Redfin pickerel dominated the sample but three American eel were also collected (Richards 2003a). Although the fish community included only two macrohabitat generalist species, both redfin pickerel and American eel are common in slow-moving wetland dominated streams. The American eel migrates through streams at both the juvenile (upstream) and adult (downstream) stages,

however, they are found in a number of different habitat types (lotic and lentic). Therefore, they are classified as macrohabitat generalists.

Too limited data are available, so all uses for the Hockomock River are not assessed.

Hockomock River (MA62-35) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in

Hockomock River bracketing potential sources of pollution (e.g., golf course operations, developments). Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

TOWN RIVER (SEGMENT MA62-11)

Location: Outlet of Lake Nippenicket, Bridgewater to Route 28 bridge, West Bridgewater.
Classification: Class B
Segment Length: 4.5 miles

The drainage area of this segment is approximately 51.7 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....48.7%
Residential.....23.9%
Open land.....7.6%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Nippenicket Lake (MA62131) is in the Lake Assessment section of this report.

The Hockomock Swamp was designated an ACEC in 1990 and includes this segment of the Town River and Lake Nippenicket (MA DCR 2005).

There is one NPL site located in this subwatershed. The site description was excerpted from the EPA New England NPL website (EPA 2005d):

> The Cannon Engineering Corporation (CEC) site, located in Bridgewater, MA, was originally developed to transport, store and incinerate hazardous wastes. In 1980 their license for operation was revoked due to alleged waste mishandling and violations. Operations at the CEC ceased in 1980, leaving behind approximately 700 drums and 155,000 gallons of liquid waste and sludge in bulk storage. The on-site soils, sediments, buildings, groundwater and surface waters are contaminated with volatile organic compounds (VOCs), polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons, pesticides, and metals to varying degrees. The cleanup process involved fencing the entire Site to restrict access, on-site thermal aeration of upland area and wet soils contaminated with VOCs, and off-site incineration of PCB contaminated soils in excess of 9 PPM. Currently only the site groundwater remains contaminated above established safety levels.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 55 acres of land which are classified in the Land-Use theme as cranberry land in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.5 MGD. This cranberry acreage is entirely within the subwatershed for the Hocomock River (Segment MA62-35), which is the upper portion of this larger subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Thorny Lea Golf Club	NA	42504404	01S 02S	0.15 reg
Brockton Country Club	NA	42504403	01G	0.09 reg

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The Town of West Bridgewater is authorized (NPDES permit # MA0102061 issued in November 2003) to seasonally (September through June) discharge 0.003 MGD (average monthly) of treated wastewater from the Rose L. MacDonald School Wastewater Facility (WWF) via Outfall 001 to West Meadow Brook, a tributary to this segment of the Town River. The facility has a septic tank, sand filtration beds with an underdrain system, and a chlorination chamber that utilizes sodium hypochlorite for disinfection. Effluent sampling is conducted at Manhole #3. The facility is required to conduct an acute whole effluent toxicity test using *Ceriodaphnia dubia* with an LC_{50} limit of ≥100% and a monitoring frequency of one time/year. Their seasonal (1 April to 31 October) TRC limits are 0.4 mg/L (average monthly) and 0.7 mg/L (maximum daily). Their average monthly total phosphorus limit is 1.0 mg/L. The permit also has limits for BOD_5, TSS, fecal coliform bacteria, and requires reporting of total phosphorus and oil and grease. According to the facility's November 2004 whole effluent toxicity testing report, the pH of the effluent was

3.8 SU, the ammonia-nitrogen concentration was 5.4 mg/L and specific conductivity was 1026 µmho/cm (TOXTD database). The TRC measurement in the effluent was <0.02 mg/L (TOXTD database).

The Town of West Bridgewater is authorized (NPDES permit # MA0101753 issued in November 2003) to discharge a flow of 0.005 MGD (average monthly) of treated effluent from the Howard School Wastewater Facility (WWF) via Outfall 001 to this segment of the Town River. This WWF treats wastewater from the Police Station, Fire Station, Town Library, and the Howard School (Hamblin 2005). This facility has a septic tank, sand filtration beds with an underdrain system, and a chlorination chamber that utilizes sodium hypochlorite for disinfection. A Parshall flume, located at the effluent common manhole, is used for flow measurement (Hamblin 2005). Wastewater from several other municipal facilities (Senior Center, Spring Street School and West Bridgewater High School) is also collected into the common manhole. The Howard School permit limits apply to all of these wastewater streams, which are then discharged via the common manhole to the Town River. The permit has limits for BOD_5, TSS, fecal coliform bacteria, temperature, and requires reporting of total phosphorus and oil and grease. The facility is required to conduct an acute whole effluent toxicity test using *Ceriodaphnia dubia* with a LC_{50} limit of ≥50% effluent and a monitoring frequency of one time/year. The pH of the effluent was 4.2 SU, the ammonia-nitrogen concentration was 8.7 mg/L and specific conductivity was 990 µmho/cm (TOXTD database). This facility has seasonal TRC limits (1.0 mg/L average monthly and maximum daily between 1 April to 15 October). The TRC measurement in the effluent was <0.02 mg/L (TOXTD database).

USE ASSESSMENT
AQUATIC LIFE
Toxicity
Ambient
The Howard School WWF staff collected water from the Town River approximately 20 feet upstream from outfall 001 for use as dilution water in their whole effluent toxicity tests (Hamblin 2005). In November 2004 survival of *Ceriodaphnia dubia* exposed (48 hours) to river water was 100%.

Effluent
The Rose L. MacDonald School WWF effluent exhibited acute toxicity to *Ceriodaphnia dubia* (LC_{50} = 17.7% effluent) in the November 2004 test event.

The Howard School WWF effluent exhibited acute toxicity to *Ceriodaphnia dubia* (LC_{50} = 66% effluent) in their November 2004 test event although the result did not violate the whole effluent toxicity permit limit.

Chemistry-water
The Howard School WWF staff collected water from the Town River approximately 20 feet upstream from Outfall 001 for use as dilution water in their whole effluent toxicity tests in November 2004. Data from the facility's report are summarized below.

pH
The pH of the river was 6.0 SU.

Ammonia-nitrogen
The ammonia-nitrogen concentration was 0.22 mg/L. This measurement was below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999).

TRC
The TRC measurement was below the minimum quantification level of 0.05 mg/L.

Specific Conductance
Specific conductance was 249 µmho/cm.

Too limited data are available so the *Aquatic Life Use* is not assessed for this segment of the Town River. This use is identified with an Alert Status because of low pH and acute toxicity in the discharges.

Town River (MA62-11) Use Summary Table

Aquatic Life*	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Continue to review results of the NPDES facilities DMRs and toxicity tests to evaluate compliance with their permit limits. If acute toxicity continues to be problematic, determine the need to require a toxicity identification/toxicity reduction evaluation. Separate waste stream and flow monitoring should be required/implemented as part of the Howard School WWF permit (various waste streams discharge into a common manhole). The need to separately permit these discharges can then be properly evaluated.

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Town River bracketing potential sources of pollution (e.g., discharges, golf courses, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

TOWN RIVER (SEGMENT MA62-12)

Location: Route 28 Bridge, West Bridgewater to the Bridgewater WWTP discharge, Bridgewater.
Segment Length: 3.8 miles
Classification: Class B

The drainage area of this segment is approximately 56.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....47.3%
Residential.....24.7%
Open land.....8.1%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 55 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.5 MGD. This cranberry acreage is entirely within the subwatershed for the Hocomock River (Segment MA62-35), which is the upper portion of this larger subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Bridgewater Water Department*	9P42504201	42504201	4042000-03G 4042000-04G 4042000-06G 4042000-07G 4042000-08G	1.66 reg 0.74 perm Total – 2.40

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Chemistry – water

As part of their site-specific copper criteria development study, ENSR conducted sampling at one station (Site 10) in this segment of the Town River off Broad Street (Route 18), Bridgewater, upstream from the Bridgewater WWTP (ENSR 2002).

Dissolved Oxygen and % Saturation

All of the DO measurements (day surveys only) were above 5.0 mg/L ranging from 7.16 to 13.53 mg/L and saturation was >60%.

Temperature

Temperature did not exceed 23.39°C.

Specific Conductance

Specific conductance ranged from 204 to 236 µS/cm.

Turbidity

Turbidity ranged from 1.98 to 4.20 NTU.

Copper

Between 15 March and 19 September 2001, dissolved copper concentrations reported by ENSR ranged from 0.65 to 3.00 µg/L (n=5) (ENSR 2002). None of these data exceeded the current EPA water quality criterion of 3 µg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

Although the limited water quality data that are available for this segment of the Town River do not indicate water quality impairment, these data do not represent worse-case conditions so the *Aquatic Life Use* is not assessed.

Town River (MA62-12) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Town River bracketing potential sources of pollution (e.g., golf course, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permit (9P42504201).

TOWN RIVER (SEGMENT MA62-13)

Location: Bridgewater WWTP discharge, Bridgewater to confluence with Matfield River forming the Taunton River, Bridgewater.
Segment Length: 2.4 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 60.5 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....46.8%
Residential.....25.6%
Open land.....8.0%

The impervious cover area for this subwatershed is 11%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Carver Pond (MA62033) is in the Lake Assessment section of this report.

WMA WATER WITHDRAWALS AND NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G1)

There are 55 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 0.5 MGD. This cranberry acreage is entirely within the subwatershed for the Hockomock River (Segment MA62-35), which is the upper portion of this larger subwatershed.

The Town of Bridgewater is authorized to discharge (MA0100641 issued December 2003) an average monthly flow of 1.44 MGD from the Bridgewater Wastewater Treatment Facility (WWTF) of treated sanitary wastewater vial Outfall #001 to the Town River. This tertiary treatment facility incorporates rotating biological contactors to treat municipal and industrial wastewater and to perform nitrification for ammonia reduction (3 mg/l NH_3-N average monthly from April 1 to October 31). The highest concentration of NH_3-N in the effluent between October 1998 and August 2004 was 5.6 mg/L (n=24) (TOXTD database). The pH measurements of the effluent between October 1998 and August 2004 ranged from 6.7 to 7.7 SU (n=25) (TOXTD database). Total phosphorus (TP) reduction is accomplished by chemical addition (1 mg/l TP average monthly April 1 to October 31). The facility utilizes gaseous chlorine for seasonal disinfection and sulfur dioxide for dechlorination (TRC limit = 0.024 mg/L average monthly from April 1 to October 31 - 0.042 mg/L maximum daily) (Correia 2004). The TRC concentrations between October 1998 and August 2004 were all <0.05 mg/L (n=24) (TOXTD database). The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq 45\%$ with a monitoring frequency of four times/year using *Ceriodaphnia dubia*.

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Effluent

A total of 25 toxicity tests using *Ceriodaphnia dubia* were conducted on the Bridgewater WWTP effluent (Outfall #001) between October 1998 and August 2004. The LC_{50}s were all $\geq$100% except one test event (LC_{50} = 89%, January 2003). The C-NOECs ranged from 50 to 100% in the 24 tests conducted with all meeting the C-NOEC limit.

Chemistry – water

As part of their site-specific copper criteria development study, ENSR conducted sampling at one station (Site 9) in this segment of the Town River at Hayward Street, Bridgewater downstream from the Bridgewater Publicly Owned Treatment Works (ENSR 2002).

The Bridgewater State WAL collected water quality samples in the Town River at Hayward Street, Bridgewater (Curry 2004). Between June and September 2004 the Town River was sampled six times using automatic samplers to collect data on temperature, pH and DO through a 24-hour period.

Additionally, nutrient samples (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen) were taken every hour using a Sigma 900® automated sampler with samples for every other hour used for analysis. A QAPP for the WAL has not been approved by MassDEP and their data are not quality-assured. For the purpose of this report data reported by WAL for 2004 were reviewed for consistency with other quality-assured data sources.

Dissolved Oxygen and % Saturation
Measurements for DO at Site 9 ranged from 6.94 to 13.16 mg/L with saturations between 76.4 and 100.2%. It should be noted that these measurements do not represent worst-case (pre-dawn) conditions. During its 2004 hourly Hydrolab® sampling WAL reported one DO concentration below 5.0 mg/L.

Temperature
The maximum water temperature at Site 9 was 23.71°C. Hourly Hydrolab® temperature measurements by WAL did not exceed 28.3°C during its 2004 sampling.

pH
With the exception of one measurement (6.07 SU), all of the pH measurements at Site 9 were greater than 6.5 SU ranging from 6.51 to 6.85 SU. Hourly Hydrolab® pH measurements taken by WAL were within this range but indicated a couple more measurements slightly below 6.5 SU.

Specific Conductance
Specific conductance at Site 9 ranged from 217 to 329 µS/cm.

Turbidity
Turbidity at Site 9 ranged from 3.20 to 4.80 NTU.

Copper
Between 15 March and 19 September 2001, dissolved copper concentrations reported ENSR ranged from 2.40 to 4.00µg/L (n=5) (ENSR 2002). Four of the five measurements exceeded the current EPA water quality criterion of 3 µg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

Too limited water quality data (particularly the lack of instream biological data – response type indicators of in-stream water quality conditions) are available for this segment of the Town River so the *Aquatic Life Use* is not assessed.

Town River (MA62-13) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Town River bracketing potential sources of pollution (e.g., discharge, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance of the Bridgewater WWTF NPDES permit limits and other special conditions of the permit. Samples should also be collected upstream from the discharge for use as either dilution water or a control in the facility's whole effluent toxicity tests.

The WAL should continue to conduct water quality monitoring at its established sampling site in the Town River to meet its sampling objectives. In order for the MassDEP to utilize the WAL data for water quality assessment reporting purposes, the WAL should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

MILL RIVER SUBWATERSHED

Tributaries draining the eastern portion of the Mill River subwatershed (Figure 11) are Beaver and Mulberry Meadow Brooks. Beaver Brook has its source just west of Bay Road in Easton and flows into Old Pond, Easton. Mulberry Meadow Brook starts at the outlet of New Pond in Easton and flows to Winnecunnet Pond in Norton. The northern portion of the Mill River subwatershed is drained by the Canoe River, which originates near Cow Hill in Sharon. It flows southeasterly through the communities of Sharon, Foxborough, Mansfield and Norton before terminating in Winnecunnet Pond. With the exception of parts of Mansfield center, the Canoe River drains relatively undeveloped areas of wetland, ponds, forest and light residential land use. The outlet of Winnecunnet Pond becomes the Snake River flowing into Lake Sabbatia in Taunton. The outflow from Lake Sabbatia in turn becomes the Mill River, which flows in a southeasterly direction to the confluence with the Taunton River in Taunton. The Mill River subwatershed includes the following five segments:

Beaver Brook (Segment MA62-30)
Mulberry Meadow Brook (Segment MA62-31)
Canoe River (Segment MA62-27)
Snake River (Segment MA62-28)
Mill River (Segment MA62-29)

The Canoe River Aquifer ACEC and a portion of the Hockomock Swamp are located in this subwatershed. The Canoe River Aquifer ACEC is generally defined by the Canoe River watershed basin and underlying aquifer, which also connects to surface and ground waters in the Mulberry Brook and Snake River basins. The Canoe River Aquifer ACEC is characterized by an extensive system of surface waters, wetlands, floodplains and high-yield aquifers. The aquifers provide drinking water to four communities within the ACEC. This ACEC is located adjacent to the Hocokomock Swamp ACEC (discussed under the Town River Subwatershed).

The land use in the Mill River subwatershed is primarily forest followed by residential and some open space areas. This includes approximately 388 acres of land which are classified in the Land-Use theme as cranberry bogs and are located in the eastern portion of this subwatershed. The impervious area is all less than 10% indicating there is a low potential for adverse water quality impacts from impervious surface water runoff.

Five of the six facilities permitted under the WMA are municipal public water supply sources, the majority of which are located in the Canoe River segment. Authorized surface and groundwater withdrawals total 7.746 MGD. Additionally, it is estimated that water use for the cranberry bog areas is 3.5 MGD.

There is only one facility, Morton Hospital, which requires an NPDES permit to discharge to the Mill River. However, numerous Multi-sector General Stormwater Permits have been issued for facilities in this subwatershed. The communities of Taunton, Norton, Easton, Foxborough, Mansfield and Sharon are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

DWM conducted water quality sampling in the Canoe River, which was selected as a regional reference station for biological integrity. The *Aquatic Life Use* is assessed as support for the Canoe River since the macroinvertebrate assemblage indicated a healthy aquatic community. The TRWA conducts water quality sampling at three sites on the Mill River and the Bridgewater State WAL also collects water quality samples at one site on the Mill River. Because of concerns regarding bacteria the recreational and aesthetics uses were identified with an Alert Status. No current data were available for the Snake River, Mulberry Meadow Brook or Beaver Brook so the designated uses for these waterbodies were not assessed.

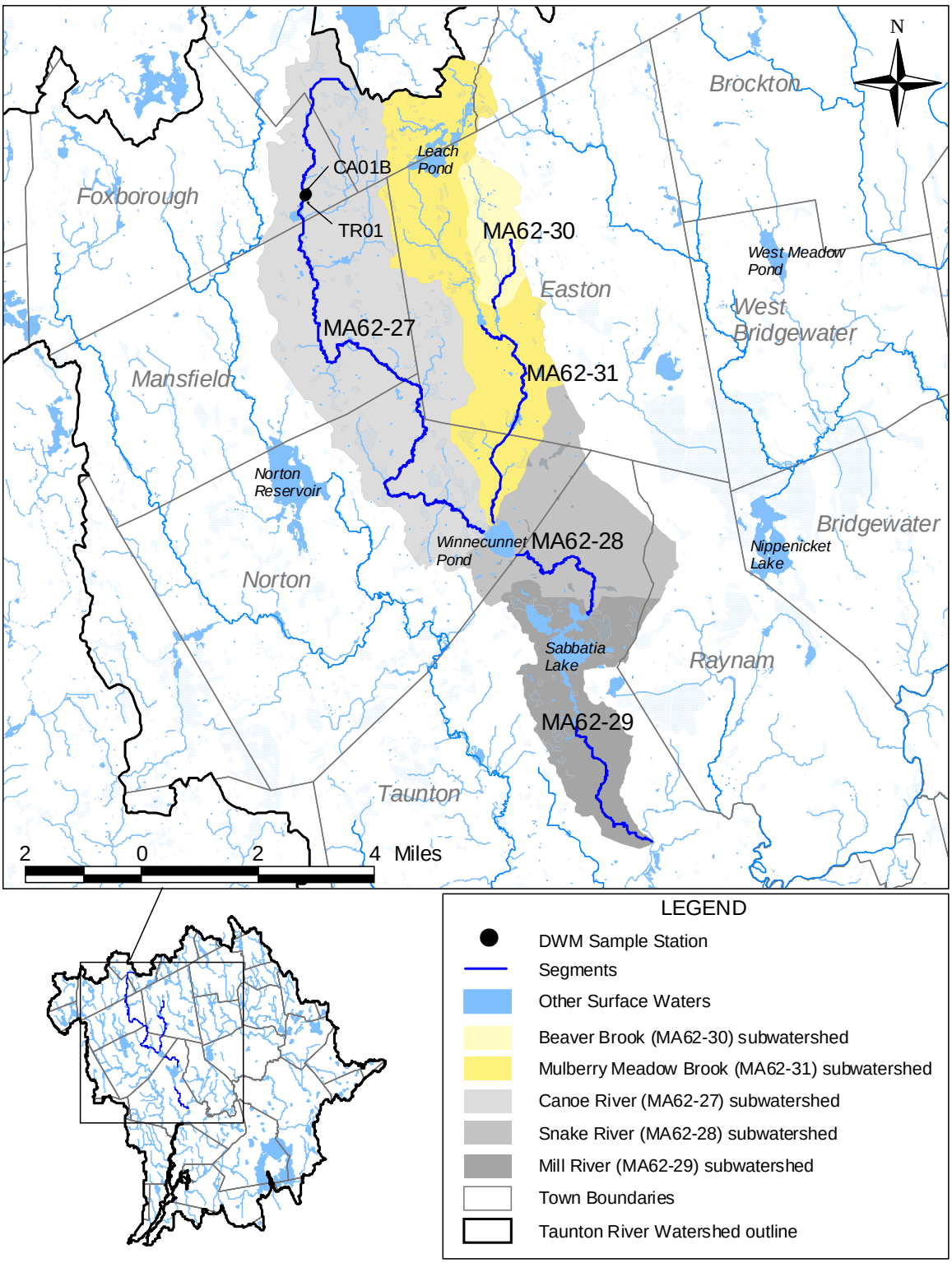


Figure 11. Mill River Subwatershed

BEAVER BROOK (SEGMENT MA62-30)

Location: Source just west of Bay Road, Easton to the inlet Old Pond, Easton.
Segment Length: 1.4 miles
Classification: Class B

The drainage area of this segment is approximately 2.1 square miles. Land-use estimates (top three) for the subwatershed:

Residential 44.9%
Forest 43.6%
Open land 6.7%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The Canoe River Aquifer was designated an ACEC in 1991 and includes a portion of Beaver Brook (MA DCR 2005).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA withdrawals or NPDES dischargers in this subwatershed.

USE ASSESSMENT

No recent water quality data are available for Beaver Brook so all uses are not assessed.

Beaver Brook (MA62-30) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Beaver Brook bracketing potential sources of pollution (e.g., developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

MULBERRY MEADOW BROOK (SEGMENT MA62-31)

Location: Outlet New Pond, Easton to inlet of Winnecunnet Pond, Norton.
Segment Length: 4.5 miles
Classification: Class B

The drainage area of this segment is approximately 12.1 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....60.5%
Residential.....24.0%
Open land.....5.3%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Briggs Pond (MA62021), Puds Pond (MA62151), Upper Leach Pond (MA62123), Leach Pond (MA62103), New Pond (MA62130), and Reservoir (MA62158) are in the Lake Assessment section of this report.

The Canoe River Aquifer was designated an ACEC in 1991 and includes Mulberry Meadow Brook, New Pond, Ward Pond, and Fuller Hammond Reservoir (MA DCR 2005).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 186 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 1.7 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Easton Water Department*	9P42508801	42508801	4088000-06G	1.44 reg 1.01 perm Total – 2.45

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

No recent water quality data are available for Mulberry Meadow Brook so all uses are not assessed.

Mulberry Meadow Brook (MA62-31) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS:

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in Mulberry Meadow Brook bracketing potential sources of pollution (e.g., cranberry bogs, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Conduct a hydrologic evaluation/assessment to determine if there are any impacts to Mulberry Meadow Brook from groundwater withdrawals.

CANOE RIVER (SEGMENT MA62-27)

Location: Headwaters in wetland east of Cow Hill, Sharon to inlet of Winnecunnet Pond, Norton.
Segment Length: 14.3 miles
Classification: Class B

The drainage area of this segment is approximately 18.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....51.8%
Residential.....31.8%
Open land.....5.7%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 2 (MassDEP 2003).

The use assessments for Beaumont Pond (MA62009) and Whiteville Pond (MA62211) are in the Lake Assessment section of this report.

The Canoe River Aquifer was designated an ACEC in 1991 and includes the entire length of the Canoe River, Beaumont, Whiteville, and Winnecunnet Ponds (MA DCR 2005).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Mansfield Water Department*	9P42516701	42516701	4167000-01G 4167000-08G 4167000-09G 4167000-10G	1.59 reg 0.40 perm Total – 1.99
Benjamin W. Flint – Flintland Farm	NA	V42516701	01S	0.02 reg
Easton Water Department*	9P42508801	42508801	4088000-03G 4088000-05G	1.44 reg 1.01 perm Total – 2.45
Norton Water Department*	9P342521801	42521801	4218000-03G 4218000-04G 4218000-05G 4218000-06G	1.21 reg 0.64 perm Total – 1.85
Sharon Water Department*	9P42526601	42526601	4266000-05G	0.55 reg 0.31 perm Total – 0.86

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In July 2001 DWM evaluated the habitat quality of the Canoe River downstream from Willow Street, Foxborough (Station TR01). Due to low baseflow conditions (biological station is located upstream from the above mentioned water withdrawals), TR01 received a composite habitat score of 153 out of 200 (Appendix D). This site was also sampled by DWM biologists in August 1996 (Appendix E).

Biology

In July 2001 the benthic community of the Canoe River (Station TR01) was characterized by a macroinvertebrate assemblage indicating a healthy aquatic community, with metric values indicative of good water quality and "least impacted" conditions (Appendix D). This site was used as the regional

reference station for the Taunton River Watershed. This site was also sampled by DWM biologists in August 1996 (Appendix E).

Chemistry – water
DWM conducted water quality sampling of the Canoe River near East Street, Foxborough (Station CA01B) in August and September 2001 (Appendix A). Results are indicated below.

Dissolved Oxygen and % Saturation
The DO measured 8.3 and 10.4 mg/L with saturations of 92 and 95%.

Temperature
The maximum temperature recorded was 21.4°C in August 2001.

pH and Alkalinity
The pH of the river was 6.6 and 6.7 SU with alkalinities of 8 and 10 mg/L.

Specific Conductance
Specific conductance measured 111 and 120 µS/cm.

Hardness
Hardness measurements were 19 and 23 mg/L.

Chloride
Values of 20 and 29 mg/L were recorded for chloride.

TSS
The concentration of total suspended solids were both <1.0 mg/L.

Nitrate and Nitrite-nitrogen
The concentrations were 0.48 and 0.91 mg/L.

Ammonia-nitrogen
No detectable concentrations of ammonia-nitrogen were measured in either of the samples (<0.02 mg/L). Neither of these measurements exceeded the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999a).

Total Phosphorus
The concentration of total phosphorus was 0.011 and 0.033 mg/L.

The *Aquatic Life Use* is assessed as support for the Canoe River. The macroinvertebrate assemblage indicating a healthy aquatic community and the sampling site was utilized as a regional reference condition for biological integrity.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
DWM survey crews did not note any objectionable deposits or odors in the Canoe River near Willow Street or East Street, Foxborough during the 2001 surveys (MassDEP 2001b).

In August and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Canoe River at East Street in Foxborough (Station CA01B) (Appendix A). The fecal coliform bacteria counts were 19 and 230 cfu/100mL. Additionally samples were collected on August 7, 2001 for Fluorescent Whitening Agents and Optical Brighteners. Results for all samples indicated recovery as below the detection limits. This would indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering the Canoe River.

Too limited bacteria data are available so the *Recreational* uses are not assessed for the Canoe River. The *Aesthetics Use* is assessed as support.

Canoe River (MA62-27) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in the Canoe River.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

SNAKE RIVER (SEGMENT MA62-28)

Location: Outlet of Winnecunnet Pond, Norton to inlet of Lake Sabbatia, Taunton.
Segment Length: 3.3 miles
Classification: Class B

The drainage area of this segment is approximately 37.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....56.8%
Residential.....25.7%
Open land.....4.9%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Winnecunnet Pond (MA62213) is in the Lake Assessment section of this report.

The Snake River is included and runs through two ACECs, the Canoe River Aquifer and the Hockomock Swamp (MA DCR 2005).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 202 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 1.8 MGD.

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

Sampling of the Snake River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near Bay Street, Norton (Sampling Station SNK-005). During June, July and August 2002, the TRWA reported that DO at the Snake River sample site was below the 5.0 mg/L critical level (Domingos 2003a). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. Therefore, the designated uses for the Snake River are not assessed.

Snake River (MA62-28) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in the Snake River bracketing potential sources of pollution (e.g., developments, highway).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA should continue to conduct water quality monitoring at its established sampling site on the Snake River to meet its sampling objectives. In order for the MassDEP to utilize the TRWA data for water quality assessment reporting purposes, the TRWA should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

MILL RIVER (SEGMENT MA62-29)

Location: Outlet Whittenton Impoundment, Taunton to the confluence with Taunton River, Taunton.
Segment Length: 3.4 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 43.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....53.2%
Residential.....27.1%
Open land.....5.4%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessments for Sabbatia Lake (MA62166), Watson Pond (MA62205), and Whittenton Impoundment (MA62228) are in the Lake Assessment section of this report.

There are two ponds, Watson Pond and Lake Sabbatia, within this subwatershed that are also within the Canoe River Aquifer ACEC (MA DCR 2005).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 202 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 1.8 MGD. This cranberry acreage is entirely within the subwatershed for Segment MA62-28, which is the upper portion of this subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (S = surface)	Authorized Withdrawal (MGD)
Infinity Holding LLC	9P442529306	NA	01S	0.576 perm

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

Reed & Barton in Taunton is reusing some of their non-contact cooling water and has tied the rest of their discharges into the Taunton WWTP. The facility no longer discharges non-contact cooling water to the Mill River from any outfalls (NPDES permit MA0001422 was terminated in November 2004) (EPA 2004b).

USE ASSESSMENT

Sampling of the Mill River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA at three locations as described below.

MIL-030 - Whittendon Street, Taunton approximately 3.0 miles from the confluence with the Taunton River.
MIL-014 - Washington Street, Taunton approximately 1.4 miles from the confluence with the Taunton River.
MIL-000 - Ingell Street, Taunton before the confluence with the Taunton River.

The TRWA reported that DO at the mouth of the Taunton River (Station MIL-000) was below 5.00 mg/L in August and September of 2002. Additionally, high phosphorus and fecal coliform levels were reported at this sampling station in May 2002. Stations MIL-000 and MIL-014 consistently showed high fecal coliform levels (Domingos 2003a).

The Bridgewater State WAL collected water quality samples (DO, temperature, pH, specific conductivity, phosphorus and nitrate) in the Mill River off of Court Street, Taunton once a month in June, July and August 2004 (Curry 2005). The WAL indicated that water quality standards were generally met for pH, DO and temperature at this site.

Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. A QAPP for the Bridgewater State WAL has not been approved by MassDEP and their data are not quality-assured. Therefore, the designated uses for the Mill River are not assessed.

It should be noted that illicit sewer connections were discovered in 2003 along the Mill River in the Weir Street area. Several homes and businesses have their waste water systems hooked up to stormwater drain pipes instead of sewer pipes. An engineering firm was contracted by the city of Taunton to characterize the sewage leak to the Mill River. Twenty-five illicit connections were verified along Weir, High, and Winthrop streets. A rehabilitation project in underway to correct the illicit connections by the spring of 2005 (Hyman 2004). Because of these illicit connects and the high coliform counts reported by TRWA, the *Recreational* and *Aesthetics* uses of the Mill River are identified with an Alert Status.

Mill River (MA62-29) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact*	Secondary Contact*	Aesthetics*
				
NOT ASSESSED				

*Alert Status issues identified see details in use assessment

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in the Mill River bracketing potential sources of pollution (e.g., discharges, developments).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA and WAL should continue to conduct water quality monitoring at their established sampling sites on the Mill River to meet their sampling objectives. In order for the MassDEP to utilize the TRWA and WAL data for water quality assessment reporting purposes, the TRWA and WAL should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

THREEMILE RIVER SUBWATERSHED

The Threemile River with a drainage area of 84.5 square miles is formed at the confluence of the Wading and Rumford Rivers in the northwest section of the Taunton River Basin (Figure 12). The Rumford River forms at the outlet of Gavins Pond in Sharon. As it flows southward through Mansfield, it is joined by Robinson Brook before emptying into Norton Reservoir. The Rumford River then flows southeasterly from the outlet of Norton Reservoir until it converges with the Wading River. From its headwaters also in Foxborough, the Wading River flows in a southeasterly direction through Foxborough and Mansfield and converges with the Rumford River in Norton to from the Threemile River. The Threemile River subwatershed includes the following segments:

Robinson Brook (Segment MA62-14)
Rumford River (Segment MA62-39)
Rumford River (Segment MA62-40)
Wading River (Segment MA62-47)
Wading River (Segment MA62-49)
Threemile River (Segment MA62-56)
Threemile River (Segment MA62-57)

The land use in the Threemile River subwatershed is primarily forested particularly in the Wading and Threemile Rivers. Residential is the next largest land use category followed by a much lower percentage of open space (6.6 to 9.6%). Approximately 100 acres of land which are classified in the Land-Use theme as cranberry bogs are located throughout the subwatershed. The impervious area in the eastern portion of the Threemile River subwatershed (Robinson Brook and Rumford River) ranges from 13.6 to 23.7%. This is some of the highest impervious area in the Taunton watershed and indicates the potential for water quality to be impacted by impervious surface water runoff. The impervious area in the Wading River and Threemile River is 10.5% or less indicating there is a much lower potential for adverse water quality impacts from impervious surface water runoff.

With the exception of Robinson Brook, all three rivers have been placed on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting Water Quality Standards. There are several NPL sites in the Wading River and the Rumford River. Because of elevated dioxin and pesticides levels in fish tissue, MA DPH issued a fish consumption advisory on the Rumford River.

The majority of the facilities (eight out of thirteen) permitted under the WMA are municipal public water supply sources. Authorized surface and groundwater withdrawals total 12.27 MGD. Water use for the cranberry bog areas is estimated at 0.9 MGD.

There are seven permitted NPDES discharges in this subwatershed. They include one municipal major, one industrial major and 5 minor permits. Although some of the discharges were problematic in the past, progress has been made through the NPDES permit program to correct these problems. Additionally, there are numerous Multi-sector General Stormwater Permits particularly for facilities in the City of Taunton. The communities of Taunton, Norton, Sharon, Dighton, Foxborough and Mansfield are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

As part of its 2001 sampling program, DWM sampled all segments in this subwatershed with the exception of the lower portion of the Threemile River (Segment MA62-57). Water quality in the Threemile River was sampled during the ENSR International study and as part of their NAQWA project the USGS conducted water quality sampling in the Wading River. The TRWA also conducts water quality sampling at two sites on the Threemile River and the Bridgewater State WAL does water quality monitoring at one site on the Threemile River. Due to benthic community impacts the *Aquatic Life Use* was assessed as impaired in Robinson Brook and a portion of the Rumford River. In all other segments that had sufficient information/data to be evaluated the Aquatic Life and Aesthetics Use was assessed as support. The Shellfish Use is impaired in the lower portion of the Threemile River due to elevated bacteria counts.

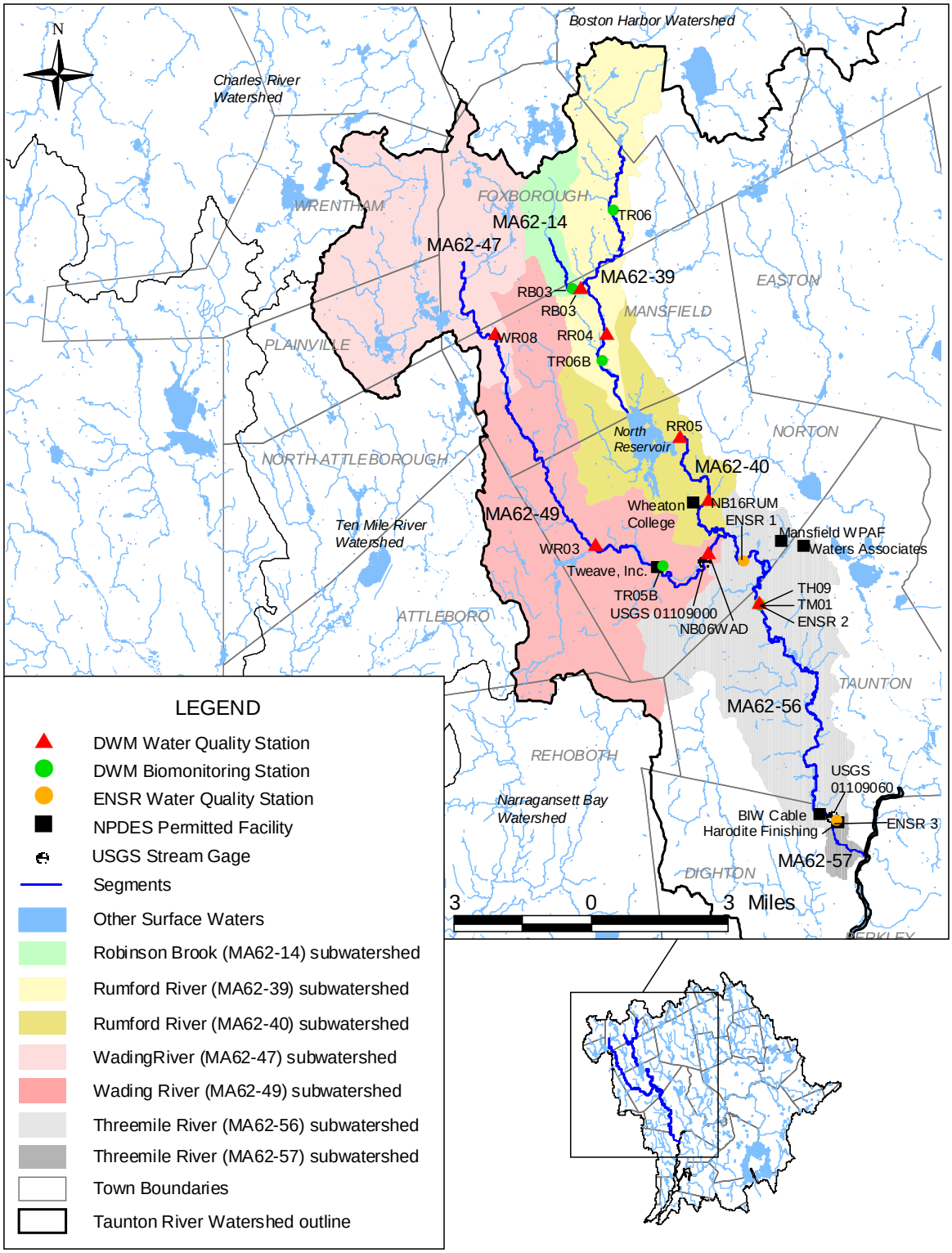


Figure 12. Threemile River Subwatershed

ROBINSON BROOK (SEGMENT MA62-14)

Location: Outlet Hersey Pond, Foxborough to confluence with Rumford River, Mansfield.
Segment Length: 1.9 miles
Classification: Class B

The drainage area of this segment is approximately 2.7 square miles. Land-use estimates (top three) for the subwatershed:

Residential 38.5%
Forest 28.1%
Open land 9.6%

The impervious cover area for this subwatershed is 23.7%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Foxborough Country Club Inc.	NA	42509901	01S 01G 02G 03G	0.07 reg

Based on available information there are no current NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In July 2001 DWM evaluated the instream habitat along one reach in Robinson Brook upstream from Route 140, Mansfield (Station RB03). The total habitat assessment score was 162 out of 200. Instream sedimentation, and limited velocity/depth combinations and channel flow status compromised instream habitat quality most negatively (Appendix D).

Biology

The RBP III analysis of the benthic community in Robinson Brook upstream from Route 140, Mansfield (Station RB03) indicated “moderately impacted” conditions compared to the Canoe River reference station (TR01). Organic enrichment and habitat quality degradation from sediment inputs were thought to compromise biological potential in the brook (Appendix D).

Chemistry – water

Between July and September 2001 DWM collected water quality samples in Robinson Brook at Central Street, Mansfield (Station RB03) (Appendix A). Following is a summary of the sampling results.

Dissolved Oxygen and % Saturation

Measurements for DO were 8.4 and 9.9 mg/L with saturations of 96 and 94%, respectively in August and September. It should be noted that these measurements do not represent worst-case (pre-dawn) conditions.

Temperature

The maximum temperature in Robinson Brook was 23.2°C in August of 2001.

pH and Alkalinity

pH was 6.7 and 6.8 SU and alkalinity was 18 and 21 mg/L (n=2).

Specific Conductance

Specific conductance was very high with values of 806 and 857µS/cm.

Chloride
Values of 210 and 230 mg/L were recorded for chloride.

Hardness
Hardness measurements were 67 and 71 mg/L.

TSS
Total suspended solids were low with values of <1.0 and 1.4 mg/L.

NO_3-NO_2-nitrogen
Values were 0.90 and 1.2 mg/L.

Ammonia-nitrogen
Ammonia nitrogen was consistently <0.02 mg/L (n=2). Both of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999).

Total Phosphorus
Total phosphorus measured 0.011 and 0.021 mg/L.

The *Aquatic Life Use* is assessed as impaired for Robinson Brook based primarily on the RPBIII analysis that indicated moderate impacts to the benthic community. Organic enrichment and habitat quality degradation from sediment inputs were thought to compromise biological potential in the brook.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from Robinson Brook near Central Street, Mansfield (Station RB03). The fecal coliform bacteria counts ranged from 150 - 300 cfu/100 mL, while the *E.Coli* and *Enterococci* counts ranged from 24 – 150 cfu/100mL and 260 – 560 cfu/100mL, respectively (Appendix A). Additionally, samples were collected on August 7, 2001 for Fluorescent Whitening Agents and Optical Brighteners. Results for all samples indicated recovery as below the detection limits. This would indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering Robinson Brook.

No objectionable conditions (i.e., odors, colors, turbidity, oils) other than some trash and debris were observed by DWM biologists in Robinson Brook upstream from Route 140, Mansfield or by DWM field sampling crews near Central Street (MassDEP 2001a and MassDEP 2001b).

Too limited bacteria data are available so the *Primary* and *Secondary Contact Recreational* Uses are not assessed for Robinson Brook. The *Aesthetics Use* is assessed as support.

Robinson Brook (MA62-14) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Combined biota/habitat degradation Source: Unknown (Suspected Source: Highway/road/bridge runoff)
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS

Investigate the need to implement BMPs to minimize/reduce the effects of sediment inputs and other NPS pollutants associated with road runoff from Routes 95 and 140 to Robinson Brook.

Continue to conduct monitoring (biological, habitat and water quality) to evaluate impacts to Robinson Brook from potential sources of pollution (e.g., highway runoff, developments) and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

RUMFORD RIVER (SEGMENT MA62-39)

Location: Outlet Gavins Pond, Sharon to inlet Norton Reservoir, Mansfield.
Segment Length: 8.0 miles
Classification: Class B
(Note this segment was formerly part of MA62-15).

The drainage area of this segment is approximately 13.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....38.6%
Residential.....34.1%
Open land.....7.4%

The impervious cover area for this subwatershed is 16.3%.

The use assessments for Wolomolopoag Pond (MA62216), Gavins Pond (MA62077), Vandys Pond (MA62112), Fulton Pond (MA62075), Hodges Pond (MA62091), and Cabot Pond (MA62029) are in the Lake Assessment section of this report.

This segment (formerly part of MA62-15) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality standards for pesticides, pathogens and organic enrichment/low DO (MassDEP 2003).

MDFW has proposed that Henkes Brook, a tributary to this segment, be listed in the next revision of the SWQS as a cold water fishery (Richards 2003b).

There is one NPL site located in this subwatershed. The site description was excerpted from the EPA New England NPL website (EPA 2005e):

> Hatheway and Patterson Company (HPC) is a former wood preserving facility located in a mixed residential and industrial area in Mansfield, MA. The property is roughly divided in half by the Rumford River, which runs north to south, and by a railroad track right-of-way, which runs east and west. The HPC was listed on the NPL because releases of dioxins, furans, and phenols from the facility to the Rumford River have impacted fisheries and wetlands, and releases of arsenic, chromium, copper, phenols (including pentachlorophenol (PCP)), and polycyclic aromatic hydrocarbons (PAHs) to ground water pose a threat to nearby municipal and private drinking water wells. HPC began wood treating operations at the property in 1953, although it operated at the facility since 1927. Operations between 1927 and 1953 are unknown. At the end of 1972, a citizen complained of "oily water" and dead waterfowl in the Rumford River downstream of the HPC facility. Subsequently, MassDEP and the town of Mansfield requested that HPC contain the seepage. By 1973, HPC developed a contaminated ground water recovery trench located along the east bank of the Rumford River just upstream from its confluence with the Rumford River backwash channel. A prospective buyer of the site again detected oily seepage in the Rumford River in 1981. In 1987, HPC was issued a Notice of Noncompliance by the MassDEP, which ordered that HPC conduct a soils and hydrology assessment of the site. In 1988, MassDEP issued HPC a Notice of Responsibility, and in 1990, MassDEP issued a Request for Short-Term Measure to address the imminent contamination of the Rumford River emanating from the site. In 1992, EPA's RCRA program personnel conducted inspections of the HPC facility and determined that the drip pads were not in compliance. In 1993, HPC filed for bankruptcy and ceased operations in April 1993. In 1999, the state of Massachusetts, at the recommendation of the Agency for Toxic Substances and Disease Registry, closed the Rumford River from below Glue Factory Pond dam to the Norton Reservoir to all fishing due to dioxin contamination attributed to HPC. Releases of dioxins and phenols also have impacted approximately 1.25 miles of wetland frontage along the Rumford River, and the releases pose a threat to several other wetland areas, fisheries, and habitats used by State designated threatened species downstream of the facility. In addition, over 44,000 people receive drinking water from private and municipal wells within four miles of the HPC facility. EPA conducted a preliminary environmental investigation in the fall of 2001 and issued a Final Data Report on June 4, 2002. The preliminary environmental investigation focused on sampling existing ground water monitoring wells at the site and collecting water and sediment samples from the Rumford River. The Final Data Report summarizes all historical soil data collected at the site and data collected during the preliminary environmental investigation. Based on the information presented in the Final Data Report, EPA was able to identify where additional information is needed to complete a Remedial Investigation.

There are two sites awaiting a NPL decision located in this subwatershed. The site descriptions were excerpted from the EPA website (EPA 2005f and 2005g):

Mansfield Bleachery (MB) in Foxborough, MA operated a textile manufacturing business on the property from approximately 1890 until 1966. MB reportedly engaged in the uncontrolled disposal of process wastes in the northern portion of the property. Analysis of soil samples collected in 1990 revealed elevated levels of semivolatile organic compounds (SVOCs). Two oil spills had occurred in the past and impacted the Rumford River. In 1987, Summit Casting (owner and occupant of one of the parcels of land occupied by MB) removed two 20,000-gallon fuel oil underground storage tanks and contaminated soil from their property after discovering oil seeping through a basement wall of their building. Groundwater samples collected on site have revealed the presence of petroleum related compounds. Surface water runoff drains into Glue Factory Pond and then the Rumford River. Surface water samples taken from the Glue Factory Pond and the Rumford River indicated the presence of trans-1,2-dichloroethene. Currently the site has no status under the Massachusetts Contingency Plan and is not an active site under the MassDEP.

In 1986, the Town of Sharon Board of Appeals requested that a hydrogeologic study be conducted to assess the potential impact of the on-site septic system at Shaw's Plaza (SP) property to Sharon Well No. 5, a public drinking water supply, located about 0.3 miles southeast and down gradient from the property. Five chlorinated and non-chlorinated volatile organic compounds (VOCs) were detected in soil samples. Analytical results of groundwater and drinking water sampling done in 1995 have documented the release of benzene and seven chlorinated VOCs to groundwater beneath and down gradient from the SP property and extending to the southeast. Groundwater sampling results of the testing done in 1995 indicated that a groundwater contamination plume of tetrachloroethylene (PCE) originating at the SP property was discovered, and the presence of PCE in samples collected from Sharon Well No. 5 at the concentration of 3.6 PPB. A groundwater treatment system was installed in 1992 to treat the contaminated groundwater. Surface water runoff from the SP property flows south towards Billings Brook. Analytical results of surface water pathway sampling have documented a release of semivolatile organic compounds to surface water in Billings Brook and associated wetlands at concentrations near 1 part per million. The property is in Phase V (Operation, Maintenance, and/or Monitoring) of the five phase Massachusetts Contingency Plan.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 23 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.2 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Sharon Water Department*	9P42526601	42526601	4266000-04G 4266000-06G	0.55 reg 0.31 perm Total – 0.86
Foxborough Water Department*	9P42509901	42509902	4099000-07G 4099000-08G 4099000-09G 4099000-10G	1.6 reg 0.22 perm Total – 1.82

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

The former Gorham Silver Company, Mansfield has submitted an application (NPDES MA0035700) to discharge to a wetland near this segment of the Rumford River.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In July 2001 DWM evaluated instream habitat along two reaches in this segment of the Rumford River (Appendix D). The most upstream station was located 200 meters downstream from Coccasset Street, Foxborough (Station TR06). The overall habitat score here was 142 out of 200. Habitat was limited most by low flow conditions (limited velocity depth combinations and fish cover) and sediment deposition (sediment deposition was not noted during the survey conducted by DWM in 1996). The overall habitat score of the second station located downstream from Willow Street, Mansfield (Station TR06B) was 159 out of 200. Instream habitat quality was primarily compromised by sediment deposition, embeddedness and limited instream cover for fish (MassDEP 2001b). DWM biologists also evaluated habitat in the Rumford River downstream from Coccasset St., Foxborough (Station TR06) in July 1996 (Appendix E).

Biology

The RBP III analysis of the benthic macroinvertebrate sample collected by DWM in July 2001 from the Rumford River downstream from Coccasset Street, Foxborough (Station TR06) indicated slightly impacted conditions compared to the Canoe River reference station (Appendix D).
The benthic community in the river downstream from Willow Street, Mansfield (Station TR06B), however, was found to be moderately impacted (RBP III analysis indicated only 33% comparability to the Canoe River reference station). In September 2001 DWM conducted fish population sampling downstream from Willow Street, Mansfield using a backpack shocker. A total of 36 fish were collected and six species were represented. The fish community was dominated by pumpkinseed. Other fish present included black crappie, yellow perch, redfin pickerel, bluegill, and American eel (Mitchell 2001). The fish community was comprised entirely of macrohabitat generalists. Redfin pickerel and American eel are common in slow-moving wetland dominated streams. The remaining species are indicative of lentic habitats and may be coming from the large impoundment (Cabot Pond) located upstream.

The results of the July 1996 DWM RBP II analysis of the benthic macroinvertebrate community in the Rumford River downstream from Coccasset St., Foxborough (StationTR06) can be found in Appendix E.

Chemistry – water

DWM conducted water quality sampling in the Rumford River near Spring Street, Mansfield (Station RR04) between July and September 2001 (Appendix A). A summary of these data are presented below.

Dissolved Oxygen and % Saturation

All measurements for DO at RR04 were greater than 5.0 mg/L during both the pre-dawn and daytime surveys. Saturation exceeded 60% ranging from 70 to 96%.

Temperature

The maximum temperature recorded was 26.7°C in July 2001.

Chloride

Chloride measurements ranged from 110 to 120mg/L.

pH and Alkalinity

pH ranged from 6.5 to 7.8 SU while alkalinity ranged was 17 to 25 mg/L.

Hardness

The range for hardness was 49 to 52 mg/L.

Specific Conductance

Specific conductance ranged from 457 to 479 µmhos/cm.

TSS

Concentrations of suspended solids were low ranging from 1.3 to 2.9 mg/L.

Ammonia-nitrogen

The concentration of ammonia-nitrogen was <0.02 mg/L. This measurement was below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999).

Nitrate and Nitrite-nitrogen

Concentrations were 0.18, 0.33 and 0.38 mg/L.

Total Phosphorus

Total phosphorus concentrations were all less than 0.05 mg/L with a range of 0.022 to 0.032 mg/L.

The *Aquatic Life Use* is assessed as support for the upper 3.0 mile reach of the Rumford River (upstream from the Glue Factory Pond dam in Foxborough) based primarily on the RPB III analysis. Downstream from the Glue Factory Pond dam, the *Aquatic Life Use* for the Rumford River is assessed as impaired (the lower 5.0 mile reach of this segment). This assessment is based in part on best professional judgment (unknown impacts associated with the HPC site) and the RPB III analysis that indicated moderate impacts to the benthic community in the river near Willow Street, Mansfield and the fish community analysis which documented the absence of fluvial dependant/specialists. Organic enrichment and habitat quality degradation from sediment inputs likely compromise biological integrity.

FISH CONSUMPTION

In 1998/1999 fish toxics monitoring was conducted by EPA in the Rumford River in Mansfield. In 1999 the state of Massachusetts, at the recommendation of the Agency for Toxic Substances and Disease Registry, closed the Rumford River from below Glue Factory Pond dam to the Norton Reservoir to all fishing due to dioxin contamination attributed to HPC (EPA 2005e). The dioxin and pesticides data triggered a site-specific advisory against the consumption of fish from this waterbody and the MA DPH issued the following fish consumption advisory (MA DPH 2004).

> "The general public should not consume any fish from this water body".

The upper 3.0 mile reach of this segment of the Rumford River is not assessed for the *Fish Consumption Use*. The lower 5.0 mile reach (portion of the Rumford River between Glue Factory Pond dam in Foxborough and the inlet of Norton Reservoir in Mansfield which includes Fulton, Kingman and Cabot ponds) is assessed as impaired for this use due to elevated dioxin and pesticides levels in fish tissue as a result of contamination from the HPC site.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Rumford River near Spring Street, Mansfield (Station RR04). Fecal coliform bacteria counts were low (n=3) ranging from 25 – 190 cfu/100mL (Appendix A). *E. Coli* and *Enterococci* counts ranged from 15 – 100 and from 30 - 710 cfu/100mL, respectively. Additionally samples were collected on August 7, 2001 for Fluorescent Whitening Agents and Optical Brighteners at this sampling site. Results for all samples indicated recovery as below the detection limits. This would indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering the Rumford River.

Although the water was described as slightly turbid, no other objectionable conditions (e.g., odors, oils, deposits) were noted by DWM biologists in the Rumford River near either Cocassett Street, Foxborough or Willow Street, Mansfield in July 2001 (MassDEP 2001b). Some trash and debris and a small oil sheen was noted in the river near Spring Street in Mansfield during the July 2001 water quality survey.

Too limited bacteria data are available so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support but is identified with an Alert Status because of trash and debris in the river downstream from Mansfield center.

Rumford River (MA62-39) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT upper 3.0 mile reach IMPAIRED lower 5.0 mile Reach Cause: Combined biota/habitat degradation Source: Unknown (Suspected Sources: Highway/road/bridge runoff, and municipal separate storm sewers)
Fish Consumption		NOT ASSESSED upper 3.0 mile reach IMPAIRED lower 5.0 mile reach Cause: Dioxin and pesticides Source: NPL superfund site
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT*

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Rumford River from potential sources of pollution (e.g., hazardous waste site, Robinson Brook, developments) to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

A stream cleanup should be conducted to remove trash and debris.

Review data and evaluate status of hazardous waste site cleanups along this segment of the Rumford River to monitor progress of improvements and to determine needs, if any, to collect additional data.

MDFW has proposed that Henkes Brook, a tributary to the Rumford River, be protected as cold water fishery habitat. Additional monitoring of the fish population, dissolved oxygen, and temperature is needed to evaluate MDFW's proposal to list this stream as a cold water fishery in the next revision of the Surface Water Quality Standards.

RUMFORD RIVER (SEGMENT MA62-40)

Location: Outlet Norton Reservoir, Norton to confluence with Wading and Threemile rivers, Norton.
Segment Length: 4.5 miles
Classification: Class B
(Note this segment was formerly part of MA62-15.)

The drainage area of this segment is approximately 22.3 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....45.0%
Residential.....28.2%
Open land.....8.0%

The impervious cover area for this subwatershed is 13.6%.

The use assessment for Norton Reservoir (MA62134) is in the Lake Assessment section of this report.

This segment (formerly part of MA62-15) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality standards for pesticides, pathogens and organic enrichment/low DO (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 23 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.2 MGD. This cranberry acreage is entirely within the subwatershed for Segment MA62-39, which is the upper portion of this subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Tournament Players Club	9P442521802	NA	RW-3 RW-4 RW-5 RW-6 RW-9 RW-11 RW-13	0.23 perm

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)

Wheaton College is authorized to discharge a monthly average of 0.12 MGD and a daily maximum of 0.16 MGD of sanitary wastewater and cooling water via outfall 001 (NPDES permit # MA0026182 reissued in August 2004). MassDEP issued an Administrative Consent Order to Wheaton College in December 2004 establishing timelines to develop, permit, and construct enhancements to its wastewater treatment facility. The improved facility will be designed to attain compliance with Wheaton's reissued NPDES permit.

USE ASSESSMENT

AQUATIC LIFE

Biology

As part of the MassDEP biocriteria development project the fish population in the Rumford River was sampled (electrofishing) in October 1996 (Appendix I). The fish population in the river (Station NB16RUM) was comprised, in order of abundance, of tessellated darter; American eel; and two each of pumpkinseed, largemouth bass, and redfin pickerel (MassDEP 1996b). The fish community was heavily dominated (74%) by tessellated darter, a fluvial specialist. The next most dominant species, American eel (a macrohabitat generalist) is usually more common in ponds and low gradient streams. However, they also inhabit faster moving streams especially areas close to dams, which may obstruct their upstream movement.

Chemistry – water

DWM conducted water quality sampling in the Rumford River near Reservoir Street, Norton between July and September 2001 (Station RR05). These data are summarized below. It should also be noted that DWM collected *in-situ* measurements of the Rumford River (DO, %saturation pH, temperature and conductivity) approximately 25 meters southwest (downstream) of Pine Street (Station #NB16RUM) on October 7, 1996 (Appendix B).

Dissolved Oxygen and % Saturation

All measurements for DO were greater than 5.0 mg/L during both the pre-dawn and daytime surveys. Saturation was greater than 60% ranging from 69 to 96%.

Temperature

The maximum temperature was 28.9°C in August 2001. All other readings at this site were ≤ 28.3°C.

Chloride

Chloride ranged from 88 to 100 mg/L.

pH and Alkalinity

pH ranged from 6.8 to 7.2 SU while the alkalinity ranged from 18 to 21 mg/L.

Hardness

Hardness measured between 38 and 39 mg/L.

Specific Conductance

Specific conductance ranged from 362 to 390 µmhos/cm.

TSS

Concentrations of TSS were low ranging from 2.4 to 3.6 mg/L.

Ammonia-nitrogen

Ammonia nitrogen concentrations were all <0.02 mg/L. These measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 and temperature of 30° C) (EPA 1999).

NO_3-NO_2-nitrogen

All measurements were ≤0.06 mg/L.

Total Phosphorus

Total phosphorus concentrations ranged from 0.032 to 0.041 mg/L.

There are too limited data available and a lack of instream biological data (response type indicators of in-stream water quality conditions) so the *Aquatic Life Use* is not assessed for this segment of the Rumford River.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Rumford River near Reservoir Street, Norton (Station RR05) and near Route 123, Norton (Station RR06). Fecal coliform bacteria counts were low ranging from 35 – 300 cfu/100mL (only one of five counts was > 200 cfu/100 mL) (Appendix A). *E. coli* and *Enterococci* counts ranged from 10 – 60 and from 60 - 500 cfu/100mL, respectively. Additionally samples were collected on September 17, 2001 for Fluorescent Whitening Agents and Optical Brighteners. Results for all samples indicated recovery as below the detection limits. This would indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering the Rumford River.

No objectionable conditions (oils, odors, deposits) other than some trash and debris near Reservoir Street, Norton were noted by DWM field sampling crews during the water quality surveys in the summer 2001 (MassDEP 2001a).

Too limited bacteria data are available so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support.

Rumford River (MA62-40) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Rumford River from potential sources of pollution (e.g., discharges) to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

WADING RIVER (SEGMENT MA62-47)

Location: Source in wetland north of West Street, Foxborough to Balcolm Street, Mansfield.
Segment Length: 4.2 miles
Classification: Proposed Class A

The drainage area of this segment is approximately 19.6 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....54.4%
Residential.....23.7%
Open land.....6.6%

The impervious cover area for this subwatershed is less than 10%.

The use assessments for Crocker Pond (MA62051), Route One Pond (MA62165), Thurston Street Pond (MA62192), Carpenter Pond (MA62032), Sunset Lake (MA62184), Cocasset Lake (MA62043), Furnace Lake (MA62076), Turnpike Lake (MA62198), Mirimichi Lake (MA62118), Robinson Pond (MA62163), and Blakes Pond (MA62221) are in the Lake Assessment section of this report.

This segment (formerly part of Segment MA62-17) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for organic enrichment/low DO, pathogens and causes unknown (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 15 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.1 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Wrentham Water Division	9P42535001	42535001	4350000-02G	0.38 reg 0.23 perm Total - 0.61
Plainville Water Department	9P42523801	42523801	4238000-01G 4238000-02G 4238000-05G	0.39 reg 0.0 perm Total – 0.39
Law Greenhouses & Gardens	NA	V42509903	01S	0.01 reg
Foxborough Water Department*	9P42509901	42509902	4099000-04G 4099000-05G 4099000-06G 4099000-12G	1.60 reg 0.22 perm Total – 1.82
Attleboro Department of Public Works	9P42501601	42501602	4016000-05S	1.62 reg 0.47 perm Total – 2.09

* Indicates system-wide withdrawal

Based on the available information there are no NPDES discharges to this segment of the Wading River.

USE ASSESSMENT

AQUATIC LIFE

Chemistry – water

DWM conducted water quality sampling of the Wading River near West Street, Mansfield (Station WR08) between July and September 2001 (Appendix A). These data are summarized below.

Dissolved Oxygen and % Saturation

DO measurements ranged from 4.1 to 8.0 mg/L with saturations between 50 and 79%. Of the six measurements taken, two (both pre-dawn) were below 5.0 mg/L and 60% saturation.

Temperature

The maximum temperature recorded was 26.2°C in August 2001.

Chloride
Chloride measurements ranged from 97 to 110 mg/L.

pH and Alkalinity
The pH ranged between 6.6 and 6.7 while alkalinity ranged from 22 to 24 mg/L.

Specific Conductance
Specific conductance ranged from 391 to 451 µS/cm.

Hardness
Hardness ranged from 49 to 56 mg/L.

TSS
TSS were low ranging between <1.0 and 4.5 mg/L.

Ammonia-nitrogen
Ammonia-nitrogen concentrations were all <0.02 mg/L. These measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

NO_3-NO_2-N
The concentration ranged between 0.18 and 0.21 mg/L.

Total Phosphorus
Total phosphorus concentrations were all less than 0.05 mg/L ranging from 0.020 to 0.037 mg/L.

Due to the lack of instream biological data (response type indicators of in-stream water quality conditions), the *Aquatic Life Use* for this segment of the Wading River is not assessed. Whether or not low dissolved oxygen/saturation results from anthropogenic influences or from natural conditions (wetland influences) is unknown.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION
In August 2001, DWM collected fecal coliform (590 cfu/100 mL), *E. coli* (300 cfu/100 mL), and *Enterococci* (450 cfu/100 mL) bacteria from the Wading River near West Street, Mansfield (Station WR08) (Appendix A).

Field observations were made by DWM field sampling staff during the surveys conducted in this segment of the Wading River between June and September 2001. No objectionable conditions (odors, oils, deposits, trash or debris) were noted during any of the surveys (MassDEP 2001a).

Too limited bacteria data are available so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support.

Wading River (MA62-47) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS

Conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Wading River bracketing potential sources of pollution (e.g., developments, water withdrawals).

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Consideration should be given to conducting a hydrologic evaluation/assessment to determine if there are any impacts to the Wading River from the numerous groundwater withdrawals.

WADING RIVER (SEGMENT MA62-49)

Location: Balcom Street, Mansfield to confluence with Threemile River, Norton.
Segment Length: 9.7 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 29.3 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....53.3%
Residential.....24.0%
Open land.....7.2%

The impervious cover area for this subwatershed is less than 10%.

The use assessments for Sweets Pond (MA62185), Chartley Pond (MA62038), and Barrowsville Pond (MA62007) are in the Lake Assessment section of this report.

This segment (formerly part of Segment MA62-17) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for organic enrichment/low DO, pathogens and causes unknown (MassDEP 2003).

A USGS gaging station (01109000) on the Wading River in Norton has been in operation since June 1925. The drainage area at the gage is 43.3 square miles. The highest daily mean flow at the gage was recorded at 1,460 cfs on 19 March 1968 and the lowest daily mean flow was 0.3 cfs on 10 September 1926 (Socolow *et al*. 1999, Socolow *et al*. 2000, Socolow *et al.* 2001, Socolow *et al.* 2002, and Socolow *et al*. 2003).

There is one NPL site located in this subwatershed. The site description was excerpted from the EPA New England NPL website (EPA 2005a):

> The Shpack Landfill covers 8 acres, 5 acres of which are within the Town of Norton, and the remaining 2 acres are in the City of Attleboro. The landfill was operated from 1946 until 1965, when a court order forced its closing. This landfill received domestic and industrial waste, including inorganic and organic chemicals, and radioactive waste. The groundwater contains volatile organic compounds (VOCs) including vinyl chloride and trichloroethylene (TCE), and heavy metals including chromium, barium, copper, nickel, manganese, arsenic, cadmium, and lead. Sediments on the edge of the swamp and soils contain radionuclides including radium and uranium. Surface water in the swampy area is contaminated with radium and alpha and beta particles, and organic compounds. An investigation into the nature and extent of the contamination at the site was begun by the potentially responsible parties in 1990. Through sampling and characterization of soil, sediments, surface water, and groundwater, the investigation will define the contaminants of concern and will recommend alternatives for the final cleanup. The results of the first phase of study were released in 1993. The scheduled field work was completed in the Spring of 2003. The Record of Decision (ROD) for the site was signed on 30 September 2004. Cleanup costs are estimated to be about $43 million. The Army Corps of Engineers will be conducting the cleanup of the radiological contamination of the Shpack site and the remaining cleanup will be led by EPA. The ROD includes the following major components:
>
> > Excavation and off-site disposal of approximately 34,000 cubic yards of soil and 1,000 cubic yards of sediment from Chartley Swamp which exceed the radiological and chemical cleanup levels for the site.
> >
> > Following excavation, impacted wetlands will be restored or replicated and clean fill will be used to backfill and bring open areas up to grade, as necessary.
> >
> > Extension of the public water supply line to two residences adjacent to the site that currently have private wells.
> >
> > Implementation of institutional controls to restrict future use of the property and groundwater.
> >
> > A traffic control plan will be designed to manage the increased volume of truck traffic associated with transporting contaminated material off-site. EPA will closely coordinate these activities with local, state and federal partners prior to beginning the cleanup.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 18 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.2 MGD. However, 15 acres of this cranberry acreage are located in the subwatershed for Segment MA62-47which is the upper portion of this subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Mansfield Water Department*	9P42516701	42516701	4167000-11G	1.59 reg 0.4 perm Total – 1.99
Texas Instruments	NA	42501601	Well #1 Well #3 Well #7 MW No. 11	0.37 reg

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLES G2 AND G3)

C. A. Richardson, Inc. located in Mansfield (NPDES permit #MA0001805) discontinued discharging to the Wading River in 2001. The facility, located near the Wading River and Sweets Pond impoundment, West Mansfield, Massachusetts, is a manufacturer of metal stampings. It was authorized (MA0001805 issued in May 2000) to discharge a flow of 0.003 MGD (average monthly) via outfall #001 of treated effluent to the Wading River. Zero discharge resulted from reduced water consumption and use of an evaporator (800 gpd capacity) to eliminate their wastewater (Richardson 2001). The facility had conducted whole effluent toxicity tests as part of their NPDES permit.

The Sun Chemical Corporation/GPI Division located in Mansfield was issued an NPDES permit (#MAG250244) on 1 December 2000 to discharge non-contact cooling water through a ditch to Hodges Brook, a tributary to the Wading River. This permit expired on April 25, 2005.

Since early in 2000, Texas Instruments, Inc., (TI) located in Attleboro, has directed all of its wastewater to the City of Attleboro's Water Pollution Control Facility (Elliot 2004). Therefore, the facility no longer discharges treated industrial wastewater via outfall #003 to the Wading River (Elliott 2004). The facility had conducted acute and chronic whole effluent toxicity tests as part of their NPDES permit.

Sinclair Manufacturing Company in Norton, which manufactures electrons components and screw machine products, is authorized (NPDES permit #MAG250030 issued in October 2004) to discharge an average flow of 0.0075 MGD and a maximum flow of 0.0125 MGD of non-contact cooling water into Chartley Brook, a tributary to the Wading River.

The NPDES permit (#MA0030724) for Kilburn Glass Industries Incorporated (now Isotronics), Norton was terminated in June 2004.

Tweave, Inc., located in Norton, is permitted (MA0005355 in August 2000) to discharge from Outfall #001 a flow of 0.008 MGD (average monthly) or 0.01 MGD (daily maximum) of treated process wastewater to this segment of the Wading River. Tweave, Inc. manufactures fabric and dye stretch woven fabrics as finished goods. Tweave, Inc. has an industrial waste treatment facility (WWTF) that consists of screening (removal of solids), aerated lagoons (aerobic treatment), clarification (removal of solids), and sand filtration (Frasher 2004). Total phosphorus reduction (7.5 mg/L maximum daily) is accomplished by source reduction. The pH of the effluent between September 2000 and August 2004 ranged from 5.4 to 8.6 SU with 7 out of 16 measurements <6.5 SU and one measurement >8.3 SU (TOXTD database). The low pH may be attributed to the use of acidic dyes in the manufacturing process (DuBois 2005). The ammonia-nitrogen concentrations in the effluent between September 2000 and August 2004 ranged from 1.70 to 40.30 mg/L (n=16) with a notable increase in the concentrations reported between August 2002 and May 2004 (TOXTD database). The increase in ammonia-nitrogen concentrations reported between August 2002 and May 2004 may be attributed to the increased use of colored dyes in the manufacturing process (DuBois 2004). The facility's acute whole effluent toxicity limit is $LC_{50} \geq 100\%$ with a monitoring

frequency of four times/year using *Ceriodaphnia dubia*. The permit also requires that the facility perform a Toxics Identification and Reduction Evaluation to reduce the toxicity of its discharge.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In August 2001 DWM conducted a RBP III benthic macroinvertebrate survey at one station (TR05B) on the Wading River downstream from Barrows St, Norton. The overall habitat assessment score was 173 out of 200 (Appendix D).

It should also be noted that in July 1996 DWM conducted a RBP II benthic macroinvertebrate survey at two stations (TR05A and TR05B) on the Wading River. TR05A was located 200 meters downstream from Barrows St., Norton (upstream from the Tweave Inc. discharge). These data are located in Appendix E.

Biology

The 2001 RBP III analysis indicated a "slightly impacted" community in the Wading River downstream from Barrows Street, Norton (TR05B) compared to the Canoe River reference station (TR01). The results of the 1996 RBP II analysis can be found in Appendix E.

As part of the MassDEP biocriteria development project the fish population in the Wading River near Route 140, Norton was sampled (electrofishing) in October 1996 (Appendix I). The fish population in the river (Station NB06WAD) was comprised of five species including, in order of abundance: tessellated darter, American eel, redfin pickerel, bluegill and a white sucker (MassDEP 1996b).

Toxicity

Ambient

Between March 1995 and February 2000, survival of *Ceriodaphnia dubia* exposed (48 hours) to river water collected from the Sweets Pond impoundment of the Wading River for use as dilution water for the C. A. Richardson whole effluent toxicity tests was not less than 95% (n=19 tests) and survival of *Pimephales promelas* (48-hour exposure) was not less than 90% (n=19) (TOXTD database).

Water from the Wading River at the Sweets Pond impoundment was also collected for use as dilution water in Texas Instruments' whole effluent toxicity tests. Between October 1996 and October 1999, survival of *Ceriodaphnia dubia* exposed (7 days) to the river water was $\geq$ 80% (n=16). Survival of *Daphnia pulex* exposed (48 hours) to river water was $\geq$ 85 % (n=48).

The Tweave WWTF staff collected water from the Wading River at the Barrows Street overpass for use as dilution water in their whole effluent toxicity tests (Fraser 2004). Between September 2000 and August 2004, survival of *Ceriodaphnia dubia* exposed (48 hours) to river water ranged from 90 to 100% (n=16 test events) (TOXTD database).

Effluent

Acute toxicity to both *Ceriodaphnia dubia* and *Pimephales promelas* was detected in all (n=18 and 20 valid tests, respectively) of the Charles A. Richardson, Inc.'s whole effluent toxicity tests with LC_{50}'s ranging from <6.25 to 81% effluent (TOXTD database).

No acute whole effluent toxicity was detected in Texas Instruments' treated effluent with either *Ceriodaphnia dubia* (n=16 tests conducted between October 1996 and October 1999) or *D. pulex* (n=48 tests conducted between October 1996 and December 1999). The C-NOEC results using *Ceriodaphnia dubia* (n=15 valid test results) ranged from 10 to 100%.

The Tweave WWTF staff collected treated process water at their outfall #001 prior to entering an unnamed creek that flows (approximately 0.25 mile) into the Wading River for use in their whole effluent toxicity tests (DuBois 2004). A total of 16 acute whole effluent toxicity tests using *Ceriodaphnia dubia* were conducted between September 2000 and August 2004. The LC_{50}s ranged from 8.84 to >100% effluent. Half of the tests exhibited acute toxicity although it should be noted that since May 2003 all tests results were >100% effluent (TOXTD database).

Chemistry – water

Water from the Sweets Pond impoundment of the Wading River was collected for use as dilution water in the Charles A. Richardson, Inc. facility's whole effluent toxicity tests between October 1995 and February 2000.

Between October 1996 and December 1999, dilution water used in TI's whole effluent toxicity tests was taken from the Wading River. Data from these toxicity test reports are maintained in the TOXTD database by DWM.

DWM conducted water quality sampling in the Wading River near Route 123, Norton (Station WR03) between July and September 2001 (Appendix A). It should also be noted that DWM took *in-situ* measurements of the Wading River (DO, %saturation pH, temperature and conductivity) on October 7, 1996 approximately 300 meters northeast (downstream) of Route 140 (Station #NB06WAD) (Appendix B).

The Tweave WWTF staff collected river water from the Wading River at the Barrows Street overpass for use as dilution water in their whole effluent toxicity tests. Data from the facility's whole effluent toxicity test reports, between September 2000 and August 2004, are maintained in the TOXTD database by DWM and are summarized below.

The USGS as part of their NAQWA project conducted water quality sampling of the river between October 1999 and September 2001 near their USGS gaging station in Norton (n=21 unless otherwise noted) (Socolow *et al.* 2001 and 2002). As part of their mercury studies total and methyl mercury samples from the water column were also collected from the Wading River at Norton by USGS on 21 April and 9 August 2000 (USGS 2003). These data are also summarized below.

Data collected by DWM (*in-situ* measurements of the Wading River including DO, %saturation pH, temperature and conductivity) taken on 7 October 1996 approximately 300 meters northeast (downstream) of Route 140 (Station #NB06WAD) can be found in Appendix B.

Data from these sources are summarized below:

Dissolved Oxygen and % Saturation

DO measurements ranged from 5.3 to 8.7 mg/L with saturations between 60 and 80% in the river near Route 123 (Station WR03) including pre-dawn measurements. DO ranged from 5.7 to 14.7 mg/L in the river at the USGS gaging station (day surveys only).

Temperature

The maximum temperature recorded in the river near Route 123 (Station WR03) was 25.9°C in July 2001. The maximum temperature of the river was 24.6°C at the USGS gaging station (July 2001).

Hardness

Hardness of the Wading River samples collected between October 1995 and February 2000 ranged from 24 to 80 mg/L with only 1 of the 18 measurements <25 mg/L (TOXTD database – C.A. Richardson).
Hardness of the Wading River (Sweets Pond) between October 1996 and December 1999 ranged from 23 to 56 mg/L (n=57) (TOXTD database - TI). Only 3 measurements were <25 mg/L.
Hardness of the river near Route 123 (WR03) ranged from 41 to 47 mg/L. Hardness of the Wading River collected at the Barrows Street overpass between September 2000 and August 2004 ranged from 21 to 44 mg/L (TOXTD database - Tweave). One of the 16 measurements was <25 mg/L.

pH and Alkalinity

The pH of the Wading River samples collected between October 1995 and February 2000 ranged from 6.1 to 8.0 SU with 5 of the 18 measurements <6.5 SU. Alkalinity ranged from 4 to 37 mg/L (n=18) (TOXTD database - C.A. Richardson). The pH of the Wading River (Sweets Pond) between October 1996 and December 1999 ranged from 6.2 to 7.5SU with two of the 58 measurements <6.5 SU. Alkalinity ranged from <10 to 86 mg/L (n=53) (TOXTD database - TI). pH of the river near Route 123 ranged

between 6.5 and 6.9 while alkalinity ranged from 15 to 22 mg/L (Station WR03). The pH of the Wading River collected at the Barrows Street overpass between September 2000 and August 2004 ranged from 5.6 to 7.2 SU with 8 of the 16 measurements <6.5 SU. Alkalinity ranged from 10.9 to 96 mg/L (n=16) (TOXTD database - Tweave). At the USGS gaging station *in situ* measurements for pH ranged from 6.4 to 6.9 SU (only one measurement <6.5 SU) (n=19) and alkalinity ranged from 6 to 22 mg/L (n=14).

Specific Conductance
The specific conductance of the Wading River samples collected between October 1995 and February 2000 ranged from 150 to 320 µmho/cm (n=18) (TOXTD database - C.A. Richardson). The specific conductivity of the Wading River (Sweets Pond) between October 1996 and December 1999 ranged from 150 to 370 µmho/cm (n=58) (TOXTD database - TI). Specific conductance of the river near Route 123 ranged from 273 to 365 µS/cm (Station WR03). Specific conductance of the river near the Barrows Street overpass between September 2000 and August 2004 ranged from 237 to 818 µmho/cm (TOXTD database – Tweave).

Chloride
Chloride ranged from 56 to 88 mg/L (station WR03).

Ammonia-nitrogen
The ammonia-nitrogen concentrations of the Wading River samples collected between October 1995 and February 2000 were all ≤0.50 mg/L (n=18) (TOXTD database - C.A. Richardson). Concentrations of ammonia-nitrogen in the river near Route 123 were all <0.02 mg/L (Station WR03). The ammonia-nitrogen concentrations of the Wading River collected at the Barrows Street overpass between September 2000 and August 2004 were all ≤0.10 mg/L (n=15) (TOXTD database). The concentration of ammonia-nitrogen ranged from <0.02 to 0.145 mg/L in the river at the USGS gage. All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

NO_3-NO_2-Nitrogen
The concentration (Station WR03) ranged from 0.23 to 0.30 mg/L.

TRC
No detectable concentrations of TRC (n=18) were measured in the Wading River samples collected in the Sweets Pond impoundment between October 1995 and February 2000 (TOXTD database- C.A. Richardson). The TRC measurements of the of the Wading River (Sweets Pond) between October 1996 and December 1999 ranged from <0.01 to 0.36 mg/L (n=58) (TOXTD database - TI). With the exception of four measurements (all in July and August 1997) TRC was < 0.05 mg/L. The TRC measurements (n=16) of the Wading River collected at the Barrows Street overpass between September 2000 and August 2004 were all <0.05 mg/L with the exception of two results (0.16 mg/l in September 2000 and 0.08 mg/L in June 2001) (TOXTD database).

TSS
Concentrations ranged from <1.0 to 1.4 mg/L in the river near Route 123 (Station WR03).

Total Phosphorus
Total phosphorus concentrations ranged from 0.011 to 0.020 mg/L in the river near Route 123 (Station WR03). The concentration of total phosphorus ranged from 0.012 to 0.083 mg/L in the river at the USGS gage. Three of the 21 measurements were >0.05 mg/L.

Mercury
The concentrations of total and methyl mercury samples from the water column of the Wading River reported by USGS (samples collected on 21 April and 9 August 2000) were 2.04 and 3.22 and 0.226 and 0.369 ng/L, respectively (USGS 2003).

Chemistry – sediment
USGS collected sediment from the Wading River near the USGS gaging station in Norton in August 2000, as part of their Toxics Substances Hydrology Program (an extension of the National Mercury Pilot Study),

and the Urban Land Use Gradient Study (part of the NAWQA program). The sediment was analyzed for trace elements and organic compounds. Cadmium, chromium, copper, lead, mercury, nickel and zinc concentrations all exceeded the L-EL guidelines while arsenic, iron and manganese exceeded the S-EL guidelines (Chalmers 2002 and USGS 2003).

The *Aquatic Life Use* is assessed as support for this segment of the Wading River based on the benthic macroinvertebrate community analysis, good survival of test organisms exposed to the river water and the water quality data. Although the C.A. Richardson discharge was acutely toxic, the facility eliminated their discharge to the Wading River in 2001.

FISH CONSUMPTION

An edible fillet composite sample (scales off, skin on) from five bluegill collected by USGS from this segment of the Wading River near the USGS gage in Norton in August 2000 was analyzed for total mercury (Chalmers 2002). The concentration of mercury in the edible fillet sample was 0.097 ppm wet weight (USGS 2003).

No site-specific fish consumption advisory is in place for this segment of the Wading River and therefore, the *Fish Consumption Use* is not assessed.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

Between June and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from this segment of the Wading River and from one tributary (Hodges Brook) (Appendix A). The stations and data are summarized below.

WR04 - Wading River at Walker Street, Norton, (n=1)
WR03 - Wading River at Route 123, Norton, (n=3)
HB01 - Hodges Brook (a tributary to the Wading River) at the road crossing upstream from the confluence with the Wading River in Mansfield, (n=2)

2001 DWM bacteria data

Station	Fecal Coliform (cfu/100 mL)	*E. coli* (cfu/100 mL)	*Enterococci* sp. (cfu/100 mL)
WR04	460	190	690
WR03	50, 67 and 860	20, 43 and 85	50, 100 and 5,000
HB01	130 and 740	38 and 290	230 and 1,000

Between June and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Wading River near Route 140, Norton (Station WR01). The fecal coliform counts ranged from 55 – 110 cfu/100 mL, *E. coli* counts ranged from 25 – 50 cfu/100 mL, and *Enterococci* counts ranged from 33 – 190 cfu/100 mL (Appendix A). One tributary (the outlet of Chartley Pond, Norton – Sdtation CB01) was sampled in August and September 2001. Bacteria counts for this tributary were low (fecal coliform 22 and 90 cfu/100 mL, *E. coli* <5 and 17 cfu/100 mL, and *Enterococci* <5 and 370 cfu/100 mL). Additionally samples were collected in August and September 2001 for Fluorescent Whitening Agents and Optical Brighteners at all these stations. Results for all samples indicated recovery as below the detection limits. This would indicate that on these sampling dates waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering the Wading River or Hodges Brook.

DWM staff made field observations during the surveys conducted in this segment of the Wading River between June and September 2001. With the exception of isolated areas of trash/debris and some slight turbidity, no objectionable conditions (odors, oils) were noted during any of the surveys (MassDEP 2001a and 2001b).

Too limited bacteria data are available, so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support.

Wading River (MA62-49) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Wading River bracketing potential sources of pollution (e.g., developments, golf course, water withdrawals, point discharges).

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

Continue to evaluate Tweave's whole effluent toxicity testing results.

THREEMILE RIVER (SEGMENT MA62-56)

Location: Confluence of Wading and Rumford rivers, Norton to impoundment spillway behind 66 South Street (Harodite Finishing), Taunton.
Segment Length: 12.8 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 84.4 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....53.7%
Residential.....24.1%
Open land.....7.2%

The impervious cover area for this subwatershed is 10.5%.

The use assessment for Meadow Brook Pond (MA62113), Oakland Pond (MA62136), and Mount Hope Mill Pond (MA62122) are in the Lake Assessment section of this report.

This segment (formerly part of segment MA62-16) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality standards for pathogens (MassDEP 2003).

A USGS gaging station (01109060) on the Threemile River in North Dighton, MA, has been in operation since July 1966. The drainage area at the gage is 84.3 square miles. The highest daily mean flow at the gage was recorded at 2,870 cfs on 16 June 1998 and the lowest daily mean flow was 1.9 cfs on 12 September 1995 (Socolow *et al*. 1999, Socolow *et al*. 2000, Socolow *et al.* 2001, Socolow *et al.* 2002, and Socolow *et al*. 2003).

The Town of Dighton has received funding in 2003 from the Clean Water SRF to identify areas of the community where existing on-site sewage disposal systems are inadequate for wastewater disposal and to develop recommendations for wastewater management to protect groundwater and surface waters including the Threemile River.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

There are 100 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.9 MGD. However, 23 acres of this cranberry acreage are located in Segments MA62-39, MA62-47, and MA62-49, which are the upper portion of this subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Norton Water Department*	9P342521801	42521801	4218000-01G 4218000-02G	1.21 reg 0.64 perm Total – 1.85
Harodite Finishing Company	NA	42507602	01S 01G 02G 03G	0.16 reg

* Indicates system-wide withdrawal

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLES G1 AND G3)

The Town of Mansfield is authorized to discharge from the Mansfield Water Pollution Abatement Facility (WPAF) (MA0101702 issued in April 2004) 3.14 MGD (average monthly) of treated effluent (municipal and industrial wastewater) via outfall #001 to the Threemile River. This conventional activated-sludge facility employs advanced waste treatment methods such as nitrification for ammonia-nitrogen reduction (1 mg/l NH_3-N average monthly June 1 to October 31) and total phosphorus reduction by multi-point chemical addition (0.2 mg/L average monthly April 1 to October 31). The NH_3-N concentrations of the effluent between February 2001 and August 2004 were all <1.0 mg/L (n=15) (TOXTD database). The pH of the effluent between February 2001 and August 2004 ranged from 6.92 to 7.34 SU (n=15) (TOXTD database). This facility is equipped with effluent sand filtration that utilizes a mechanical traveling bridge.

The facility now utilizes sodium hypochlorite for disinfection (changed in April 2004 from gaseous chlorine) and sodium bisulfite for dechlorination [TRC limit = 0.024 mg/L average monthly, 0.042 mg/L maximum daily]. The TRC concentrations between February 2001 and August 2004 were all <0.05 mg/L (n=15) (TOXTD database). The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq 45\%$ with a monitoring frequency of four times/year using *Ceriodaphnia dubia* and *Pimephales promelas*.

Waters Associates, Inc. was authorized to discharge 0.31 MGD of non-contact cooling water not to exceed 28.3°C via outfall 001 (NPDES permit # MA0026867 issued in September 1978). The permit was terminated by EPA in January 2004 because the facility implemented a closed-loop system.

BIW Cable Systems is authorized to discharge 0.0017 MGD average monthly and 0.0027 MGD maximum daily of processed wastewater via outfall 001a, and a maximum daily of 0.006 MGD of wastewater from the electrical test tank via outfall 001b (NPDES permit # MA0028649 issued May 1986). Both outfalls have a maximum temperature allowance of 28.3°C as both a monthly average and daily maximum.

The Harodite Finishing Co. - a textile finishing facility where cotton rayon and polyester fabrics are bleached, dyed, finished and coated to produce interlinings - had a NPDES permit that authorized them to discharge process and sanitary wastewater into this segment of the Threemile River (NPDES permit # MA0000761 issued in September 1983). This individual permit was terminated and the facility was issued an NPDES permit (#MAG250032) on October 28, 2004 to discharge noncontact cooling water from outfalls #004 and 005 for 0.036 MGD with a maximum temperature of 83°F.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In July 2001 DWM conducted a RBP III benthic macroinvertebrate survey at one station (TH09) on the Threemile River, 300 meters downstream from Harvey Street, Taunton. TH09 received a total habitat assessment score of 180 out of 200. This was the best habitat evaluation for a biomonitoring station in the Taunton River Watershed during the 2001 survey (Appendix D).

A project to install fish ladders on the two dams (Harrodite and Raytheon) located on this segment of the Three Mile River has recently been funded (Appendix I, Watershed Initiative Project MASS – 1).

Biology

The RBP III analysis of the benthic macroinvertebrate community in the Threemile River near Harvey Street, Taunton (Station TH09) indicated "slightly impacted" conditions compared to the Canoe River reference station. The productive nature of the river is reflected in the abundant filter-feeders present, dense macrophyte and algae cover, and instream turbidity (Appendix D).

Toxicity

Ambient

The Mansfield WPAF staff collected water from the Threemile River at the Crane Street bridge for use as a site-water control in their whole effluent toxicity tests (approximately 200 yards upstream from their discharge) (O'Neill 2004). Between December 2000 and August 2004, survival of *Ceriodaphnia dubia* exposed (7-day) to river water (n=15 test events) was $\geq$ 80% with the exception of one test (February 2002 survival = 50%) (TOXTD database). Survival of *Pimephales promelas* (7-day exposure) ranged from 18 to 100% and survival was less than 75% in three of the 15 test events (40% in December 2000, 18% in February 2002 and 70% in November 2002).

Effluent

A total of 15 whole modified acute and chronic whole effluent toxicity tests were conducted on the Mansfield WPAF effluent between December 2000 and August 2004 using both *Ceriodaphnia dubia* and *Pimephales promelas.* The LC_{50} and C-NOEC results for both species were $\geq$ 100 and 100% effluent, respectively, with the exception of one *Ceriodaphnia dubia* test (LC_{50} =76.10 and C-NOEC = 50% effluent in November 2003).

Chemistry – water

The Mansfield WPAF staff collected water from the Threemile River at the Crane Street bridge for use as a site-water control in their whole effluent toxicity tests (approximately 200 yards upstream from their discharge) (O'Neill 2004). Data from these reports, which are maintained in the TOXTD database by DWM, are also summarized below.

During 2001 DWM collected water quality samples on the Threemile River near Harvey Street, Taunton (Station TM01) (Appendix A).

ENSR International conducted an investigation to evaluate instream site-specific copper criteria for streams in the Taunton River watershed and for three POTWs discharging to the Taunton River and its tributaries. The discharges included the Mansfield WPAF, the Middleborough POTW and the Bridgewater POTW. Water quality sampling was conducted during March, May, July, August and September of 2001 (ENSR 2002). Three sampling stations were located in the Threemile River as follows:

Site 1 – Crane Street, Norton (upstream from the Mansfield WPAF).
Site 2 – Harvey Street, Taunton (downstream of the Mansfield WPAF).
Site 3 – South Street, Taunton (downstream of the Mansfield WPAF and upstream from the confluence with the Taunton River).

Sampling of the Threemile River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is also conducted on a monthly basis by TRWA near Route 44/Cohannet Street, Taunton (Station TMR 034). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. For the purpose of this report data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources.

The Bridgewater State WAL collected water quality samples in the Threemile River near Route 140, Taunton once a month in June, July and August 2004 (Curry 2004). Grab samples were collected for nutrients (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen). A Hydrolab® minisonde was used to obtain instantaneous measurement of pH, dissolved oxygen, temperature and specific conductance. A QAPP for the WAL has not been approved by MassDEP and their data are not quality-assured. For the purpose of this report data reported by WAL were reviewed for consistency with other quality-assured data sources.

The following is a summary of the sampling results for the above sites.

Dissolved Oxygen and % Saturation

At TM01 pre-dawn and daytime measurements for DO were similar ranging from 6.3 to 8.5 with saturations between 76 and 83%. With the exception of the March sampling date, the range for DO at ENSR Sites 1, 2 and 3 was 6.92 to 9.30 mg/L with saturations of 80.4 to 99.2%. During the March sampling event DO measurements ranged from 12.97 to 14.52 mg/L with saturations between 91.8 and 103.3%. It should be noted, however, that the ENSR measurements do not represent worst-case (pre-dawn) conditions. DO measurements taken by TRWA at Station TMR-034 were consistently above 5.0 mg/L. The WAL indicated that water quality standards were generally met for DO at its sampling site near Route 140, Taunton.

Temperature

The maximum temperature recorded at TM01 was 25.4°C in July. The maximum temperature reported by ENSR at Sites 1, 2 and 3 was 23.75°C. TRWA recorded a similar maximum temperature at TMR-034 consistent with these values. The WAL indicated that water quality standards were generally met for temperature at its sampling site near Route 140, Taunton.

pH and Alkalinity

The pH of the Threemile River collected at the Crane Street bridge ranged from 6.56 to 7.37 SU while alkalinity ranged from 6 to 24 mg/L (n=16) (TOXTD database).
At TM01 pH varied between 7.0 and 7.1 SU and alkalinity ranged from 23 to 36 mg/L.

At Sites 1, 2 and 3 pH ranged from 6.41 to 7.30 SU. At Site 3 alkalinity ranged from 16 to 37 mg/L as CaCO3.
A slightly lower pH range than the above were recorded by TRWA at Station TMR-034.
The WAL indicated that water quality standards were generally met for pH at its sampling site near Route 140, Taunton.

Specific Conductance
Specific conductance of the river near the Crane Street bridge ranged from 214 to 412 µmho/cm (n=16) (TOXTD database).
At TM01 specific conductance ranged from 313 to 460 µS/cm.
Specific conductance ranged from 236 to 380 µS/cm at Sites 1, 2 and 3.

Chloride
Values ranged from 67 to 80 mg/L at TM01.

Turbidity
Turbidity ranged from 0.21 to 17.92 NTU at Sites 1, 2 and 3 but only two measurements (n=14) were > 5.13 NTU.

Hardness
The hardness of the Threemile River near the Crane Street bridge ranged from 29 to 180 mg/L (n=16) (TOXTD database).
At TM01 measurements for hardness ranged from 45 to 75 mg/L.
Site 3 exhibited hardness values between 40 and 62 mg/L as $CaCO_3$.

TSS
TSS were low $\leq$1.2 mg/L at TM01. Slightly higher values for TSS were recorded by TRWA at TMR-034.

NO_3-NO_2-Nitrogen
At TM01 values were 1.7, 2.0 and 7.3 mg/L.

Ammonia-nitrogen
The ammonia-nitrogen concentrations of the Threemile River near the Crane Street bridge were all less than the reported detection limits (0.1 and 0.4 mg/L) (n=16) (TOXTD database).
At TM01 ammonia nitrogen concentration were all <0.02 mg/L.
At Site 3 ENSR reported concentrations <1.0 mg/L on all three sampling dates.
All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

Total Phosphorus
At TM01 total phosphorus concentrations ranged from 0.098 to 0.12 mg/L. Similar values were recorded by TRWA at TMR-034.

TRC
TRC measurements of the Threemile River near the Crane Street bridge were all below the minimum quantification level of 0.05 mg/L (n=16) (TOXTD database).
TRC at Site 3 was 0.06 mg/L on one occasion and <0.05 mg/L on the other two sampling dates.

Copper
Between 15 March and 19 September 2001, dissolved copper concentrations reported by ENSR ranged from 0.65 to 5.90 µg/L (n=15) (ENSR 2002). Seven of the 15 measurements exceeded the current EPA water quality criterion of 3 µg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

The *Aquatic Life Use* is assessed as support for this segment of the Threemile River based on the results of the benthic macroinvertebrate community analysis, the generally good survival of test organisms exposed to the river, and the water quality data. The use is identified with an Alert Status, however,

because of the occasionally low survival of test organisms (minnows) exposed to the river and the somewhat elevated levels of total phosphorus.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Threemile River at Harvey Street in Taunton (Station TM01) (Appendix A). The bacteria counts were generally low; fecal coliform 130 - 220 cfu/100 ml, *E.Coli* 24-110 cfu/100 ml, and *Enterococci* 76 – 350 cfu/100mL. With the exception of one date, relatively lower counts of fecal coliform were found at TRWA's sampling stationTMR-034.

With the exception of a sewage odor, no other objectionable deposits or other objectionable conditions (oils, trash and debris) were noted by DWM field sampling crews in the Threemile River near the Harvey Street Bridge (MassDEP 2001a).

Although the bacteria counts were low in samples collected from this segment of the Threemile River, too limited quality-assured data are available, so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support but is identified with an Alert Status because of the sewage odor.

Threemile River (MA62-56) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT*

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
Evaluate the effectiveness of the anadromous fish restoration project (shad and herring passage/data). Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of the *Aquatic Life Use* in this segment of the Threemile River bracketing potential sources of pollution (e.g., developments, discharges).

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

The TRWA and WAL should continue to conduct water quality monitoring at their established sampling sites on the Threemile River to meet their sampling objectives. In order for the MassDEP to utilize the TRWA and WAL data for water quality assessment reporting purposes, the TRWA and WAL should work with MassDEP to meet its Quality Assurance/Quality Control requirements.

THREEMILE RIVER (SEGMENT MA62-57)

Location: Impoundment spillway behind 66 South Street (Harodite Finishing), Taunton to confluence with Taunton River, Taunton/Dighton.
Segment Length: 0.02 square miles
Classification: Class B (proposed SB, Shellfishing Restricted)

The drainage area of this segment is approximately 85.1 square miles. Land-use estimates (top three) for the subwatershed:

Forest 53.6%
Residential 24.2%
Open land 7.2%

The impervious cover area for this subwatershed is less than 10%.

This segment (formerly part of segment MA62-16) is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality standards for pathogens (MassDEP 2003).

The Town of Dighton has received funding in 2003 from the Clean Water SRF to identify areas of the community where existing on-site sewage disposal systems are inadequate for wastewater disposal and to develop recommendations for wastewater management to protect groundwater and surface waters including the Threemile River.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 100 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 0.9 MGD. This cranberry acreage is entirely within the subwatershed for Segment MA62-56, which is the upper portion of this subwatershed

Based on the available information there are no NPDES discharges in this segment of the Threemile River.

USE ASSESSMENT

Sampling in this segment of the Threemile River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near Somerset Avenue (Route 138), Dighton (Station TMR 004). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. No unusual or adverse water quality conditions were highlighted by TRWA for this station in their 2002 annual report (Domingos 2003a).

SHELLFISHING

The DMF Shellfish Status Report of 2003 indicates that area MHB2.2 is prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Threemile River because of elevated bacteria counts.

Threemile River (MA62-57) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Source: Discharges from municipal separate storm sewer systems)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.2.

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to the Threemile River from potential sources of pollution (e.g., developments) to better assess the status of the *Aquatic Life Use*.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

The TRWA should continue to conduct water quality monitoring at its established sampling site on the Threemile River to meet its sampling objectives. In order for the MassDEP to utilize the TRWA data for water quality assessment reporting purposes, the TRWA should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

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NEMASKET RIVER SUBWATERSHED

The Nemasket River originates at the outlet of Assawompset Pond, which, in turn is fed by Long Pond. The ponds act as an emergency water supply for the New Bedford area. Flow is regulated at the dam located between Assawompset Pond and Great Quittacas Pond. The Nemasket flows northward from its source before joining the Taunton River near the Bridgewater/Middleborough border. There is one flow regulation dam in Middleborough, below which the river flow becomes sluggish through the remainder of its course to the Taunton River. In addition to urbanized portions of Middleborough, the Nemasket River subwatershed (Figure 13) drains vast areas of forest, wetland, and cranberry bog. There are two segments as follows:

Nemasket River (Segment MA62-25)
Nemasket River (Segment MA62-26)

Over half of the land use in the Nemasket River subwatershed is forested followed by residential (approximately 14%) and some open space areas. This includes approximately 1133.44 acres of land which are classified in the Land-Use theme as cranberry bogs. The impervious area is all less than 10% indicating there is a low potential for adverse water quality impacts from impervious surface water runoff.

Six facilities (which includes two municipal public water supply sources) have WMA permits with authorized surface and groundwater withdrawals totaling 10.92 MGD. An almost equal amount of water, estimated at 10.12 MGD, is utilized in cranberry bog areas.

The Middleborough Wastewater Treatment Plant is the only NPDES permitted facility that discharges to the Nemasket River. Several Multi-sector General Stormwater Permits have been issued for facilities in Lakeville and Middleborough. The communities of Lakeville and Middleborough are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

As part of its 1996 sampling program, DWM collected water quality samples from eight sites on the Nemasket River. Water quality data were also collected at two sites established for the ENSR Copper study. The TRWA conducts water quality sampling at two sites on the Nemasket River and the Bridgewater State WAL also collects water quality samples at one site on the Nemasket River. Additionally, the Nemasket River Stream Team performed a shoreline survey on the river. The *Aquatic Life Use* for Segment 62-25 was assessed as support but identified with an Alert Status. The Aesthetics Use is assessed as support for both segments, however, all the other designated uses are not assessed.

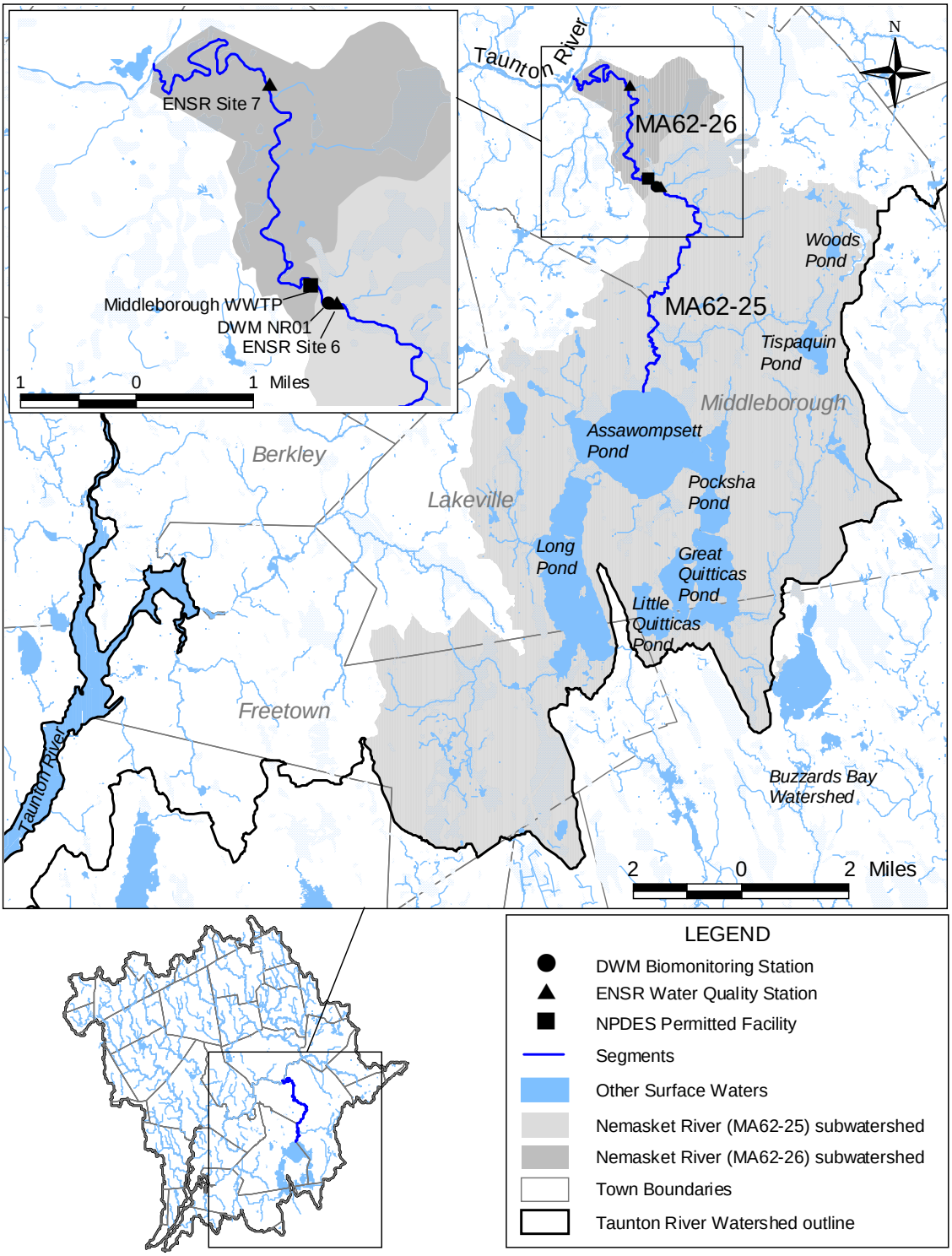

Figure 13. Nemasket River Subwatershed

NEMASKET RIVER (SEGMENT MA62-25)

Location: From the outlet of Assawompset Pond, Lakeville/Middleborough to the Middleborough WWTP, Middleborough.
Segment Length: 6.1 miles
Classification: Class B

The drainage area of this segment is approximately 66.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....52.9%
Residential.....14.1%
Open Land.....6.4%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 2 (MassDEP 2003).

The use assessments for Sassaquin Pond (MA62232), East Freetown Pond (MA62063), Mullein Hill Chapel Pond (MA62127), The Reservoir (MA62189), Long Pond (MA62108), Little Quitticas Pond (MA62107), Pocksha Pond (MA62145), Assawompsett Pond (MA62003), Tispaquin Pond (MA62195), and Woods Pond (MA62220) are in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 1,116 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 10.0 MGD.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)
Middleborough Water Department*	9P42518201	42518203	4182000-01G 4182000-02G 4182000-03G 4182000-04G 4182000-05G 4182000-06G 4182000-07G 4182000-10G 4182000-11G	1.53 reg 1.50 perm Total – 3.03
Thurston Burns	NA	42518233	01S	0.01reg
Byrne Sand and Gravel	NA	42518226	01S	0.25 reg
Lakeville Country Club	NA	42529304	01S	0.17 reg
Lebaron Hills Golf Course	9P442514603	NA	01G	0.17 perm
Taunton DPW – Water Division*	9P42529304	42529304	4293000-02S (Elders Pond)	5.87 reg 1.42 perm Total – 7.29

* Indicates system-wide withdrawal

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In August 2001 DWM evaluated the habitat at one station (NR01) on this segment of the Nemasket River, approximately 200 meters upstream from Route 44, Middleborough. The sampling reach provided macroinvertebrates with excellent epifaunal habitat. However, the lack of stream sinuosity, homogenous flow regimes, and an absence of stable cover, resulted in poor fish habitat. Rooted macrophytes covered the majority (>90%) of the streambed and filamentous green algae were observed attached to cobble substrate. NR01 received a total habitat score of 119 out of 200, which was the poorest evaluation of instream and riparian habitat for a biomonitoring station in the 2001 survey. Greatly modified channel morphology coupled with near-complete removal of a riparian buffer affected the scoring significantly (Appendix D).

Three dams form obstructions to fish passage on the Nemasket River. Each is equipped with a fishway. The first, at Oliver Mills, was incorporated into an historic site restoration project and is essentially a highly efficient set of stream baffles. The second, at Wareham Street, is a large weir-pool ladder that was designed and constructed by DMF in 1996. The last fishway is at the outlet of Lake Assawompset and is a relatively small Denil-type fishway (Reback, *et al*. 2004).

Biology

The RBP III analysis indicated a "slightly impacted" benthic community at Station NR01 on the Nemasket River, approximately 200 meters upstream from Route 44, Middleborough compared to the Canoe River reference station (TR01) (Appendix D).

The Nemasket River supports what is probably the largest coastal river herring population in Massachusetts. Estimates based on visual counts by volunteers have consistently exceeded one million fish per year. The primary reason for this run's large size is the total lacustrine and impoundment spawning and nursery habitat, which exceeds 5000 acres (Reback, *et al*. 2004).

Toxicity

Ambient

The Middleborough WWTP staff collected water from the Nemasket River near Oliver Mills Park on Route 44 (approximately 2000' upstream from their outfall) for use as dilution water in their whole effluent toxicity tests (Ciaglo 2004). Between October 2000 and August 2004, survival of *Ceriodaphnia dubia* exposed (7-day) to river water (n=16 test events) was $\geq$ 90% (TOXTD database). Survival of *Pimephales promelas* (7-day exposure) ranged from 63 to 100% and survival was less than 75% in three of the 17 test events.

Chemistry – water

As part of their site-specific copper criteria development study, ENSR conducted sampling at one station (Site 6) in this segment of the Nemasket River off Nemasket Street/Plymouth Street, Middleborough upstream from the Middleborough WWTP (ENSR 2002).

The Middleborough WWTP staff collected water from the Nemasket River near Oliver Mills Park on Route 44 (approximately 2,000 feet upstream from their outfall) for use as dilution water in their whole effluent toxicity tests (Ciaglo 2004). Reports between October 2000 and August 2004, which are maintained in the TOXTD database by DWM, are also summarized below.

Sampling (DO, temperature, pH, TSS, nitrate-nitrogen and total phosphorus) is also conducted on a monthly basis by TRWA at Oliver Mill Parkway, Route 44, Middleborough (Station NMK-041). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. For the purpose of this report, data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources.

The following is a summary of the sampling results for the above sites.

Dissolved Oxygen and % Saturation
At Site 6 all of the DO measurements were above than 5.0 mg/L ranging from 6.90 to 13.18 mg/L and saturation values were all greater than 60%.
A similar range for DO was reported at the TRWA sampling site (NMK-041) with all measurements greater than 5.0 mg/L.

Temperature
At Site 6 the water temperatures did not exceed 25.6°C. The maximum temperature recorded at the TRWA sampling site (NKM-041) did not exceed this value either.

pH and Alkalinity
At Site 6 the pH range was 6.19 to 7.00 SU. Of the five measurements taken at this site, four were below 6.5 SU.
The pH of the Nemasket River measured near Oliver Mills Park on Route 44 ranged from 5.70 to 7.20 SU with seven of the 16 measurements less than 6.5 SU. Alkalinity ranged from 20 to 40 mg/L (n=17) (TOXTD database).
The TRWA reported numerous pH values less than 6.5 SU at Sampling Site NKM-041.

Spedific Conductance
At Site 6 the range for 95 to 128 µS/cm. The specific conductance of the Nemasket River collected near Oliver Mills Park on Route 44 ranged from 107.0 to 240.0 µmho/cm (n=17) (TOXTD database).

Turbidity
At Site 6 the range for turbidity was 0.30 to 1.85 NTU.

Ammonia-nitrogen
The ammonia-nitrogen concentrations of the Nemasket River collected near Oliver Mills Park on Route 44 ranged from <0.01 to 0.35 mg/L (n=17) (TOXTD database). All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

Total phosphorus
Total phosphorus concentrations reported by TRWA were above 0.05 mg/L in 50% of their samples collected at Station NMK-041.

Copper
Between 15 March and 19 September 2001, dissolved copper concentrations reported ENSR ranged from 0.65 to 3.00 µg/L (n=5) (ENSR 2002). None of these data exceeded the current EPA water quality criterion of 3 µg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

Hardness
Hardness of the Nemasket River collected near Oliver Mills Park on Route 44 ranged from 14 to 44 mg/L with nine of the 17 measurements less than 25 mg/L (TOXTD database).

TRC
TRC measurements (n=17) of the Nemasket River collected near Oliver Mills Park on Route 44 were all below the minimum quantification level of 0.05 mg/L with the exception of one measurement (0.24 mg/L in the July 2003 test event (TOXTD database).

It should also be noted that DWM collected water quality samples from six stations along this segment of the Nemasket River (June through October 1996). These data can be found in Appendix B.

The *Aquatic Life Use* is assessed as support for this segment of the Nemasket River based primarily on the results of the benthic macroinvertebrate community evaluation, and the good survival of *C.dubia* exposed to river water. This use is identified with an Alert Status because of the low pH and alkalinities, the occasionally low survival of *Pimephales promelas*, and the instream and riparian zone habitat quality.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

Fecal coliform bacteria samples were collected by TRWA from this segment of the Nemasket River at Oliver Mill Parkway (Route 44) in Middleborough. No adverse or unusual conditions were highlighted for this site in the TRWA 2002 water quality report (Domingos 2003a). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured.

DWM biologists did not note any objectionable deposits or odors in the river upstream from Route 44, Middleborough (Station NR01) (MassDEP 2001b).

The Nemasket River Shoreline Survey Report (Nemasket River Stream Team 2003) noted one area of trash that included several tires in this segment of the river.

Unfortunately no quality-assured bacteria data are available, so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support since, with the exception of one isolated area of trash and debris no objectionable aesthetic conditions were identified in this segment of the Nemasket River.

Nemasket River (MA62-25) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

* Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS

Continue to monitor compliance with WMA registration/permit limits and other special conditions of the permits.

The TRWA should continue to conduct water quality monitoring at its established sampling site on the Nemasket River to meet its sampling objectives. In order for the MassDEP to utilize the TRWA data for water quality assessment reporting purposes, the TRWA should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

The Nemasket River Stream Team should continue in its efforts to preserve the Nemasket River. Recommendations made in the Shoreline Survey Report should be reviewed and implemented as appropriate.

NEMASKET RIVER (SEGMENT MA62-26)

Location: From the Middleborough WWTP, Middleborough to the confluence with the Taunton River, Middleborough.
Segment Length: 5.2 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 70.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....53.1%
Residential.....14.2%
Open Land.....6.4%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY

There are 1,135 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 10.1 MGD. However, 1,116 acres of this cranberry acreage are located in the subwatershed for Segment MA62-26 which is the upper portion of this subwatershed.

See Segment MA62-25 for information on water withdrawals in this subwatershed.

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G1)

The Town of Middleborough is authorized to discharge an average monthly flow of 2.16 MGD of treated effluent (municipal and industrial wastewater) from the Middleborough Wastewater Treatment Plant (WWTP) into the Nemansket River (MA0101591 issued September 2003). This conventional activated-sludge facility utilizes advanced waste treatment methods, such as nitrification for ammonia-nitrogen reduction (1 mg/l NH_3-N average monthly June 1 to October 31) and total phosphorus reduction by multi-point chemical addition (0.2 mg/l TP average monthly April 1 to October 31). The highest concentration of NH_3-N in the effluent between October 2000 and August 2004 was 0.06 mg/L (TOXTD database). Total phosphorus (TP) reduction is accomplished by chemical addition (0.2 mg/l TP average monthly April 1 to October 31). The pH of the effluent between October 2000 and August 2004 ranged from 7.0 to 8.2 SU (n=16) (TOXTD database). This facility is equipped with effluent sand filtration that utilizes a mechanical traveling bridge. The facility utilizes sodium hypochlorite for seasonal disinfection and sodium bisulfite for dechlorination (TRC limit = 0.021 mg/L average monthly April 1 to October 31, 0.036 mg/L maximum daily) (Ciaglo 2004). The TRC concentrations of the effluent between October 2000 and August 2004 were all $\leq$0.05 mg/L (n=17) with the exception of one test event (0.07mg/L, February 2004) (TOXTD database). The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq$53% with a monitoring frequency of four times/year using both *Ceriodaphnia dubia* and *Pimephales promelas*.

USE ASSESSMENT

AQUATIC LIFE

Toxicity

Effluent

A total of 16 and 17 modified acute and chronic whole effluent toxicity tests were conducted on the Middleborough WWTP effluent between October 2000 and August 2004 using *Ceriodaphnia dubia* and *Pimephales promelas*, respectively. The effluent did not exhibit any acute toxicity (LC_{50}s were all >100% effluent) to either test organism. With the exception of one test event (C-NOEC =25% in July 2002), the C-NOECs for *Ceriodaphnia dubia* ranged from 55 to 100% effluent. Of the 14 valid *Pimephales promelas* test events, the C-NOEC results were all 100% effluent with the exception of one test event (C-NOEC = 50% in April 2002).

Chemistry – water

Sampling of the Nemasket River (DO, temperature, pH, TSS, nitrate-nitrogen, total phosphorus, and bacteria) is conducted on a monthly basis by TRWA near Murdock Street, Middleborough (Sampling Station NMK-023). Although a draft Quality Assurance Project Plan (QAPP) was reviewed in 2001, a final QAPP for the TRWA has not been approved and their data are not quality-assured. For the purpose of this report data reported by TRWA for 2002/2003 were reviewed for consistency with other quality-assured data sources.

The Bridgewater State WAL conducts water quality sampling in the Nemasket River at Murdock Street, Middleborough (Curry 2004). Between June and September 2004, the Matfield River was sampled six times by WAL using automatic samplers to collect data on temperature, pH and DO through a 22-hour period. Additionally, nutrient samples (total phosphorus, soluble reactive phosphorus and nitrate-nitrogen) were taken every hour using a Sigma 900 automated sampler with samples for every other hour used for analysis.
A QAPP for the WAL has not been approved by MassDEP and their data are not quality-assured. For the purpose of this report data reported by WAL for 2004 were reviewed for consistency with other quality-assured data sources.

As part of their site-specific copper criteria development study, ENSR conducted sampling at one station (Site 7) in this segment of the Nemasket River near Murdock Street, Middleborough downstream from the Middleborough WWTP (ENSR 2002).

Dissolved Oxygen and % Saturation

The DOs at Site 7 ranged from 5.61 to 13.37 mg/L (n=5) with saturations ranging from 66.0 to 110.0%. A similar range for DO was reported by the TRWA at Sampling Station NMK-023. Hourly Hydrolab® measurements taken by WAL at its Murdock Street sampling site were also within this range.

Temperature

The maximum temperature at Site 7 was 23.56°C. A slightly higher maximum temperature was reported at NMK-023 by TRWA. Hourly Hydrolab® temperature measurements taken by WAL did not exceed 28.3°C during its 2004 sampling.

pH and Alkalinity

The pH measurements at Site 7 were all above 6.5 SU with the exception of one value of 6.19 SU. Numerous measurements for pH at the TRWA Sampling Site NMK-023 were below 6.5 SU. Hourly Hydrolab® sampling for pH by WAL also indicated numerous measurements slightly below 6.5 SU during 2004.

Specific Conductance

Conductance at Site 7 ranged from 102 to 161 µS/cm.

Turbidity

Turbidity at Site 7 ranged from 0.25 to 2.70 NTU.

Total Phosphorus

Numerous values above 0.05 mg/L for total phosphorus were measured by TRWA at sampling site NMK-023. Somewhat lower values of total phosphorus were reported by WAL.

Copper

Between 15 March and 19 September 2001, dissolved copper concentrations reported ENSR ranged from 0.65 to 3.00 µg/L (n=5) (ENSR 2002). None of these data exceeded the current EPA water quality criterion of 3 µg/L at a hardness of 25 mg/L. A site-specific copper criterion is currently being developed.

In June through October 1996 DWM collected water quality samples from two stations (NK04 and NK05) along this segment of the Nemasket River (Appendix B).

Too limited quality-assured water quality data are available to evaluate the effects, if any, of the

Middleborough WWTP on this segment of the Nemasket River, so the *Aquatic Life Use* is not assessed.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
The TRWA found that high coliform counts occurred intermittently at Station NMK-023 throughout 2002 (Domingos 2003a).

With the exception of several areas with trash and debris, the Nemasket River Shoreline Survey Report (2003) noted almost pristine conditions in this segment of the Nemasket River.

Unfortunately, the available bacteria data are not quality-assured, so the *Primary* and *Secondary Contact Recreational* uses are not assessed. They are identified with an Alert Status because of the intermittent high levels measured by TRWA. Since no objectionable deposits, odors, or oils were identified in this segment of the Nemasket River, the *Aesthetics Use* is assessed as support but is identified with an "Alert Status" because of the isolated areas of trash and debris.

Nemasket River (MA62-26) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		SUPPORT*

*"Alert Status" issues identified, see details in the use assessment section.

RECOMMENDATIONS
Biological monitoring should be conducted to evaluate the impacts, if any, of the Middleborough WWTP discharge and to assess the status of the *Aquatic Life Use*.

The TRWA and WAL should continue to conduct water quality monitoring at their established sampling sites on the Nemasket River to meet their sampling objectives. In order for the MassDEP to utilize the TRWA and WAL data for water quality assessment reporting purposes, the TRWA and WAL should work with MassDEP to meet its Quality Assurance /Quality Control requirements.

The Nemasket River Stream Team should continue in its efforts to preserve the Nemasket River. Recommendations made in the Shoreline Survey Report should be reviewed and implemented as appropriate.

ASSONET RIVER SUBWATERSHED

The Cedar Swamp River originates in Cedar Swamp, Lakeville and flows through an extensive wetland area. After it is joined by an unnamed tributary that also originates in Cedar Swamp, Cedar Swamp River flows to the west becoming the inlet to Forge Pond where it becomes the Assonet River. The freshwater portion of the Assonet River flows through Lakeville and Freetown. The lower Assonet forms a broad estuarine finger of the Taunton River. Rattlesnake Brook originates in the Freetown-Fall River State Forest and flows in a northerly direction to Paynes Cove, part of Assonet Bay in the estuarine portion of the Assonet River. The Assonet River is the last major tributary to empty into the Taunton Estuary and includes the following segments (Figure 14):

Unnamed tributary to the Cedar Swamp River (Segment MA62-42)
Cedar Swamp River (Segment MA62-44)
Assonet River (Segment MA62-19)
Rattlesnake Brook (Segment MA62-45)
Assonet River (Segment MA62-20)

The land use is dominated by forest with over 70% in that category. Residential land use is less than 15% followed by open space. Approximately 413 acres of land which are classified in the Land-Use theme as cranberry bogs are present in the Assonet River Subwatershed. The impervious area is all less than 10% indicating there is a low potential for adverse water quality impacts from impervious surface water runoff.

The lower portion of the Assonet River (Segment 62-20) has been placed on the Massachusetts Year 2002 Integrated List of Waters – Category 5 as not meeting Water Quality Standards for pathogens. The DMF Shellfish Status Report of 2003 indicates that shellfish harvesting is prohibited in all growing areas of the lower Assonet River (Segment 62-20).

One facility, the Town Line Farm, is authorized under the WMA for a surface water withdrawal of 0.03 MGD. Additionally, it is estimated that water use for the cranberry bog area (inclusive but not limited to WMA registered growers) is 3.6 MGD.

There are no NPDES permitted discharges in this subwatershed. However, Multi-sector General Stormwater Permits have been issued for facilities in several communities. Additionally, the communities of Lakeville, Freetown, Berkley and Fall River are Phase II stormwater communities. Each community was issued a stormwater general permit from EPA and MassDEP in 2003/2004 and is authorized to discharge stormwater from their municipal drainage system. Over the five-year permit term, the communities will develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

Water quality sampling was conducted at three sites on the Assonet River by DWM in 2001. Sampling was also conducted at one site in each of the tributaries to the Assonet River (Rattlesnake Brook, Cedar Swamp River and an unnamed tributary to the Cedar Swamp River). The *Aquatic Life Use* is assessed as support in most segments with the exception of the lower portion of the unnamed tributary to Cedar Swamp River which was assessed as impaired. The Shellfish Harvesting use is also assessed as impaired. All other uses were either not assessed or assessed as support.

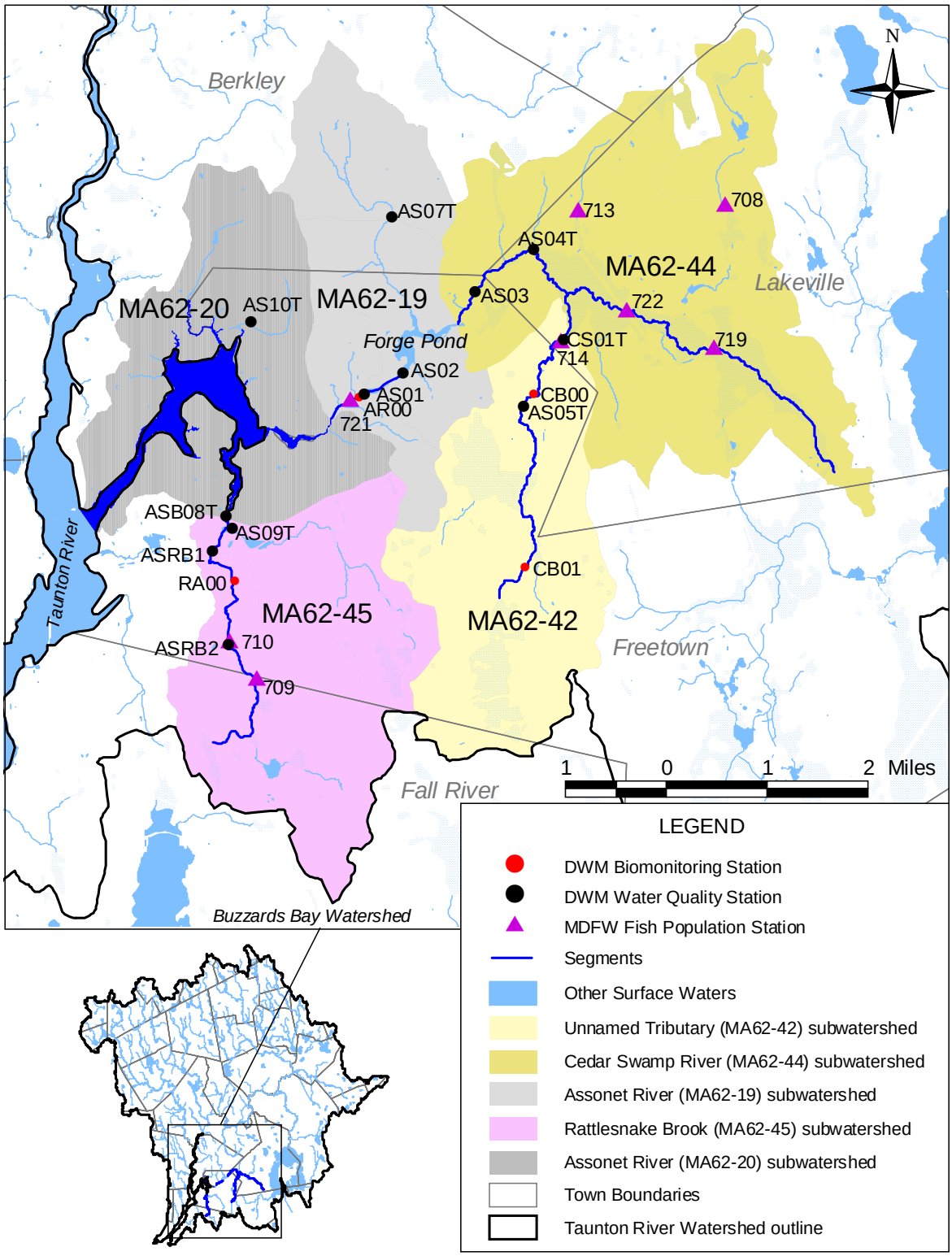

Figure 14. Assonet River Subwatershed

UNNAMED TRIBUTARY TO CEDAR SWAMP RIVER (SEGMENT MA62-42)

Location: Headwaters, south of Slab Bridge Road (in Cedar Swamp portion of Freetown-Fall River State Forest), Freetown to confluence with the Cedar Swamp River, Lakeville.
Segment Length: 4.0 milesj
Classification: B

The drainage area of this segment is approximately 66.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....97.4%
Residential.....1.1%
Open land.....0.8%

The impervious cover area for this subwatershed is less than 10%.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 191 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 1.7 MGD.

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In August 2004 DWM biologists conducted an upstream/downstream evaluation of the cranberry bog operation on this unnamed tributary to Cedar Swamp River (a followup qualitative evaluation to further investigated the impacted conditions in the brook found in 2001). At their sampling location near Slab Bridge Road in Freetown (Station CB01) located upstream from the cranberry bog the habitat was good (limited most by the low flow conditions) (Fiorentino 2005).

In July 2001 DWM conducted a RBP III benthic macroinvertebrate survey at one station downstream from the cranberry bog and 300 meters downstream from Howland Road, Freetown (Station CB00). The combination of swift current velocity and deep pools, coupled with a substrate dominated by large cobble and boulders, provided both fish and macroinvertebrates with excellent habitat throughout this reach. Instream algal growth was minimal and macrophytes were absent, although mosses covered nearly half the instream substrates. Channel flow status was slightly less than optimal. Although NPS inputs were not observed, localized road runoff (sand deposits) was noted downstream from the Howland Road crossing. CB00 received a total habitat score of 171 out of 200 (Appendix D).

Biology

A qualitative benthic survey was conducted in August 2004 in this unnamed tributary near Slab Bridge Road in Freetown (Station CB01) upstream from the cranberry bog operation. A diverse assemblage of benthic macroinvertebrates was found (Fiorentino 2005).

Downstream from the cranberry bog operation, the benthic community in the brook in 2001 (Station CB00) was found to be severely impacted comparable to the Canoe River (Station TR01) reference station despite the excellent habitat that was available. The absence of Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa and significant reductions in other insect taxa suggest the possibility of a toxic effect in this portion of the river. Additionally, several dead bullheads were observed. Backpack electrofishing in one reach of this tributary was conducted by DWM staff in September 2001. Only one fish, a chain pickerel, was found. While the cranberry bog located immediately upstream from CB00 may provide a significant source of organic loadings, other potential pollutants (e.g., organo-phosphates and other pesticides known to be toxic to aquatic life) that may originate from cranberry farming should be considered as well (Appendix D). Similar conditions were found by DWM biologists during their qualitative survey conducted in August 2004 (Fiorentino 2005).

In July 2002 MDFW conducted fish population sampling using a backpack shocker. Samples were collected from one station along this segment, above Mill Street, Lakeville (Station 714). Only two fish, a brown bullhead and an American eel, were collected (Richards 2003a).

Chemistry – water

DWM conducted water quality sampling in August and September 2001 at Station AS05T, the outlet of the cranberry bog at Howland Road, Freetown (Appendix A). Following is a summary of the sampling results for this site.

Dissolved Oxygen and % Saturation

DO was measured at 7.8 and 9.8 mg/L with saturations of 100 and 103%, respectively. It should be noted that these data do not represent worst case (pre-dawn) conditions.

Temperature

The maximum water temperature was 29.7°C in August while the temperature in September measured 18.9°C.

Chloride

Values of 10 mg/L were recorded for chloride.

pH and Alkalinity

Instream pH measurements were low at 4.7 and 5.9 SU as were alkalinity values at <2 and 4 mg/L.

Conductance

Conductance was recorded at 45.6 and 47.5 µS/cm.

Hardness

Measurements for hardness were 6.4 and 8 mg/L as CaCO3.

TSS

Total suspended solids values were low at 2.9 and 4.6 mg/L

NO_3-NO_2-nitrogen

Values for nitrate-nitrite-nitrogen were <0.06 mg/L on both sampling occasions.

Ammonia-nitrogen

Ammonia-nitrogen was <0.02 mg/L on both sampling occasions. These measurements were both below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

Total Phosphorus

Elevated total phosphorus concentrations were measured at 0.15 and 0.16 mg/L.

The *Aquatic Life Use* is assessed as support in the upper 1.2 mile reach of this unnamed tributary (upstream from the cranberry bog) but is as impaired for the 2.8 mile reach through and downstream from the cranberry bog based on the severely impacted benthic macroinvertebrate community and the lack of fish. The source of impairment is a result of cranberry bog operations (organic enrichment, pesticide applications, flow issues).

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the unnamed tributary to Cedar Swamp River at the following stations (Appendix A):

AS05T - Howland Road, Freetown (outlet of cranberry bog), (n=3)
CS01T - Mill Street, Lakeville, (n=1)

It should be noted that attempts to sample this location on 23 July 2001 were unsuccessful due to lack of flow.

2001 DWM bacteria data

Station	Fecal Coliform (cfu/100mL)	*E. coli* (cfu/100mL)	*Enterococci* sp. (cfu/100mL)
AS05T	<5, 15 and 25	<5, 5 and 5	10, 24 and 60
CS01T	30	10	70

No objectionable deposits or other conditions other than a sulfide odor (assumed to be natural) were noted by DWM survey crews on this unnamed tributary (MassDEP 2001a).

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support based on the low fecal coliform bacteria counts and the lack of objectionable deposits, odors or other conditions.

Unnamed tributary to Cedar Swamp River (MA62-42) Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT upper 1.2 mile reach IMPAIRED lower 2.8 mile reach Causes: Combined benthic and macroinvertebrate bioassessment impairment and impairment unknown Source: Specialty crop production
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the impacts from cranberry bog operations and to assess the status of *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

CEDAR SWAMP RIVER (SEGMENT MA62-44)

Location: Headwaters south of Freetown Street, Lakeville to the inlet Forge Pond, Freetown (stream name changes to Assonet River at Lakeville/Freetown corporate boundary).
Segment Length: 5.3 miles
Classification: B

The drainage area of this segment is approximately 16.5 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....72.6%
Residential.....13.2%
Open land.....6.6%

The impervious cover area for this subwatershed is less than 10%.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 366 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 3.3 MGD. However, 191 acres of this cranberry acreage is located in the subwatershed for Segment MA62-42 that is the upper portion of this subwatershed.

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Biology

In August 2002 MDFW conducted fish population sampling using a backpack shocker at two locations along this segment - in the wetland reach upstream from the Conrail line (Station 719) and near the Conrail line north of Howland Road (Station 722), both of which were in Lakeville. A total of 72 fish, representing six species, were collected from these two sites. The upstream sample was dominated by American eel and the downstream sample was dominated by creek chubsucker and redfin pickerel. Other species in order of abundance included swamp darter and two each of banded sunfish and brook trout (Richards 2003a). Although there is no current record of trout stocking in Cedar Swamp Brook, both trout were of stockable length. No other age/size classes were collected. Both fish samples were comprised primarily of tolerant and moderately tolerant macrohabitat generalists, however, the presence of creek chubsucker, an intolerant fluvial specialist (occasionally found in ponds), is indicative of excellent habitat quality. Most fish present are known to thrive in naturally acidic waters.

It should also be noted that MDFW conducted fish population sampling at two tributaries to Cedar Swamp River in July 2002. Samples were collected in Pierce Brook - below Pierce Street, Lakeville – using a backpack shocker. A total of 24 fish, representing four species were collected. The samples were dominated by golden shiners. Other species included brown bullhead, bluegill, and redfin pickerel. Samples were also collected from Holloway Brook – off Pickens Street, Lakeville – using a backpack shocker. A total of 34 fish, representing five species were collected. The samples were dominated by largemouth bass. Other species included redfin pickerel, pumpkinseed, swamp darter, and golden shiner (Richards 2003a). Both samples were comprised entirely of macrohabitat generalists, which are either moderately tolerant or tolerant to pollution.

Chemistry – water

DWM conducted water quality sampling in July, August and September 2001 at two stations on this segment of Cedar Swamp River - at Malbone Street in Lakeville (Station AS04T) and Route 79 (Richmond Road), Freetown (Station AS03). (NOTE: *The data for Station AS03 is labeled as the Assonet River in Appendix A (name changes from Cedar Swamp River to Assonet River at Lakeville/Freetown municipal boundary).* The results are summarized below.

Dissolved Oxygen and % Saturation

Measurements for DO in Cedar Swamp River at Station AS04T ranged from 1.3 to 6.0 mg/L (three of six measurements < 5.0 mg/L) and saturation ranged from 15 to 61% (five of six values recorded less than 60%). At the downstream station (AS03) DOs ranged from 3.0 to 7.8 mg/L (three of five measurements< 5.0 mg/L)

and saturation ranged from 34 to 74% (three of five measurements less than 60%). The lowest DOs were measured during the August survey (both day and pre-dawn surveys).

Temperature
The maximum temperature recorded at AS04T and AS03 was 23.4 and 23.1°C, respectively.

Chloride
Chloride did not exceed 19 mg/L at either sampling station.

pH and Alkalinity
Instream pH measurements at both AS04T and AS03 were low ranging from 4.6 to 6.0 SU as were alkalinities (ranged from <2 to 4 mg/L).

Specific Conductance
Conductance was similar at both sampling locations ranging from 77.5 to 90.9 µS/cm.

Hardness
Measurements for hardness ranged between 11 and 14 mg/L as $CaCO_3$ at both stations.

TSS
Total suspended solids were low at both sampling locations (all measurements $\leq$ 1.5 mg/L).

NO_3-NO_2-nitrogen
Values for nitrate-nitrite-nitrogen at both AS04T and AS03 were similar ranging from <0.06 to 0.29 mg/L.

Ammonia-nitrogen
On one occasion the concentration of ammonia-nitrogen was 0.06 mg/L (Station AS04T) although all other values were less than detection (0.02 mg/L). All of these measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

Total phosphorus
Total phosphorus concentrations at AS04T and AS03 ranged from 0.051 to 0.093 mg/L.

The *Aquatic Life Use* is assessed as support based primarily on the water quality data. And although the fish community is comprised of macrohabitat generalists, it is consistent with those normally found in wetland dominated streams. This use is identified with an Alert Atatus, however, because of the low DO, pH and alkalinity (all associated with the extensive wetlands).

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Cedar Swamp River at the following stations (Appendix A):

AS04T - Malbone Street, Lakeville, (n=3)
AS03 - Route 79, (Richmond Road) Freetown, (n=3) [NOTE: *The data for station AS03 is labeled as the Assonet River in Appendix A (name changes from Cedar Swamp River to Assonet River at Lakeville/Freetown municipal boundary)*].

2001 DWM bacteria data

Station	Fecal Coliform data range (cfu/100mL)	*E. coli* bacteria data range (cfu/100mL)	*Enterococci* bacteria data range (cfu/100mL)
AS04T	25 - 120	5 - 130	15 - 50
AS03	38 - 130	5 - 55	30 - 110

Additionally, samples were collected on September 18, 2001 for Fluorescent Whitening Agents and Optical Brighteners. Results for all samples indicated recovery as below the detection limits. This would

indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering Cedar Swamp River.

With the exception of some trash and debris in the Cedar Swamp River and a sulfide odor at the upstream sampling location during one of the surveys, no other objectionable conditions were noted by the DWM survey crews (MassDEP 2001a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support based on the low fecal coliform bacteria counts. The *Aesthetics Use* is also assessed as support but is identified with an Alert Status because of the trash and debris in the river near Malbone Street.

Cedar Swamp River (MA62-44) Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		SUPPORT*

* Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of *Aquatic Life Use* in Cedar Swamp River.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

ASSONET RIVER (SEGMENT MA62-19)

Location: Outlet Forge Pond, Freetown to Tisdale Dam (north of Route 79/Elm Street intersection) Freetown.
Segment Length: 0.9 miles
Classification: Class B

The drainage area of this segment is approximately 21.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....71.3%
Residential.....14.3%
Open land.....5.9%

The impervious cover area for this subwatershed is less than 10%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 3 (MassDEP 2003).

The use assessment for Forge Pond (MA62072) is in the Lake Assessment section of this report.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 403 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area 3.6 MGD. However, 366 acres of this cranberry acreage are located in the subwatershed for segment MA62-42 and MA62-44, which are the upper portion of this subwatershed.

See Segment MA62-20 for information on water withdrawals in this subwatershed.

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In August 2001 DWM conducted a RBP III benthic macroinvertebrate survey at one station (AR00) on this segment of the Assonet River, 100 meters downstream from Locust Street, Freetown. Macroinvertebrates had ample productive epifaunal habitat, which was riffle and run (0.20 – 0.30 m depth) dominated and with an abundance of cobble substrates. AR00 received a total habitat score of 173 out of 200. This was the second highest habitat evaluation received by a biomonitoring station in the 2001 survey. Despite the lack of deep pools, fish habitat was optimal (Appendix D).

Biology

The RBP III analysis indicated the macroinvertebrate community at Station AR00 was “slightly impacted” (52% comparability to the reference community in the Canoe River - Station TR01).

In September 2001 DWM conducted fish population sampling in this segment of the Assonet River at Locust Street using a backpack shocker. The dominant species collected was American eel. Other species present included brown bullhead and bluegill. This reach appears to be populated by highly tolerant, warm water species (Mitchell 2001).

In August 2002 MDFW conducted fish population sampling at one location along this segment of the Assonet River – upstream from Route 79, Freetown (Station 721) - using a backpack shocker. A total of 24 fish, representing five species, were collected. The sample was dominated by American eel and pumpkinseed. Other species included brown bullhead, largemouth bass, and redfin pickerel (Richards 2003a). Both fish samples were comprised entirely of tolerant and moderately tolerant macrohabitat generalists. Sampling stations were situated in a small stream reach located between two impoundments.

Chemistry – water
DWM conducted water quality sampling at Locust Street, Freetown (Station AS01) on the Assonet River in 2001 (Appendix A).

Results are summarized below.

Dissolved Oxygen and % Saturation
Pre-dawn and daytime measurements for DO were similar ranging from 7.3 to 9.1 with saturations between 82 and 97%.

Temperature
The maximum water temperature recorded was 25.0°C.

Chloride
Values ranged from 17 and 20 mg/L.

pH and Alkalinity
Instream pH measurements ranged from 5.3 to 6.4 SU (n=6) and alkalinity values ranged from <2 to 4 mg/L.

Specific Conductance
Conductance ranged from 85.7 to 95.2 µS/cm.

Hardness
Measurements for hardness were consistently 14 mg/L as $CaCO_3$.

TSS
TSS measurements were low ranging from 2.7 to 7.4 mg/L.

NO_3-NO_2-Nitrogen
Values were all less than 0.06 mg/L.

Ammonia-nitrogen
Values for ammonia-nitrogen were all <0.02 mg/L. These measurements were below the conservative criterion of 1.09 mg/L NH_3-N (chronic instream criterion for ammonia at pH of 8.0 SU and temperature of 30°C) (EPA 1999).

Total Phosphorus
Total phosphorus concentrations ranged from 0.051 to 0.067 mg/L (n=6).

The *Aquatic Life Use* is assessed as support based primarily on the benthic macroinvertebrate community analysis and the water quality data. This use is identified with an alert status because of the low pH and low alkalinity.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
In July, August, and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from the Assonet River at the following stations (Appendix A):

AS02 - Outlet of Forge Pond, Forge Road, Freetown, (n=2)
AS01 - Locust Street, Freetown, (n=3)

2001 DWM bacteria data

Station	Fecal Coliform data range (cfu/100mL)	*E. coli* bacteria data range (cfu/100mL)	*Enterococci* bacteria data range (cfu/100mL)
AS02	15 and 45	<5 and 5	<5 and 40
AS01	7 - 90	5 - 25	20 – 1,100

DWM survey crews did not note any objectionable deposits, odors, or other conditions in the river at the outlet of Forge Pond but did observe some trash and debris and some foam in the river near Locust Street (MassDEP 2001a).

The *Primary* and *Secondary Contact Recreational* uses are assessed as support based on the low fecal coliform bacteria counts. The *Aesthetics Use* is also assessed as support but is identified with an Alert Status because of the trash and debris in the river near Locust Street.

Assonet River (MA62-19) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		SUPPORT*

* Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of *Aquatic Life Use* in this segment of the Assonet River.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

A river cleanup should be conducted to remove trash and debris.

RATTLESNAKE BROOK (SEGMENT MA62-45)

Location: Headwaters east of Riggenbach Road, Fall River to confluence with Assonet River, Freetown.
Segment Length: 3.2 miles
Classification: B

The drainage area of this segment is approximately 6.8 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....90.8%
Open land 2.5%
Residential 1.9%

The impervious cover area for this subwatershed is less than 10%.

MDFW has proposed that Terry Brook, a tributary to Rattlesnake Brook, be listed in the next revision of the SWQS as a cold water fishery (Richards 2003b).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on available information there are no WMA regulated withdrawals and NPDES dischargers in this subwatershed.

USE ASSESSMENT

AQUATIC LIFE

Habitat and Flow

In July 2001 DWM conducted a RBP III benthic macroinvertebrate survey at one station (RA00) on Rattlesnake Brook, 400 meters upstream from Route 24, Freetown. The large instream substrates, submerged woody materials, overhanging bank vegetation, and occasional pools (0.2 m depth) provided fish with stable cover and excellent overall habitat. Channel flow status was optimal, with water reaching the base of both banks and leaving minimal amounts of substrates exposed. Instream vegetation and algal cover were absent. RA00 received a total habitat assessment score of 172 out of 200, one of the higher habitat evaluations in the 2001 biomonitoring survey (Appendix D).

Biology

The RBP III analysis indicated that the benthic community at Station RA00 represented 71% comparability to the Canoe River reference Station (TR01) and resulted in an assessment of “slightly impacted” for biological condition (Appendix D).

Using a backpack shocker DWM conducted fish population sampling in Rattlesnake Brook at the Freetown State Forest near the Waumpanoag Native American Reservation in September 2001. The population was represented by three species with American eel (*Anguilla rostrata*) dominating the sample. Chain pickerel (*Esox niger*) and redfin pickerel (*Esox americanus americanus*) were the other species present (Mitchell 2001).

MDFW conducted fish population sampling at two locations along this segment - above and below Upper Ledge Road (Station 709), Freetown, and below Ledge Road (Station 710), Freetown - using a backpack shocker in July 2002. A total of 29 fish, representing three species, were collected. The samples were dominated by American eel and redfin pickerel although banded sunfish were also collected (Richards 2003a). Both fish samples were comprised entirely of tolerant and moderately tolerant macrohabitat generalists. Both pickerel and banded sunfish are known to thrive in naturally acidic waters.

Chemistry – water

In August 2001 *in-situ* measurements of Rattlesnake Brook were taken by DWM at the footbridge in the Freetown-Fall River Forest (Station ASRB2), Freetown. A summary of the data follows (Appendix A).

Dissolved Oxygen and % Saturation

DO was 8.4 mg/L and saturation was 90%.

Temperature
Temperature was recorded at 20.1°C.

pH
The pH was 4.4 SU.

Specific Conductance
Specific conductance was 45.1 µmhos/cm.

The *Aquatic Life Use* is assessed as support for Rattlesnake Brook based primarily on the benthic macroinvertebrate community evaluation. Although the fish community is comprised of macrohabitat generalists, it is consistent with those normally found in streams with contributing wetlands. This use is identified with an Alert Status because of the low pH and low alkalinity.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS
In July and September 2001, DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria from Rattlesnake Brook at the following stations:

-ASRB1 - Rattlesnake Brook at South Main Street, Freetown, (n=1)
-ASB08T - Rattlesnake Brook at Narrows Road, Freetown, (n=1)
-AS09T - Terry Brook (tributary to Rattlesnake Brook) at South Main Street, Freetown, (n=1)

All three fecal coliform samples were ≤ 45 cfu/100mL. Additionally, samples were collected on September 18, 2001 at Stations ASRB1 and AS09T for Fluorescent Whitening Agents and Optical Brighteners. Results for all samples indicated recovery as below the detection limits. This would indicate that on this sampling date waste from septic systems or industrial applications that might include paper whiteners or laundry products were not likely to be entering either Rattlesnake Brook or Terry Brook.

With the exception of some yard waste noted at Station ASB08T, no other objectionable deposits, odors or other conditions were noted by DWM biologists or survey crews in Rattlesnake Brook (MassDEP 2001a and 2001b).

Too limited bacteria data are available, so the *Primary* and *Secondary Contact Recreational* uses are not assessed. The *Aesthetics Use* is assessed as support.

Rattlesnake Brook (MA62-45) Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

*Alert Status issues identified, see details in use assessment section.

RECOMMENDATIONS
MDFW has proposed that Terry Brook, a tributary to Rattlesnake Brook, be protected as cold water fishery habitat. Additional monitoring of the fish population, dissolved oxygen, and temperature is needed to evaluate MDFW's proposal to list this stream as a cold water fishery in the next revision of the Surface Water Quality Standards.

Continue to conduct monitoring (biological, habitat and water quality) to evaluate the status of *Aquatic Life Use* in Rattlesnake Brook.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

ASSONET RIVER (SEGMENT MA62-20)

Location: From Tisdale Dam north of Route 79/Elm Street intersection), Freetown to the confluence with the Taunton River, Freetown.
Segment Size: 0.82 square miles
Classification: Class SA

The drainage area of this segment is approximately 34.2 square miles. Land-use estimates (top three) for the subwatershed:

Forest.....72.1%
Residential.....12.9%
Open land.....5.3%

The impervious cover area for this subwatershed is less than 10%.

The segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality for pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5) AND NPDES WASTEWATER DISCHARGE SUMMARY

There are 413 acres of land which are classified in the Land-Use theme as cranberry bog in this subwatershed (UMass Amherst 1999). For the purpose of this report, a conservative estimate of water use for this bog area is 3.7 MGD. However, 403 acres of this cranberry acreage are located in the subwatershed for segment MA62-42, MA62-44, and NA62-19 which are the upper portion of this subwatershed.

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground)	Authorized Withdrawal (MGD)
Town Line Farm	NA	V42510204	01S	0.03

Based on available information there are no NPDES dischargers in this subwatershed.

USE ASSESSMENT

SHELLFISH HARVESTING

The DMF Shellfish Status Report of 2003 indicates that area MHB 2.5, which includes this entire segment, is prohibited (Sawyer 2003).

Based on the DMF shellfish growing area status, the *Shellfish Harvesting Use* is assessed as impaired for this segment of the Assonet River because of elevated bacteria counts.

PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS

One bacteria sample was collected by DWM from an unnamed tributary (Station AS10T) to this segment of the Assonet River in September 2001 – the fecal coliform count was 5 cfu/100mL (Appendix A).

No data are readily available, so the *Primary* and *Secondary Contact Recreational* and *Aesthetics* uses are not assessed for this segment of the Assonet River.

Assonet River (MA62-20) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Fecal coliform bacteria Source: Unknown (Suspected Sources: Discharges from municipal separate storm sewer systems, septic systems, and marina/boating pumpout releases)
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Review and implement recommendations in the DMF shellfish sanitary survey reports and the triennial reviews for growing area MHB2.5.

Conduct monitoring (biological, habitat and water quality) to evaluate the status of *Aquatic Life Use* in this segment of the Assonet River.

Conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Continue to monitor compliance with WMA registration/permit limits and any other special conditions of the permit.

TAUNTON RIVER WATERSHED LAKE ASSESSMENTS

A total of 208 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) have been identified and assigned PALIS code numbers in the Taunton River Watershed (Ackerman 1989 and MassDEP 2001a). The total surface area of the Taunton River Watershed lakes is 12,517 acres. They range in size from <1 to 2,034 acres; 173 lakes are less than 50 acres, 21 are greater than 100 acres, and, of these, 11 are greater than 200 acres. This report presents information on 98 of these lakes that are in the WBS database. One hundred ten (110) lakes, which total 1,458 acres, are unassessed (i.e., they are not currently included as segments in the WBS database).

The 98 lakes assessed in this report represent 11,059 of the 12,517, or 88% of the acreage, in the Taunton River Watershed (Figure 15). Fourteen lakes are designated water supplies (i.e., Class A), which accountsfor 54% (or 6,715 acres) of the assessed acreage. Additionally, another nine lakes are proposed Class A waterbodies, since they are upstream from public water supplies.

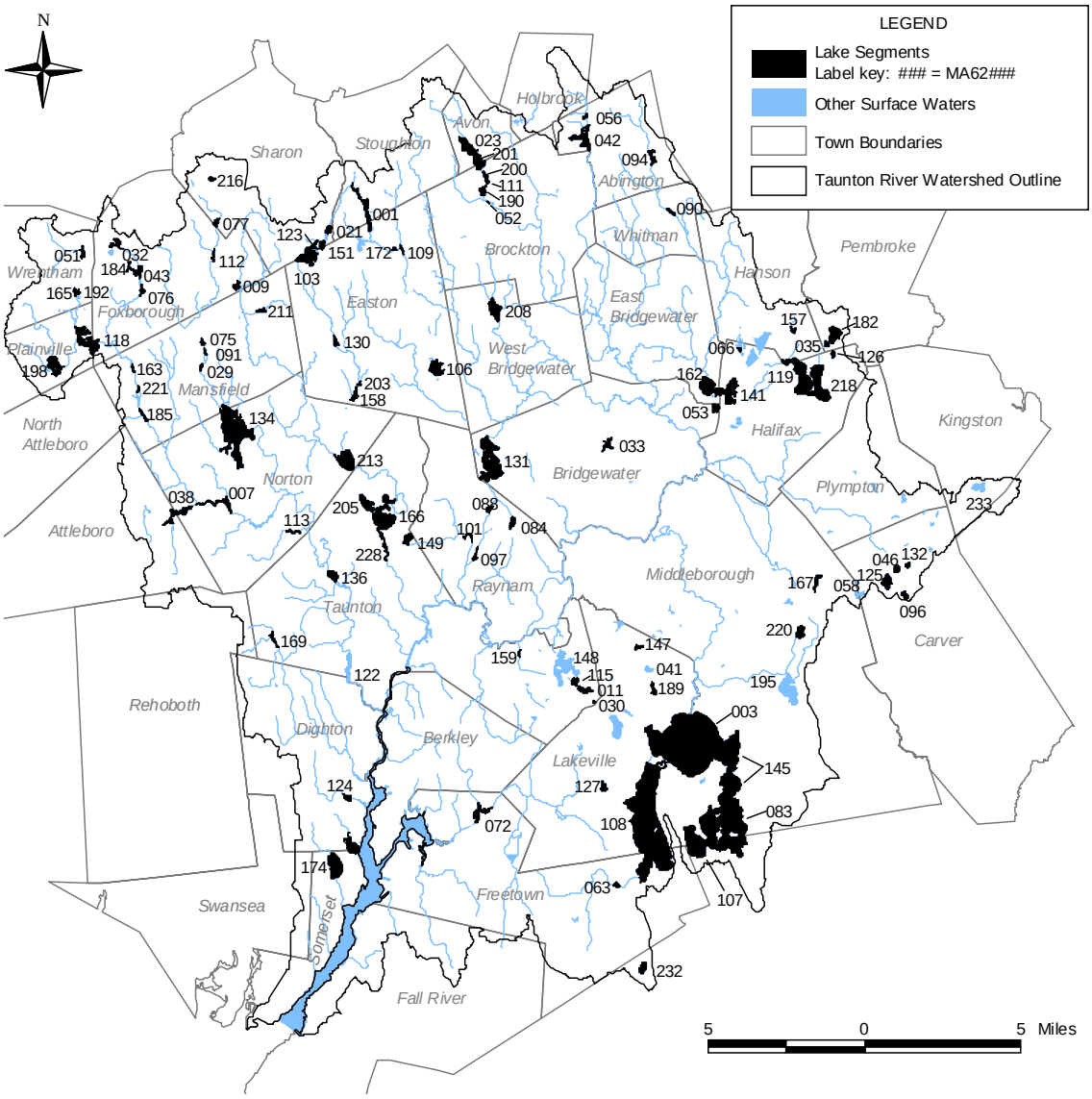

Figure 15. Lake segments in the Taunton River Watershed

LAKE USE ASSESSMENTS

Lake assessments are based on information gathered during DWM surveys (recent and historic) and pertinent information from other reliable sources (e.g., abutters, herbicide applicators, diagnostic/feasibility studies, MA DPH, etc.). The 1996 DWM synoptic surveys focused on visual observations of water quality and quantity (e.g., water level, sedimentation, etc.), the presence of native and non-native aquatic plants (both distribution and aerial cover), and presence/severity of algal blooms (Appendix C, Table C1). During 2001 more intensive in-lake sampling was conducted by DWM in five lakes in the Taunton River Watershed for nutrient related issues. This sampling included: in-lake measurements of DO, pH, temperature, and Secchi disk transparency; sampling for nutrients and chlorophyll *a*; and detailed macrophyte mapping (Appendix C, tables C2 and C3). While these surveys provided additional information to assess the status of the designated uses, fecal coliform bacteria data were unavailable and, so the *Primary Contact Recreational Use* was usually not assessed. In the case of the *Fish Consumption Use*, fish consumption advisory information was obtained from the MA DPH (MA DPH 2004). Although the *Drinking Water Use* was not assessed in this water quality assessment report, the Class A waters were identified. Information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/brp/dws/dwshome.htm and from the Taunton River Watershed's public water suppliers.

The use assessments and supporting information were entered into the EPA Waterbody System database. Data on the presence of non-native plants were entered into the MassDEP DWM informal non-native plant tracking database.

AQUATIC LIFE

Biology

Non-native aquatic macrophytes were observed in 43 of the 98 lakes surveyed by DWM in 1996 (Appendix C, Table C1). The four non-native aquatic species documented in the Taunton River Watershed lakes were *Myriophyllum heterophyllum* (variable water milfoil), *M. spicatum* (Eurasian water milfoil), *Cabomba caroliniana* (fanwort), and *Potomogetan crispus* (curlyleaf pondweed). The mere presence of these species is considered an imbalance to the native biotic community, so these lakes are listed as impaired (4,228 acres). Additionally, these species have a high potential for spreading and are likely to have established themselves in downstream lake and river segments in the Taunton River Watershed that may not have been surveyed.

Two non-native wetland species, *Lythrum salicaria* (purple loosestrife) and *Phragmites australis* (reed grass), were identified at 46 of the lakes surveyed by DWM in 1996 (Appendix C, Table C1). Although the presence of these species is not generally a cause of impairment to lakes, their invasive growth habit can result in the impairment of wetland habitat associated with lakes. Because of unconfirmed reports of the non-native species presence (*Myriophyllum heterophyllum*) in Muddy Pond (Kingston), North Center Street Pond (Carver), and Robbins Pond (East Bridgewater) the *Aquatic Life Use* in these waterbodies is identified with an Alert Status .

As part of its fish toxics monitoring effort, DWM sampled Ames Long Pond (Stoughton) and Monponsett Pond [East Basin] (Halifax) in August of 2001. Species found in Ames Long Pond included: largemouth bass, yellow perch, bluegill, pumpkinseed, black crappie, chain pickerel, American eel, brown bullhead and golden shiner. In Monponsett Pond [East Basin] the following species were observed: largemouth bass, yellow perch, bluegill, pumpkinseed, chain pickerel, golden shiner and white perch (Maietta *et al*. 2002).

MDFW conducted fish population assessments in Ames Long Pond in Stoughton/Easton and West Meadow Pond in West Bridgewater as part of the Lakes Survey for TMDL Development (Appendix I, Project 99-06/104). Collection methods included electrofishing at night, gillnetting and shoreline seining in Ames Long Pond and electrofishing at night in West Meadow Pond. The species list and counts for fish collected in 2000 are provided in Table 4 below. A watershed based fisheries management plan will be produced by MDFW at a later date.

Table 4. Species-level taxa list and counts for fish collected by MDFW between April and October 2001 in ponds in the Taunton River Watershed (Richards 2003).

Species	Location	
	Ames Long Pond	West Meadow Pond
American eel	10	1
Bluegill	281	144
Brown bullhead	5	10
Black crappie	2	5
Chain pickerel	18	6
Golden shiner	1	7
Largemouth bass	107	12
Pumpkinseed	346	53
Yellow perch	62	0

Chemistry-water

Six lakes were surveyed by DWM and/or MDFW in the Taunton River Watershed to provide data in support of the DWM TMDL Program. Lake monitoring included: the preparation of a bathymetric map (if not already available), mapping of aquatic vegetation, Secchi disc readings, *in situ* water quality profile measurements (i.e., temperature, dissolved oxygen, pH, conductance) at one or more stations, water quality sampling for phosphorus analysis, and chlorophyll *a* determinations. Each of the following lakes was sampled on three separate occasions. (Ponds marked with an asterisk were sampled by MDFW.) Data from these surveys are presented in Appendix C, Tables C2 and C3.

LAKE	*MUNICIPALITY*
Ames Long Pond*	Stoughton/Easton
Lake Sabbatia	Taunton
Monponsett Pond (west basin)	Halifax/Hanson
Monponsett Pond (east basin)	Halifax
Watson Pond	Taunton
West Meadow Pond*	West Bridgewater

Forty lakes statewide were sampled by DWM on one occasion in 2003 to provide data in support of the DWM nutrient criteria derivation effort. Lake monitoring included: *in situ* water quality profile measurements (i.e., temperature, dissolved oxygen, pH, specific conductance), Secchi disk readings, water quality sampling for phosphorus analysis, aquatic vegetation mapping, chlorophyll *a* determinations, and the analysis of apparent color. In the Taunton River Watershed, Ames Long Pond and Stetson Pond were sampled. However, these data are still provisional and not used in this assessment report.

The *Aquatic Life Use* is assessed as impaired in a total of 43 lakes, representing 5,247 acres, based on the presence of non-native macrophytes. Monponsett Pond (west basin) and Watson Pond are also impaired because of elevated phosphorus levels and Sabbatia Lake is also impaired because of low dissolved oxygen/saturation encompassing a large portion of the lake area. The remaining 55 lakes, representing 5,812 acres, in the Taunton River Watershed were not assessed for the *Aquatic Life Use* because of the cursory nature of the 1996 synoptic surveys and/or the lack of dissolved oxygen data and other more recent observations. It should be noted that the *Aquatic Life Use* for three lakes was identified with an Alert Status because of the unconfirmed report of a non-native aquatic plant species (*Myriophyllum heterophyllum*).

FISH CONSUMPTION

In July 2001 MA DPH issued new consumer advisories on fish consumption and mercury contamination. The MA DPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MA DPH 2001)." Additionally, MA DPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not

covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to two (2) cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury (MA DPH 2001)." MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially. The advisory encompasses all freshwaters in Massachusetts, so the *Fish Consumption Use* for lakes in the Taunton River Watershed cannot be assessed as support.

In August 2001 fish toxics monitoring (metals, PCB, and organochlorine pesticide in edible fillets) was conducted by DWM in Monponsett Pond (east basin), Halifax, and Ames Long Pond, Easton, respectively, at the request of the Taunton Watershed Team for human consumption considerations (Maietta *et al*. 2002). In Monponsett Pond (east basin) mercury exceeded the MA DPH trigger level of 0.5 mg/kg in largemouth bass and a fish consumption advisory was issued (see below). Arsenic, lead, cadmium and selenium were either below the MDL or at concentrations that do not appear to be of concern. PCB and most organochlorine pesticides were below the MDL. In Ames Long Pond mercury concentrations were below the MA DPH trigger level of 0.5 mg/kg. Lead levels of 0.94 mg/kg were found in the largemouth bass sample. All remaining metals were either below the MDL or at concentrations that do not appear to be of concern. PCB and organolchlorine pesticides were below the MDL.

The most recent MA DPH Fish Consumption List recommends the following for lakes in the Taunton River Watershed (MA DPH 2004).
East Monponsett Pond (Halifax) because of mercury.

1. Children younger than 12 years, pregnant women, and nursing mothers should not eat largemouth bass from this waterbody.
2. The general public should limit consumption of largemouth bass to two meals per month.

Somerset Reservoir (Somerset) because of mercury.

1. Children younger than 12 years, pregnant women, and nursing mothers should not eat largemouth bass from this waterbody.
2. The general public should limit consumption of largemouth bass to two meals per month.

Cabot Pond (Mansfield), Fulton Pond (Mansfield), Hodges Pond [Kingman Pond] (Mansfield), and Norton Reservoir (Norton/Mansfield) because of dioxin and pesticides.

1. The general public should not consume any fish from these waterbodies.

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

Six lakes representing a total of 983 acres are assessed as impaired for the *Fish Consumption Use* because of either mercury contamination or dioxin/pesticide contamination. The source of mercury is unknown although atmospheric deposition is suspected. The dioxin/pesticide contamination is associated with the Hatheway & Patterson Company site. The remaining 92 lakes representing 10,076 acres are not assessed for the *Fish Consumption Use.* However, it should be noted that since there is no barrier to fish migration between the east and west basins of Monponsett Pond, the west basin is identified with an Alert Status for the *Fish Consumption Use*. [NOTE: The MA DPH fish consumption advisory list contains the status of each water body for which an advisory has been issued. If a water body is not on the list, it may be because either an advisory was not warranted or the water body has not been sampled. MA DPH's most current Fish Consumption Advisory list is available online at http://db.state.ma.us/dph/fishadvisory/.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS

In 1996 DWM conducted synoptic surveys of 87 lakes in the Taunton River Watershed. These surveys included: general observations of water quality and quantity, the presence of native and non-native aquatic plants, and presence/severity of algal blooms (Appendix C, Table C1). Additional data were collected in six of these lakes by DWM in 2001 for the purpose of TMDL development. Two lakes (Ames Long Pond and

Stetson Pond) were also sampled by DWM in 2003 as part of a nutrient criteria development project. These data, Massachusetts Department of Conservation and Recreation (MA DCR) and public bathing beach bacteria data, MA DPH beach posting data, and diagnostic/feasibility studies were used to assess the recreational and aesthetics uses.

Bacteria samples were collected at the following MA DCR beaches: Watson Pond State Park in Taunton and Campers Beach at Middle Pond in Massasoit State Park, Taunton. There were elevated bacteria counts on four occasions at Watson Pond and once at Middle Pond. Neither of these beaches was reported closed or posted during the 2002 swimming season (MA DPH 2002b).

Bacteria samples were collected from the following bathing beaches during the summer of 2001 and 2002: Clear Pond (Lakeville), Cooper Pond (Carver), East Monponsett Pond (Halifax), Island Grove Pond (Abington), John's Pond (Carver), Sassaquin Pond (New Bedford), Tispaquin Pond (Middleborough), and Monponsett Pond (west basin). The Lake Street beach at Monponsett Pond (east basin) was closed three times during the 2002 swimming season due to elevated bacteria counts. The closure dates were from June 13 to June 20, July 10 to July 25 and August 15 to August 29. The beach at Clark Shores 1 on Long Pond was closed once from August 21 to August 22, 2002 due to elevated bacteria counts. The Freetown Public beach on Long Pond was also closed in 2001 due to elevated bacteria counts. Closure dates were June 18 to June 26 and August 21 to August 24. Halifax Beach on West Monponsett Pond was closed once in 2002 from August 21 to August 29 due to elevated bacteria counts. The beach at Sassaquin Pond was closed for swimming the entire season in 2002 due to elevated bacteria counts (MA DPH 2002b).

The *Primary* and *Secondary Contact Recreational* uses were assessed as support in eight lakes, representing a total of 2,299 acres (Table 5). The *Recreational* and *Aesthetic* uses were assessed as impaired in six lakes (854 acres) because of elevated bacteria counts/swimming beach closures, excess algal growth, poor Secchi disk transparency, and/or the dense infestation of non-native aquatic plants. The *Recreational* uses for the remaining 84 lakes in the Taunton River Watershed, representing 7,906 acres, were not assessed because of a lack of bacteria, transparency and in-lake survey data. The *Aesthetics Use* for the 92 remaining lakes representing 10,205 acres were also not assessed because of a lack of transparency and in-lake survey data.

SUMMARY

Almost half (48 of 98, or 49%) of the lakes in the Taunton River Watershed assessed in this report were impaired for one or more uses (Table 5). Causes of impairment included: non-native plant infestation, low dissolved oxygen/saturation, elevated total phosphorus, mercury contamination, dioxin/pesticide contamination, elevated bacteria counts/swimming beach closures, excess algal growth, and poor Secchi disk transparency. Similarly almost half (46 of 98) representing 5,338 acres were not assessed for any uses.

Table 5. Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Ames Long Pond, Stoughton/Easton	MA62001	88	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	IMPAIRED (Non-native aquatic plants)		
This waterbody is on the 2002 Integrated List of Waters in Category 5 for noxious aquatic plants, turbidity and exotic species. The 1996 MassDEP lake synoptic survey noted moderate turbidity (Secchi disc depth was 0.9 m in the south basin at the culvert) and a very dense cover of floating leaf and submergent plants in the north basin and upper end of the south basin. Two non-native aquatic species, *Myriophyllum heterophyllum* and *Cabomba caroliniana,* and a non-native wetland species, *Lythrum salicaria,* were also noted (Appendix C, Table C1). Monitoring was conducted in Ames Long Pond by MDFW in the summer of 2001 to support the DWM TMDL Program. Results indicated that biovolume density was estimated as 71.1% with a very dense coverage of macrophytes. *Cabomba caroliniana* was the most dominant macrophyte covering approximately 90% of the pond bottom (Hartley 2002). No DO/saturation problems were found during the surveys conducted in 2001 (Appendix C, Table C2). In-lake total phosphorus concentrations were fairly low. None of the Secchi disk depth measurements violated the bathing beach guidance of four feet (Appendix C, Table C3). The fish population sampled was dominated by pumpkinseed, bluegill and largemouth bass. Data were also collected from Ames Long Pond in 2003 in support of the DWM nutrient criteria derivation effort. Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired. In August 2001 fish toxics monitoring (metals, PCB, and organochlorine pesticide in edible fillets) was conducted by DWM at the request of the Taunton Watershed Team for human consumption considerations (Appendix F, Table F2). No site-specific advisory was issued, so the *Fish Consumption Use* is not assessed. Because of the high percentage of biovolume occupied by aquatic macrophytes including a non-native aquatic plant in Ames Long Pond, the *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are also assessed as impaired. In 2000 the Town of Stoughton received one MA DCR Lake and Pond Grant to prepare a lake and watershed management program.							
Assawompsett Pond, Lakeville/ Middleborough	MA62003	2034	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Assawompset Pond is a Class A, Public Water Supply. New Bedford Water Department (Permit 9P4250101 – Appendix G, Table G5) and Taunton DPW – Water Division (Permit 9P42529304 – Appendix G, Table G5) have registered and permitted surface water intakes on this pond. The Cities of New Bedford and Taunton have received funding through the SRF program to purchase land in the watershed of the Assawompsett Pond complex. Purchases will prevent development of the land and as a consequence protect the pond from the introduction of pollutants. This waterbody is on the 2002 Integrated List of Waters in Category 2. The 1996 MassDEP lake synoptic survey noted slight turbidity with a sparse coverage of emergent aquatic plants (Appendix C, Table C1). The non-native wetland species *Lythrum salicaria* was observed during this survey.							
Barrowsville Pond, Norton	MA62007	47	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. No recent data are available, so all uses are not assessed.							
Beaumont Pond, Foxborough	MA62009	24	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Beaumont Pond is in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Beaumont Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a wetland species, was noted (Appendix C, Table C1). No recent data are available, so all uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Big Bearhole Pond, Taunton	MA62011	38	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for organic enrichment/low DO, noxious aquatic plants and exotic species. The 1996 MassDEP lake synoptic survey noted moderate turbidity with the southern perimeter of the pond almost entirely banded by very dense floating leaf plants. Two non-native aquatic species, *Cabomba caroliniana* and *Myriophyllum spicatum,* were also noted (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired.							
Blakes Pond, Mansfield (Jewel Street Pond)	MA62221	6	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Blakes Pond is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 3. No recent data are available; so all uses are not assessed.							
Briggs Pond, Sharon	MA62021	19	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. No objectionable conditions were noted by DWM during the 1996 synoptic survey (Appendix C, Table C1). However, no recent data are available ans, so all uses are not assessed.							
Brockton Reservoir, Avon (Salisbury Brook Reservoir)	MA62023	89	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Brockton Reservoir is a Class A, Public Water Supply. Brockton DPW Water Division has a registered surface water intake on this reservoir (WMA registration 9P42504401 – Appendix G, Table G5). This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. A non-native aquatic species, *Cabomba caroliniana,* and a non-native wetland species, *Lythrum salicaria,* were noted (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Cabot Pond, Mansfield	MA62029	2	NOT ASSESSED	IMPAIRED (Dioxin and pesticides)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for pesticides. Sediment and water quality data were collected by MassDEP in 1998 and a "Provisional Advisory" was issued in October 1998. MassDEP, USEPA, and MA DFW collected fish samples in Cabot Pond as part of the Hatheway & Patterson Company site investigation. As a result of the fish sampling the provisional status of the advisory was lifted in June 1999 and a fish consumption advisory was issued by MA DPH due to elevated levels of dioxin and pesticides (MA DPH 2004). Because of the fish consumption advisory the *Fish Consumption Use* is assessed as impaired. No other data are available, so all other uses are not assessed.							
Cain Pond, Taunton	MA62030	3	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for organic enrichment/low DO and turbidity. No recent data are available, so all uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Carpenter Pond, Foxborough (Lakeview Pond)	MA62032	29	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Carpenter Pond is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Carpenter Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a wetland species, was noted (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Carver Pond, Bridgewater	MA62033	29	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. A non-native aquatic species, *Myriophyllum heterophyllum,* was identified (Appendix C, Table C1) during the DWM 1996 synoptic survey. Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired. The Town of Bridgewater received one MA DCR Lake and Pond Grant in 2000 to provide a public education program.							
Chaffin Reservoir, Pembroke	MA62035	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Chaffin Reservoir is a tributary to the Class A, Public Water Supply, Monponsett Pond (east basin). This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Chaffin Reservoir. No non-native aquatic or wetland plants were observed, but, the lake was completely covered with floating and submerged plants (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Chartley Pond, Norton/Attleboro	MA62038	68	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Chartley Pond is a Class A, Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Chartley Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a wetland species, was noted (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Clear Pond, Lakeville	MA62041	18	NOT ASSESSED	NOT ASSESSED	SUPPORT	SUPPORT	NOT ASSESSED
Weekly testing is conducted for *Enterococci* bacteria at the beach area during the swimming season. A total of twelve tests were performed In 2001 and 2002 with no exceedences reported (MA DPH 2003). Since there were no closures/postings during the 2001 or 2002 bathing beach seasons, the *Recreational* uses are assessed as support.							
Cleveland Pond, Abington	MA62042	96	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Cushing Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Cocasset Lake, Foxborough	MA62043	32	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Cocasset Lake is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 5 for turbidity. In 1996 DWM conducted a synoptic survey of Cocasset Lake. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Cooper Pond, Carver	MA62046	22	NOT ASSESSED	NOT ASSESSED	SUPPORT	SUPPORT	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Cooper Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). At the beach area, monthly testing is conducted for *E. coli*. In 2001 and 2002, five and six tests, respectively, were performed with no exceedences (MA DPH 2003). Since there were no closures/postings during the 2001 or 2002 bathing beach seasons, the *Recreational* uses are assessed as support.							
Crocker Pond, Wrentham	MA62051	17	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Crocker Pond one non-native aquatic macrophyte species, *Potamogeton crispus*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Cross Pond, Brockton	MA62052	2	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. No recent data are available and, so all uses are not assessed.							
Cross St. Pond, Bridgewater	MA62053	27	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Cross St. Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Cushing Pond, Hanson	MA62056	6	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Cushing Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
East Freetown Pond, Freetown	MA62063	11	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of East Freetown Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum,* was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Elm Street Pond, Halifax/Hanson	MA62066	19	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters as a Category 3. In 1996 DWM conducted a synoptic survey of Elm Street Pond, no non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Forge Pond, Freetown	MA62072	56	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Forge Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Fulton Pond, Mansfield	MA62075	9	NOT ASSESSED	IMPAIRED (Dioxin and pesticides)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for pesticides. Sediment and water quality data were collected by MassDEP in 1998 and a "Provisional Advisory" was issued in October of 1998. MassDEP, USEPA and MA DFW collected fish samples in Fulton Pond as part of the Hatheway and Patterson Company site investigation. As a result of the fish sampling the "provisional" status was lifted in June of 1999 and MA DPH issued a fish consumption advisory due to elevated levels of dioxin and pesticides (MA DPH 2004). The fish consumption advisory recommends that "The general public should not consume any fish from this waterbody." Because of the site-specific advisory the *Fish Consumption Use* is assessed as impaired. No other data are available so all other uses are not assessed.							
Fuller Street Pond, Carver/Middleborough	MA62234	20	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody (formerly identified as Segment MA95058) is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Fuller Street Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired.							
Furnace Lake, Foxborough	MA62076	15	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Furnace Lake is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Furnace Lake. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available and, so all uses are not assessed.							
Gavins Pond, Sharon/ Foxborough	MA62077	18	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Gavins Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Great Quitticas Pond, Lakeville/ Middleborough/ Rochester	MA62083	1124	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Great Quitticas Pond is a Class A, Public Water Supply. New Bedford Water Department has a registered and permitted surface water intake on this pond (Permit 9P4250101 – Appendix G, Table G5). This waterbody is on the 2002 Integrated List of Waters as a Category 2. In 1996 DWM conducted a synoptic survey of Great Quitticas Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so all uses are not assessed.							
Gushee Pond, Raynham	MA62084	27	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Gushee Pond is located in the Hockomock Swamp ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Gushee Pond two non-native aquatic macrophyte species, *Myriophyllum heterophyllum* and *Cabomba caroliniana,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired. The Forge River Stream Team in its shoreline survey report observed a fair amount of trash at the boat launch area, includes bottles, paper precuts, and a discarded carpet.							
Hewitt Pond, Raynham	MA62088	14	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Hewitt Pond is located in the Hockomock Swamp ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Hewitt Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No other recent data are available, so all uses are not assessed.							
Hobart Pond, Whitman	MA62090	9	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Hobart Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired. During a 2002 NPS study, the ESS Group, Inc. observed that there are numerous catch basins in a large parking lot area on Colebrook Boulevard that drain to Hobart Pond (ESS 2003).							
Hodges Pond (Kingman Pond), Mansfield	MA62091	7	NOT ASSESSED	IMPAIRED (Dioxin and pesticides)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for pesticides. Sediment and water quality data were collected by MassDEP in 1998 and a “Provisional Advisory" was issued in October of 1998. MassDEP, USEPA and MA DFW collected fish samples in Hodges Pond as part of the Hatheway and Patterson Company site investigation. As a result of the fish sampling the "provisional" status was lifted in June of 1999 and MA DPH issued a fish consumption advisory due to elevated levels of dioxin and pesticides (MA DPH 2004). The fish consumption advisory recommends that “The general public should not consume any fish from this waterbody.” Because of the site-specific advisory the *Fish Consumption Use* is assessed as impaired. No other data are available, so all other uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Island Grove Pond, Abington	MA62094	31	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	SUPPORT*	SUPPORT	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for noxious aquatic plants, turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Island Grove Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. The Island Grove Beach is tested weekly during the swimming season for *Enterococci*. In 2001 seven tests were perform and in 2002 nine tests were performed with no exceedences (MA DPH 2003). Since there were no closures/postings during the 2001 or 2002 bathing beach seasons, the *Recreational* uses are assessed as support. However, the *Primary Contact Recreational Use* is identified with an Alert Status since the ESS Group, Inc. study (ESS 2003) indicated that wildlife waste impacts might be problematic (known goose populations on the lake and off of Lake Street). The Town of Abington received a Lake and Pond Grant in 1999 to prepare a lake and watershed management plan.							
Johns Pond, Carver	MA62096	21	NOT ASSESSED	NOT ASSESSED	SUPPORT	SUPPORT	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Johns Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). Monthly testing for *E. coli* at the beach area is performed during the swimming season. Six tests were performed in 2001 and five tests were performed in 2002 with no exceedences reported (MA DPH 2003). Since there were no closures/postings during the 2001 or 2002 bathing beach seasons, the *Recreational* uses are assessed as support.							
Johnson Pond, Raynham	MA62097	14	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters as a Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Johnson Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired. The 1996 MassDEP lake synoptic survey noted moderate turbidity with a Secchi depth reading of 0.2 meters at the boat ramp. No recent data are available, so all uses are not assessed.							
Kings Pond, Raynham	MA62101	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Kings Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available, so all uses are not assessed.							
Leach Pond, Easton/Sharon	MA62103	111	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Leach Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). There were dense, floating leaf and submergent plants covering 100% of the surface area. No recent data are available, so all uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Little Cedar Swamp Pond, Easton	MA62106	91	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Little Cedar Swamp Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). The 1996 MassDEP lake synoptic survey noted no open water on this pond, which is comprised of marsh and floating leaf plants. No recent data are available, so all uses are not assessed.							
Little Quitticas Pond, Lakeville/ Rochester	MA62107	295	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Little Quitticas Pond is a Class A, Public Water Supply. New Bedford Water Department has a registered and permitted surface water intake on this pond (Permit 9P4250101). This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Little Quitticas Pond. No non-native aquatic plants were observed, but, *Phragmites australis,* a non-native wetland species, was noted (Appendix C, Table C1). Fish toxics monitoring for PCB, organochlorine pesticides and selected metals, including Hg, As, Se, Pb, and Cd, was conducted in Little Quitticas Pond as part of a MassDEP Office of Research and Standards (ORS) R&D study in 1994 (Appendix F). No site-specific advisory was issued and, therefore, the *Fish Consumption Use* is not assessed. No other data are available, so all uses are not assessed.							
Long Pond, Lakeville	MA62108	1741	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	SUPPORT*	SUPPORT	NOT ASSESSED
Long Pond is a Class A, Public Water Supply. New Bedford Water Department (9P4250101 – Appendix G, Table G5) and Taunton DPW – Water Division (9P42529304 - Appendix G, Table G5) have registered and permitted surface water intakes on this pond. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Long Pond two non-native aquatic macrophyte species, *Myriophyllum heterophyllum* and *Cabomba caroliniana,* and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired. Weekly testing during the summer season is conducted for *Enterococci* at the following three locations in Lakeville: Clark Shores 1, Clark Shores 2 and Clark Shores 3. In 2002 twenty tests were performed with two exceedences of 112 and 142 cfu/100 ml. The beach at Clark Shores 1 was closed once from August 21 to August 22, 2002 due to elevated bacteria counts. The Freetown Public beach on Long Pond was tested weekly during 2001 for *E.Coli*. Three exceedences out of 14 tests were reported. This beach was closed twice in 2001 due to elevated bacteria counts. Closure dates were June 18 to June 26 and August 21 to August 24 (MA DPH 2003). Because the beaches were open for the majority of the 2001 and 2002 bathing seasons, the *Recreational* uses are assessed as support. However, the *Primary Contact Recreational Use* is identified with an Alert Status because of the beach closures.							
Longwater Pond, Easton	MA62109	8	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Longwater Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Lower Porter Pond, Brockton	MA62111	8	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Longwater Pond one non-native aquatic macrophyte species, *Cabomba caroliniana* was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present.							
Meadow Brook Pond, Norton	MA62113	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Meadow Brook Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available, so all uses are not assessed.							
Middle Pond, Taunton	MA62115	26	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	SUPPORT	SUPPORT	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Middle Pond two non-native aquatic macrophyte species, *Myriophyllum spicatum* and *Cabomba Caroliniana,* and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired. Fish toxics monitoring for PCB, organochlorine pesticides and selected metals, including Hg, As, Se, Pb, and Cd, was conducted in Middle Pond as part of a MassDEP ORS R&D study in 1994 (Appendix F). No site-specific advisory was issued and, so the *Fish Consumption Use* is not assessed. Weekly testing for *Enterococci* is performed at Campers Beach at Middle Pond in the Massasoit State Park. There were no closures/postings during the 2002 bathing beach season (MA DPH 2003). Because the beach was open for the 2002 bathing season, the *Recreational* uses are assessed as support.							
Mirimichi Lake, Plainville/ Foxborough	MA62118	175	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Mirimichi Lake is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Mirimichi Lake one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. Fish toxics monitoring for PCB, organochlorine pesticides and selected metals, including Hg, As, Cu, Se, Pb, and Cd, was conducted in Mirimichi Lake by DWM in 1995 (Appendix F, Table F1). No site-specific advisory was issued and, therefore, the *Fish Consumption Use* is not assessed. No other data are available, so all other uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Monponsett Pond, Halifax [east basin]	MA62218	245	IMPAIRED (Non-native aquatic plants)	IMPAIRED (Mercury)	SUPPORT*	SUPPORT	NOT ASSESSED
Monponsett Pond (east basin) is a Class A, Public Water Supply. The Brockton DPW Water Commission is registered and permitted to withdraw a total of 0.87 MGD from a surface water intake (9P42504401 – Appendix G, Table G5). This waterbody is on the 2002 Integrated List of Waters in Category 5 for metals. During the 1996 MassDEP lake synoptic survey of Monponsett Pond (east basin) one non-native aquatic macrophyte species, *Cabomba caroliniana,* was identified (Appendix C, Table C1). In 2001 MassDEP surveyed the lake for the purpose of TMDL development. Low DO/saturation occurred at depths greater than 2.5 m during two of the three surveys during the summer of 2001 (Appendix C, Table C2). Since Monponsett Pond is a shallow waterbody surrounded by wetlands, these conditions are considered naturally occurring. In-lake total phosphorus concentrations were fairly low with some evidence of phosphorus release from potentially anoxic sediments. None of the Secchi disk depth measurements violated the bathing beach guidance of four feet (Appendix C, Table C3). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. In August 2001 fish toxics monitoring (metals, PCB, and organochlorine pesticide in edible fillets) was conducted by DWM in Monponsett Pond (east basin), Halifax, at the request of the Taunton Watershed Team for human consumption considerations (Appendix F, Table F2). Because of elevated mercury MA DPH issued a fish consumption advisory recommending that "Children younger than 12 years, pregnant women, and nursing mothers should not eat largemouth bass from this waterbody and the general public should limit consumption of largemouth bass to two meals per month" (MA DPH 2004). Because of the site-specific advisory the *Fish Consumption Use* is assessed as impaired. Weekly testing during the summer season is conducted for *E. coli* at the following locations in Halifax: Lake Street (#17, #19 and #93), Annawon Street, Holmes Street, Wamsutta Beach. In 2001 there were no exceedences at these sites, with the exception of Lake Street where there was one exceedence with a count 450 cfu/100 ml. In 2002 there were no exceedences at the Annawon Street, Holmes Street and Wamustta Beach sites. However, there were five exceedences out of 12 tests at 17 Lake Street, ranging from 244 to 3600 cfu/100 ml, one exceedence (360 cfu/100 ml) out of thirteen tests at 19 Lake Street, and one exceedence (2400 cfu/100 ml) out of 12 tests at 93 Lake Street. The Lake Street beach was closed three times during the 2002 swimming season due to these elevated bacteria counts. The closure dates were from June 13 to June 20, July 10 to July 25 and August 15 to August 29 (MA DPH 2003). Because most of the beaches were open for the majority of the 2001 and 2002 bathing seasons, the *Recreational* uses are assessed as support. However, the *Primary Contact Recreational Use* is identified with an Alert Status because of the frequency and duration of closures/postings at the Lake Street Beach in the 2002 bathing season. A Diagnostic/Feasibility Study is available for the pond (Lycott 1987).							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Monponsett Pond, Halifax/ Hanson [west basin]	MA62119	283	IMPAIRED (Non-native aquatic plants, Phosphorus)	NOT ASSESSED*	IMPAIRED (Secchi disk transparency, Excess algal growth)		
Monponsett Pond (west basin) is a Class A, Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 5 for turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Monponsett Pond (west basin) one non-native aquatic macrophyte species, *Cabomba caroliniana,* was identified (Appendix C, TableC1). In 2001 MassDEP surveyed the lake for the purpose of TMDL development. Low DO/saturation and evidence of primary productivity (e.g., supersaturation, high pH, and elevated chlorophyll) occurred in the pond during the summer of 2001 (Appendix C, Table C2). A qualitative analysis of the phytoplankton population taken in August indicated multiple bluegreen species, including *Microcystis* sp. In-lake total phosphorus concentrations were moderately high with some evidence of phosphorus release from anoxic sediments. All of the Secchi disk depth measurements violated the bathing beach guidance of four feet (Appendix C, Table C3). The Diagnostic/Feasibility Study for the pond identified high phosphorus loading as problematic (Lycott Environmental Research 1987). The current phosphorus data continue to support those findings. Because of the presence of a non-native aquatic macrophyte and the elevated phosphorus levels, the *Aquatic Life Use* is assessed as impaired. Because DPH has not issued a Fish Consumption Advisory for the west basin of Monponsett Pond the Fish Consumption Use is not assessed. However, since there is no barrier to fish migration between the two basins and the east basin does have an advisory (elevated mercury), the *Fish Consumption Use* is identified with an Alert Status. Weekly testing for *E.Coli* is conducted at Halifax Beach, the Lingan Street beach and the Ocean Avenue beach. In 2001 a total of 33 tests were performed with one exceedence of 4,800 cfu/100 ml. In 2002 a total of 33 tests were performed with one exceedence of 2,400 cfu/ml. Halifax Beach was closed once in 2002 from August 21 to August 29 due to elevated bacteria counts (MA DPH 2003). While the beaches were open for the majority of the 2001 and 2002 bathing seasons, the *Recreational* and *Aesthetic* uses are assessed as impaired because of low Secchi disk transparency and the algal bloom. Based on the loading calculation of the Diagnostic/Feasibility Study, the major source of total phosphorus is septic systems (Lycott Environmental Research 1987).							
Mount Hope Mill Pond, Taunton/ Dighton	MA62122	45	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants (incorrectly identified as Threemile River Impoundment –MA62231). During the 1996 MassDEP lake synoptic survey Mount Hope Mill Pond was infested with one non-native aquatic macrophyte species, *Cabomba caroliniana* (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Muddy Cove Brook Pond, Dighton	MA62124	23	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED*	NOT ASSESSED*	NOT ASSESSED*
This waterbody is on the 2002 Integrated List of Waters in Category 5 for the presence of noxious aquatic plants and turbidity. In 1996 DWM conducted a synoptic survey of Muddy Cove Brook Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria*, a non-native wetland species, was noted, as well as evidence of a bluegreen bloom (Appendix C, Table C1). No recent data are available, so, all uses are not assessed. However, because of objectionable conditions noted in 1996, the *Recreational* and *Aesthetic* uses are identified with an Alert Status.							
Muddy Pond, Carver	MA62125	61	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Muddy Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Muddy Pond, Halifax	MA62126	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Muddy Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Muddy Pond, Kingston	MA62233	41	NOT ASSESSED*	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody (formerly identified as MA94104) is on the 2002 Integrated List of Waters in Category 3. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present (Appendix C, Table C1). Because of the *M*. sp. the *Aquatic Life Use* is identified with an Alert Status.							
Mullein Hill Chapel Pond, Lakeville	MA62127	23	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Mullein Hill Chapel Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
New Pond, Easton	MA62130	18	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
New Pond is located in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of New Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired.							
Nippenicket Lake, Bridgewater	MA62131	375	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Nippenicket Lake is located in the Hockomock Swamp ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Nippenicket Lake one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired.							
North Center Street Pond, Carver	MA62132	12	NOT ASSESSED*	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. During the 1996 MassDEP lake synoptic survey a species of *Myriophyllum* (suspect the non-native aquatic species *Myriophyllum heterophyllum*) was present but needs to be identified when flowering heads are present (Appendix C, Table C1). Because of the *M*. sp. The *Aquatic Life Use* is identified with an alert status.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Norton Reservoir, Norton/ Mansfield	MA62134	556	IMPAIRED (Non-native aquatic plants)	IMPAIRED (Dioxin and pesticides)	NOT ASSESSED*	NOT ASSESSED*	NOT ASSESSED*
This waterbody is on the 2002 Integrated List of Waters in Category 5 for pesticides, nutrients, noxious aquatic plants, turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Norton Reservoir two non-native aquatic macrophyte species, *Myriophyllum heterophyllum* and *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired. Fish toxics monitoring was conducted by DWM in 1988 for metals and PCB. At that time, no fish consumption advisory was issued. More recently MassDEP, MDFW and USEPA, as part of the Hatheway and Patterson Company site investigation in November 1998, conducted additional fish toxics monitoring. Because of elevated levels of dioxin and pesticides MA DPH issued a fish consumption advisory recommending that "The general public should not consume any fish from this waterbody" (MA DPH 2004). Because of the site-specific advisory the *Fish Consumption Use* is assessed as impaired. The Town of Norton has received one Lakes and Ponds Grant in 1994 for education of town officials and residents regarding watershed management. The *Recreational* and *Aesthetic* uses are not assessed but are identified with an alert status because of a history of bluegreen blooms.							
Oakland Pond, Taunton	MA62136	38	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. No recent data are available, so, all uses are not assessed.							
Plymouth Street Pond, Halifax/ E. Bridgewater	MA62141	164	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. The 1996 MassDEP lake synoptic survey noted that the pond was drained with only isolated pools remaining (Appendix C, Table C1). No recent data are available, so, all uses are not assessed. It should be noted that in July 2001 DWM collected fecal coliform, *E. coli*, and *Enterococci* bacteria upstream from this pond (see station SA02T). The counts and the duplicate sample were all very low ($\leq$ 45 cfu/100 mls) (Appendix A).							
Pocksha Pond Lakeville/ Middleborough	MA62145	592	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Pocksha Pond is a Class A, Public Water Supply. New Bedford Water Department (Permit 9P4250101 – Appendix G, Table G5) and Taunton DPW – Water Division (Permit 9P42529304 – Appendix G, Table G5) have registered and permitted surface water intakes on this pond. This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Pocksha Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Poquoy Pond, Lakeville	MA62147	10	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Poquoy Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Prospect Hill Pond, Taunton/ Raynham	MA62149	42	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Prospect Hill Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). Fish toxics monitoring for PCB, organochlorine pesticides and selected metals including Hg, As, Se, Pb, and Cd, was conducted in Prospect Hill Pond as part of MassDEP ORS R&D study in 1994 (Appendix F). No site-specific advisory was issued, so, the *Fish Consumption Use* is not assessed.							
Puds Pond, Sharon/ Easton	MA62151	23	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Puds Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Reservoir, Hanson	MA62157	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Reservoir is a tributary to a Class A, Public Water Supply, Monponsett Pond-West. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Reservoir. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). During the 1996 survey, almost 100% cover of dense floating leaf and emergent plants were observed. No recent data are available, so, all uses are not assessed.							
Reservoir, Easton	MA62158	27	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Reservoir. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). During the 1996 survey, the entire surface of this waterbody was covered with aquatic plants. No recent data are available, so, all uses are not assessed.							
Richmond Pond, Taunton	MA62159	6	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Richmond Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Rico Lake, Taunton (*Precinct Street Pond/Furnace Pond*)	MA62148	188	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Rico Lake two non-native aquatic macrophyte species, *Myriophyllum spicatum* and *Cabomba caroliniana,* and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired.							
Robbins Pond, East Bridgewater	MA62162	124	NOT ASSESSED*	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 2. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present (Appendix C, Table C1). Because of the *M*. sp. the *Aquatic Life Use* is identified with an Alert Status.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Robinson Pond, Mansfield	MA62163	9	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Robinson Pond is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 3. No recent data are available, so, all uses are not assessed.							
Route One Pond (west), Wrentham	MA62165	10	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Route One Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Sabbatia Lake, Taunton	MA62166	265	IMPAIRED (Non-native aquatic plants, Dissolved oxygen saturation)	NOT ASSESSED	IMPAIRED (Non-native aquatic plants)		
Sabbatia Lake is in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 and 2001 MassDEP lake surveys of Sabbatia Lake two non-native aquatic macrophyte species, *Cabomba Caroliniana* and *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1 and Mattson and Haque 2004). In 2001 MassDEP surveyed the lake for the purpose of TMDL development. Low DO/saturation occurred at depths greater than 2.4 m during all three surveys during the summer of 2001 (Appendix C, Table C2). In-lake total phosphorus concentrations were fairly low with evidence of phosphorus release from potentially anoxic sediments. None of the Secchi disk depth measurements violated the bathing beach guidance of four feet (Appendix C, Table C3). Because of low DO/saturation encompassing approximately 40% of the lake area and the infestation with non-native aquatic macrophyte species, the *Aquatic Life Use* is assessed as impaired. In 2001 the City of Taunton received funds from the Clean Water SRF for Area Collectors around Lake Sabbatia (Appendix I). The *Recreational* and *Aesthetic* uses are assessed as impaired because of the density (approximately 50% of the lake area) of the non-native macrophytes (Mattson and Haque 2004).							
Sassaquin Pond, New Bedford	MA62232	36	NOT ASSESSED	NOT ASSESSED	IMPAIRED (*Enterococci* and fecal coliform bacteria (*Primary Contact* only), Excess algal growth, Sewage odor)		
This waterbody (formerly identified as MA95129) is on the 2002 Integrated List of Waters in Category 2. In 1995 DWM conducted a synoptic survey of Sassaquin Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria* and *Phragmites australis,* non-native wetland species, were noted (Appendix C, Table C1). There is no formal public bathing beach, but, the shoreline is developed. The pond is used by a neighborhood association for swimming and recreation and has been frequently closed to swimming because of high *Enterococci* and fecal coliform bacteria particularly after rain events (MA DPH 2002b). Swimming was prohibited for all of 2002 due to high levels of contamination, possibly from failed septic and stormwater outfalls. Aesthetically objectionable conditions (filamentous algae, sewage odors) also noted on field sheets. Because of the frequent and prolonged beach closures/postings and the aesthetic problems, the *Recreational* and *Aesthetic* uses are assessed as impaired. Suspected sources of impairment include municipal separate storm sewer systems, stormwater, on-site treatment systems (septic systems), municipal separate storm sewer systems, municipal (urbanized high density area), and residential districts.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Savery Pond, Middleborough (Waterville Pond)	MA62167	24	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Savery Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Segreganset River Pond, Taunton	MA62169	14	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Segreganset River Pond is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 5 for noxious aquatic plants and turbidity. In 1996 DWM conducted a synoptic survey of Segreganset River Pond. No non-native aquatic plants were observed, but, *Phragmites australis,* a non-native wetland species, was noted (Appendix C, Table C1). During the 1996 survey, the entire surface of this waterbody was covered with aquatic plants. No recent data are available, so, all uses are not assessed.							
Shovelshop Pond, Easton	MA62172	7	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Shovelshop Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Somerset Reservoir, Somerset	MA62174	164	NOT ASSESSED	IMPAIRED (Mercury)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Somerset Reservoir is a Class A, Public Water Supply. Somerset Water Department has a registered surface water intake on this reservoir (Permit 9P42527301). This waterbody is on the 2002 Integrated List of Waters in Category 5 for metals. In 1996 DWM conducted a synoptic survey of Somerset Reservoir. No non-native aquatic plants were observed, but, *Lythrum salicaria* and *Phragmites australis,* non-native wetland species, were noted (Appendix C, Table C1). Fish toxics monitoring for PCBs, organochlorine pesticides and selected metals including Hg, As, Se, Pb, and Cd, was conducted in Somerset Reservoir as part of MassDEP ORS R&D study in 1994 (Appendix F). Because of elevated mercury MA DPH issued a fish consumption advisory recommending that "Children younger than 12 years, pregnant women, and nursing mothers should not eat largemouth bass from this waterbody and the general public should limit consumption of largemouth bass to two meals per month" (MA DPH 2004). Because of the site-specific advisory, the *Fish Consumption Use* is assessed as impaired.							
Stetson Pond, Pembroke	MA62182	88	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Stetson Pond is a tributary to a Class A, Public Drinking Water Supply, Monponsett Pond (east basin). This waterbody is on the 2002 Integrated List of Waters in Category 5 for nutrients, organic enrichment/low DO and exotic species. Although in 1996 DWM conducted a synoptic survey of Stetson Pond and no non-native aquatic or wetland plants were observed (Appendix C, Table C1), a previously conducted Diagnostic/Feasibility Study documented the presence of *Myriophyllum spicatum* (Baystate 1993). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. Sampling of Stetson Pond was conducted by DWM as part of a nutrient criteria development project in September 2003, but, these data are not yet available.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Sunset Lake, Foxborough	MA62184	14	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Sunset Lake is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of Sunset Lake. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Sweets Pond, Mansfield	MA62185	13	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Sweets Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
The Reservoir, Lakeville	MA62189	23	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
The Reservoir is a tributary to a Class A, Public Drinking Water Supply, Assawompset Pond. This waterbody is on the 2002 Integrated List of Waters in Category 2. In 1996 DWM conducted a synoptic survey of The Reservoir. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Thirty Acre Pond, Brockton	MA62190	26	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Thirty Acre Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Phragmites australis,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present.							
Thurston Street Pond, Wrentham	MA62192	7	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Thurston Street Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Tispaquin Pond, Middleborough	MA62195	195	NOT ASSESSED	NOT ASSESSED	SUPPORT	SUPPORT	NOT ASSESSED
Three beach areas are located on this pond at Camp Avoda, Camp Yomechas, and the Family Campground. Weekly testing was conducted for *E. coli* at the beaches on Camp Yomechas and Camp Avoda in 2002. A total of 17 tests were performed with no exceedences. In 2001 the beach at Camp Avoda was tested once for *E.coli*, fecal coliform and total coliform with no exceedences reported. Also in 2001, testing for *E. coli* was conducted weekly at Camp Yomechas for a total of eight tests and monthly at the Family Campground beach for a total of two tests. No exceedences were reported for either beach area (MA DPH 2003). Since there were no closures/postings during the 2001 or 2002 bathing beach seasons, the *Recreational* uses are assessed as support.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Turnpike Lake, Plainville	MA62198	99	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Turnpike Lake is upstream from a Public Water Supply. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Turnpike Lake two non-native aquatic macrophyte species, *Myriophyllum heterophyllum* and *Cabomba caroliniana,* and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of two non-native aquatic macrophytes, the *Aquatic Life Use* is assessed as impaired.							
Upper Leach Pond, Sharon (Mountain Street Pond)	MA62123	28	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Upper Leach Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Upper Porter Pond, Brockton	MA62200	11	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Upper Porter Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present.							
Vandys Pond, Foxborough (Mcavoy Pond)	MA62112	9	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Vandys Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired.							
Waldo Lake, Avon/Brockton	MA62201	72	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Waldo Lake one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present. Fish toxics monitoring for PCB and selected metals was conducted in Waldo Lake as part of MassDEP Matfield River study in 1989 (MassDEP 1992). No site-specific advisory was issued, so, the *Fish Consumption Use* is not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Ward Pond, Easton	MA62203	6	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Ward Pond is in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Ward Pond. No non-native aquatic plants were observed, but, *Lythrum salicaria,* a non-native wetland species, was noted (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Watson Pond, Taunton	MA62205	78	IMPAIRED (Non-native aquatic plants, Total phosphorus)	NOT ASSESSED	IMPAIRED (Secchi disk transparency, Excess algal growth)		
Watson Pond is in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 5 for nutrients, organic enrichment/low DO, noxious aquatic plants, turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Watson Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). In 2001 MassDEP surveyed the pond for the purpose of TMDL development. Low DO/saturation occurred only near the bottom of the deep hole, which represents a very small portion of the lake (Appendix C, Table C2). In-lake total phosphorus concentrations were moderately high with evidence of phosphorus release from potentially anoxic sediments. Because of the presence of a non-native aquatic macrophyte and the elevated total phosphorus levels, the *Aquatic Life Use* is assessed as impaired. Fish toxics monitoring for PCB, organochlorine pesticides and selected metals, including Hg, As, Se, Pb, and Cd, was conducted in Watson Pond as part of MassDEP ORS R&D study in 1994 (Appendix F). No site-specific advisory was issued, so, the *Fish Consumption Use* is not assessed. Weekly testing for *Enterococci* is performed at Watson Pond. There were no closures/postings during the 2002 bathing beach season (MA DPH 2003). The Secchi disk depth measurements taken during the MassDEP surveys in 2001 violated the bathing beach guidance of four feet on two of the four dates. Moderate chlorophyll levels and field observations of moderate/dense algal populations were also documented (Appendix C, Table C3 and MassDEP 2001a). The *Recreational* and *Aesthetic* uses are assessed as impaired because of the low Secchi disk transparency and the excessive algal growth.							
West Meadow Pond, W. Bridgewater	MA62208	104	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	IMPAIRED (Non-native aquatic plants)		
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of West Meadow Pond one non-native aquatic macrophyte species, *Myriophyllum heterophyllum*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). In 2001 MDFW surveyed the lake for MassDEP for the purpose of TMDL development (Hartley 2002). Results indicated that biovolume density was estimated as 87.50% with a very dense coverage of macrophytes. Limited unqualified water quality data are available (Appendix C, tables C2 and C3). The fish population sampled was dominated by bluegill and pumpkinseed. Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. Fish toxics monitoring for PCB, organochlorine pesticides and selected metals, including Hg, As, Se, Pb, and Cd, was conducted in West Meadow Pond as part of MassDEP (Appendix F). No site-specific advisory was issued, so, the *Fish Consumption Use* is not assessed. The *Recreational* and *Aesthetic* uses are assessed as impaired because of the high density of non-native macrophytes.							
Whiteville Pond, Mansfield	MA62211	14	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Whiteville Pond is in the Canoe River Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 3. In 1996 DWM conducted a synoptic survey of Whiteville Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							

Table 5 (continued). Taunton River Watershed Lake Use Assessments.

Lake, Location	WBID	Size (Acres)	Aquatic Life (Impairment Cause)	Fish Consumption (Impairment Cause)	Primary Contact (Impairment Cause)	Secondary Contact (Impairment Cause)	Aesthetics (Impairment Cause)
Whittenton Impoundment, Taunton	MA62228	20	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Whittenton Impoundment one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present.							
Winnecunnet Pond, Norton	MA62213	152	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
Winnecunnet Pond is a Class A, Public Water Supply and is a part of the Canoe Rive Aquifer ACEC. This waterbody is on the 2002 Integrated List of Waters in Category 4c for the presence of exotic species of plants. During the 1996 MassDEP lake synoptic survey of Winnecunnet Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, and one non-native wetland species, *Lythrum salicaria,* were identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte, the *Aquatic Life Use* is assessed as impaired. A species of *Myriophyllum* was present but needs to be identified when flowering heads are present.							
Wolomolopoag Pond, Sharon	MA62216	13	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters as a Category 2. In 1996 DWM conducted a synoptic survey of Wolomolopoag Pond. No non-native aquatic or wetland plants were observed (Appendix C, Table C1). No recent data are available, so, all uses are not assessed.							
Woods Pond, Middleborough	MA62220	51	IMPAIRED (Non-native aquatic plants)	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED	NOT ASSESSED
This waterbody is on the 2002 Integrated List of Waters in Category 5 for turbidity and exotic species. During the 1996 MassDEP lake synoptic survey of Woods Pond one non-native aquatic macrophyte species, *Cabomba caroliniana*, was identified (Appendix C, Table C1). Because of the presence of a non-native aquatic macrophyte the *Aquatic Life Use* is assessed as impaired.							

LAKE RECOMMENDATIONS

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

- Work with MA DPH and local municipalities to collect quality-assured data under the "Beaches Bill," which requires water quality testing (bacteria sampling) at all formal bathing beaches. When available, review data and beach closure information to assess the status of the recreational uses.

- Review the MassDEP Drinking Water Program SWAP evaluations when they are completed to develop and implement recommendations for the protection of Class A lakes in the Taunton River Watershed.

- Work with the MA DCR Weed Watchers Program to monitor ponds in the Taunton River Watershed for the presence of exotic invasive species and to develop a removal plan if an infestation is found. Additional information may be obtained from the MA DEM website: http://www.state.ma.us/dem/programs/lakepond/weedwatch.htm.

- Action is necessary to manage non-native aquatic or wetland plant species that are isolated in one or a few location(s) in order to alleviate the need for costly and potentially fruitless efforts to do so in the future. Two courses of action should be pursued concurrently. More extensive surveys need to be conducted to determine the extent of the infestation. And, "spot" treatments (refer to the Generic Environmental Impact Report (GEIR) for Eutrophication and Aquatic Plant Management in Massachusetts [Mattson *et al.* 2004] for advantages and disadvantages of each) should be undertaken to control populations at these sites. These treatments may include careful hand-pulling of individual plants in small areas. In larger areas, other techniques, such as selective herbicide application, may be necessary. In either case, the treatments should be undertaken prior to fruit formation and with a minimum of fragmentation of the individual plants. These actions will minimize the spreading of the populations. This GEIR (Mattson *et al.* 2004) should be consulted prior to the development of any lake management plan to control non-native aquatic or wetland plant species.

- Where non-native plant infestations are more extensive conduct additional monitoring to determine the extent of the problem. The Generic Environmental Impact Report for Eutrophication and Aquatic Plant Management in Massachusetts (Mattson *et al* 2004) should be consulted prior to the development of any lake management plan to control non-native aquatic plant species. Plant control options can be selected from several techniques (i.e., bottom barriers, drawdown, herbicides, etc.) each of which has advantages and disadvantages that need to be addressed for the specific site. However, methods that result in fragmentation (such as cutting or raking) should be discouraged because of the propensity for some invasive species to reproduce and spread vegetatively (from cuttings).

- Prevent spreading of invasive plants. Once the extent of the problem is determined and control practices are exercised vigilant monitoring needs to be practiced to guard against infestations in unaffected areas and to ensure that managed areas stay in check. A key portion of the prevention program should be posting of boat access points with signs to educate and alert lake-users to the transport mechanisms and their ability/responsibility to reduce the spread of these species.

- Implement recommendations identified in TMDLs and lake Diagnostic/Feasibility studies, including lake watershed surveys, to identify sources of impairment. The single draft TMDL report for total phosphorus, which is being developed for the eight lakes sampled by DWM in 2001, has been delayed until the C*ranberry Bog Phosphorus Dynamics TMDL Project* has been completed.

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LIST OF APPENDICES, TABLES AND FIGURES

APPENDIX E - TECHNICAL MEMORANDUM (TM-62-2) – TAUNTON RIVER WATERSHED BENTHIC MACROINVERTEBRATE BIOMONITORING

Appendix 1.

Table 1. List of macroinvertebrate taxa collected from stream sites in the Taunton River Watershed between 28 July and 1 August 1996. The sampling sites were in: Canoe River (01), Foxborough; Salisbury Plain River (02 and 03), Brockton; Wading River (05A and 05B), Norton; Rumford River (06), Foxborough--all in Massachusetts.

Appendix 2.

Table 1. Summary of RBP II data analysis for macroinvertebrate communities sampled at six stream sites in the Taunton River Watershed. Seven biological metrics were calculated for taxa collected at each station, and scored (in parentheses). Scores were totaled and compared to the reference station TR01. The percent comparability to the reference station yields a final impairment score for each station.

Table 2. Summary of RBP II data analysis for macroinvertebrate communities sampled at four stream sites (TR02, TR03, TR05A, TR05B) in the Taunton River Watershed. Seven biological metrics were calculated for taxa collected at each station, and scored (in parentheses). Scores were totaled and compared to the upstream reference station. The percent comparability to the reference station yields a final impairment score for each station.

APPENDIX F - MADEP OWM/DEP FISH TOXICS MONITORING IN THE TAUNTON RIVER WATERSHED 1994, 1995, 2001, AND 2003

Table F1. Analytical Results for 1995 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys.

Table F2. Analytical Results for 2001 Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys.

APPENDIX G - SUMMARY OF NPDES AND WMA PERMITTING INFORMATION, TAUNTON RIVER WATERSHED

Table G1. Taunton River Watershed Municipal Major NPDES Wastewater Discharge Facilities.

Table G2. Taunton River Watershed Industrial Major NPDES Wastewater Discharge Facilities.

Table G3. Taunton River Watershed Minor NPDES Wastewater Facilities.

Table G4. Taunton River Watershed Multi-sector General Stormwater Permits.

Table G5. Taunton River Watershed User Data.

APPENDIX H - TAUNTON RIVER WATERSHED - 2001 PERIPHYTON DATA AND RESULTS

APPENDIX I - MA DEP GRANT AND LOAN PROGRAM PROJECTS IN THE TAUNTON RIVER WATERSHED

There are no tables or figures in this appendix.