CHICOPEE RIVER WATERSHED
2003 WATER QUALITY ASSESSMENT REPORT

Ware River, Ware, Massachusetts

COMMONWEALTH OF MASSACHUSETTS
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Prepared by
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Massachusetts Department of Environmental Protection
Division of Watershed Management

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Division of Watershed Management
Worcester, Massachusetts

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  - Bureau of Resource Protection (BRP)
  - Bureau of Waste Prevention (BWP)
  - Bureau of Waste Site Cleanup (BWSC)
- Massachusetts Department of Public Health (MDPH)
- Massachusetts Department of Fish and Game (MassWildlife)
  Division of Fisheries and Wildlife (MDFW)
- Massachusetts Department of Conservation and Recreation (MA DCR)

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

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Cover Photo Credit: Ware River – Therese Beaudoin, MassDEP

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List of Acronyms and Abbreviations

7Q10'……..Lowest mean flow for seven consecutive days to be expected once in ten years
ACOE Army Corps of Engineers
ADB .....Assessment Database
BRP……Bureau of Resource Protection
BMP.....Best Management Practices
BOD.....Biological Oxygen DemandF
BWSC……Bureau of Waste Site Cleanup
CERO..... Central Environmental Regional Office
C-NOEC .....Chronic No Observe Effect Concentration
CSO ..... Combined Sewer Overflow
DO .....Dissolved Oxygen
EOEA .....Executive Office of Environmental Affairs
EPA.....United States Environmental Protection Agency
FERC.....Federal Energy Regulatory Commission
LC_{50}.....Lethal concentration to 50% of the test organisms
MA DCR Massachusetts Department of Conservation and Recreation.
MassDEP.....Massachusetts Department of Environmental Protection
MA DFG.....Department of Fish and Game (formerly the Department of Fisheries, Wildlife and Environmental Law Enforcement)
MA DPH.....Massachusetts Department of Public Health
MDC Metropolitan District Commission
MDL..... Method Detection Limit
MWRA..... Massachusetts Water Resources Authority
NOAA……..National Oceanic and Atmospheric Adminsitration
NPDES..... National Pollutant Discharge Elimination System
PALIS..... Pond and Lake Information System
PCB..... Polychlorinated Biphenyl
QAPP ..... Quality Assurance Project Plan
RBP..... Rapid Bioassessment Protocol
SARIS ..... Stream and River Inventory System
SMART ..... Strategic Monitoring and Assessment for River Basin .....Teams
SRF..... State Revolving Fund
SWQS..... Surface Water Quality Standards
TMDL ..... Total Maximum Daily Load
TOXTD..... MassDEP DWM Toxicity Testing Database
TRC .....Total Residual Chlorine
TSS ..... Total Suspended Solids
USFWS.....United States Fish and Wildlife Service
USGS..... United States Geological Survey
WBID..... Waterbody Identification Code
WBS..... Waterbody System Database
WMA ..... Water Management Act
WWTP..... Wastewater treatment plant

List of Units

cfs ..... cubic feet per second
cfu..... colony forming unit
MGD..... million gallons per day
mg/L ..... milligram per liter
NTU..... nephelometric turbidity units
ppm ..... parts per million
SU..... standard units
µS/cm..... microsiemens per centimeter
µg/g ..... microgram per gram
kg/ha/year ..... kilogram per hectacre per year

Table of Fish Scientific Names

Common name	*Scientific name*	Common name	*Scientific name*
Alewife	*Alosa pseudoharengus*	Largemouth bass	*Micropterus salmoides*
American Eel	*Anguilla rostrata*	Longnose dace	*Rhinichthys cataractae*
Black crappie	*Pomoxis nigromaculatus*	Northern pike	*Esox lucius*
Eastern blacknose dace	*Rhinichthys atratulus*	Pumpkinseed	*Lepomis gibbosus*
Banded Sunfish	*Enneacanthus obesus*	Rainbow trout	*Oncorhynchus mykiss*
Bluegill	*Lepomis macrochirus*	Redbreasted Sunfish	*Lepomis auritus*
Brook trout	*Salvelinus fontinalis*	Redfin x Chain Pickerel	*Esox americanus x niger*
Brown bullhead	*Ameiurus nebulosus*	Rock bass	*Ambloplites rupestris*
Brown trout	*Salmo trutta*	Smallmouth Bass	*Micropterus dolomieu*
Chain pickerel	*Esox niger*	Tesselated Darter	*Etheostoma olmstedi*
Common Shiner	*Luxilus cornutus*	Tadtpole Madtom	*Noturus gyrinus*
Creek Chubsucker	*Erimyzon oblongus*	Yellow Bullhead	*Ameiurus natalis*
Fallfish	*Semotilus corporalis*	Yellow Perch	*Perca flavens*
Golden shiner	*Notemigonus crysoleucas*	White sucker	*Catostomus commersonii*

Executive Summary

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 Massachusetts Surface Water Quality Standards (SWQS) for the Chicopee River Watershed for reporting to EPA in the Integrated List of Waters, updates the assessments from the 1998 Water Quality Assessment Report (Mass DEP 2001), and provides basic information that can be used to focus resource protection and remediation activities later in the watershed management planning process.

The SWQS designate the most sensitive uses for which surface waters in the Commonwealth shall be protected. 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 exist or quality-assured data are unavailable, 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 many lakes and river miles do not have an assigned assessment segment and the status of the designated uses of these unassessed waters has never been reported to the 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).

In 2003 the Massachusetts Department of Environmental Protection (MassDEP), Division of Watershed Management (DWM), conducted water quality sampling and baseline lakes sampling, in the Chicopee River Watershed under Environmental Protection Agency (EPA) approved Quality Assurance Project Plans (QAPPs). The water quality monitoring data are available in a technical memorandum (DeCesare 2006, Appendix B). The lakes data are available in the technical memorandum entitled *Baseline Lakes 2003 Technical Memo* (MassDEP 2007a, Appendix C).

The data generated by DWM, together with other sources of information, were utilized to assess the status of water quality conditions of rivers and lakes in the Chicopee River Watershed in accordance with EPA's and MassDEP's use assessment methods. It is important to note that assessment methodologies have changed over time and a direct comparison between current and previous assessments of this watershed is not possible.

This report includes information on 29 freshwater rivers, stream or brooks (the term "rivers will hereafter be used to include all). The assessed rivers represent approximately 46% of the named rivers in the Chicopee River Basin that have been assigned SARIS (Stream and River Information System) code numbers (Halliwell *et al*. 1982). Numerous rivers have never been assessed, and are not included in this report. This report also includes information on seventy-four lakes, ponds, or impoundments that have been assigned a Pond and Lake Identification System (PALIS) number in the Chicopee River Watershed, representing 93% of the total lake acreage

A summary of the use assessments for the rivers and lakes in the Chicopee River Watershed is provided in Table 1. See also Figures 1-5 for a summary of the designated use assessments detailed in this report.

Table 1. River miles and lake acreage in the ChicopeeRiver Basin assessed as support, impaired, or not assessed for each use (with percentage of total river miles or acreage in report).

	River (Total Length included in report - 212.6 miles		
Use	**Support**	**Impaired**	**Not Assessed**
Aquatic Life	116.1 (55%)	2.4 (1%)	94.1 (44%)
Fish Consumption	0 (0%)	0.3 (0. 1%)	212.3 (99.9%)
Drinking Water	Not Assessed in this Report[1]		
Primary Contact	77.0 (36%)	24.2 (11%)	111.4 (52%)
Secondary Contact	98.2 (46%)	3.0 (1%)	111.4 (52%)
Aesthetics	192.9 (91%)	0 (0%)	19.7 (9%)

	Lakes (Total Acreage included in report--29798[2]		
Use	**Support**	**Impaired**	**Not Assessed**
Aquatic Life	0 (0%)	25630 (89%)	3268 (11%)
Fish Consumption	0 (0%)	25936 (87%)	3862 (13%)
Drinking Water	Not Assessed in this Report[1]		
Primary Contact	24012 (80.6%)	544 (1.8%)	5242 (17.6%)
Secondary Contact	24012 (80.6%)	544 (1.8%)	5242 (17.6%)
Aesthetics	24239 (81%)	544 (2%)	5015 (17%)

1- While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers

2 – Quabbin Reservoir (20412 acres) constitutes 81 percent of the lake acreage in the Chicopee River basin.

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Fish Consumption Use

The following waterbodies in the Chicopee River Basin are impaired for the *Fish Consumption Use*: Ware River (MA36-03), Pottapaug Pond Basin (MA36125), Quabbin Reservoir (MA36129), Lake Lashaway (MA36079), Quaboag Pond (MA36130), Quacumquasit Pond (MA36131), Wickaboag Pond (MA36166). There is also currently a statewide fish consumption advisory (see Figure 2, MA DPH 2001). A TMDL, a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for certain regional waterbodies to meet and maintain compliance with state and federal water quality standards, was recently approved for mercury by the U.S. EPA.

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). All of the waterbodies impaired for *Fish Consumption Use* and listed above with the exception of Ware River (MA36-03) and Quaboag Pond (MA361630) are covered by this TMDL. The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time. It should be noted that not all river segments or lakes will have specific recommendations. Numerous general recommendations detailed below apply to these river segments or lakes.

GENERAL RECOMMENDATIONS

Bacteria source tracking studies should be conducted as appropriate in the seven river segments that are impaired for *Primary Contact Recreation Use*.

Continue to conduct biological and water quality monitoring to evaluate the effect(s), if any of National Pollution Discharge Elimination (NPDES) discharges, water withdrawals, and non-point sources of pollution and to document any changes in water quality as a result of infrastructure improvements/pollution abatement controls. Specific attention should be given towards gauging *Primary* and *Secondary Contact Recreation Uses* in segments impaired for these uses and those segments affected by CSO discharges.

Baseline sampling and aquatic macrophyte mapping should be conducted to evaluate the status of designated uses of lakes in the basin with special attention to sampling lakes with suspected infestations of non-native aquatic macrophytes.

Fish passage should be encouraged at both hydropower plants and other dams in the watershed. In addition, dam removal should be encouraged to promote ecological continuity as feasible.

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) should be successfully implemented, with a minimum of a 90 percent control on out-of region coal-fired power plants emissions and successful control of in-state/regional reductions in mercury sources (NEIWPCC 2007). Fish toxics monitoring should be conducted in waterbodies impaired for the *Fish Consumption Use*

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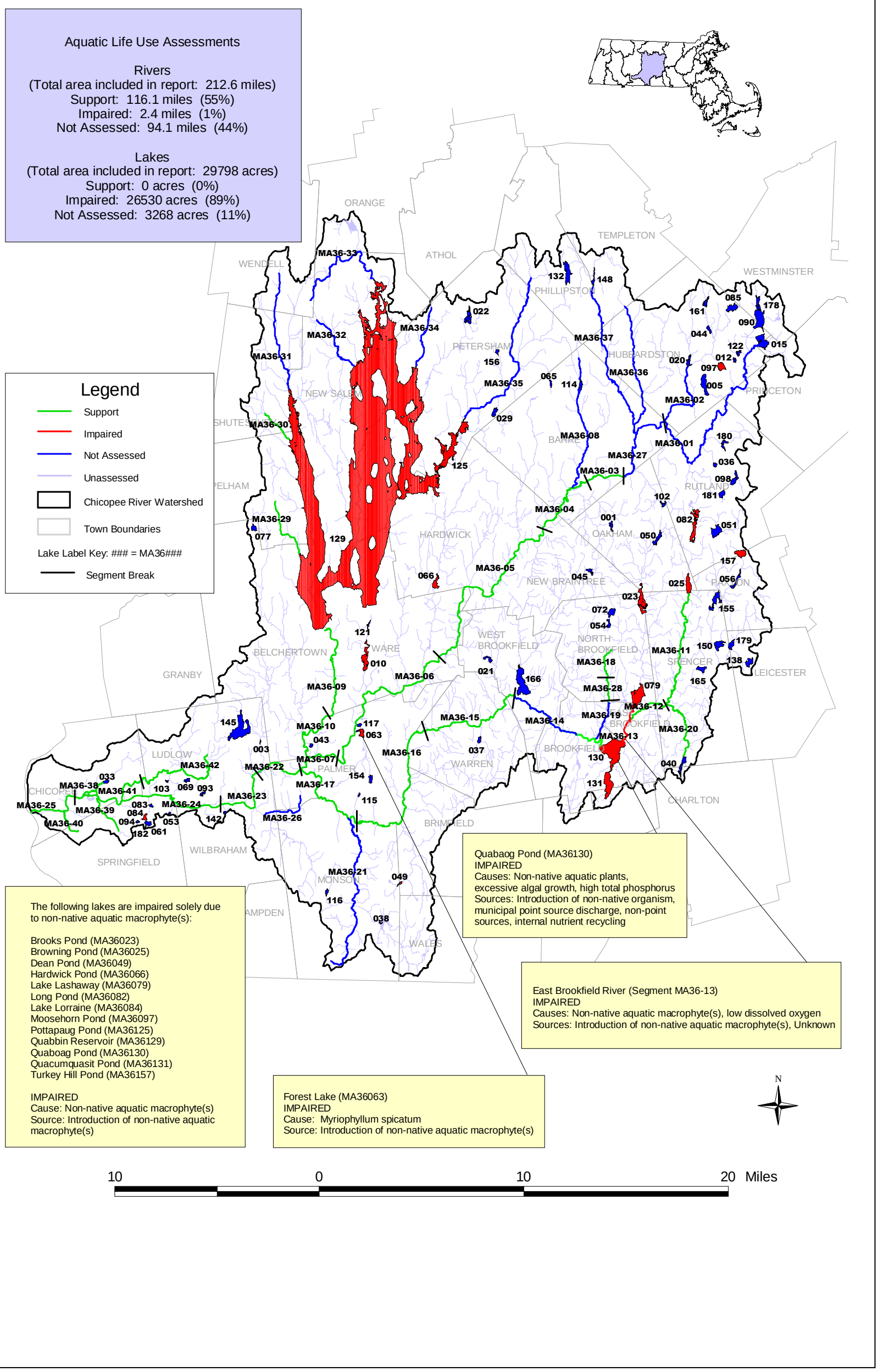

Figure 1: Chicopee River Basin *Aquatic Life Use* Summary

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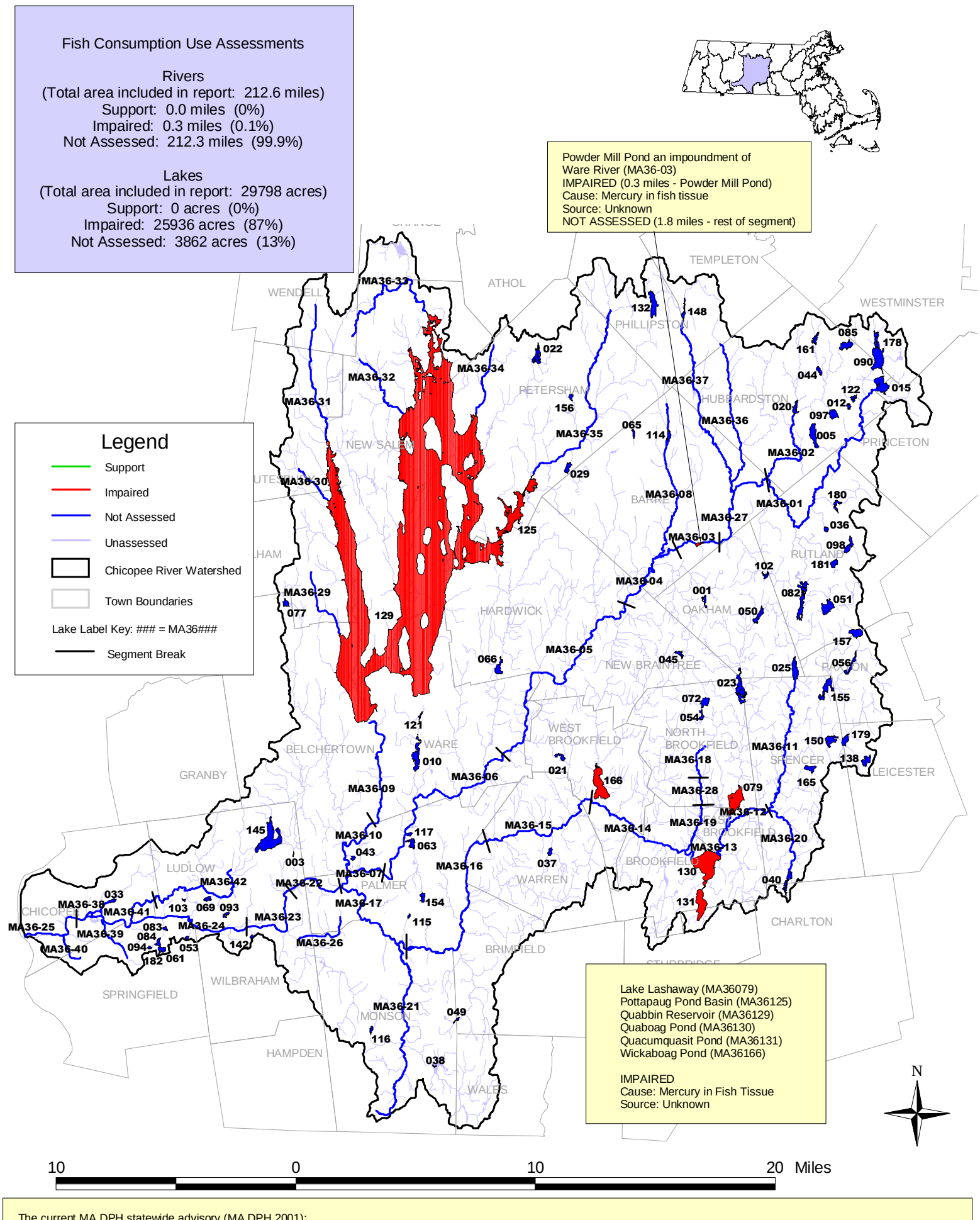

The current MA DPH statewide advisory (MA DPH 2001):

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

Since the statewide advisory encompasses all freshwaters in Massachusetts, the Fish Consumption Use for waterbodies cannot be assessed as support.

Northeast Regional Mercury TMDL: On 20 December 2007 the U.S. EPA approved the Northeast Regional Mercury Total Maximum Daily Load (TMDL). This TMDL is a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for regional waterbodies to meet and maintain compliance with state and federal water quality standards. It was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers inland waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data.
Final targets will be determined at that time.

Figure 2: Chicopee River Basin *Fish Consumption Use* Assessment Summary

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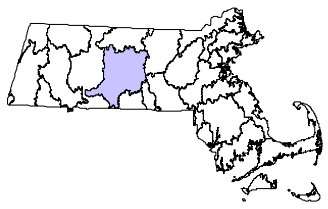
Primary Contact Recreation
Use Assessments

Rivers
(Total area included in report: 212.6 miles)
Support: 77.0 miles (36.2%)
Impaired: 24.2 miles (11.4%)
Not Assessed: 111.4 miles (52.4%)

Lakes
(Total area included in report: 29798 acres)
Support: 24012 acres (80.6%)
Impaired: 544 acres (1.8%)
Not Assessed: 5242 acres (17.6%)



Ware River (MA36-05)
SUPPORT (Upper 3.8 miles)
IMPAIRED (Lower 7.7 miles)
Cause: Elevated E. coli
Source: Unknown

Legend
- Support
- Impaired
- Not Assessed
- Unassessed
- Chicopee River Watershed
- Town Boundaries

Lake Label Key: ### = MA36###
Segment Break

Fuller Brook (MA36-41)
Unnamed tributary
to the Chicopee River (MA36-39)
IMPAIRED
Cause: Elevated E. coli
Source: Unknown

Quaboag River (MA36-17)
Chicopee River (MA36-22)
Chicopee River (MA36-25)
IMPAIRED
Cause: Elevated E. coli
Source: Combined sewer overflows

Forget-Me-Not-Brook (MA36-28)
IMPAIRED
Cause: Elevated E. coli
Source: Unknown

Quaboag Pond (MA36130)
IMPAIRED
Causes: Non-native aquatic macrophyte(s), excessive algal growth
Sources: Introduction of non-native aquatic macrophyte(s),
municipal point source discharge, internal nutrient recycling

10 0 10 20 Miles

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Figure 3: Chicopee River Basin *Primary Contact Recreational Use* Assessment Summary

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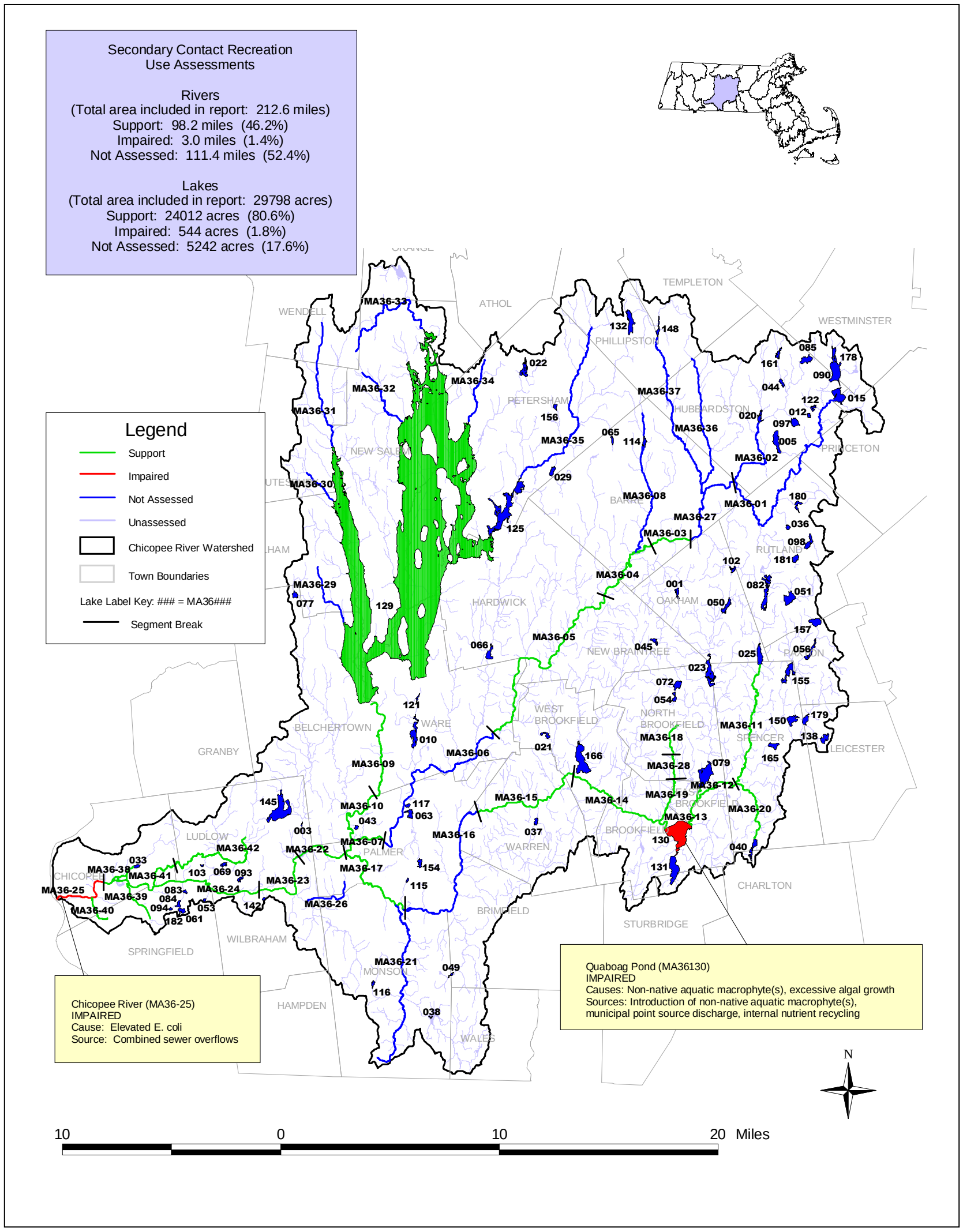

Figure 4: Chicopee River Basin *Secondary Contact Recreation Use* Assessment Summary

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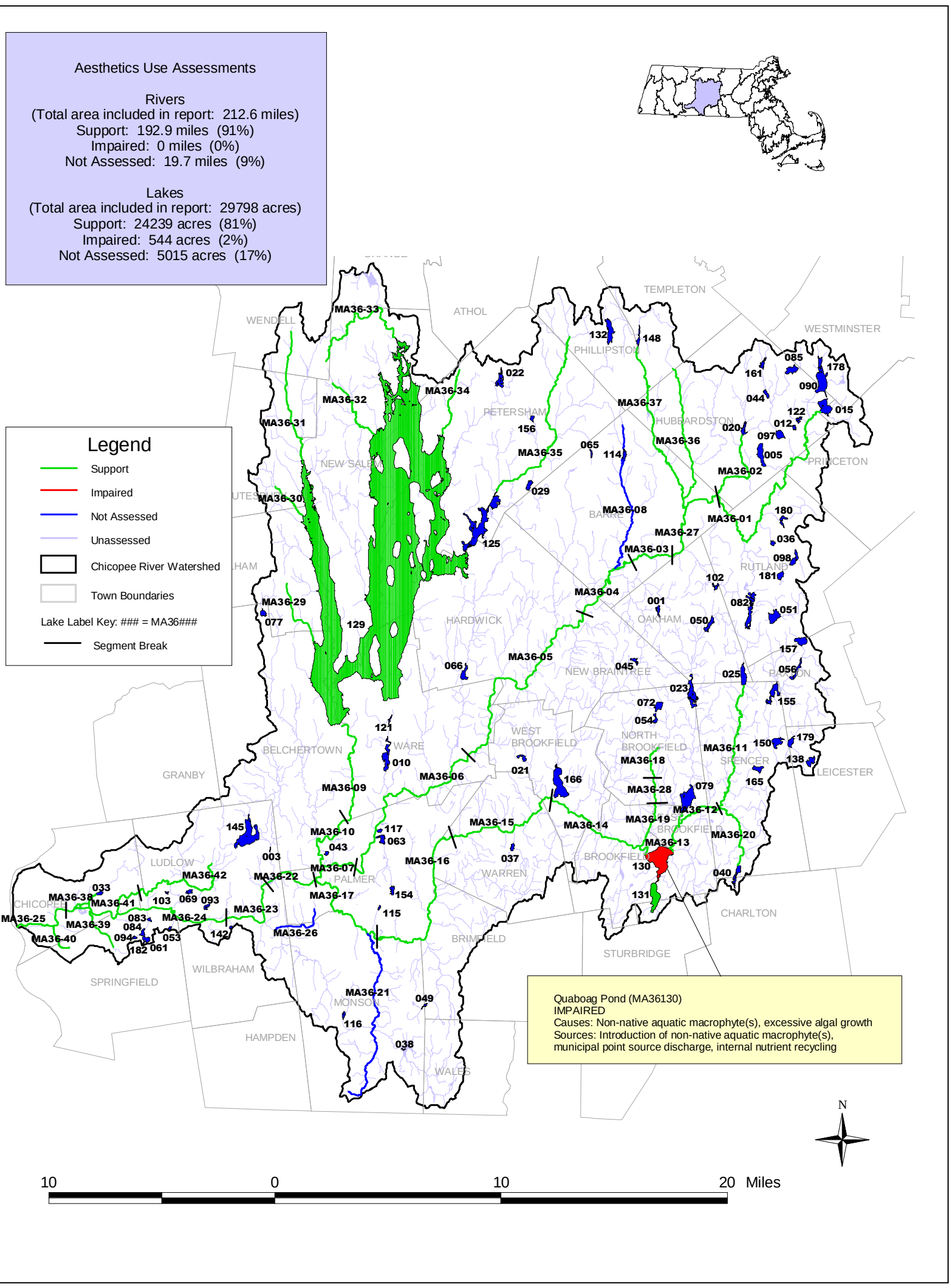

Figure 5: Chicopee River Basin *Aesthetics Use* Assessment Summary

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Chicopee River Basin Description

The Chicopee River Basin covers an area of 723 square miles in Franklin, Hampshire, Hampden, and Worcester counties in central Massachusetts (Wandle 1984). It encompasses all or parts of 39 communities: Athol, Barre, Belchertown, Brimfield, Brookfield, Charlton, Chicopee, East Brookfield, Granby, Hampden, Hardwick, Hubbardston, Leicester, Ludlow, Monson, New Braintree, New Salem, North Brookfield, Oakham, Orange, Palmer, Paxton, Pelham, Petersham, Phillipston, Princeton, Rutland, Shutesbury, Spencer, Springfield, Sturbridge, Templeton, Wales, Ware, Warren, Wendell, West Brookfield, Westminster, and Wilbraham. It is bordered by the Connecticut River Basin on the west and the Millers River Basin on the north, the Nashua River Basin on the northeast, a small portion of the Blackstone River Basin on the east, and the French and Quinebaug river basins to the southeast.

The Chicopee River Basin includes three major subbasins (the Swift, Ware, and Quaboag river systems) that merge to form the mainstem Chicopee River. The Swift River has three upper branches that flow into the Quabbin Reservoir, a manmade reservoir that serves as one of the major water supplies for metropolitan Boston. From the outlet of Quabbin Reservoir, the Swift River flows in a southerly direction to its confluence with the Ware River. The Ware River is formed by the confluence of east and west branches in Barre, and it flows in a generally southwest direction until joining the Quaboag River. The Quaboag River originates at the outlet of Quaboag Pond in Brookfield and flows southwest until it joins the Ware River. The Chicopee River is formed at the confluence of the Ware and Quaboag rivers in the village of Three Rivers in Palmer. It flows generally west to its confluence with the Connecticut River in Chicopee, MA. The Chicopee River contributes an average annual flow of 909 cubic feet per sec (cfs) to the Connecticut River (USGS 2007).

The topography of the Chicopee River Basin is characterized by rolling hills and alluvial plains with numerous natural and artificial lakes. The topography rises to heights of over 1,500 feet above mean sea level in the northern portion of the basin and drops to only 40 feet in the Connecticut Valley lowlands in the southwest. Granite and metamorphic rocks underlie most of the basin, while red sandstones, dark shales, and other sedimentary rocks are found near the Connecticut River (Kimball 1975).

There are 136 named rivers in the Chicopee River Basin that have been assigned SARIS (Stream and River Information System) code numbers (Halliwell *et al*. 1982). These streams and rivers flow an estimated 464.2 miles. There are approximately 1,200 river miles in the Chicopee River Basin according to the 1:24,000 National Hydrography Data coverage (Meek 2007). A total of 174 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) have been identified and assigned Pond and Lake Information System (PALIS) code numbers in the Chicopee River Basin (Ackerman 1989 and MassDEP 2000). The total surface area of the catalogued Chicopee River Basin lakes is 32,099 acres. For a map of river segments and lakes detailed in this report see Figure 6.

In the Swift River Subbasin the Swift River and Old Beaver Brook were impounded by Windsor Dam and Goodnough Dike in 1946 to form the Quabbin Reservoir. The Quabbin Reservoir's watershed area is 187 square miles, more than a quarter of the entire Chicopee River Basin. The Massachusetts Department of Conservation and Recreation manages this public water supply reservoir, which has a capacity of 412 billion gallons, and a surface area of 39.4 square miles. The mean and maximum depth in the reservoir is 45 and 151 feet, respectively. Due in part to Quabbin Reservoir's elongated shape and large size that results in long detention times, significant dilution and settling of tributary inflows, water quality in the reservoir is excellent. The reservoir has very crystalline water with low turbidity, bacterial counts, algal densities, and nutrients (MA DCR 2004, 2005, 2006b, 2007). The Massachusetts Water Resources Authority (MRWA) is allowed to withdraw (WMA Registration Number 10830901) 186.7 MGD from the reservoir. The majority of this water is transferred out of the Chicopee River Basin to supply potable water to 44 communities in the Metropolitan Boston area and three western Massachusetts communities. Water is delivered from Quabbin Reservoir via two tunnel systems.

The Quabbin Aqueduct is a 24.6-mile tunnel that travels from midway up the eastern arm of the reservoir in Hardwick to the Oakdale Power Station on the upper end of Wachusett Reservoir in West Boylston (Nashua River Basin). The Chicopee Valley Aqueduct (CVA) is a 14.77-mile tunnel that runs from the southern end of Quabbin Reservoir at Windsor Dam in Belchertown to the Nash Hill Reservoir in Chicopee. The Ware River may also be diverted via Shaft 8 in Barre into either the Quabbin or Wachusett Reservoirs. The diversions are allowed between 15 October and 15 June when flow in the Ware River exceeds 85 MGD. All other diversions require MassDEP approval (MDC 1997).

Manufacturing, wholesale and retail trades are the key industries of the region. Combined sewer overflow locations are present in the lower Chicopee River Basin, particularly in the Chicopee River, lower Ware River and the lower Quaboag River. There are a number of municipal and industrial National Pollution Discharge Elimination System (NPDES) permits as well as communities permitted for stormwater runoff (Appendix D). These permitted sources of pollution are also important determinants of water quality. Nonpoint source pollution that is associated with storm runoff, septic systems, landfills, and agriculture is also known to contribute to the watershed's water quality problems. In addition to providing drinking water, water in the Chicopee River Basin is managed by a number of dams in the Chicopee River Basin that are used for hydropower (listed below:)

Hydroelectric power plants:

- The Consolidated Edison Energy Massachusetts, Inc. plants on the Chicopee River (MA0035777 Dwight Station, MA0035815 Indian Orchard Station, MA0035823 Red Bridge Station and MA0035831 Putts Bridge Station in Chicopee and Ludlow) are all exempt from FERC licensing requirements.

Other hydroelectric projects exempt from FERC licensing requirements that do not have NPDES permits:

- Chicopee Municipal Light Plant (on Chicopee River), Chicopee
- Ware River Power (Ware Lower Project on Ware River)
- South Barre Hydroelectric Company (South Barre Mill Pond Dam Project and Powdermill Pond Project both on the Ware River)
- I Maxmat Corp. (Collins Project on Chicopee River)

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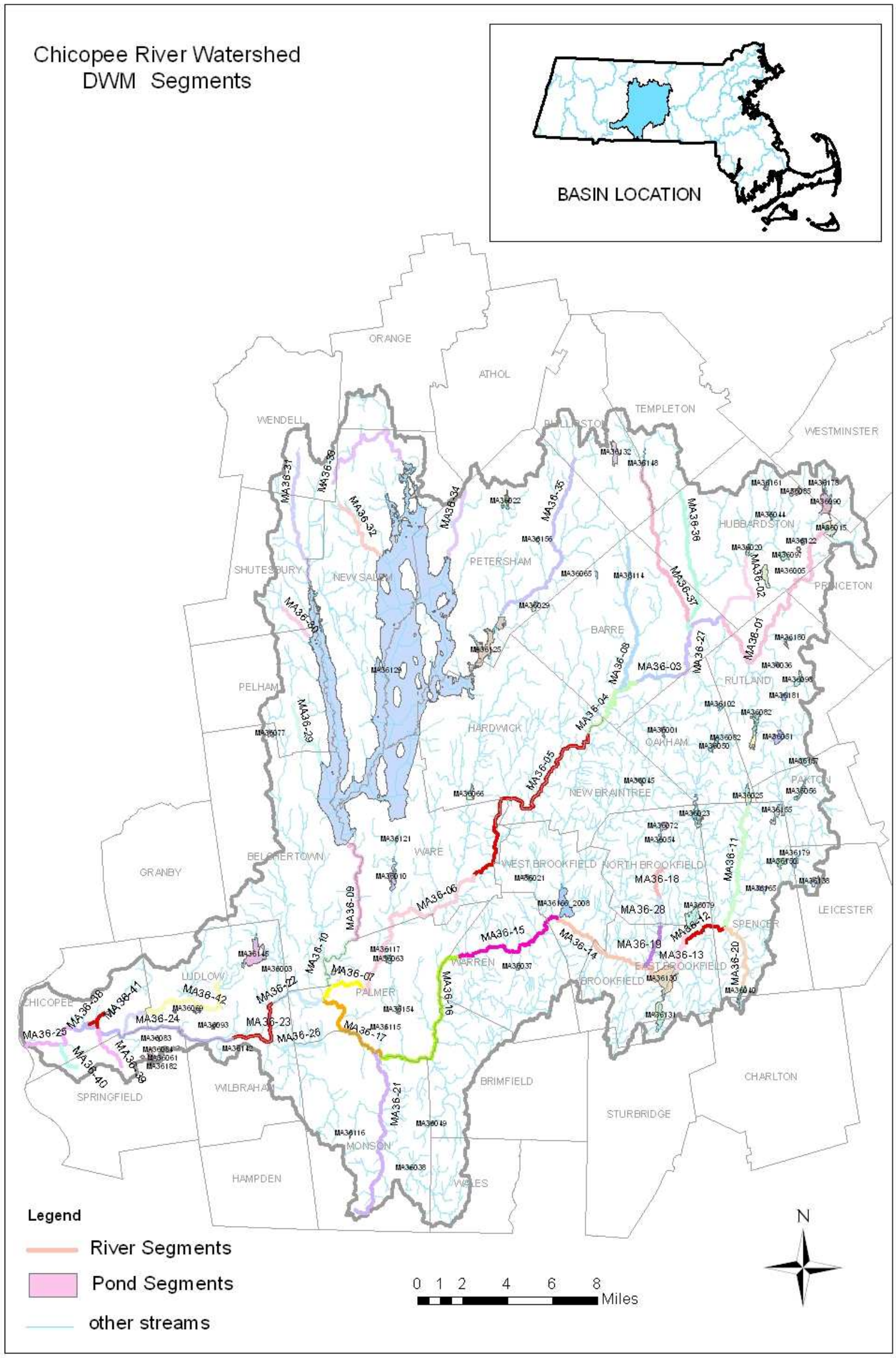

Figure 6: Chicopee River Basin - River Segments and Lake Segments

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The Swift River Subbasin

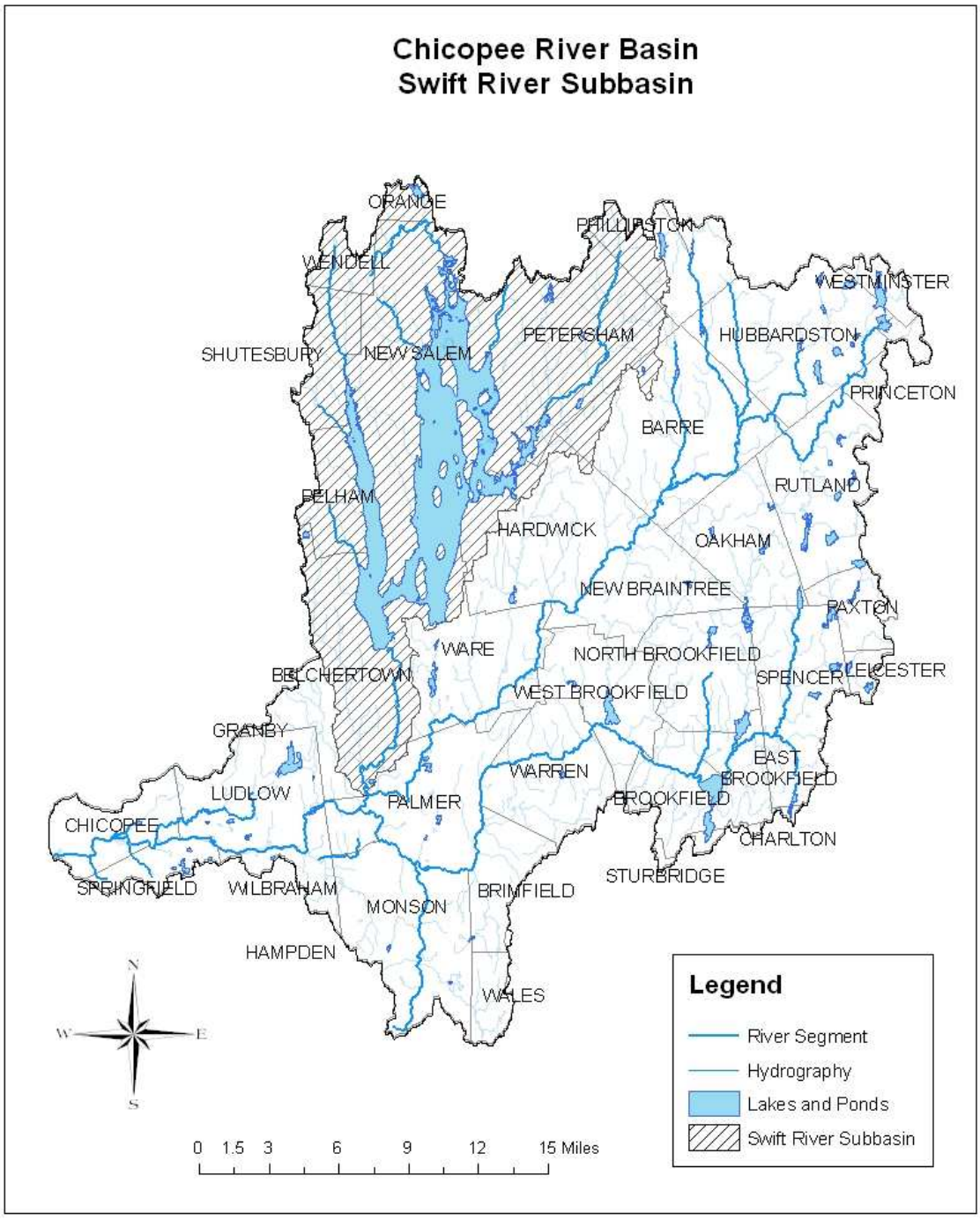


Figure 7: Swift River Subbasin

CADWELL CREEK (SEGMENT MA36-29)
Location: Headwaters east of Route 202 and northwest of Dodge Hill, Pelham, to mouth at Quabbin Reservoir, Belchertown
Segment Length: 3.2 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG conducted fish population sampling in Cadwell Creek at Gate 8, Quabbin Road crossing (Site 1211) in Pelham using a backpack electro-shocker (Richards 2006). Sixty-one brook trout were collected (61 fish total). This stream is considered a Coldwater Fishery Resource by MA DFG (Richards 2006).

The presence of multiple age classes of wild brook trout is indicative of excellent water and habitat quality as well as a stable flow regime. It is quite common to find only brook trout in small first order tributary streams (Maietta 2007).

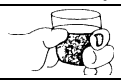
Water Chemistry
Cadwell Creek has been identified as critically sensitive to acid rain deposition given the creek's limited acid neutralizing capacity and low pH (MA DCR 2004).

Given the presence of multiple age classes of brook trout *the Aquatic Life Use* is assessed as support. Due to its acid sensitivity Cadwell Creek is given "Alert Status".

Primary and Secondary Contact Recreation and Aesthetics Uses
No objectionable conditions have been reported in Cadwell Creek, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent quality-assured data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Cadwell Creek (Segment MA36-29) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
** Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment.

Given the presence of brook trout, collect sufficient water temperature data to evaluate this waterbody for designation as a Cold Water Fishery in future Surface Water Quality Standards.

ATHERTON BROOK (SEGMENT MA36-30)
Location: Headwaters at confluence of Town Farm and Osgood Brooks, Shutesbury, to mouth at Quabbin Reservoir, Pelham
Segment Length: 1.9 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG conducted fish population sampling in Atherton Brook at Route 202 – Gate 15, Quabbin Reservoir Road crossing (Site 1210) in Shutesbury on 12 September 2005 using a backpack electro-shocker (Richards 2006). Forty-eight brook trout were collected (48 fish total). This stream is considered a Coldwater Fishery Resource by MA DFG (Richards 2006).

The presence of multiple age classes of wild brook trout is indicative of excellent water and habitat quality as well as a stable flow regime. It is quite common to find only brook trout in small first order tributary streams (Maietta 2007).

Water Chemistry
No quality-assured data are available for Atherton Brook.

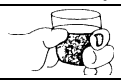
Atherton Brook has been identified as critically sensitive to acid rain deposition given the creek's limited acid neutralizing capacity and low pH (MA DCR 2004).

Given the presence of multiple age classes of brook trout the *Aquatic Life Use* is assessed as support. Due to its acid sensitivity Atherton Creek is given "Alert Status".

Primary and Secondary Contact Recreation and Aesthetics Uses
No objectionable conditions have been reported in Atherton Brook, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent quality-assured data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Atherton Brook (Segment MA36-30) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
** Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment.

Given the presence of brook trout, collect sufficient water temperature data to evaluate this waterbody for designation as a Cold Water Fishery in future Surface Water Quality Standards.

WEST BRANCH SWIFT RIVER (SEGMENT MA36-31)
Location: Headwaters - Outlet of small unnamed impoundment east of Cooleyville Road in Wendell State Forest, Wendell, to mouth at Quabbin Reservoir, Shutesbury/New Salem.
Segment Length: 6.3 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
USGS maintains a gage near Shutesbury, MA, on the west branch of the Swift River (Gage 01174565) 800 feet downstream from State Highway 202. The average annual discharge at the gage is 22.0 cfs (period of record 2000 to 2005).

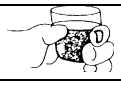
The drainage area to this gage is 12.6 mi^2. The period of record is Nov. 1983-Sept. 1985 and April 1995 to present. The average discharge for ten water years (1985, 1996-2004) is 22.1 cfs. The maximum discharge occurred on 17 September 1999 (1,490 cfs) and the minimum discharge occurred in mid-September of 1995 (about 0.35 cfs) (Socolow *et. al* 2005). Records are considered fair by USGS except estimated daily discharges and discharges greater than 100 cfs, which are considered poor (Socolow *et. al* 2005).

Biology
MA DFG stocks the West Branch Swift River with trout (MA DFG 2007).

Due to a lack of recent quality-assured data the *Aquatic Life Use* is not assessed.

Primary and Secondary Contact Recreation and Aesthetics Uses
No recent quality-assured data are available for the West Branch Swift River. No objectionable conditions have been reported in the West Branch Swift River, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006). The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

West Branch Swift River (Segment MA36-31) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment. Conduct water quality monitoring to assess *Aquatic Life Use*.

Given the presence of brook trout, collect sufficient water temperature data to evaluate this waterbody for designation as a Cold Water Fishery in future Surface Water Quality Standards.

HOP BROOK (SEGMENT MA36-32)
Location: Headwaters upstream from West Street, New Salem, to mouth at Quabbin Reservoir, New Salem.
Segment Length: 3.7 miles
Classification: Class A, Public Water Supply

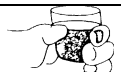
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
No recent quality-assured data are available for Hop Brook. All designated uses with the exception of the *Aesthetics Use* are not assessed.

No objectionable conditions have been reported in the Hop Brook, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006). The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Hop Brook (Segment MA36-32) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment. Conduct water quality monitoring to assess *Aquatic Life Use*.

Conduct fish population sampling to assess the *Aquatic Life Use*.

MIDDLE BRANCH SWIFT RIVER (SEGMENT MA36-33)
Location: Headwaters just north of Wendell and New Salem State Forests (South of the Swift River School), Wendell, to mouth at Quabbin Reservoir, New Salem.
Segment Length: 6.9 miles.
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2- Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).
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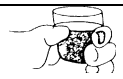
WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Biology
MA DFG stocks the Middle Branch Swift River with trout (MA DFG 2007).

No recent quality-assured data are available for Middle Branch Swift River. All designated uses with the exception of the *Aesthetics Use* are not assessed.

No objectionable conditions have been reported in the Middle Branch Swift River, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006). The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Middle Branch Swift River (Segment MA36-33) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment. Conduct water quality monitoring and conduct fish population sampling to assess *Aquatic Life Use*.

WEST BRANCH FEVER BROOK (SEGMENT MA36-34)
Location: Headwaters just north (upstream) of Route 122 in Petersham, to mouth at Quabbin Reservoir, Petersham
Segment Length: 3.4 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks West Branch Fever Brook with trout (MA DFG 2007).

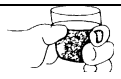
MA DFG conducted fish population sampling in West Branch Fever Brook at Route 122 – Women's Federal Forest (Site 887) in Petersham, MA, on 20 August 2003 using a backpack electro-shocker (Richards 2005). Twenty fallfish, sixteen blacknosed dace, two chain pickerel, and one channel catfish were collected (39 fish total). MA DFG fishery biologists noted that the stream was free-flowing at this location and located downstream from a large beaver pond. They also noted that few fish were collected given the area sampled.

Although total numbers of fish were low the sample was dominated by two fluvial specialists; a condition indicative of a stable flow regime. It is unclear why fish numbers were so low within this reach; but the presence of a large beaver dam just upstream may be affecting total fish numbers.

Other than the MA DFG fish population work, no other recent quality-assured data are available for West Branch Fever Brook. All designated uses with the exception of the *Aesthetics Use* are not assessed.

No objectionable conditions have been reported in the West Branch Fever Brook, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006). The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

West Branch Fever Brook (Segment MA36-34) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Coordinate with MA DCR on future water quality data collection on this segment. Conduct water quality monitoring to assess *Aquatic Life Use*.

Consider fish population sampling in an area unaffected by beaver dams to determine fish population structure and numbers.

EAST BRANCH SWIFT RIVER (SEGMENT MA36-35)
Location: Headwaters at the confluence of Shattuck and Popple Camp Brooks, Phillipston, to mouth at Pottapaug Pond, Petersham.
Segment Length: 9.8 miles
Classification: Class A, Public Water Supply.

Connor Pond (MA36039) will no longer be reported on as an approximately 22-acre lake segment since the estimated retention time of this waterbody is approximately two days. It will be considered a run–of-the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from two USGS stream gages in the Chicopee River Basin (01173000 and 01172500) and the normal storage volume of the dam reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the East Branch Swift River with trout (MA DFG 2007).

MA DFG conducted fish population sampling in the East Branch Swift River at East Street below Browning Pond (Site 877) in Petersham on 21 July 2003 using a backpack electro-shocker (Richards 2006). Fifteen pumpkinseed, fifteen common shiner, ten brown bullhead, seven eastern blacknose dace, four chain pickerel, three white sucker, three longnose dace, two brown trout and one tessellated darter were collected (67 fish total). MA DFG biologists noted the water level was low during sampling and that the two brown trout collected were stocked fish.

The fish sample was a mix of fluvial specialist/dependent and macrohabitat generalist species. Although the presence of six fluvial specialist/dependent species is generally indicative of a stable flow regime the low numbers of fish and low water levels noted by MA DFG suggests otherwise. All fish species present (with exception of stocked brown trout) are classified as being tolerant or moderately tolerant to pollution. The presence of macrohabitat generalists is most likely a result of this reach's proximity to Browning Pond. It should be noted that although native trout were not collected or observed, this stream is considered a Coldwater Fishery Resource by MA DFG (Richards 2006)

MA DFG also conducted fish population sampling in the East Branch Swift River at Quaker Road crossing (Site 874) in Petersham on 21 July 2003 using a backpack electro-shocker (Richards 2006). Seventy-three eastern blacknose dace, fifteen longnose dace, fourteen fallfish, five yellow bullhead, four common shiner, three white sucker and one tessellated darter were collected (115 fish total). MA DFG fishery biologists noted that the water level was low at this sampling site.

Despite low water levels noted on the date of sampling, all fish collected at this station, except yellow bullhead, are classified as fluvial specialist/dependents, which usually indicates a stable flow regime. Overall number of fluvial specialist/dependents was low (n= 38).

MA DFG conducted fish population sampling in the East Branch Swift River below Connors Pond Road (Site 870) in Petersham on 21 July 2003 using a backpack electro-shocker (Richards 2006). Ninety-eight golden shiner, twenty-three longnose dace, twenty-three eastern blacknose dace, eighteen common shiner, ten pumpkinseed, nine tessellated darter, four yellow perch, two

white sucker and two yellow bullhead were collected (189 fish total). MA DFG fishery biologists noted that the water level was very low at this sampling site.

The fish sample was a mix of fluvial specialist/dependent and macrohabitat generalist species. Although the presence of five fluvial specialist/dependent species is generally indicative of a stable flow regime the golden shiner dominance (macrohabitat generalists) in the sample and the low flow levels suggest otherwise. All fish species present are classified as being tolerant or moderately tolerant to pollution. The presence of macrohabitat generalists may be a result of this reach's proximity to Connors Pond.

MA DFG conducted fish population sampling in the East Branch Swift River upstream the Glen Valley Road crossing (Site 895) in Petersham on 8 August 2003 using a backpack electro-shocker (Richards 2006). One hundred and eighteen eastern blacknose dace, twenty-three longnose dace, eighteen fallfish, fourteen bluegill, seven white sucker, five tessellated darter, four largemouth bass, three golden shiner, two yellow perch, two yellow bullhead, two pumpkinseed and one chain pickerel were collected (199 fish total). MA DFG fishery biologists noted that the water level was low at this sampling site and they covered 85 percent of the river in the sampling reach during sampling.

The fish sample was a mix of fluvial specialist/dependent and macrohabitat generalist species. Although the presence of seven macrohabitat generalist species is generally indicative of compromised flow regime the sample was heavily dominated by fluvial specialist/dependent species. All fish species present are classified as being tolerant or moderately tolerant to pollution. Eastern blacknose dace dominance in the sample (n= 118) suggests the possibility of nutrient enrichment at this site (Maietta 2007).

MA DFG conducted fish population sampling in the East Branch Swift River near the intersection of Glen Valley Road and the powerlines (Site 896) in Petersham on 8 August 2003 using a backpack electro-shocker (Richards 2006). Sixty-four eastern blacknose dace, fifty-five white sucker, twenty-nine fallfish, twenty-three longnose dace, thirteen common shiner, ten tessellated darter, ten golden shiner, ten largemouth bass, three bluegill, three brook trout, and one yellow perch were collected (221 fish total). MA DFG fishery biologists noted sampling started at end of long pond and estimated they caught 70% of the fish and covered 100% of river. MA DFG fishery biologists also noted that the brook trout caught were wild.

The fish sample was a mix of fluvial specialist/dependent and macrohabitat generalist species. Although four macrohabitat generalist species were present, the sample was heavily dominated by fluvial specialist/dependent species. With the exception of brook trout (wild), which are intolerant to pollution, all other fish species present are classified as being tolerant or moderately tolerant to pollution. Atlhough the numbers of wild brook trout were low (n=3) their presence suggests excellent water and habitat quality and corroborates MA DFG's classification of the East Branch Swift River as a Coldwater Fishery Resource.

MA DFG conducted fish population sampling in the East Branch Swift River near the Route 32A crossing (Site 878) in Petersham on 8 August 2003 using a backpack electro-shocker (Richards 2006). Thirty-nine fallfish, thirty-eight longnose dace, thirty-one eastern blacknose dace, seven yellow bullhead, five largemouth bass, four pumpkinseed, four bluegill, three yellow perch, three brook trout, three white sucker and one golden shiner were collected (139 fish total). MA DFG fishery biologists noted that they used two backpack electro-shockers and that the three brook trout collected were wild.

The fish sample was a mix of fluvial specialist/dependent and macrohabitat generalist species. Although six macrohabitat generalist species were present, the sample was dominated by fluvial specialist/dependent species. With the exception of brook trout (wild), which are intolerant to pollution, all other fish species present are classified as being tolerant or moderately tolerant to pollution. Although the numbers of wild brook trout were low (n=3) their presence suggests

excellent water and habitat quality and corroborates MA DFG's designation of the East Branch Swift River as a Coldwater Fishery Resource.

Water Chemistry
Other than the MA DFG fish population work, no other recent quality-assured data are available for East Branch Swift River.

East Branch Swift River is classified by MassDEP as a Class A waterbody. It is not only stocked with trout by MA DFG but is also designated a Cold Water Fishery Resource by MA DFG(Richards 2006). Wild trout were only found at two of the six sites sampled and their numbers were low. MA DCR sampling data for temperature indicate that the East Branch of the Swift River often exceeds 20°C during summer months (MA DCR 2006a). Fish assemblages varied between sites and although a compromised flow regime was suggested at a few sites while other sites appeared to be supporting a fluvial fish community. Macrohabitat generalists dominated at two sites that were located in close proximity to mainstem impoundments. The *Aquatic Life Use* is assessed as support given the presence of pollution intolerant wild trout. This segment is given an "Alert Status" due to the low numbers of trout observed despite it's designation as a Coldwater Fishery Resource.

Primary and Secondary Contact Recreation and Aesthetics Uses
No objectionable conditions have been reported in the West Branch Fever Brook, which is protected and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent quality-assured data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

East Branch Swift River (Segment MA36-35) 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
Coordinate with MA DCR on future water quality data collection on this segment. Conduct water quality monitoring and benthic macroinvertebrate monitoring to assess *Aquatic Life Use*.

Future fish population monitoring should concentrate sampling on areas further from mainstem impoundments and include extended deployment of temperature sensors during the summer to better document the extent of the wild trout population.

SWIFT RIVER (SEGMENT MA36-09)
Location: Windsor Dam, Belchertown, to Upper Bondsville Mill Dam, Belchertown/Palmer.
Segment Length: 5.6 miles.
Classification: Class B, Cold Water Fishery.

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Massachusetts Division of Fisheries and Wildlife (McLaughlin& Palmer State Fish Hatchery) registration/permit (10802402/9P10802401)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D1, D4)
Massachusetts Division of Fisheries and Wildlife (McLaughlin& Palmer State Fish Hatchery) (MA0110043)
Belchertown (MAR0411002)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
USGS maintains a gage (Gage 01175500) on the Swift River in West Ware, MA, 1.4 mi downstream from the Quabbin Reservoir. The drainage area is 189 mi^2 including 1.6 mi^2 drained by Beaver Brook, flow that is diverted from the Ware River Basin (USGS 2007). The period of record is July 1910 to present (USGS 2007). The average discharge after completion of Quabbin Reservoir (1940-2005) is 94.4 cfs (USGS 2007). The maximum discharge occurred on 19 March 1936 (7,590 cfs). The maximum discharge since the construction of Quabbin Reservoir in 1939 occurred on 1 June 1984 (3,070 cfs). The minimum discharge occurred on 15 December 1968 (9.1 cfs) (USGS 2007).

The USGS remarks that flow has been regulated by Quabbin Reservoir since August 1939 (USGS 2007). The flow has been diverted from the Ware River to Quabbin Reservoir since 1940, from Quabbin Reservoir to Wachusett Reservoir since 1941, from Quabbin Reservoir to Chicopee Valley aqueduct since 1950, and from Quabbin Reservoir to the city of Worcester at times since 1966 (Socolow *et al.* 2004). Records with estimated daily discharge above 200 cfs are considered fair by USGS while all other records are considered good. During 2003 the Quabbin Reservoir released a total of 9236.4 million gallons or 25.3 MGD into the Swift River (MA DCR 2004). The Swift River's largely steady flow mimics this discharge (Appendix B).

The Swift River begins at the Windsor Dam with flow regulated by the MWRA via a control structure in the Quabbin power plant. From 1 December through 31 May, MA DCR is required to release 20 MGD out of Quabbin Reservoir to the Swift River. From 1 June through 30 November, the required releases (per order of the US War Department) are dependent on the streamflow of the Connecticut River at the USGS Montague gage. When the flow of the Connecticut River is <4900 cfs, the required release at Quabbin Reservoir is 45 MGD and when the flow is <4650 cfs, the required release at Quabbin Reservoir is 71 MGD. In practice, however, the MA DCR releases either 20 or 71 MGD from the reservoir or more depending on reservoir operating conditions (Austin 1993).

The wetlands and waterways in this segment of the Swift River are identified as habitat for rare and endangered species by the state's Natural Heritage and Endangered Species Program. The Swift River contains a variety of habitat types. The river's gradient, cold water coming from the depths of Quabbin Reservoir, and the impoundment and extensive wetlands formed by the Upper Bondsville Mill Dam in the village of Bondsville, Palmer, result in a mix of cold and warmwater fisheries habitat. The Upper Bondsville Mill Dam, however, has been classified by MA DCR's

Office of Dam Safety as a high hazard dam. There is currently no responsible party to implement dam safety improvements or removal.

The Swift River is heavily stocked with trout and is fished all year long by anglers, including icefishing. Special fishing regulations apply to two different portions of this river segment (see *MA DFG Abstracts of the Massachusetts Fish and Wildlife Laws* for details).

In July 2006 Mass Riverways conducted a habitat improvement project on this segment. The project entitled "Swift River Rock Structure Removal" improved habitat by eliminating flow constriction caused by rock piles left in the river by a former bridge (Graber 2004). The goal was to change pool habitat into new riffles. Mass Riverways staff conducted longitudinal and cross-sectional profiles off the stream before project implementation (Graber 2004). Since the river now carries approximately one quarter of the flow it experienced before the Quabbin Reservoir, they found a channel that was deeply incised, largely uniform in structure and disconnected from the floodplain (Graber 2004). A new channel has formed inside of the former channel, which was sized by historic flows. Riverways staff also found the bed structure to be comprised of a larger particle size distribution, typical of a stream that saw higher flows than currently found (Graber 2004).

Biology

MA DFG stocks this stream with trout (MA DFG 2007). Graber (2004) found significant number of rainbow trout and brook trout during their pre-project implementation habitat survey. The rainbow trout were found to be largely adults while multiple age classes of brook trout were found (Graber 2004).

Water Chemistry

DWM conducted water quality monitoring at Station SR03 (Cold Spring/Old Belchertown Road, Belchertown) along this segment of the Swift River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. There is also a MassDEP Central Environmental Regional Office (CERO) Strategic Monitoring and Assessment for River Basin Teams (SMART) station on this segment off River Road, at the USGS flow gage, west of River Road in Ware. DWM conducted water quality at this station (SRG) on the Swift River between May and August 2003 (Appendix B). CERO SMART crews also conduct water quality monitoring at this location each year in addition to DWM sampling. The DWM data collected in 2003 at both stations (SR03 and SRG) as part of DWM monitoring is summarized below.

Parameter	DWM 2003
DO (mg/L)	8.2 – 11.4 (n=13)
Percent Saturation (%)	82 – 108 (n=13)
pH (SU)	5.9-6.5 (n=13)
Temperature (℃)	8.9 – 14.6 (n=13)
Conductivity (µS/cm at 25℃)	43.5 – 67.0 (n=13)
Total phosphorus (mg/L)	0.008- 0.034 (n=7)
Ammonia- nitrogen (mg/L)	<0.02- 0.15 (n=6)
Total suspended solids (mg/L)	<1 -<2 (n=3)

All water quality data meets standards except pH, which was found to be slightly lower than the criterion on the majority of sampling events. Given the good water quality and the presence of multiple age classes of brook trout this segment supports the *Aquatic Life Use*. This use is identified with an "Alert Status" due to the low pH found.

Primary and Secondary Contact Recreation Uses

DWM conducted water quality monitoring at one station (SR03-Cold Spring/Old BelchertownRoad, Belchertown) along this segment of the Swift River between April and October 2003 (Appendix B). The geometric mean of *E. coli* counts was 5.1 cfu/100 mL. The bacteria

samples collected are summarized below. None of the DWM or CERO field crews noted any objectionable conditions (objectionable deposits, scums, or odors) at this site during the sampling season with the exception of two occasions when the water had a manure odor (Appendix B).

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<0.9 - 100
Geometric mean	8.1
E. coli (cfu/100mL)	<0.9 - 80
Geometric mean	5.1

Both *Primary* and *Secondary Contact Recreational Uses* are supported given the low bacteria levels found at this site. The *Aesthetics Use* is supported for the Swift River.

Swift River (Segment MA36-09) Use Summary Table

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

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

RECOMMENDATIONS

Conduct benthic macroinvertebrate and fish population sampling to assess *Aquatic Life Use*.

SWIFT RIVER (SEGMENT 36-10)
Location: Upper Bondsville Mill Dam, Belchertown/Palmer, to confluence with Ware River, Palmer.
Segment Length: 3.9 miles.
Classification: Class B, Cold Water Fishery, CSO.

Although this segment is classified as a CSO in the 2006 Massachusetts Water Quality standards, all CSOs in this segment have been eliminated (see below) and this should not be classified with a CSO qualifier.

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

The Old Bondsville Factory, a Tier 1A Hazardous Waste Site (#1-0000968), is located along the upper reach of this segment (Mass DEP 2001)

The Upper Bondsville Mill Dam has been classified as a high hazard dam (MA DCR 2002). The Belchertown Land Trust currently owns it.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Bondsville Fire and Water Department registration/permit (10822704/9P210822702)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D2, D4)
Palmer WTTP (MA0101168)
Belchertown (MAR041002)
Palmer (MAR041017)

Palmer WWTP (MA0101168) is permitted to discharge via three wet weather CSOs (outfalls 024, 025, and 026) to this segment of the Swift River. Hydraulic modeling performed as part of Palmer's CSO Abatement Plan conducted in 1994-1996 estimated the following discharge quantities based on a three-month frequency storm.

Village of Bondsville (upstream to downstream)
Outfall #026 – 1,380 gallons (intersection of Main Street with Spring Street)
Outfall #025 – 8,650 gallons (intersection of Main Street with Depot Street)
Outfall #024 – 7,230 gallons (intersection of Main Street with First Street)

The Town's permit was reissued on 29 September 2000. Palmer's May 1999 Final Long Term Control Plan for CSO Abatement identified four phases of sewer separation throughout Palmer to eliminate CSO discharges. Sewer separation work to eliminate CSO outfalls 024, 025, and 026 was proposed for the third phase of work at an estimated cost of $810,000. In 1999 Palmer submitted a request for MA SRF financing for the first three phases of work and in November 1999 was selected to receive financing for $7.1 million dollars. MassDEP approved sewer separation, including drainage areas to CSO outfalls #024, 025, and 026, in December 2000 as part of CW SRF-423. Sewer Separation has been completed and there are no known remaining CSO's on this Swift River segment (Boisjolie 2007a).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
DWM conducted water quality monitoring at one station (SR02- Rte 181/State St., Palmer) along this segment of the Swift River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, ammonia-nitrogen and total phosphorus (Appendix B).

A summary of measured water quality parameters at the DWM station on this segment is below.

Parameter	DWM 2003
DO (mg/L)	9.2 – 11.1 (n=9)
Percent Saturation (%)	98 – 105 (n=9)
pH (SU)	6.8 –7.0 (n=9)
Temperature (℃)	11.9 – 19.5 (n=9)
Conductivity (µS/cm at 25℃)	56.0 – 66.0 (n=9)
Total phosphorus (mg/L)	0.023- 0.033 (n=5)
Ammonia- nitrogen (mg/L)	<0.02-< 0.10 (n=6)
Total suspended solids (mg/L)	< 2 (n=6)

Dissolved oxygen, pH, and temperature all meet criteria at the DWM station on the Swift River. Ammonia-nitrogen concentrations were low while total phosphorus concentrations ranged from 0.020 mg/L and 0.033 mg/L. Given the good water quality conditions found the *Aquatic Life Use* is assessed as support.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted water quality monitoring at one station (SR02- Rte 181/State St., Palmer) along this segment of the Swift River between April and October 2003 (Appendix B). The geometric mean of *E. coli* counts was 34.4 cfu/100 mL and no count was greater than 235 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 - 140
Geometric mean	40.4
E. coli (cfu/100mL)	2 - 120
Geometric mean	34.4

DWM field crews found trash on four occasions (mainly cans and bait worm containers) although the extent of the trash was not extensive. White foam was noted on three occasions but generally no scums were noted. No water odor was noted with the exception of one occasion when the water had a rotting vegetable smell. No shoreline erosion was found at this station as the banks were armored.

Both *Primary* and *Secondary Contact Recreational Uses* are supported given the low bacteria counts found at this site. Due to the lack of objectionable conditions, the *Aesthetics Use* is assessed as support for this segment of the Swift River

Swift River (Segment MA36-10) Use Summary Table

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

RECOMMENDATIONS

Conduct water quality monitoring (water chemistry, multiprobe) to assess the *Aquatic Life Use.*

Conduct bacteria sampling to assess the *Primary* and *Secondary Contact Recreational Uses*.

The Ware River Subbasin

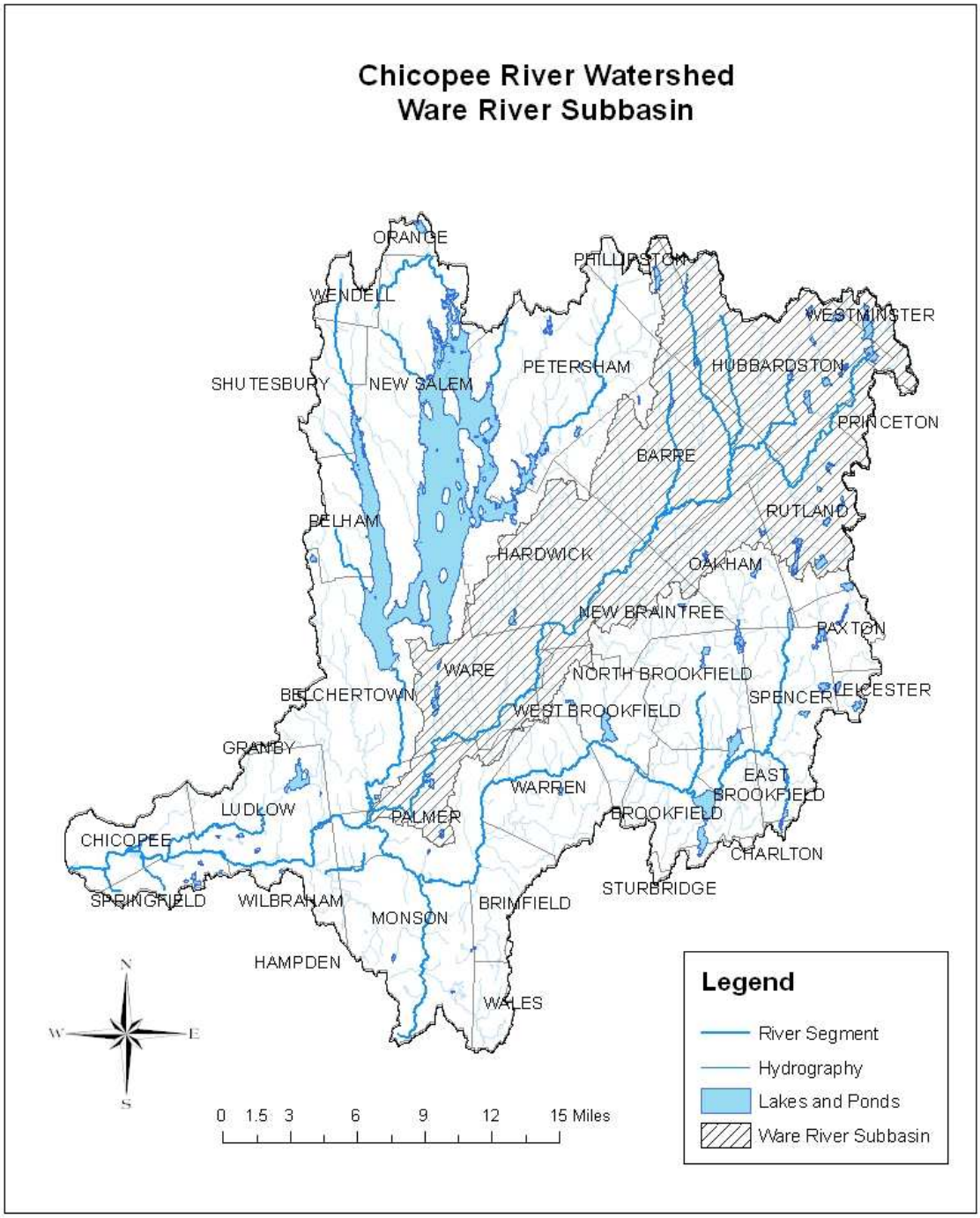


Figure 8: Ware River Subbasin

EAST BRANCH WARE RIVER (SEGMENT MA36-01)
Location: Outlet Bickford Pond, Hubbardston, to confluence with the West Branch Ware River, Barre.
Segment Length: 12.4 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Organic enrichment/low DO (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Fitchburg Water Department registration/permit (20809701/9P20809701)

The Fitchburg Water Department's use of water from the Bickford Reservoir and Mare Meadow Reservoir for drinking water purposes, have the potential to influence streamflows in the East Branch Ware River. This withdrawal also represents an out-of-basin transfer of water as the drinking water is consumed and the wastewater is disposed of in Fitchburg in the Nashua River Basin.

NPDES SURFACE WATER DISCHARGES (APPENDIX E, TABLE E4)
Town of Rutland (MAR041154)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG conducted fish population sampling on the East Branch Ware River near Intervale Road in Rutland (Site 889) and at the Prison Camp Road crossing in Rutland (Site 891) on 26 August 2003 using a backpack electro-shocker (Richards 2006). Fourteen longnose dace, five fallfish, three common shiner, one tessellated darter, one chain pickerel, one brown trout and one eastern blacknose dace were found at the Intervale Road site (Site 889, 26 fish total). Fluvial specialists/dependants dominated the sample. Although overall fish numbers were low at this site, it should be noted that fish sampling efficiency was rated as poor due to dark stained water. It is unclear what effect the presence of numerous beaver dams (upstream and downstream) may be having on the fish assemblage at this site.

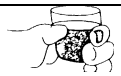
At the Prison Camp Road crossing site (Site 891) eighteen redbreasted sunfish, five longnose dace, five fallfish, five common shiner, four chain pickerel, three yellow bullhead, three tessellated darter, and one brown trout were collected (44 fish total). Although the sample was dominated by redbreast sunfish, a macrohabitat generalist, five fluvial specialists/dependants were also present. This sampling station was located just upstream from a wetland dominated reach, which likely contributed to the large number of redbreast sunfish.

Although the fish community was fairly diverse and fluvial specialist/dependant species were well represented, too limited data are available, so the *Aquatic Life Use* is not assessed.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics
No recent quality-assured bacterial data are available for East Branch Ware River.
No objectionable conditions have been reported in the East Branch Ware River, which is protected and managed by MA DCR as part of the Ware River Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

East Branch Ware River (Segment MA36-01) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

Conduct water quality monitoring to evaluate designated uses.

Review USGS report (2006-5044) and forthcoming reports on reservoir operations and flow management practices.

Evaluate the flow management practices (e.g., outlet control operations) of the lakes in this subwatershed.

Conduct continuous temperature to determine the temperature dynamics during the summer months.

WEST BRANCH WARE RIVER (SEGMENT MA36-02)
Location: Outlet Brigham Pond, Hubbardston, to confluence with the East Branch Ware River, Barre
Segment Length: 4.5 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the West Branch Ware River with trout (MA DFG 2007). MA DFG conducted fish population sampling in the West Branch Ware River near Brigham Road crossing in Barre (Site 890) on 26 August 2003 using a backpack electro-shocker (Richards 2006). Sixteen fallfish, fifteen tessellated darter, eight longnose dace, six chain pickerel, six banded sunfish, one wild brook trout, one common shiner and one redbreast sunfish were collected (54 fish total). Fluvial specialists/dependants dominated the sample and the presence of a single native brook trout is noteworthy. Although only brook trout are classified as being intolerant to pollution, the additional presence of longnose dace and tessellated darter (moderately tolerant) suggests good water quality and quantity. Overall fish numbers were low given the length of the reach that was sampled.

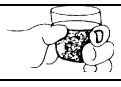
Water Chemistry
No recent quality-assured water quality data are available for West Branch Ware River.

Although the fish community was fairly diverse and fluvial specialist/dependant species were well represented, too limited data are available, so the *Aquatic Life Use* is not assessed.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics
No recent quality-assured bacterial data are available for the West Branch Ware River.
No objectionable conditions have been reported in the West Branch Ware River, which is protected and managed by MA DCR as part of the Ware River Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

West Branch Ware River (Segment MA36-02) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Conduct water quality and biological monitoring to evaluate designated uses.

Deploy multiple multiprobes along this segment to determine the effects if any of large wetland areas on oxygen dynamics in this segment.

CANESTO BROOK (SEGMENT MA36-36)
Location: Headwaters northwest of Hubbardston State Forest near the Hubbardston/Templeton town line to the confluence with Ware River, Barre
Segment Length: 7.3 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG conducted fish population sampling in the Canesto Brook near the Route 62 crossing in Barre (Site 883) on 14 August 2003 using a backpack electro-shocker (Richards 2006). Twelve eastern blacknose dace, five white sucker, four tessellated darter, one banded sunfish, and one chain pickerel were collected (23 fish total). Fluvial specialists/dependants dominated the sample. Overall fish numbers were low given the length of the reach sampled although sampling efficiency was noted as poor due to high and cloudy waters at the sampling site (Richards 2006).

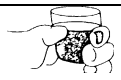
Water Chemistry
No recent quality-assured water quality data are available for Canesto Brook.

Although the fish community was largely composed of fluvial specialist/dependant species, too limited data are available, so the *Aquatic Life Use* is not assessed.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics
No objectionable conditions have been reported in Canesto Brook, which is protected and managed by MA DCR as part of the Ware River Watershed (Bishop 2006).

The Primary and Secondary Contact Recreation Uses are not assessed given the lack of recent data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Canesto Brook (Segment MA36-36) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Conduct water quality and biological monitoring to evaluate designated uses.

BURNSHIRT RIVER (SEGMENT MA36-37)
Location: Headwaters - Outlet Stone Bridge Pond, Templeton/Phillipston, to the confluence with Canesto Brook, Barre
Segment Length: 8.6 miles
Classification: Class A, Public Water Supply

Williamsville Pond (MA36167) will no longer be reported on as an approximately 57-acre lake segment since the estimated retention time of this waterbody is approximately five days. It will be considered a run-of-the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from two USGS stream gages in the Chicopee River Basin (01173000 and 01172500) and the normal storage volume of the dam reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the Burnshirt River with trout (MA DFG 2007).

MA DFG conducted fish population sampling in the Burnshirt River downstream from Gilbert Road in Barre (Site 881) on 19 August 2003 using a backpack electro-shocker (Richards 2006). Forty-three common shiner, twenty-three eastern blacknose dace, sixteen fallfish, ten brown bullhead, seven longnose dace, six white sucker, two yellow bullhead, two bluegill, one brown trout, one tessellated darter, and one chain pickerel were collected (112 fish total). Fluvial specialists/dependent species dominated the sample.

The presence of longnose dace and tessellated darter (moderately tolerant) suggests good water quality and quantity. Although the presence of brown trout, an intolerant fluvial specialist is notable, only one specimen assumed to have been stocked was collected. Overall fish numbers were good.

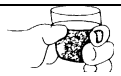
Water Chemistry
No recent quality-assured data are available for Burnshirt River.

Although the fish community was largely composed of fluvial specialist/dependant species, too limited data are available, so the *Aquatic Life Use* is not assessed.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics
No recent quality-assured data are available for Burnshirt River. No objectionable conditions have been reported in Burnshirt River, which is protected and managed by MA DCR as part of the Ware River Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Burnshirt River (Segment MA36-37) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

Conduct water quality and biological monitoring to evaluate designated uses.

A review of flow management practices at Queen Lake, Stone Bridge and Williamsville ponds could be conducted to determine the effects if any of said practices on temperatures in the Burnshirt River.

WARE RIVER (SEGMENT MA36-27)
Location: Headwaters - Confluence of East Branch Ware and West Branch Ware rivers to MDC intake, Barre
Segment Length: 4.9 miles
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Organic Enrichment/low DO and thermal modifications (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
MDC-MWRA Ware River diversion, registration (10830901)

The Massachusetts Water Resources Authority (MRWA) is allowed to divert the Ware River via Shaft 8 in Barre into either the Quabbin or Wachusett Reservoirs (WMA registration number 10830901). The diversions are allowed between 15 October and 15 June when flow in the Ware River exceeds 85 MGD. All other diversions require MassDEP approval (MDC 1997).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The U.S. Army Corps of Engineers (ACOE) owns and maintains Barre Falls Dam, a dry bed reservoir built in 1958 for flood control purposes, along this segment of the Ware River Segment near the Barre/Hubbardston town boundary. The Barre Falls Dam does not maintain a conservation or recreation pool, so inflow equals outflow except during flood-control operations. According to the ACOE (US ACOE 2003), during daily operations and maintenance activities "the minimum outflow should be the less of inflow or 55 cfs from October through March, 220 cfs from April through May and 30 cfs from June to September". The ACOE operations procedure "stipulates a minimum release of 30 cfs at dam during periods of regulation to sustain downstream fish life" (US ACOE 2003). Active dam operations may influence the flow of water in this segment.

USGS maintains a gage near Barre, MA, on the Ware River (Gage 01172500) 700 feet downstream from the Barre Falls Reservoir. The average annual discharge at the gage is 95.3 cfs (period of record 1946 to 2005) (USGS 2007). The drainage area is 55.1 mi^2 and the maximum discharge occurred on 16 October 1955 (1,890 cfs) (USGS 2007). Since the construction of the Barre Falls Reservoir in 1958, the maximum discharge for this gage occurred on 13 April 1987 (1,630 cfs) (Socolow *et al*. 2004). The minimum daily discharge occurred on 8 September 1995 and 11 September 1995 (0.1cfs) (Socolow *et al*. 2004). During the period of 3-8 September and on 13 September 1996 this gage experienced no flow for at least part of the day (Socolow *et al*. 2004).

The USGS remarks that there was slight regulation at low flow at times by Long Pond before August 1955. The flow has been regulated by the Barre Falls Reservoir since 1958 and since 1955 has been diverted at times from 6.5 mi^2 upstream the station for municipal drinking water supply to Fitchburg (Socolow *et al*. 2004). Estimated daily discharge records are considered fair by the USGS (Socolow *et al*. 2004).

Biology
MA DFG stocks the Ware River with trout (MA DFG 2007). MA DFG conducted fish population sampling in the Ware River upstream from Route 122 in Barre (Site 893) on 10 September 2002 using a backpack electro-shocker (Richards 2006). This sampling station is within the impounded portion of the Ware River formed by the MDC intake dam. One hundred and forty golden shiner, thirty-four chain pickerel, twenty-seven common shiner, sixteen white sucker, twelve pumpkinseed, ten yellow perch, nine bluegill, six creek chubsucker, two largemouth bass, two fallfish, one rainbow trout and one redbreast sunfish were collected (260 total fish). The fish

assemblage at this station was a mix of macrohabitat generalists and fluvial specialist/dependent species. Although macrohabitat generalists dominated the sample, this is not surprising given the lentic nature of this narrow impoundment.

Geosyntec Consultants as part of their 2006 Quabbin Reservoir/Ware River aquatic macrophytes assessment sampled in this segment of the Ware River. Aquatic macrophytes were sampled at 22 stations in a one mile stretch of river immediately upstream from the Quabbin Reservoir's Shaft #8 (Geosyntec Consultants, 2006). The majority of stations were characterized as having no plant growth or very sparse plant growth and the remaining stations had sparse plant growth. Yellow water lily (*Nuphar variegatum*), pickerelweed (*Pontederia cordata*) and common bladderwort (*Utricularia vulgaris*) were the three most dominant species found (Geosyntec Consultants, 2006). The Ware River has a wide shallow channel in portions of the reach sampled.

Water Chemistry

No recent quality-assured data are available for the Ware River. The *Aquatic Life Use* is not assessed due to a lack of sufficient information.

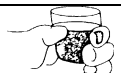
Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics

There are two beaches along the shoreline of Ware River in this segment: Cozy Cabin Beach and Barre Dam. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH, as required by the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No objectionable conditions have been reported in this segment of the Ware River, which is protected and managed by MA DCR as part of the Ware River Watershed (Bishop 2006).

The *Primary* and *Secondary Contact Recreation Uses* are not assessed given the lack of recent data. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Ware River (Segment MA36-27) Use Summary Table

Aquatic Life	Fish Consumption	Drinking Water*	Primary Contact	Secondary Contact	Aesthetics
					
NOT ASSESSED					SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

Conduct water quality monitoring to evaluate designated uses.

WARE RIVER (SEGMENT MA36-03)
Location: MDC intake, Barre to dam in South Barre
Segment Length: 2.1 miles
Classification: Class B, Cold Water Fishery, High Quality Water

Powder Mill Pond (MA36126) and South Barre Reservoir (MA36141) will no longer be reported on as approximately 18-acre and 19-acre lake segments, respectively, since the retention time of these waterbodies was estimated at less than one day. They will be considered run of the river impoundments (McVoy 2006). The retention time estimates were based on the annual historical mean discharge from two USGS stream gages in the Chicopee River Basin (01173000 and 01172500) and the normal storage volume of the dams reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life, Primary Contact, Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
MDC-MWRA Ware River diversion, registration (10830901)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The USGS maintains a gage near Barre, MA, on the Ware River at the intake works above diversion dam on Ware River, 2.7 miles downstream from Burnshirt River (Gage 01173000). The drainage area is 96.3 mi^2 (Socolow *et al*. 2004). The period of record for this gage is 1928 to present and the average discharge from 1929-2004 is 168 cfs (Socolow *et al*. 2004). The maximum discharge occurred on 21 September 1938 (14,000 cfs) by computation of flow over dam. Since the construction of Barre Falls Reservoir in 1958, the maximum discharge occurred on 14 April 1987 (1,590 cfs) while the minimum discharge, which was caused by unusual regulation, occurred on 15 September 1987 (0.46 cfs) (Socolow *et al*. 2004).

The USGS remarks that each year discharge is diverted as needed for the Boston Metropolitan district (now MA DCR) from 15 October to 14 June and at other times for emergency flood-control purposes as authorized by U.S. Army Corps of Engineers. The flow has been regulated 4.3 mi upstream by Barre Falls Reservoir since 1958, and since 1955 it has been diverted at times from 6.5 mi^2 upstream from the station for municipal drinking water supply to Fitchburg *(Socolow et al. 2004)*.

Biology
One potential non-native aquatic macrophyte species, *Myriophyllum* sp., was identified in Powder Mill Pond during the 1998 synoptic lake survey (MassDEP 1998). Confirmation of the species is needed.

Water Chemistry
There is a MassDEP Central Regional Office Strategic Monitoring and Assessment for River Basin Team (SMART) station on this segment off River Road, at the USGS flow gage, west of River Road in Ware. The DWM conducted water quality at this station (CBG) on the Ware River between May and August 2003 (Appendix B). CERO crews have conducted water quality monitoring at this location yearly from 1998 to the present. DWM also conducted water quality monitoring at Station WAWV (New Braintree Rd. bridge, White Valley, S. Barre) along this segment of the Ware River between April and October 2003 (Appendix B). *In-situ* parameters

were measured in 2003 on nine occasions (three during pre-dawn hours) at Station WAWV and on four occasions (three during pre-dawn hours). Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus at both locations (Appendix B).

Water quality data met dissolved oxygen criteria at the stations on the Ware River. pH was below the criterion the majority of the time at both stations, but the low pH is considered to be naturally-occurring. Low alkalinity and hardness values, recorded at Station WAWV located below Powder Mill Pond (Appendix B), are indicative of poor buffering ability. Temperature exceeded the criterion in July and August at both stations. The duration and extent of high temperatures is currently unknown. All nutrient concentrations were generally low with the exception of one slightly elevated total phosphorus concentration measured in July at Station WAWV. The *Aquatic Life Use* is assessed as support for this segment but listed as "Alert Status" due to temperature issues and the possible presence of a non-native macrophytes species.

Fish Consumption

The MA DPH (MA DPH 2005) has issued a fish consumption advisory due to mercury contamination for Powder Mill Pond, Barre, as follows.

> "*Children under 12, pregnant women, women of childbearing age who may become pregnant and nursing mothers should refrain from consuming any fish from Powder Mill Pond in order to prevent exposure to developing fetuses, nursing infants and young children to mercury. The general public should limit consumption of all fish species from Powder Mill Pond to two meals per month*".

Because of the site-specific fish consumption advisory due to mercury contamination, the *Fish Consumption Use* is assessed as impaired for the 0.3 mile reach of the Ware River through Powder Mill Pond. Although sources are unknown, atmospheric deposition is a suspected source. The close proximity of this pond to the Martone Landfill must also be noted however.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics

The DWM conducted fecal coliform and *E. coli* bacteria monitoring at two stations (WAWV and CBG) along this segment of the Ware River between April and October 2003 (Appendix B). Only one *E.coli* sample was collected at station CBG. The geometric mean of *E. coli* counts at station WAWV was 12.3 cfu/100 mL. Neither DWM nor CERO field crews noted any objectionable conditions (objectionable deposits, scums, or odors) at these sites during the sampling season with the exception of isolated trash at Station WAWV. White foam, believed to be naturally-occurring, was also noted at both stations.

Parameter	DWM Station WAWV 2003 (n=5)
Fecal coliform (cfu/100mL)	<2 - 100
Geometric mean	18.0
E. coli (cfu/100mL)	<2 - 70
Geometric mean	12.4

The *Primary* and *Secondary Contact Recreational Uses* and the *Aesthetics Use* are assessed as support given the low bacteria counts and the lack of objectionable conditions.

Ware River (Segment MA36-03) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		IMPAIRED (0.3 miles- Powder Mill Pond) Cause: Mercury in fish tissue Source: Unknown Suspected source: Atmospheric deposition NOT ASSESSED (1.8 miles-rest of segment)
Primary Contact		SUPPORT
Secondary Contact		
Aesthetics		

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

RECOMMENDATIONS

Conduct water quality and biological monitoring to evaluate designated uses.

Conduct temperature monitoring along the Ware River especially above and below impoundments on this segment and determine conditions that result in exceedences of standards.

Conduct macrophyte mapping in Powder Mill Pond to ascertain whether any non-natives species are present.

WARE RIVER (SEGMENT MA36-04)
Location: Dam in South Barre to Wheelwright Dam, New Braintree
Segment Length: 5.36 miles
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Barre Water Department Registration # (2021000)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2)
Barre Wastewater Treatment Plant WWTP- (MA0103152)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the Ware River with trout (MA DFG 2007). The MA DFG conducted fish population sampling in the Ware River well upstream from the Wheelwright Impoundment, approximately one half mile downstream from Barre Plains in Barre (Site 462) on 2 October 2001 using a boat shocker (Richards 2006). One hundred nineteen golden shiner, one hundred three common shiner, twenty-six white sucker, twenty-four chain pickerel, twelve pumpkinseed, ten yellow perch, five fallfish, five brown bullhead, four bluegill, three largemouth bass, two yellow bullhead, one creek chubsucker and one tessellated darter were collected (315 fish total).

MA DFG conducted fish population sampling in the Ware River near Airport Road approximately 1.6 miles downstream from Barre Plains near the Barre/Hardwick town line (Site 463) on 2 October 2001 using a boat shocker (Richards 2006). Seventy-one yellow perch, ten golden shiner, eight chain pickerel, five pumpkinseed, five common shiner, four white sucker, three creek chubsucker, two brown bullhead, one black crappie, one largemouth bass, one bluegill and one fallfish were collected (66 fish total).

MA DFG conducted fish population sampling in the Ware River upstream from the Wheelwright Impoundment near the Barre-Hiller Airport in Hardwick (Site 464) on 2 October 2001 using a boat shocking technique (Richards 2006). Thirty-eight golden shiner, twenty-one pumpkinseed, twenty-one chain pickerel, eighteen yellow perch, eighteen brown bullhead, thirteen white sucker, nine bluegill, five black crappie, four largemouth bass, and one creek chubsucker were collected (148 fish total)

The fish assemblage in this segment was dominated by macrohabitat generalists with limited numbers of fluvial specialist/dependent species. Although macrohabitat generalists dominated the samples, this is not surprising given the impounded nature of this reach.

Toxicity
Ambient
The Barre Wastewater Treatment Plant (WWTP) staff collected water from the Ware River at the Route 32 Bridge for use as dilution water in the facility's whole effluent toxicity tests. Between July 2000 and May 2007 survival of *C. dubia* exposed (48 hours) to the Ware River water ranged from 90 to 100% (n=28). For August 2002 survival of *P. promelas* exposed (48 hours) to the Chicopee River water was 100% (n=1). Hardness ranged from 12 mg/L to 28 mg/L (n=28).

Effluent
Whole effluent toxicity tests have been conducted on the Barre Wastewater Treatment Plant (WWTP) treated effluent. Between July 2000 and May 2007 thirteen valid chronic tests were conducted using *C. dubia*. Results of the *C. dubia* chronic whole effluent toxicity tests (CNOEC) ranged from <6.25 to 100% effluent. The LC_{50} using *C. dubia* ranged from 18.30% to >100% effluent (n=28). Of the 28 valid tests, ten did not meet the LC_{50} limit, which is $\geq$100%. Seven of the nine acutely toxic samples were during the January/February or April/May testing period. The LC_{50} using *P. promelas* was >100% (n=1).

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between July 2000 and May 2007 ranged from 0.150 mg/L to 70.0 mg/L (n=28). Total residual chlorine (TRC) concentrations reported in the whole effluent toxicity reports between July 2000 and May 2007 ranged from 0.010 to 0.150 mg/L (n=28).

Water Chemistry
DWM conducted water quality monitoring at Station WAIR (between the confluence of Pine Hill Brook and Broadmeadow Brook, Hardwick) along this segment of the Ware River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three during pre-dawn hours occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). Both temperature and dissolved oxygen met criteria. pH was below the criterion the majority of the time but generally within 0.5 units of the criterion. Total phosphorus concentration was elevated in the July sample (Appendix B).

The *Aquatic Life Use* is assessed as support for this segment based on the good survival of test organisms exposed to river water and good water quality conditions, but listed as “Alert Status” due to acute whole effluent toxicity of the Barre Wastewater Treatment Plant discharge and low instream pH values.

Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics
DWM conducted fecal coliform and *E. coli* bacteria monitoring at Station WAIR (between the confluence of Pine Hill Brook and Broadmeadow Brook, Hardwick) along this segment of the Ware River between April and October 2003 (Appendix B). Bacteria counts were low at this station and the geometric mean of *E. Coli* counts was 47.5 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 - 400
Geometric mean	67.6
E. coli (cfu/100mL)	<2 - 200
Geometric mean	47.5

DWM field crews did not note objectionable deposits at this site with the exception of one occasion when trash was noted. A pollen sheen was noted on three occasions and an oily sheen was noted once although generally no scums were noted. DWM field crews did not note any water odor. Slight undercut banks were noted on the left bank at this station.

The *Primary* and *Secondary Contact Recreational Uses* and the *Aesthetics Use* are assessed as support given the low bacteria counts and the general lack of objectionable conditions.

Ware River (Segment MA36-04) Use Summary Table

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

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

RECOMMENDATIONS

Conduct water quality and biological monitoring to evaluate designated uses.

Macroinvertebrate sampling upstream and downstream of the Barre WWTP discharge should be conducted to ascertain if the discharge is having any adverse effects on aquatic life.

Barre WWTP should conduct a toxicity identification and reduction evaluation (TIE/TRE). If one is not conducted before their NPDES permit renewal, one should be required as part of their permit renewal.

PRINCE RIVER (SEGMENT MA36-08)
Location: Source, outlet Hemingway Pond to confluence with Ware River, Barre.
Segment Length: 7.1 miles.
Classification: Class B, Cold Water Fishery, High Quality Water.

Old Reservoir (MA36114) is a pond based on retention time, so the portion of the river that overlaps the reservoir will no longer be considered part of this segment.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Barre Water Department Registration # 2021000

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
No known NPDES discharges are present on this segment.

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aesthetics* (MassDEP 2007b).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the Prince River with trout (MA DFG 2007). MA DFG conducted fish population sampling in Prince River near the Williamsville Road crossing (Site 884) in Barre on 14 August 2003 using a backpack electro-shocker (Richards 2006). Fifteen eastern blacknose dace, nine white sucker, two tessellated darter, two brown bullhead, and one brook trout were collected (29 fish total).

Although fluvial specialist/dependent species dominated the sample at Williamsville Road and the presence of a single brook trout is noteworthy, blacknosed dace and white sucker (fluvial specialist/dependent species) are both classified as tolerant to pollution while the brook trout was most likely a stocked fish. In light of the classification of the Prince River as a coldwater fishery the absence of reproducing brook trout must be noted. Overall fish numbers were low given the length of the reach that was sampled.

MA DFG conducted fish population sampling in Prince River near the Valley Road crossing (Site 888) in Barre on 19 August 2003 using a backpack electro-shocker (Richards 2006). Ninety eastern blacknose dace, six longnose dace, five white sucker, three brook trout, one yellow bullhead, one pumpkinseed, one tessellated darter and one brown trout were collected (108 fish total). Fluvial specialist/dependent species dominated the sample collected at the Valley Road crossing. In addition, although multiple age classes of brook trout suggest a reproducing population, only three specimens were collected. A stocked brown trout and one tessellated darter (in addition to a couple of macrohabitat generalist species) complete the sample.

Too limited quality-assured data are available for Prince River. Although there was evidence of a reproducing population of brook trout the numbers were very low and don't allow a definitive assessment of *Aquatic Life Use*. All designated uses are not assessed.

Prince River (Segment MA36-08) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS

Conduct water quality and biological monitoring (fish population and macroinvertebrate) to evaluate designated uses.

Conduct bacteria monitoring in this segment to assess the *Primary* and *Secondary Contact Recreation Uses*.

WARE RIVER (SEGMENT MA36-05)
Location: Wheelwright Dam, New Braintree, to Ware Dam, Ware
Segment Length: 11.5 miles
Classification: Class B, Warm Water Fishery. CSO**

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2- Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life and Aesthetics* (MassDEP 2007b).

** Although the river as defined in the 2006 standards inclusive of this segment has a CSO qualifier, there are no CSOs in this segment, so the CSO qualifier does not apply to this segment. All Class B standards apply.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Ware Water Department Registration/Permit (10806101/9P210830903)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2)
Town of Hardwick (Hardwick Pollution Control Facility- Gilbertville) (MA01001021)
Town of Hardwick (Hardwick Pollution Control Facility- Wheelwright) (MA0102431)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the Ware River with trout (MA DFG 2007). MA DFG conducted fish population sampling in the Ware River off Route 32 in Hardwick (Site 879) on 7 July 2003 using barge shocking (Richards 2006). Fifteen fallfish, nine yellow perch, nine yellow bullhead, nine golden shiner, eight bluegill, seven redbreast sunfish, six longnose dace, five tessellated darter, three chain pickerel, three rock bass, two pumpkinseed, two common shiner, one eastern blacknose dace, and one largemouth bass were collected (80 fish total).

The fish assemblage in this segment consisted of a diverse mix of macrohabitat generalists and fluvial specialist/dependent species. Although detailed information regarding habitat type is not available it appears that a mix of habitat types was sampled. This accounts for the wide variety of species collected. Given the amount of flow and wide width in this reach of the Ware River, fish sampling efficiency was less than optimal.

MA DFG conducted fish population sampling in the Ware River near the Church Street crossing in Ware (Site 873) on 31 July 2003 using the barge shocking technique (Richards 2006). One hundred fifty-nine tessellated darter, one hundred four spot-tail shiner, fifty-nine redbreast sunfish, forty-six white sucker, fifteen rock bass, fifteen pumpkinseed, ten yellow bullhead, six fallfish, four bluegill, four largemouth bass, three longnose dace, two chain pickerel, one yellow perch, one eastern blacknose dace, and one brown trout were collected (430 fish total).

The majority of fish collected at both sites were macrohabitat generalists, although good numbers of fluvial specialists/dependent species were also present at both sites.

Toxicity
Ambient
The Hardwick Water Pollution Control Facility staff collected water from the Ware River, approximately 50 yards above the outfall at the Wheelwright facility, for use as dilution water in the Wheelwright facility's whole effluent toxicity tests. Between May 2000 and May 2007 survival of *C. dubia* exposed (48 hours) to the Ware River was all 100% (n=15). Between May 2000 and May 2003 survival of *P. promelas* exposed (48 hours) to the Ware River water ranged from 95 to 100% (n=7). Hardness ranged from 8.0 mg/L to 27.0 mg/L (n=14).

The Hardwick Pollution Control Facility staff collected water from the Ware River, approximately 50 yards above the outfall at the Gilbertville WWTP, for use as dilution water in the Gilbertville facility's whole effluent toxicity tests. Between May 2000 and November 2007 survival of *C. dubia* exposed (48 hours) to the Ware River water was all 100% (n=15). Between May 2000 and May 2003 survival of *P. promelas* exposed (48 hours) to the Ware River water was all 100% (n=7). Hardness ranged from 12.0 mg/L to 61.0 mg/L (n=14).

The Ware Treatment Plant (WWTP) staff collected water from the Ware River, off of Upper Church Street by the northern end of the landing strip, for use as dilution water in the facility's whole effluent toxicity tests. Between November 2005 and May 2006 survival of *C. dubia* exposed (approximately 7 days) to the Ware River water was 100% (n=3). Hardness ranged from 8.0 mg/L to 20.0 mg/L (n=3).

Effluent
Whole effluent toxicity tests have been conducted on the Hardwick Water Pollution Control Facility in Wheelwright treated effluent. Between May 2000 and November 2007 fifteen valid tests were conducted using *C. dubia* and seven using *P. promelas*. The LC_{50}'s using *C. dubia* ranged from 10.9% to >100% effluent (n=15). Overall of the 15 tests, six did not meet the limit of $\geq$100%. The LC_{50}'s using *P. promelas* were all >100% (n=7) with the exception of May 2002, which was 57.4% (Appendix D).

Whole effluent toxicity tests have been conducted on the Hardwick Water Pollution Control Facility in Gilbertville treated effluent. Between May 2000 and May 2007 fifteen valid tests were conducted using *C. dubia* and seven using *P. promelas*. The LC_{50} using *C. dubia* was all >100% effluent (n=15), except for May 2001 (93.90%), and November 2001 and 2002 (both results = 70.70%) and August 2006 (79.4% effluent). The LC_{50} using *P. promelas* were all >100% (n=7) (Appendix D).

Water Chemistry
DWM conducted water quality monitoring at two stations, WA06A (Upper Church St. Ware) and WAX (Creamery Road/Unitas Road, Hardwick/New Braintree), along this segment of the Ware River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). Total phosphorus concentrations at both locations were slightly elevated in June, July and August. All water quality data meets criteria, although pH was slightly low on occasion.

The *Aquatic Life Use* is assessed as support for this segment based on good survival of test organisms exposed to river water at all three locations, the presence of fluvial specialists/dependent fish species and good water quality conditions. The segment is given "Alert Status" due to acute whole effluent toxicity in both the Hardwick Water Pollution Control Facilities in Wheelwright and Gilbertville discharges and the slightly elevated total phosphorus concentrations.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at two stations, WA06A (Upper Church St. Ware) and WAX (Creamery Road/Unitas Road, Hardwick/New Braintree), along this segment of the Ware River between April and October 2003 (Appendix B). DWM field crews did not note any objectionable conditions (trash, scums, odors, etc) at either station (Appendix B). White foam was generally noted at both stations, although it is believe to be natural (Appendix B).

At Station WAX *E. coli* counts ranging from 2 – 880 cfu/100 and the geometric mean of 87.6 met criteria. Only one bacteria count exceeded 235 cfu/100ml at this station and this sample represented wet weather conditions.

At Station WA06A, *E. coli* counts ranging from 2 - 1100 cfu/100 and the geometric mean of 143.4 exceeded the primary contact recreation criterion. Three bacteria counts exceeded 235 cfu/100ml at this station. The highest counts represented both wet and dry weather conditions.

Parameter	Station WAX (n=6)	Station WA06A (n=6)
Fecal coliform (cfu/100mL)	8 - 1200	4 - 3700
Geometric mean	142.6	260.1
E. coli (cfu/100mL)	2 - 880	2 - 1100
Geometric mean	87.6	143.4

The *Primary Contact Recreational Use* is assessed as support in the upper 3.8 mile reach of this segment based on bacteria counts at Station WAX and the lower 7.7 miles of this segment is assessed as impaired for this use due to elevated *E. coli* counts at station WA06A. The *Secondary Contact Recreational Use* is supported as bacteria levels at both stations met the criterion. The *Aesthetics Use* is assessed as support given the lack of objectionable conditions.

Ware River (Segment MA36-05) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT (Upper 3.8 miles) IMPAIRED (Lower 7.7 miles) Cause: Elevated *E. coli* Sources: Unknown Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Given the high *E. coli* counts found at Station WA06A bacteria source tracking should be conducted in this area and the Gilbertville area.

Continued water quality sampling and macroinvertebrate sampling should be conducted along this segment to assess the *Aquatic Life Use*.

The Hardwick Water Pollution Control Facilities in Wheelwright and Gilbertville should reduce their whole effluent toxicity to achieve compliance with permit limits.

WARE RIVER (SEGMENT MA36-06)
Location: Ware Dam, Ware, to Thorndike Dam, Palmer
Segment Length: 10.1 miles
Classification: Class B, Warm Water Fishery, CSO**

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5- Waters requiring a TMDL. Pollutants needing TMDLs: Pathogens (MassDEP 2007b).

** Although this segment is classified as a CSO in the 2006 standards, there are currently no CSOs in this segment, so this should not be classified with a CSO qualifier. Future standards will reflect this fact.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Cascades Diamond Inc. Registration # 10822705
Ware Water Department Registration/Permit (10806101/9P210830903)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D1, D2, D4)
Town of Ware- Ware Wastewater Treatment Plant (MA0100889)
Palmer Water Pollution Control Facilities (MA0101168)
Town of Palmer (MAR041017)
Quabbin Wire & Cable Co. Inc (MA0030571, MAR00A028)

Palmer WWTP (MA0101168) was permitted to discharge through two CSO outfalls (# 019 and 020) in this segment of the Ware River. The permit was issued (29 September 2000). Palmer's May 1999 Final Long Term Control Plan for CSO Abatement identified four phases of sewer separation throughout Palmer to eliminate CSO discharges. Sewer separation work to eliminate CSO #019 (and to disconnect the 100 GPM stream from entering the sewer system) was proposed for the first phase of work at an estimated cost of $135,000. In 1999 the Town of Palmer submitted a request for Massachusetts SRF financing for the first three phases of work and was selected to receive financing for the $7.1 million dollars worth of sewer separation work to be performed in the first three phases. MassDEP approved sewer separation, including drainage areas to CSO #019, in December 2000 as part of CW SRF-423. CSO #020 was blocked and inactive by 2001, while CSO #019 was blocked in 2003 (Boisjolie 2005), so the combined sewer overflow has been eliminated.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The USGS maintains a gage on the Ware River (Gage 01173500) 0.5 mi upstream from Gibbs Crossing. The drainage area for this gage is 197 mi^2 and the average annual discharge is 294 cfs (period of record 1931-2005 (USGS 2007). The maximum discharge occurred on 21 September 1938 (22,700 cfs) *(Socolow et al. 2004)*. The maximum discharge since the construction of Barre Falls Reservoir in 1958, occurred on 6 March 1979 (5,050 cfs) (Socolow 2004). The minimum discharge occurred on 24 August 1995 (4.2 cfs) *(Socolow et al. 2004)*. The USGS remarks that there have been diversions at times since March 1931 from 96.3 mi^2 to supply water to Boston Metropolitan district (now MA DCR) and since 1955 from 6.5 mi^2 for municipal water supply to Fitchburg *(Socolow et al. 2004)*. Since 1958 flow has been regulated by mills upstream and by Barre Falls Reservoir *(Socolow et al. 2004)*.

Biology
On April 16th 2003 the CERO crew noticed heavy sand deposits near the Gibbs Crossing (Route 32) bridge. These deposits were also noticed later during the 2003 field season (May 16) by DWM field crews. Beaudoin (2006) states that the "bottom at this site shows ever-increasing embeddedness but not yet covered in sand".

Toxicity

Effluent

Whole effluent toxicity tests have been conducted on the Ware Wastewater Treatment Plant (WWTP) treated effluent. Between July 2000 and May 2007 twenty-eight valid chronic tests were conducted using *C. dubia.* The chronic whole effluent toxicity tests using *C. dubia* ranged between <6.25% and 100% effluent (n=28). Of the 28 tests, twenty did not meet the required limit of >7%. The January 2001 test and the tests from November 2002 to May 2007 were all ≤6.25%. The LC_{50} ranged from 71% to 100% effluent. Five of the 24 tests did not meet the required limit (Appendix D).

Water Chemistry

DWM conducted water quality monitoring at one station (WA09A-Route 32 at Gibbs Crossing, Ware) along this segment of the Ware River between May and August 2003 (Appendix B). *In-situ* parameters were measured on four occasions with three measurements during pre-dawn hours. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

The DWM station is also a MassDEP Central Regional Office Strategic Monitoring and Assessment for River Basin Teams' station. CERO crews also conduct water quality monitoring at this location yearly in addition to DWM sampling (1998 to present).

Water quality parameters met state standards and nutrient concentrations were generally low at this station with the exception of one elevated total phosphorus concentration in June 2003. *In-situ* measurements from 2001 to 2003 as collected by DWM and CERO crews indicated good water quality conditions. *The Aquatic Life Use* is assessed as support given good water quality conditions. This use is given an "Alert Status" due to the acute and chronic whole effluent toxicity from the Ware Wastewater Treatment Plant discharge.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (WA09A-Route 32 at Gibbs Crossing, Ware) along this segment of the Ware River on one occasion in May (Appendix B). CERO crews in coordination with the DWM sampling effort conducted fecal coliform and *E. coli* bacteria monitoring on three occasions. Bacteria samples collected on August 20th, 2003 did not meet data quality objectives in terms of reproducibility (Appendix B).

Parameter	DWM 2003 (n=4)
Fecal coliform (cfu/100mL)	<2 -190
Geometric mean	37.8
E. coli (cfu/100mL)	2 - 150
Geometric mean	26.6

Both DWM field crews and CERO crews found objectionable deposits in the form of garbage and trash on the stream banks and in the stream (including tire, metals, bottles etc.) throughout the sampling season. The extent of trash coverage in this segment is not known, but isn't considered to be widespread. Water odors were not noted by either field crew. DWM field crews did not notice any scums, although CERO crews noticed small quarter size patches of foam in June, July, August and October. Water clarity was generally clear. Field crews also noted undercut banks.

The samples collected by DWM and CERO crews had low fecal coliform and *E. coli* bacteria counts but only four samples were collected and more data are needed to assess the *Primary* and *Secondary Contact Recreation Uses*, so both uses are not assessed. Given the general lack of objectionable conditions the *Aesthetics Use* is assessed as support for this segment.

Ware River (Segment MA36-06) 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

The Ware Wastewater Treatment Plant should reduce their whole effluent and chronic toxicity to achieve compliance with permit limits.

Continued water quality sampling and macroinvertebrate sampling should be conducted along this segment to assess *Aquatic Life Use*.

A habitat walk should be conducted at Station WA09A to determine the extent of sedimentation and embeddednessat this station. Best management practices should be instituted to prevent further degradation of in-stream habitat.

Conduct bacteria sampling to assess recreational uses.

WARE RIVER (SEGMENT MA36-07)
Location: Thorndike Dam, Palmer, to confluence with Quaboag River (forming headwaters Chicopee River), Palmer
Segment Length: 2.5 miles
Classification: Class B, Warm Water Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2- Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D2 D4)
Town of Palmer- Palmer Water Pollution Control Facilities (MA0101168)
Town of Palmer- (MAR041017)

Palmer WWTP (MA0101168) is permitted to discharge via six wet weather CSOs in this segment of the Ware River. The Town's permit was issued on 29 September 2000. Hydraulic modeling performed as part of Palmer's CSO Abatement Plan estimated the following discharge quantities based on a three-month frequency storm.

Village of Thorndike:	021A	no data avalaible
	021B	sealed, no longer discharges
	22	8,000 gallons
	023A	5,000 gallons
	023B	no data available
Village of Three Rivers:	18	23,000 gallons

Palmer's May 1999 final Long Term Control Plan for CSO abatement identified four phases of sewer separation throughout Palmer to eliminate CSO discharges. Sewer separation work to eliminate CSO #021A, 022, 023A, 023B and 018 is not scheduled until the fourth phase, which has an estimated cost of approximately 1.32 million dollars. However, the regulator structures to CSO # 018, 023A, 023B and 022 were scheduled to be adjusted (raised) in Phase I of the project, in order to maximize the flow to the WWTP and minimize CSO discharges from these regulators. The final adjustment of these weirs has not yet been completed. If successful, the fourth phase of sewer separation may not be required or considered to be cost effective (MassDEP 2001).

In 1999 Palmer submitted a request for MA SRF financing for the first 3 phases of work, and in November 1999 was selected to be eligible for $7.1 million in financing for the first 3 phases of sewer separation (including raising overflow weirs at CSO # 022, 023A, 023B and 018). The MassDEP in December 2000 approved this work as part of CW SRF-423. The contract was awarded in 2001 (Boisjolie 2001). Currently CSO #018, 23A, 023B and 022 are active and final adjustments of their weirs has not been completed (Boisjolie 2007a). The fourth phase of work is currently scheduled by the Town for 2012 (Boisjolie 2007a).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Toxicity
Ambient
Palmer Water Pollution Control Facility staff collect water from the Ware River, about 500 feet from the railroad tracks and about a half mile from where the Ware River and the Quaboag River converge, for use as dilution water in the facility's whole effluent toxicity. Between July 2000 and

March 2007 survival of *C. dubia* exposed (approximately 7 days) to the Ware River water ranged from 80 to 100% (n=27). Hardness ranged from 12.0 mg/L to 52.0 mg/L (n=27).

Effluent
Whole effluent toxicity tests have been conducted on the Palmer Water Pollution Control Facility treated effluent. Between July 2000 and March 2007 twenty-six valid chronic tests were conducted using *C. dubia.* Results of the chronic whole effluent toxicity tests using *C. dubia* ranged from 6.25% to ≥100% effluent (n=26). June 2001 showed a significant difference in reproduction for 25% effluent. The LC_{50} results were all 100% effluent (n=28) with the exception of September 2004, which was 33.0% (Appendix D).

Water Chemistry
DWM conducted water quality monitoring at one station (WA12 – Route 181, Palmer) along this segment of the Ware River between May and August 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). All parameters met water quality criteria. All water samples collected at this station had low ammonia-nitrogen concentrations and total phosphorus was generally low although somewhat elevated in June and July (Appendix B).

Based on the good survival of test organisms exposed to river water and good water quality conditions, the *Aquatic Life Use* is assessed as support.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (WA12 – Route 181, Palmer) along this segment of the Ware River between April and October 2003 (Appendix B). The geometric mean for *E. coli* of samples collected at this station was 50.1 cfu/100mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	2 – 510
Geometric mean	101.5
E. coli (cfu/100mL)	2 – 180
Geometric mean	50.1

No objectionable deposits or water odors were noted by DWM field crews at this site. A white foam, believed to be naturally-occurring, was noted on the majority of occasions during the 2003 sampling season. Water clarity was generally either clear or slightly turbid. DWM field crews noted that the banks are slightly undercut at this location.

The *Primary* and *Secondary Contact Recreation Use* are assessed as support given the low geometric mean of *E. coli* counts but given the presence of CSOs are identified with an “Alert Status”. Given the lack of objectionable conditions at this location the *Aesthetics Use* is assessed as support.

Ware River (Segment MA36-07) 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 water quality monitoring to evaluate designated uses. Water quality monitoring should include water chemistry and bacteria monitoring to assess the progress in CSO abatement. Particular attention should be given to a sampling below CSO# 018 and the cluster of CSOs near Summer Street in Thorndike.

Benthic macroinvertebrate sampling should be conducted along this segment to assess the *Aquatic Life Use.*

Quaboag River Subbasin

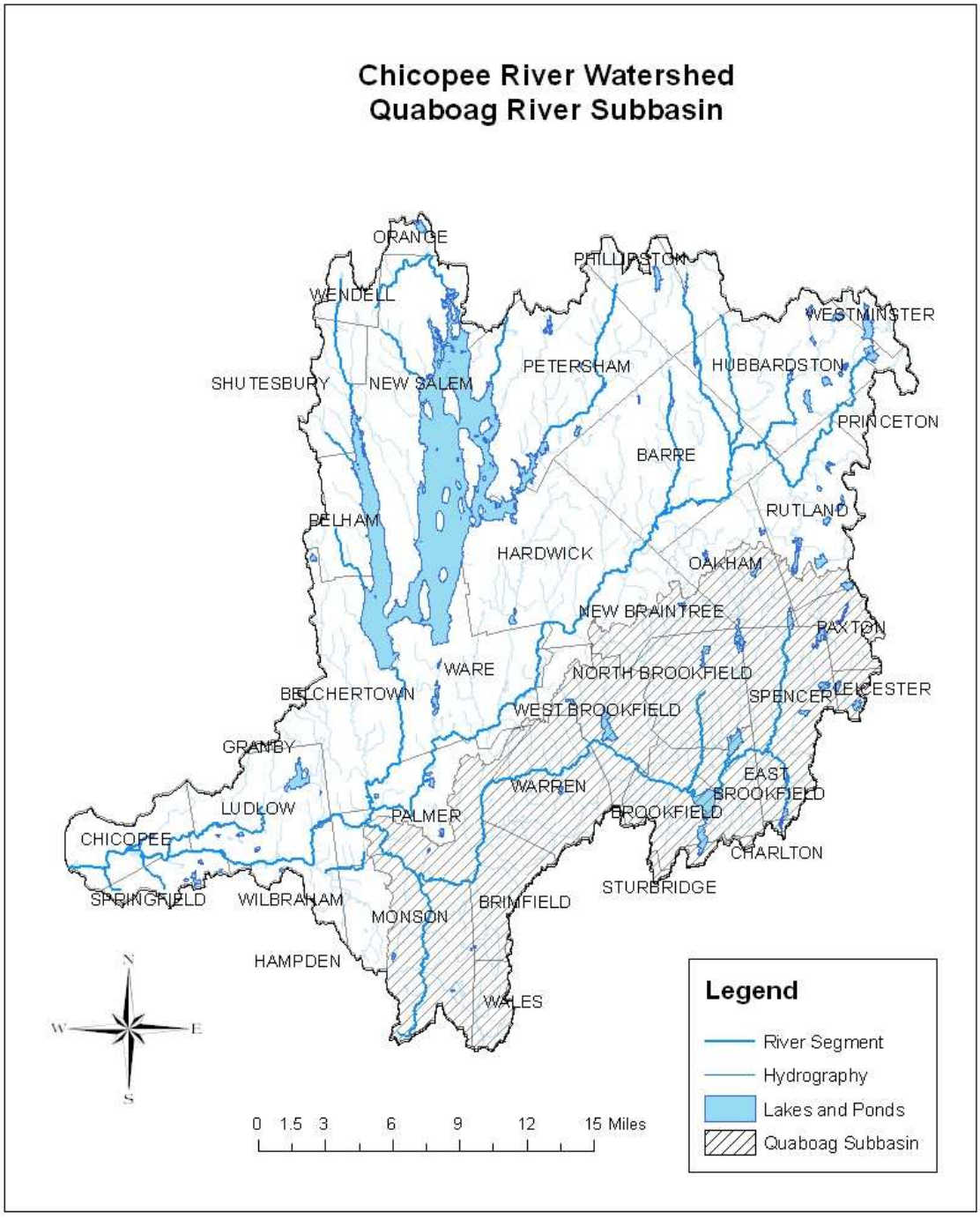


Figure 9: Quaboag River Subbasin

SEVENMILE RIVER (SEGMENT MA36-11)
Location: Source, outlet Browning Pond Spencer to confluence with Cranberry River, Spencer.
Segment Length: 7.3 miles.
Classification: Class B, Warm Water Fishery, High Quality Water.

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Bond Construction Company Registration (20828002)
Spencer Water Department Registration/Permit (20828001/9P20828001)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D4)
Town of Spencer (MAR041162)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The USGS maintained a gage near Spencer, MA, on the Sevenmile River (Gage 01175670) 40 feet upstream from the bridge on Cooney Road and 1.5 miles north of Spencer. In August 2005 the UGSS gage was relocated to the downstream side of the Cooney Road bridge. The drainage area for this gage is 8.81 mi^2 and the period of record is October 1960 to present. The average discharge is 14.9 cfs (1961-2005) (USGS 2007). The maximum discharge occurred on 18 March 1968 (412 cfs) while the minimum discharge occurred on 6, 7, 9, and 18 September 2001 (0.03 cfs) *(Socolow et al. 2004)*. According to the USGS records are good except for estimated daily discharges, which are poor *(Socolow et al. 2004)*. The Sevenmile River has been subject to occasional regulation by upstream ponds since 1971 *(Socolow et al. 2004)*. Flow fluctuations in the Sevenmile River due to the Bond Construction Company's withdrawal have been reported (Conners, 2007).

Biology
MA DFG stocks the Sevenmile River with trout (MA DFG 2007). MA DFG conducted fish population sampling in the Sevenmile River at numerous locations in Spencer.

MA DFG conducted fish population sampling near the Route 31-North Spencer Road crossing and Hasting Road in Spencer (Site 1151) on 29 July 2005 using a backpack electro-shocker (Richards 2006). Twenty-two common shiner, seven pumpkinseed, five tessellated darter, three yellow bullhead, two white sucker, two largemouth bass, two chain pickerel, one fallfish and one bluegill were collected (45 fish total). Although the majority of fish collected at this site are fluvial dependent/fluvial specialist species, a number of macrohabitat generalist species were also represented.

MA DFG conducted fish population sampling upstream from the Cooney Road crossing in Spencer (Site 789) on 18 July 2002 using a backpack electro-shocker (Richards 2006). Seventy-two common shiner, thirty longnose dace, thirty-six eastern blacknose dace, nineteen fallfish, thirteen yellow bullhead, eleven tessellated darter, five white sucker, three chain pickerel, and one brook trout were collected (197 fish total). The fish community was dominated by fluvial dependent/fluvial specialist species.

MA DFG conducted fish population sampling downstream from the Cooney Road crossing in Spencer (Site 791) on 18 July 2002 using a backpack electro-shocker (Richards 2006). Thirty-two fallfish, twenty-eight common shiner, twenty-three tessellated darter, nineteen longnose dace, eighteen yellow bullhead, seven eastern blacknose dace, four white sucker, three chain pickerel, two bluegill, two brown bullhead, one hybrid redfin/chain pickerel, and one golden shiner were

collected (140 fish total). The majority of fish collected at this site are fluvial dependent/fluvial specialist species.

MA DFG conducted fish population sampling south of the Cooney Road crossing in Spencer (Site 1150) on 28 July 2005 using a backpack electro-shocker (Richards 2006). Fifty-six fallfish, eight yellow bullhead, four longnose dace, two yellow perch, two common shiner, two white sucker, and one brown trout were collected (75 fish total). The majority of fish collected at this site are fluvial dependent/fluvial specialist species.

The Sevenmile River is considered to be a Coldwater Fishery Resource (CFR) under criteria developed by the MA DFG. One brook trout was collected in 2002 and appeared to be a wild fish. It is unclear why the Sevenmile River is considered a CRF as historic MA DFG data seems to suggest otherwise. The four trout listed within their historic dataset were all greater than >140 millimeters. It seems possible that these were stocked fish. Although the MA DFG fish surveys did not firmly establish the presence of a reproducing salmonid population, fluvial specialist/dependent species dominated the fish samples at all four locations. The fish assemblages varied somewhat between stations and time, however the consistent fluvial specialist/dependent species suggest a stable flow regime. In addition, a number of the species present are considered only moderately tolerant to pollution. It should be noted that water temperatures as high as 24.3° C have been recently documented by MassDEP (MassDEP 2006a).

Water Chemistry

DWM conducted water quality monitoring at two stations (SMG – Cooney Road at the USGS flow gaging station and SM01- upstream from the Route 9 bridge, Spencer) along this segment of the Sevenmile River between May and October 2003 (Appendix B). Station SMG is also the MassDEP, Central Regional Office, Strategic Monitoring and Assessment for River Basin Teams station. CERO crews conduct water quality monitoring at this location yearly from 1998 to present. CERO data collected between 2001 and 2003 are summarized in this report. Between both crews *in-situ* parameters were measured on ten occasions at Station SMG in 2003 with three measurements during pre-dawn hours. *In-situ* parameters were measured on eight occasions at Station SM01 in 2003 with three measurements during pre-dawn hours. Grab samples were also collected and analyzed for TSS, turbidity and nutrients at both sites (Appendix B).

All water quality parameters at Station SMG met state criteria with the exception of a few low pH measurements in the winter during the CERO sampling. Generally nutrient concentrations at this station were low. The total phosphorus concentration was greater than 0.050 mg/L on only one occasion (MassDEP 2006a). For a summary of water quality data collected at Station SMG by both crews see table below.

Parameter	DWM 2003	CERO (2001-2003)
DO (mg/L)	7.3 – 10.6 (n=4)	7.2 – 13.6 (n=16)
pH (SU)	6.6 - 6.8 (n=4)	5.7 – 6.8 (n=17)
Temperature (℃)	12.7 – 22.3 (n=4)	-0.11 – 24.3 (n=17)
Conductivity (µS/cm at 25℃)	86.0 –102 (n=4)	64.1 – 108 (n=17)
Ammonia- nitrogen (mg/L)	<0.02 (n=1)	<0.02 –0.06 (n=17)
Nitrate – nitrite nitrogen (mg/L)	--	<0.02 – 0. 19 (n=17)
Total Kjeldahl nitrogen (mg/L)	--	0.14 – 0.43 (n=17)
Total phosphorus (mg/L)	0.009 – 0.014 (n=2)	0.009 – 0.069 (n=17)
Alkalinity (mg/L)	--	3 – 11 (n=17)
Total suspended solids (mg/L)	2 (n=1)	<1 – 16 (n=17)
Turbidity (NTU)	0.77 (n=1)	0.65 – 9.0 (n=17)

Low dissolved oxygen concentrations, which does not meet standards criteria, were documented on five of the eight sampling events at Station SM01, although on three occasions the DO measurements were taken during predawn, worst-case conditions (Appendix B). Site SM01 is downstream from the Great Meadow wetland area and the Sevenmile River is relatively low gradient along this stretch of the river, which may contribute to naturally low dissolved oxygen. There are also large areas of agriculture upstream from the Great Meadows wetland area. pH is also slightly below the criterion at Station SM01. TDS and conductivity are also higher at SM01 than Station SMG (Appendix B). Nutrients at this station were low (Appendix B).

The *Aquatic Life* use is assessed as support given the presence of fluvial specialists/dependent fish species and generally good water quality conditions. However, the segment is identified with an "Alert Status" due to the low dissolved oxygen and low pH found at SM01. There is uncertainty over whether low DO is due to natural conditions. Historic measurements in the 1980s met the criterion and were higher than found during 2003 sampling (Kimball 2007).

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at two stations (SMG – Cooney Road at the USGS flow gaging station and SM01- upstream from the Route 9 bridge, Spencer) along this segment of the Sevenmile River between May and October 2003 (Appendix B). DWM and CERO crews collected four bacteria samples in 2003. All of these samples had low bacteria counts and represent both wet and dry weather conditions (Appendix B, MassDEP 2006a). Six bacteria samples were collected by DWM at Station SM01 and, with the exception of the October 15th sample, all samples had low bacteria counts. The October 15th sample result was 1000 cfu/100 ml *E. coli* and represents wet weather conditions. The geometric mean of all bacteria samples collected by DWM crews at Station SM01 is 51.7 cfu/100mL. Not enough data was collected at station SMG to compute a geometric mean.

Parameter	DWM SM01 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 - 1000
Geometric mean	53.6
E. coli (cfu/100mL)	<2 - 1000
Geometric mean	40.9

CERO crews noted that sunken granite blocks from a partially dismantled dam were present at Station SMG. Neither DWM field crews nor CERO crews noted any objectionable deposits at Station SMG. No water odors were noted but white foam was commonly observed at this site. The river at Station SMG appears to be a depositional area for sand/gravel, possibly from extraction activities upstream. A large gravel bar has formed on the western bank and has blocked flow through the western culvert except on extreme high flows.

DWM field crews did not find any objectionable deposits at Station SM01 with the exception of minimal trash on one occasion. No scums were noted at Station SM01 and no water odor was noted with the exception of one occasion when a musty smell was noted. Slight bank erosion and undercut banks were noted at this station.

The *Primary* and *Secondary Contact Recreation Uses* are assessed as support based on low bacteria counts. One wet weather sample on October 15th had a high bacteria count, so the *Primary Contact Recreation Use* is identified with an "Alert" status". The *Aesthetics Use* is assessed as support given the general lack of objectionable conditions noted by both DWM and CERO field crews.

Sevenmile River (Segment MA36-11) 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 water quality monitoring to evaluate designated uses.

Conduct bacteria sampling during wet weather events to determine whether bacterial source tracking is warranted with special attention paid to Station SM01.

Conduct macroinvertebrate sampling to fully assess the *Aquatic Life Use*.

CRANBERRY RIVER (SEGMENT MA36-20)
Location: Source, outlet Cranberry Meadow Pond in Spencer to confluence with Sevenmile River, Spencer
Segment Length: 3.6 miles
Classification: Class B, High Quality Water

Howe Pond (MA36073) will no longer be reported on as an approximately 12-acre lake segment since the estimated retention time of this waterbody is approximately 3 days. It will be considered a run of the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from two USGS stream gages in the Chicopee River Basin (01175670 and 01173000) and the normal storage volume of the dams reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Spencer Water Department Registration/Permit (20828001/9P20828001)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D2, D4)
Town of Spencer- Spencer Wastewater Treatment Plant (MA0100919)
Town of Spencer- MAR041162

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks the Cranberry River and Howe Pond with trout (MA DFG 2007). MA DFG conducted fish population sampling in Cranberry River near Howe Road, Spencer State Park, Spencer (Site 1147), on 2 August 2005 using a backpack electro-shocker (Richards 2006). Thirty yellow bullhead, twelve pumpkinseed, nine bluegill, eight white sucker, six chain pickerel, two brown trout, two largemouth bass, one black crappie, one tadpole madtom, and one fallfish were collected (72 fish total).

The Cranberry River is considered to be a Coldwater Fishery Resource under criteria developed by the MA DFG. At one station in 1983 multiple age classes of reproducing brook trout were collected (Richards 2006). Although the 2005 survey did not result in the collection of brook trout it is unclear as to the exact location of the 1983 sampling station. The fish assemblage documented as result of the 2005 survey consists of mostly macrohabitat generalist species. It is possible that the species composition is habitat related since the 2005 sampling station is just downstream from Howe Pond in and upstream from a forested wetland. Additional monitoring of the Cranberry River in an attempt to document the continued presence and extent of brook trout within this watershed is warranted.

Toxicity
Ambient
The Spencer Wastewater Treatment Plant (WWTP) staff collected water from the Cranberry River at the South Spencer Road Crossing for use as dilution water in the facility's whole effluent toxicity tests. Between May 2003 and May 2007 survival of *C. dubia* exposed (approximately 7 days) to the Cranberry River water ranged from 70 to 100% (n=17). Survival was <75% in only one test. Hardness ranged from 18.0 mg/L to 44.0 mg/L (n=17).

Effluent
Whole effluent toxicity tests have been conducted on the Spencer Wastewater Treatment Plant (WWTP) treated effluent. Between May 2000 and May 2007, twenty-two valid chronic tests were

conducted using *C. dubia.* The chronic whole effluent toxicity tests using *C. dubia* were all >100% effluent (n=27). Results of the LC_{50} were all 100% effluent (n=24) (Appendix D).

Water Chemistry

DWM conducted water quality monitoring at one station (CRN01-South Spencer Road, Spencer) along this segment of the Cranberry River between May and October 2003 (Appendix B). *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). On two occasions dissolved oxygen did not meet the criterion and pH was generally below the criterion, but by less than 0.5 SU. There are large wetland areas upstream from the sampling station. A beaver dam was noted in May near this station and by November it was breached with the installation of a culvert. Beaver activity is common upstream from the sampling station. There is also a large impoundment upstream from the sampling station. Given these factors it is likely that low dissolved oxygen and pH values are due to natural conditions. Nutrients at this station were also low.

The *Aquatic Life Use* is assessed as support given the good survival of test organisms and good water quality conditions. However, this use is identified with an "Alert Status" due to occasional low dissolved oxygen concentrations and the absence of brook trout and other fluvial species. The low dissolved oxygen conditions are likely to be naturally-occurring.

Primary and Secondary Contact Recreation and Aesthetics Uses

Howe Pond Beach in Spencer State Forest is present on this segment. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, this information is not used to assess the contact recreational uses. The pond is currently marked with "No Swimming" signs.

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (CRN01-South Spencer Road, Spencer) along this segment of the Cranberry River between April and October 2003 (Appendix B). Bacteria counts during both wet and dry weather at this site were low with the exception of October 15th, which had a bacteria count of 480 cfu/100mL and represents a wet weather sampling event. The geometric mean of *E. coli* counts was 53.3 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	2 - 500
Geometric mean	72.4
E. coli (cfu/100mL)	2 - 480
Geometric mean	53.3

DWM field crews did not find any objectionable deposits with the exception of trash on one occasion and sand from the road on two occasions. No water odors or scums were noted by DWM field crews. Slight shoreline erosion was noted at this site.

The *Primary* and *Secondary Contact Recreational Uses* are assessed as support as the geometric mean of E. coli counts meets the criterion. *Primary Contact Recreation Use* is identified with an "Alert Status" given the one wet weather sample that exceeded 235 cfu/100mL. Given the lack of objectionable conditions at this location the *Aesthetics Use* is assessed as support.

Cranberry River (Segment MA36-20) 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

Conduct water quality monitoring to evaluate designated uses. Water quality monitoring below the Spencer WWTP could test for total phosphorus and copper to document in stream conditions before any future Spencer WWTP upgrades.

SEVENMILE RIVER (SEGMENT MA36-12)
Location: Confluence with Cranberry River, Spencer, to confluence with East Brookfield River, East Brookfield
Segment Length: 2.5 miles
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from this subwatershed.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D4)
Town of Spencer (MAR041162)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
DWM field crews noted sand deposits coming from Route 49 at one water quality monitoring station (SM02, Route 49 Bridge, Spencer). Slight erosion was noted at this site in addition to sand deposits. On April 16th 2003 the sand deposits were characterized as "forming large delta from Route 49" and it was noted that the road lacks a catch basin (Appendix B).

Biology
MA DFG stocks the Sevenmile River with trout (MA DFG 2007).

Water Chemistry
DWM conducted water quality monitoring at one station (SM02, Route 49 Bridge, Spencer) along this segment of the Sevenmile River between May and October 2003 (Appendix B). *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). Generally pH was slightly less than the criterion. On one occasion (during worst-case conditions) dissolved oxygen did not meet the criterion. Ammonia-nitrogen and total phosphorus concentrations at Station SM02 were generally low.

The *Aquatic Life Use* is assessed as support for this segment given generally good water quality conditions.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (SM02, Route 49 Bridge, Spencer) along this segment of the Sevenmile River between April and October 2003 (Appendix B). Bacteria counts during both wet and dry weather at this site were low with the exception of October 15th, which had a bacteria count of 440 cfu/100mL and represents a wet weather sampling event. The geometric mean of *E. coli* counts was 42.0 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	< 2-1100
Geometric mean	89.3
E. coli (cfu/100mL)	<2 - 440
Geometric mean	42.0

DWM field crews did not find any objectionable deposits with the exception of two occasions where sand deposits coming from Route 49 were observed. Slight erosion was noted at this site in addition to sand deposits. No water odors or scums were noted except on one occasion when

a chlorine smell was noted and an oil sheen was found. Water clarity was generally recorded as slightly turbid.

The *Primary* and *Secondary Contact Recreation Uses* are assessed as support based on low bacteria counts. Elevated bacteria counts found during wet weather sampling by DWM are a cause of concern. Elevated bacteria counts at the Route 49 bridge found by ESS in 2002 during both dry and wet weather are also a cause of concern (ESS 2005). Given these facts this segment is given "Alert Status" for *Primary Contact Recreation Use*. Given the general lack of objectionable conditions at this location the *Aesthetics Use* is assessed as support.

Sevenmile River (Segment MA36-12) Use Summary Table

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

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

RECOMMENDATIONS

The recommendations of the Quaboag and Quacumquasit Ponds TMDL (MassDEP 2006b) affecting this tributary should be implemented.

Best management practices should be instituted to stop sand deposition in the Sevenmile River where it crosses under Route 49 in Spencer. A habitat walk should be conducted to determine the extent of sand deposition and quality of habitat along this reach.

Macroinvertebrate sampling should be conducted to determine water quality and assess *Aquatic Life Use* in this segment.

Effluent from the Spencer WWTP generally has greater copper concentrations than its permitted value and may have adverse affects on aquatic life in the upper part of this segment. Recently a copper removal optimization engineering report required by an Administrative Order from the EPA was written for the town of Spencer. The engineering report outlines steps to reduce copper in town drinking water and treatment techniques available at the Spencer WWTP to reduce copper concentrations in the plants effluent. Copper testing in the upper Sevenmile River to document conditions before any future Spencer WWTP upgrades may be conducted.

EAST BROOKFIELD RIVER (SEGMENT MA36-13)
Location: Outlet Lake Lashaway East Brookfield to Quaboag Pond, East Brookfield
Segment Length: 2.4 miles
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
East Brookfield Water Department Registration # 20808401
Brookfield Water Department Registration # 20804501

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Flow into the East Brookfield River is controlled by the outlet structure on Lake Lashaway. During the fall the outlet structure is adjusted to release water in order to draw down the lake. This management practice was instituted in 1984 to prevent excessive macrophyte growth and has been conducted annually since then.

Biology
In July and August the invasive species fanwort (*Cabomba carolinia)* was found at in the river near Shore Road (Station EB04A). The close proximity to Quaboag Pond explains the presence of many pond plant species found there.

Water Chemistry
DWM conducted water quality monitoring at two stations (EB04 – below Lake Lashaway outlet structures and EB04A – Shore Road, East Brookfield) along this segment of the East Brookfield River between May and October 2003 (Appendix B). *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). These stations were also part of DWM 2003 TMDL monitoring for Quaboag Pond. For a complete analysis of nutrients loading in and from the East Brookfield River consult *Quaboag and Quacumquasit Ponds Total Phosphorus Total Maximum Daily Load* (Mass DEP 2006b). Station EB04 meets all criteria and its location below Lake Lashaway makes it very different from EB04A, which is located below a large wetland.

Station EB04A has lower temperature and generally lower pH than Station EB04. Station EB04A did not meet the dissolved oxygen criterion on four occasions. It's location below a large swamp may be the cause of the low dissolved oxygen levels found there. Nutrient concentrations (ammonia-nitrogen and total phosphorus) at both EB04 and EB04A were fairly low.

Although the first 0.6 miles of this segment, from Lake Lashaway to the confluence with the Sevenmile River exhibits good water quality conditions it is assessed as impaired for the entire length due to the presence of the non-native plant species, *Cabomba caroliniana* [see below] The lower 1.85 miles of the river, from the confluence with the Sevenmile River to Quaboag Pond, is assessed as impaired based on low dissolved oxygen concentrations and best professional judgement.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at two stations (EB04 – below Lake

Lashaway outlet structures and EB04A – Shore Road, East Brookfield) along this segment of the East Brookfield River between April and October 2003 (Appendix B). All samples collected at both stations had low bacteria counts. The geometric mean of *E. coli* counts was less than 15 cfu/100 mL at both stations.

Parameter	DWM 2003 EB04 (n=12)	DWM 2003 EB04A (n=12)
Fecal coliform (cfu/100mL)	<2-100	<2 - 152
Geometric mean	12.2	16.9
E. coli (cfu/100mL)	<2-90	<0.9 – 100
Geometric mean	9.4	10.6

On four occasions DWM field crews noted objectionable deposits at Station EB04. Limited trash was found on one occasion, sunken concrete debris on another occasion and two flocculent masses on two occasions (one rust colored). On the majority of occasions DWM field crews did not note any objectionable deposits. Water odor was not noted with the exception of a musty smell on one occasion and a fishy smell on two occasions. White foam was generally noted at this station, but was considered to be naturally-occurring. Water clarity was often slightly turbid, otherwise it was clear. The west bank (opposite lake discharge pipe) was observed to be eroding according to DWM field crews.

DWM field crews did not find any objectionable deposits at Station EB04A during the sampling season. No water odors or scums were noted. No shoreline erosion was found and water clarity was generally slightly turbid. Field crews found sparse to dense amounts of many different types of aquatic plants (submerged, emergent and floating) during the sampling season.

Both *Primary* and *Secondary Contact Recreation Uses* are assessed as support based on low bacteria counts. Given the generally good aesthetic conditions found at both stations the *Aesthetics Use* is assessed as support.

East Brookfield River (Segment MA36-13) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants, low DO Source: Introduction of non-native organisms, Unknown
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		
Aesthetics		

RECOMMENDATIONS

Implement recommendations of the Quaboag and Quacumquasit TMDL (MassDEP 2006b) with special attention to the recommended slow drawdown of Lake Lashaway in the fall.

Due to the presence of large wetlands in the lower section of this segment and Lake Lashaway's impact on the upper section of this segment it is difficult to find an ideal sampling location to assess this segment. Multiple multiprobes could be deployed along this segment especially at the beginning of the wetland-influenced section of this segment and also at the confluence with Sevenmile River to evaluate the dissolved oxygen regime.

On-going non-native plant control in Lake Lashaway should continue in order to keep source populations from spreading to the East Brookfield River at a minimum. A stream walk to determine the extent and amount of non-native plants in the East Brookfield River should also be conducted.

QUABOAG RIVER (SEGMENT MA36-14)
Location: Outlet of Quaboag Pond, Brookfield, to Route 67 bridge, West Brookfield.
Segment Length: 6.1miles.
Classification: Class B, Warm Water.

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
For a two-mile section the channel bottom of the Quaboag River in West Brookfield is perched, or higher in elevation, than the channel bottom at the outlet of Quaboag Pond (MassDEP 2006b).

Biology
MA DFG conducted fish population sampling in the Quaboag River near the Route 148 bridge in Brookfield (Site 892) on 29 September 2003 using a boat shocker (Richards 2006). Thirty-seven bluegill, twenty-three yellow perch, twenty-one chain pickerel, fifteen golden shiner, eleven pumpkinseed, nine largemouth bass, three creek chubsucker, one black crappie, one brown bullhead, one American eel, one white sucker and one yellow bullhead were collected (124 fish total). The fish sample was heavily dominated by macrohabitat generalist species, which is to be expected given the nature of this reach. The reach is slow, meandering and wetland dominated. Sampling efficiency may have been affected by very poor visibility due to deep and silty water.

DWM conducted water quality monitoring at two stations (QA100 – Route 148, Brookfield and QAOBO –Long Hill Road bridge, West Brookfield) along this segment of the Quaboag River between April and October 2003 (Appendix B). DWM crews made notes of conditions at these sites throughout the sampling season. At Station QA100 phytoplankton was not found with the exception of May 14th when a moderate population was found. Early in the field season sparse coverage of emergent aquatic plants was found. Between June and October a moderate density of aquatic plants (emergent, submerged, and floating) was found at this site. Many pond species were found at this site consistent with its wide shallow nature with extensive wetlands and location below Quaboag Pond. During the first three survey dates moderate coverage of green algae was found on the river bottom, while during the remainder of the sampling season sparse to moderate coverage of thin brown films were noted (Appendix B).

At Station QAOBO sparse to moderate density of aquatic plants was found throughout the sampling season. Arrowhead (*Sagittaria* sp.), lily pads and grass and rush-like plants were found. A moderate phytoplankton was found on August 20th, although generally phytoplankton was not noted. No periphyton coverage was recorded early in the sampling season but by July a moderate coverage of green filamentous algae was found. A moderate coverage of green algae was also found in August, but in October periphyton coverage was not found (Appendix B).

Water Chemistry
DWM conducted water quality monitoring at two stations (QA100 – Route 148, Brookfield, and QAOBO –Long Hill Road bridge, West Brookfield) along this segment of the Quaboag River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. These stations were also part of DWM 2003 TMDL monitoring for Quaboag Pond. Grab samples were also collected and analyzed at both stations for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Dissolved oxygen was slightly low (4.4 mg/L) and did not meet the criterion at Station QA100 on two occasions (one occasion; pre-dawn worst-case conditions). There are large wetland areas along the Quaboag River near Station QA100.

Dissolved oxygen did not meet the criterion on three occasions (two occasions; pre-dawn worst-case measurements) at Station QAOBO. The extremely low dissolved oxygen concentration (1.9 mg/L) on August 21st, 2003 at Station QAOBO is a concern (Appendix B). A moderate phytoplankton bloom was also noted at this station on August 20th, 2003 during dry weather conditions (Appendix B). Large wetlands are also present just upstream from Station QAOBO. Given the presence of large area of wetlands directly upstream, dry weather conditions, and the fact that the Long Hill Road bridge and the nearby railroad bridge are flow constriction points for the Quaboag River, low dissolved oxygen at this station may be naturally-occurring. pH was below the criterion on occasion but generally met standards. More information on the frequency and duration of low dissolved oxygen at both sites is needed. Total phosphorus concentrations were slightly elevated throughout the summer at both sites. Ammonia-nitrogen concentrations were low at both sites (Appendix B).

The *Aquatic Life Use* is assessed as support for the upper 1.9 miles given the generally good water quality conditions while the lower 4.2 miles is not assessed given uncertainty over whether low dissolved oxygen is naturally-occurring because of the large wetland areas and meandering nature of this reach of the river. The segment is given an "Alert Status" due to the low dissolved oxygen values recorded at both locations.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at two stations (QAOBO – Long Hill Road bridge, West Brookfield, and QA100 – Route 148, Brookfield) along this segment of the Quaboag River between April and October 2003 (Appendix B). On 15 October 2003 the *E. coli* count was 460 cfu/100ml at Station QA100 and represents wet weather sampling. All other bacteria counts at the two stations were low. The geometric mean of *E. coli* counts was less than 20 cfu/100 mL at both stations.

Parameter	DWM 2003 QAOBO 2003 (n=6)	DWM 2003 QA100 (n=6)
Fecal coliform (cfu/100mL)	<2 -410	<2-800
Geometric mean	45.5	15.9
E. coli (cfu/100mL)	<2-120	<2 - 460
Geometric mean	19.7	9.5

No objectionable deposits were found at Station QA100 with the exception of one occasion when limited amounts of plastic bags were noted. DWM field crews noted no scums or water odors. Some limited erosion around a boat launch area was noted early in the sampling season but generally erosion was not noted.

Objectionable deposits in the form of siltation on the left bank from a storm drain and sand deposits on the right bank coming from the road were noted on three occasions at Station QAOBO. Water odor was not noted by DWM field crews and scums were not found with the exception of two occasions when limited patches of scum were noted. Water clarity was clear on all sampling occasions and no erosion was noted.

The *Primary* and *Secondary Contact Recreation Uses* are assessed as support based on the low bacteria counts. Given the general lack of objectionable conditions noted by DWM field crews, the *Aesthetics Use* is assessed as support.

Quaboag River (Segment MA36-14) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT (Upper 1.9 miles)* NOT ASSESSED (Lower 4.2 miles)*
Fish Consumption		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		
Aesthetics		

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

RECOMMENDATIONS

Conduct water quality monitoring to evaluate designated uses.

Multiprobe sampling further downstream at the route 67 bridge in West Brookfield in addition to sampling at the Long Hill Bridge may be warranted to determine the extent and duration of low dissolved oxygen.

FORGET-ME-NOT-BROOK (SEGMENT MA36-18)
Location: Headwaters to North Brookfield WWTP, North Brookfield
Segment Length: 1.7 miles
Classification: Class B, Cold Water Fishery, High Quality Water

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life and Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Toxicity
Ambient
The North Brookfield Wastewater Treatment Facility (WWTF) staff collected water from Forget-Me-Not Brook approximately 10 feet north of East Brookfield Road for use as dilution water in the facility's whole effluent toxicity tests. Between July 2000 and February 2006 survival of *C. dubia* exposed (approximately 7 days) to the Forget-Me-Not Brook water ranged from 80 to 100% (n=23). Between July 2000 and February 2006 survival of *P. promelas* exposed (approximately 7 days) to the Forget –Me-Not Brook water ranged from 63 to 100% (n=23). Three tests were less than 75%. Hardness ranged from 20.0 mg/L to 64.0 mg/L (n=26).

Water Chemistry
DWM conducted water quality monitoring in Forget-Me-Not Brook upstream from the East Brookfield Road bridge in North Brookfield, MA (Station DB08) between May and October 2003 (Appendix B). *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Temperatures were above 20 degrees C on four occasions while dissolved oxygen concentrations were less than 6 mg/L on three occasions. pH met the criteria on all occasions. Ammonia-nitrogen concentrations in the collected samples were generally low. Total phosphorus concentrations collected during the June, July and August sampling dates were elevated.

The *Aquatic Life Use* is assessed as support given the good survival of test organisms and generally good water quality conditions, however elevated temperatures and elevated total phosphorus concentrations are of concern so this use is identified with an "Alert Status".

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (DB08) along this segment of Forget-Me-Not Brook between April and October 2003 (Appendix B). The two highest *E. coli* counts were 1050 cfu/100mL and 4100 cfu/100mL during the June and October sampling dates, respectively. These high bacteria counts were collected during wet weather sampling while bacteria counts were low during dry weather conditions. The geometric mean of *E. coli* counts was 100.5 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 - 6000
Geometric mean	183.3
E. coli (cfu/100mL)	<2 - 4100
Geometric mean	100.5

No objectionable deposits were found at Station DB08 with the exception of one occasion when a heavy, rusty brown bottom floc was noted. No scums were found and no water odors were noted with the exception of one date when a musty water smell was noted. Water clarity was generally slightly turbid at this location and no streambank erosion was noted.

The *Primary* and *Secondary Contact Recreation Use* are assessed as support as the geometric mean of *E. coli* counts meets the criterion. Due to the two elevated bacteria counts these uses are identified with an "Alert Status". The *Secondary Contact Recreation Use* is assessed as support given the low geometric mean of *E. coli* counts. The *Secondary Contact Recreation Use* is given an "Alert Status" due to the two elevated bacteria counts. Given the lack of objectionable conditions, the *Aesthetics Use* is assessed as support for this segment

Forget-Me-Not-Brook (Segment MA36-18) 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

Conduct benthic invertebrate monitoring upstream from the North Brookfield Wastewater Treatment Facility in this segment and in the downstream segment to assess the impact of the treatment plant on Forget-Me-Not Brook and assess *Aquatic Life Use*.

Conduct temperature monitoring on Forget-Me-Not Brook to determine whether it is meeting temperature standards for a cold water fishery.

Conduct bacteria source tracking at Station DB08 to determine the source of high wet weather bacteria counts.

Conduct water chemistry monitoring above the North Brookfield Wastewater Treatment Plant to compare to values below the treatment plant

FORGET-ME-NOT-BROOK (SEGMENT MA36-28)
Location: North Brookfield WWTP, North Brookfield, to confluence with Dunn Brook, East Brookfield/Brookfield
Segment Length: 1.3 miles.
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Cause unknown, unknown toxicity, organic enrichment/low DO, taste, odor and color (MassDEP 2007b).

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2)
Town of North Brookfield- North Brookfield Wastewater Treatment Facility (MA0101061)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
DWM conducted water quality monitoring at one station (DB07) along this segment of Forget-Me-Not Brook downstream from the North Brookfield Wastewater Treatment Plant's discharge between May and October 2003 (Appendix B). DWM crews made notes of conditions at this site throughout the sampling season. Moderate densities of green algae and sparse to moderate densities of thin, brown film algae were found on substrates at this site during the sampling season. A brown floc on the stream bottom was also found on August 20th. Sparse and moderate amounts of phytoplankton were found on May 14th and June 18th, respectively, although none were found on the other survey dates. Sparse densities of grasses were found early in the sampling season but later in the sampling season no aquatic plants were noted.

MA DFG conducted fish population sampling in Forget-Me-Not-Brook at the West Main Street crossing in North Brookfield (Site 1391) on 4 August 2005 using a backpack electro-shocker (Richards 2006). Nine white sucker, seven blacknosed dace, three yellow bullhead, two chain pickerel, one pumpkinseed, and one bluegill were collected (23 fish total). MA DFG fish biologists noted that they sampled 90% of the sample reach and that the water was cloudy.

Toxicity
Effluent
Whole effluent toxicity tests have been conducted on the North Brookfield Wastewater Treatment Facility (WWTF) treated effluent. Between July 2000 and May 2007 twenty-eight valid chronic tests were conducted using *C. dubia* and 30 using *P. promelas.* The chronic whole effluent toxicity tests using *C. dubia* were all 100% effluent (n=28) with the exception of five occasions. Generally no distinct pattern relating effluent chemistry and the poor *C. dubia* CNOEC tests exists, although in February 2005 ammonia-nitrogen was elevated. The chronic whole effluent toxicity tests using *P. promelas* were all 100% (n=23) with the exception of July 2001 which was 25%. In the May 2007 CNOEC test, using *P. promelas,* significant effects were observed in 25% effluent, although the lab reported CNOEC = 100% effluent. Results of the LC_{50} were all $\geq$100% effluent. Ambient toxicity tests for the North Brookfield Wastewater Treatment plant were sampled upstream of the treatment plant in Forget-Me-Not-Brook (Segment MA36-18) and are detailed in that segment.

Water Chemistry
DWM conducted water quality monitoring in Forget-Me-Not Brook downstream from the East Brookfield Road bridge in North Brookfield, MA (Station DB07), between May and October 2003 (Appendix B). This station is downstream from the North Brookfield Wastewater Treatment Plant's discharge. *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All dissolved oxygen, pH and temperature measurements met standards at the DWM monitoring station. Ammonia-nitrogen concentrations were low in the samples collected by DWM although total phosphorus concentrations were all elevated.

The *Aquatic Life Use* is assessed as support given the good water quality conditions. However, the segment is given an "Alert Status" due to the observed chronic effluent toxicity of the North Brookfield Wastewater Treatment Plant's discharge and the elevated total phosphorus concentrations.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (DB07) along this segment of Forget-Me-Not Brook between April and October 2003 (Appendix B). *E. coli* bacteria counts were elevated on two wet weather sampling events. The highest *E. coli* count of 5100 cfu/100 mL was measured on 15 October 2003, a wet weather sampling event. Station DB08 is located downstream from the North Brookfield Wastewater Treatment Plant's discharge. During dry weather *E. coli* counts were low or at the treatment plant's permitted discharge (200 cfu/100mL). Although wet weather sampling events generally had high bacteria counts, the May sampling date low bacteria counts are the exception to this generalization. The geometric mean for *E. coli* at Station DB08 is 194.9 cfu/ 100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	96 - 5200
Geometric mean	255.3
E. coli (cfu/100mL)	60 – 5100
Geometric mean	194.9

No objectionable deposits or scums were noted although the water was often found to have either a septic or musty smell. The septic smell is not surprising given the station's close proximity to the treatment plant's discharge. On one occasion a slight chlorine smell was noted in addition to a septic smell. A brown floc on the stream bottom was also found on August 20th. The water clarity was clear, slightly turbid and highly turbid on two occasions each. No erosion was noted at this site. The MA DFG fish sampling crew also noted the water column was cloudy.

The *Primary Contact Recreation Use* is impaired for Forget-Me-Not Brook due to the elevated geometric mean of *E. Coli* counts. The *Secondary Contact Recreation Use* is assessed as support as the geometric mean of *E. coli* counts meets the criterion. The *Secondary Contact Recreation Use* is given an "Alert Status" due to the one elevated bacteria count. The *Aesthetics Use* is supported given the general lack of objectionable conditions, but is given an "Alert Status" due to the noted water odors and turbidity at Station DB08.

Forget-Me-Not-Brook (Segment MA36-28) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Unknown Suspected Sources: Illicit connections/hook-ups to storm sewers
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT*

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

RECOMMENDATIONS

Conduct benthic invertebrate monitoring downstream of the North Brookfield Wastewater Treatment Facility in this segment to assess the impact of the treatment plant on Forget-Me-Not Brook and assess *Aquatic Life Use*.

Conduct water chemistry monitoring below the North Brookfield Wastewater Treatment Plant. The presence of a beaver dam along this segment should be verified and investigated before any future sampling.

DUNN BROOK (SEGMENT MA36-19)
Location: From confluence with Forget-Me-Not Brook, East Brookfield/Brookfield, to confluence with Quaboag River, Brookfield
Segment Length: 2.4 miles
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3- No Uses Assessed (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Wetlands are present along much of this segment. A large wetland and beaver dam area is located in the upper part of this segment. Immediately upstream (<500 feet) from the DWM sampling station (DUN01 – Quaboag Street, Brookfield) there is a beaver dam along with sizeable wetland areas.

Biology
DWM conducted water quality monitoring at one station (DUN01) in Dunn Brook between May and October 2003 (Appendix B). DWM crews made notes of conditions at this site throughout the sampling season. Sparse to moderate amounts of aquatic plants were found during the sampling season and included mosses, duckweed, various emergents and pond plants. Dense green filamentous algae were found on substrates in April and July while green filamentous coverage was sparse in May. Moderate densities of a brown alga were found on substrates on the June, August and October survey dates. Sparse to moderate abundances of phytoplankton were noted throughout the sampling season.

Water Chemistry
DWM conducted water quality monitoring at one station (DUN01 – Quaboag Street, Brookfield) along Dunn Brook between May and October 2003 (Appendix B). *In-situ* parameters were measured on eight occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B). DWM sampled at DUN01 at the Quaboag Street bridge.

pH was always within 0.5 standard units of the criterion. Dissolved oxygen at Station DUN01 was generally low (minimum 2.6 mg/L) and was below the criterion on four occasions (three worst case conditions). The minimum measured dissolved oxygen value was 2.6 mg/L during the morning of 30 July 2003. On 14 May 2003 dissolved oxygen was 7.5 mg/L, the maximum measured value at this station. Ammonia-nitrogen concentrations were low at this station. Total phosphorus concentrations were elevated (as high as 0.23 mg/L) (Appendix B).

It is unclear the exact cause of low dissolved oxygen concentrations and evidence of nutrient enrichment found in Dunn Brook. It should be noted that the station on this segment of Dunn Brook is located downstream from a beaver dam and a large wetland area as well as being below the North Brookfield Wastewater Treatment Plant (MA0101061). It should also be noted that the stretch of the brook above Route 9 and downstream from the sampling station is very low gradient. The North Brookfield WWTP has reduced their load of biological oxygen demand (BOD) and under their new permit will achieve more stringent total phosphorus limits (Appendix D). Low dissolved oxygen has been documented upstream from the route 9 crossing of Dunn Brook as far back as the 1970's (Firmin 1981). Discharge monitoring reports of the North Brookfield Wastewater Treatment Plant's effluent during the months of June, July and August 2004 indicated that BOD was less than 3.5 mg/L (monthly average) (MassDEP undated).

Therefore, at this time low dissolved oxygen readings are considered natural given the sampling stations immediate proximity to a beaver dam and a large wetland area.

The *Aquatic Life Use* for Dunn Brook is not assessed due to lack of sufficient data given the complexity of the system. The *Aquatic Life Use* is given an "Alert Status" due to the low dissolved oxygen and elevated total phosphorus concentrations.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (DUN01) along Dunn Brook on five occasions between April and October 2003 (Appendix B). *E. coli* bacteria counts were generally low during both dry and wet weather sampling with the exception of 15 October 2003. The highest *E. coli* count of 960 cfu/100 mL was measured on 15 October 2003, a wet weather sampling event. The geometric mean of the *E. coli* counts is 37.6 cfu/100 mL.

Parameter	DWM 2003 (n=5)
Fecal coliform (cfu/100mL)	<2 -1400
Geometric mean	47.5
E. coli (cfu/100mL)	4 - 960
Geometric mean	37.6

No objectionable deposits or scums were noted by DWM field crews at this location. No water odors were found with the exception of one occasion when the water had a musty odor. Water clarity was generally slightly turbid.

The *Primary Contact and Secondary Contact Recreation Uses* are assessed as support based on the low geometric mean of *E. coli* counts. The Primary Contact Recreation Use is identified with an "Alert Status" due to the one elevated bacteria count. Given the lack of objectionable conditions the *Aesthetics Use* is assessed as support.

Dunn Brook (Segment MA36-19) Use Summary Table

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

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

RECOMMENDATIONS
Conduct biological monitoring to assess the *Aquatic Life Use*.

Conduct multiprobe monitoring with the intent of determining dissolved oxygen dynamics in this system.

QUABOAG RIVER (SEGMENT MA36-15)
Location: Route 67 bridge West Brookfield, to Warren WWTP, Warren
Segment Length: 6.3miles
Classification: Class B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2- Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Aquatic Life and Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1)
William E. Wright Limited Partnership (MAG2500031) (MA0001074)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
DWM conducted water quality monitoring at one station (QA06A – Gilbert Road bridge- Warren) along this segment of the Quaboag River between May and October 2003. DWM crews made notes of conditions at this site throughout the sampling season. DWM field crews did not note phytoplankton and only once a sparse coverage of aquatic plants were found. In May a sparse coverage of green filamentous algae was found on substrates while in July a moderate coverage of brown thin films was noted. In August a sparse coverage of periphyton was found (Appendix B).

MA DFG conducted fish population sampling in the Quaboag River near River Street in Warren (Site 886) on 30 July 2003 using barge shocking (Richards 2006). Forty-five redbreast sunfish, twelve bluegill, eight yellow bullhead, five fallfish, four tessellated darter, three largemouth bass, two American eel, one chain pickerel and one pumpkinseed were collected (81 fish total). MA DFG fish biologists noted low sampling efficiency due to reach width and the lack of riffle to stop fish.

MA DFG conducted fish population sampling in the Quaboag River near the intersection of Route 67 and Gilbert Road (upstream from the Warren Wastewater Treatment Plant and downstream from a dam-Site 871) in Warren on 29 July 2003 using backpack electro-shocking (Richards 2006). Seventeen longnose dace, nine redbreast sunfish, eight bluegill, three smallmouth bass, three brown bullhead, two yellow bullhead, two white sucker, two fallfish, two eastern blacknose dace, one American eel, and one pumpkinseed were collected (50 fish total). MA DFG fish biologists used two backpacks to electroshock and estimated sampling efficiency at 25% due to the river's width.

Although macrohabitat generalist species dominated both fish samples MA DFG noted very low sampling efficiencies due the river's width and/or lack of riffle to stop fish. Despite the low abundance the presence of fallfish, tessellated darter, longnose dace, eastern blacknose dace, and white sucker (fluvial species) is indicative of a stable flow regime.

Toxicity
Ambient
The Warren Treatment Plant staff collected water from the Quaboag River (MA36-15) at Gilbert Street, approximately 500 feet upstream from the discharge site, for use as dilution water in the facility's whole effluent toxicity tests. Between September 2000 and November 2005 survival of *C. dubia* exposed (approximately 7 days) to the Quaboag River water ranged from 90 to 100% (n=21). Between September 2000 and November 2001 survival of *P. promelas* exposed (approximately 7 days) to the Quaboag River water was 100% (n=1). Hardness ranged from 12.0 mg/L to 30.0 mg/L (n=21).

Water Chemistry

DWM conducted water quality monitoring at one station (QA06A – Gilbert Road bridge- Warren) along this segment of the Quaboag River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All measured water quality parameters met criteria and guidelines. Dissolved oxygen was high at this station throughout the sampling season, which is logical given the station's location below a dam. Ammonia-nitrogen concentrations at Station QA06A were generally low, but total phosphorus concentrations were slightly elevated during the majority of the sampling season.

The *Aquatic Life Use* is assessed as support given the good survival of test organisms and good water quality conditions.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (QA06A – Gilbert Road bridge- Warren) along this segment of the Quaboag River between April and October 2003 (Appendix B*). E. coli* counts were generally low during both wet and dry weather sampling events with the exception of 15 October 2003. The highest *E. coli* count of 690 cfu/100 mL was measured on that date, a wet weather sampling event. Wet weather *E. coli* counts at this station were generally higher than when compared to dry weather counts. The geometric mean of *E. coli* counts was 47cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 -800
Geometric mean	112
E. coli (cfu/100mL)	<2 - 690
Geometric mean	47.2

With the exception of May 14, 2003, when garbage and trash were noted on the banks, no objectionable deposits were found. No water odor was noted, but white foam was often found issuing from the upstream dam. No other scums were noted and the white foam is considered naturally-occurring. Water clarity was generally listed as clear or slightly turbid during the sampling season.

The *Primary* and *Secondary Contact Recreation Uses* are assessed as support based on the low geometric mean of *E. coli* counts. Given the lack of objectionable conditions the *Aesthetics Use* is assessed as support.

Quaboag River (Segment MA36-15) Use Summary Table

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

RECOMMENDATIONS

Conduct macroinverterbrate sampling along this segment to assess the *Aquatic Life Use*. A station along Route 67 west of Warren center is recommended.

QUABOAG RIVER (SEGMENT MA36-16)
Location: Warren WWTP, Warren, to the Route 32 bridge, Palmer/Monson
Segment Length: 8.7miles
Classification: Class B, Warm Water Fishery, CSO**

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens, taste, odor and color (MassDEP 2007b).

** Although the river as defined in the 2006 standards inclusive of this segment has a CSO qualifier, there are no CSOs in this segment, so the CSO qualifier does not apply to this segment. All class B standards apply.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from this subwatershed.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2)
Town of Warren-Warren Treatment Plant (MA0101567)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The USGS maintain a gage in West Brimfield, MA, on the Quaboag River (Gage 01176000) 10 feet upstream from abandoned highway bridge site at West Brimfield, 0.9 mi upstream from Blodgett Mill Brook. The drainage area is 150 mi^2 and the period of record is from August 1909 to July 1912 (twice daily gage height) and August 1912 to present *(Socolow et al. 2004)*. The average discharge is 249 cfs (1912-2005) (USGS 2007). The maximum discharge occurred on 19 August 1955 (12,800 cfs) and the minimum discharge occurred on 28 and 29 September 1957 (6.6 cfs) *(Socolow et al. 2004)*. The USGS remarks that before 1956 slight diurnal fluctuation at low flow was caused by a mill upstream. Since 1965 high flow has been slightly affected by retarding reservoirs *(Socolow et al. 2004)*. The estimated daily discharge is considered to be poor by the USGS, but otherwise records at this gage are considered good.

Biology
MA DFG conducted fish population sampling in the Quaboag River near Route 67 and Warren Street above both a Route 67 rest area and an unnamed tributary on the Warren/Palmer border (Site 876) on 30 July 2003 using backpack shocking (Richards 2005). Eleven longnose dace, eight fallfish, seven white sucker, six smallmouth bass, three eastern blacknose dace, two golden shiner, one bluegill, one rock ass, one pumpkinseed, and one tessellated darter were collected (41 total fish). MA DFG fishery biologists noted that two backpacks were used on the Quaboag River's channel on both sides of the river while the middle of the river was not sampled. MA DFG fishery biologists also noted that some white suckers were not collected due to fast flow.

MA DFG conducted fish population sampling in the Quaboag River near a Route 67 rest area and the USGS gage in West Brimfield (Site 880) on 30 July 2003 using barge shocking (Richards 2006). Eleven white sucker, nine redbreast sunfish, seven bluegill, five yellow perch, five longnose dace, three American eel, three tessellated darter, two yellow bullhead, two blacknosed dace, two rock bass, two smallmouth bass, one common shiner, one largemouth bass, and one pumpkinseed were collected (54 fish total). MA DFG fishery biologists noted that they shocked two large pool areas with poor results.

Toxicity

Effluent

Whole effluent toxicity tests have been conducted on the Warren Treatment Plant treated effluent. Between September 2000 and November 2005, nineteen valid chronic tests were conducted using *C. dubia*. The chronic whole effluent toxicity tests using *C. dubia* ranged between 13.0 to 100% effluent (n=19), all of which meet the permit limit of >13.0, except for May 2001 which was exactly 13.0%. Results of the LC_{50} for *C. dubia* were all $\geq$100% effluent, with the exception of the LC_{50} of 38.0% in May 2003 and the LC_{50} of 66.0%.in May 2004.

Water Chemistry

DWM conducted water quality monitoring at one station (QRG- near USGS flow gauging station 01176000) along this segment of the Quaboag River between May and October 2003 (Appendix B). Station QRG is also the MassDEP, Central Regional Office's Strategic Monitoring and Assessment for River Basin Team (SMART) station. CERO crews conduct water quality monitoring at this location throughout each year. CERO data collected between 2001 and 2003 are summarized in this report. Between both crews *in-situ* parameters were measured on nine occasions at Site QRG in 2003 with three measurements during pre-dawn hours. Grab samples were also collected and analyzed for TSS, turbidity and nutrients at this site (Appendix B).

All water quality parameters at Station QRG met state standards with the exception of a single pH value on one occasion (Appendix B). Dissolved oxygen concentrations were generally close to saturation. Ammonia-nitrogen concentrations were generally low at this station. Most of the total phosphorus concentrations at Station QRG were greater than 0.05 mg/L (Appendix B, MassDEP 2006a). Nitrate-nitrite-nitrogen concentrations were generally low at this station while total Kjeldahl nitrogen concentrations were on average around 0.5 mg/L. For a summary of water quality data collected at Station QRG by both crews see table below.

Parameter	DWM 2003	CERO (2001-2003)
DO (mg/L)	7.4-10.7 (n =4)	8.1 – 14.6 (n =16)
pH (SU)	7.0 – 7.4 (n =4)	6.1 – 8.1 (n =16)
Temperature (℃)	15.3 – 23.5 (n =4)	-0.08 – 24.6 (n =16)
Conductivity (µS/cm at 25℃)	117 –173 (n =4)	102 – 377 (n =16)
Ammonia- nitrogen (mg/L)	<0.02 (n =1)	<0.02 – 0.17 (n =15)
Nitrate – nitrite nitrogen (mg/L)	--	<0.06 – 0.45 (n =15)
TKN (mg/L)	--	0.19 – 0.55 (n =15)
Total phosphorus (mg/L)	0.049 (n =1)	0.026 – 0.20 (n =16)
Alkalinity (mg/L)	--	4 – 22 (n =15)
Hardness (mg/L)	--	7 – 25 (n =15)
Total suspended solids (mg/L)	5 (n =1)	<1 – 7.3 (n =15)
Turbidity (NTU)	1.3 (n =1)	0.87 – 3.8 (n =15)

Given the good water quality conditions this segment of the Quaboag River is assessed as support for *Aquatic Life Use*. This segment is given an "Alert" Status though due to elevated total phosphorus concentrations measured at Station QRG.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (QRG, near USGS Gage 01176000) along this segment of the Quaboag River between May and October 2003 (Appendix B). Four bacteria samples were collected during the 2003 sampling season by either DWM or CERO crews. The samples collected represent both wet and dry weather conditions. Two of the samples had low *E. coli* counts (both wet and dry weather sampling) while the other two samples during dry weather sampling had slightly elevated *E. coli* counts. The geometric mean of *E. coli* counts was 47.7 cfu/ 100 mL.

Parameter	DWM 2003 (n=4)
Fecal coliform (cfu/100mL)	6 - 380
Geometric mean	78.4
E. coli (cfu/100mL)	<2 - 300
Geometric mean	47.7

Both DWM and CERO crews found garbage and trash throughout the 2003 survey season at this site (tires, old appliances, metals, floatables, assorted trash, etc) and on two occasions May 14th and October 22nd sand and silt deposits were noted. The trash and debris at this site are believed to be localized. Water odor was not noted by DWM or CERO crews during 2003. Scums were not noted with the exception of small isolated patches of foam found on three occasions by CERO crews. MassDEP field crews noted some minor erosion. Water clarity was generally clear although slightly turbid on two occasions. DWM and CERO crews noted that the water color was typically reddish at Station QRG. Hardwick Knitters and Wm. E. Wright both have industrial discharges that go to the Warren WWTP plant (Kimball 2007a). Both companies use dyes and Wm. E. Wright attempted to pre-treat their discharge before treatment at the Warren WWTP while Hardwick Knitters have reduced their effluent color through operational changes (Kimball 2007a). These dyes may explain the reddish color seen in the field by crews although natural conditions are also indicated. Recently in December 2006 Wm. E. Wright announced that they were closing their operations in Warren. Hardwick Knitters has also recently gone out of business.

Since only four bacteria samples were collected at this site and five samples are required to assess both contact uses, both the *Primary* and *Secondary Contact Recreation Uses* are not assessed. Given the localized nature of objectionable conditions the *Aesthetics Use* is assessed as support.

Quaboag River (Segment MA36-16) Use Summary Table

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

RECOMMENDATIONS

Conduct macroinverterbrate sampling to assess the *Aquatic Life Use* along this segment.

Collect an adequate number of bacteria samples along this segment to assess *Contact Recreational Uses*.

QUABOAG RIVER (SEGMENT MA36-17)
Location: Route 32 bridge, Palmer/Monson, to the confluence with Ware River, forming headwaters of Chicopee River, Palmer
Segment Length: 5.3 miles
Classification: Class B, Warm Water Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Palmer Water Department registration (10822702)
Three Rivers Fire District registration/permit (10822701/9P210822701)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D2, D4)
Town of Palmer (MAR041017)
Palmer WWTP (MA0101168)

Palmer WWTP (MA0101168) is permitted to discharge an estimated 21 MG per year of combined sewage via 14 wet weather CSOs along this segment of the Quaboag River. Palmer's May 1999 Final Long Term Control Plan for CSO Abatement identified four phases of sewer separation throughout Palmer to eliminate CSO discharges (MassDEP 2001). Sewer separation work to eliminate 13 of the 14 CSO discharges into this segment of the Quaboag River is included in the first three phases of work. In 1999 the Town of Palmer submitted a request for MA SRF financing for the first three phases of work and in November 1999 was selected to receive financing for $7.1 million dollars. Sewer separation was approved by the MassDEP in December 2000 as part of CW SRF-423. The regulations in thirteen of the fourteen CSOs were plugged in 2003 (Boisjolie, 2005). CSO Outfall #008 (near Pump Station #2, on Route 181) is the one CSO in Palmer on the Quaboag River that was not scheduled to be eliminated in the first 3 phases of sewer separation work. Modeling of this CSO, however, indicates that it has little discharge (does not discharge during a three-month storm) (Boisjolie 2001). Currently CSO #008 is still active (Boisjolie, 2007).

An EPA superfund site is located at the PCS Resources site at 10 Water Street, Palmer, MA. This site has undergone significant remedial action and is the subject of continued monitoring. According to the EPA, groundwater contamination is mainly benzene and methylene chloride (volatile organic compounds). Polychlorinated biphenyls (PCBs), including Aroclor-1248 and Aroclor-1260, and lead have also been found in soils on this site in the past (EPA 2006). Contamination has been found in soils on site and groundwater in nearby wetlands. Cleanup of the contaminated soils and contaminated wetlands soils has been completed. In the 2005 five-year progress report on this site the EPA notes that groundwater contaminants have generally fallen and only benzene and vinyl chloride have exceeded their cleanup targets (EPA 2006). The EPA also notes that surface water cleanup levels in the Quaboag River have been met and the sediment contaminant cleanup levels have been met with the exception of lead, which will continue to be monitored (EPA 2006).

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
DWM conducted water quality monitoring at one station (QA09A –Palmer Street bridge, Palmer) along this segment of the Quaboag River between April and October 2003 (Appendix B). *In-situ* parameters were measured on nine occasions, including three pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All water quality parameters measured by DWM met criteria. Dissolved oxygen concentrations at Station QA09A were always greater than the criterion and often near saturation, while pH was generally neutral. Ammonia-nitrogen concentrations were low at the DWM station. Total phosphorus concentrations collected at Station QA09A were generally around 0.050 mg/L with the highest sample (0.078 mg/L) collected in June.

Given the good water quality conditions, the *Aquatic Life Use* is assessed as support.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (QA09A –Palmer Street bridge, Palmer) along this segment of the Quaboag River between April and October 2003 (Appendix B*).* The DWM station was downstream from numerous CSOs that were eliminated during the summer of 2003. Without the exact dates when the CSOs were eliminated it is impossible to determine what impacts these CSOs would have on bacteria levels during the 2003 sampling season. It is known, though, that CSO #008 was active during the period of DWM sampling.

E. coli bacteria counts were high on both wet and dry weather sampling dates. The highest *E. coli* count of 2160 cfu/100mL was collected on 15 October 2003 during wet weather sampling. The *E. coli* geometric mean was 156.8 cfu/100 mL and four samples were greater than 235 cfu/100 mL. Only the October sample had an *E. coli* count greater than 1260 cfu/100 mL. Given the high *E. coli* bacteria counts it appears that the CSOs in the Quaboag River were still having an effect on in-stream bacteria levels during DWM sampling, but it is impossible to estimate the extent of their impact.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 -410
Geometric mean	277.5
E. coli (cfu/100mL)	<2 - 2160
Geometric mean	156.8

Garbage and trash were noted on the stream banks on two occasions and in-stream trash was noted on two occasions, while on four occasions no objectionable deposits were noted. No water odor was observed. On three occasions white foam was noted while on the majority of occasions no scums were found. Water clarity was generally clear or slightly turbid during the sampling season. A sparse coverage of irises (*Iris* sp.) was found throughout the sampling season but no periphyton or phytoplankton were observed. Erosion was found on the right bank, which was undercut at this site.

The *Primary Recreation Contact Use* is assessed as impaired due to elevated *E. coli* bacteria counts. *Secondary Contact Recreation Use* is assessed as support given an *E. coli* geometric mean less than criterion. The *Secondary Contact Recreation Use* is given an “Alert Status” due to the presence of an active CSO discharge and the one high *E. coli* count. Given the general lack of objectionable conditions along this segment, the *Aesthetics Use* is assessed as support.

Quaboag River (Segment MA36-17) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Combined sewer overflows Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Continue bacteria monitoring in this segment below Palmer WPCF CSO #008 to assess recreational contact uses. A bacteria monitoring station in the upper part of this segment (Bridge St., etc) is recommended.

Conduct fish toxics work downstream of the PCS Resources superfund site to assess *Fish Consumption Use*.

Conduct benthic macroinvertebrate and fish population sampling in this segment to assess *Aquatic Life Use*.

CHICOPEE BROOK (SEGMENT MA36-21)
Location: Headwaters, east of Peaked Mountain, Monson, to confluence with Quaboag River, Monson
Segment Length: 9.9 miles
Classification: Class B, Cold Water Fishery

Chicopee Brook Pond (MA36031) will no longer be reported on as an approximately 9-acre lake segment since the estimated retention time of this waterbody is less than one day. It will be considered a run of the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from USGS two stream gages in the Chicopee River Basin (01177000 and 01176000) and the normal storage volume of the dam reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Monson Water and Sewer Department registration (10819101)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1)
Double A Plastics Co. Inc. (MAG250027)
Thermotech (MAG250376)
Polymer Injection Molding (MAG250376)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks Chicopee Brook with trout (MA DFG 2007).

Water Chemistry
All designated uses are not assessed due to the lack of quality-assured data available for Chicopee Brook.

Chicopee Brook (Segment MA36-21) Use Summary Table

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

RECOMMENDATIONS
Conduct water quality monitoring (water chemistry, multiprobe, bacteria sampling) to evaluate designated uses.

Conduct fish population sampling and temperature monitoring along this segment to assess the *Aquatic Life Use*. Although listed as a coldwater fishery no recent fish population work has been done.

Chicopee River Subbasin

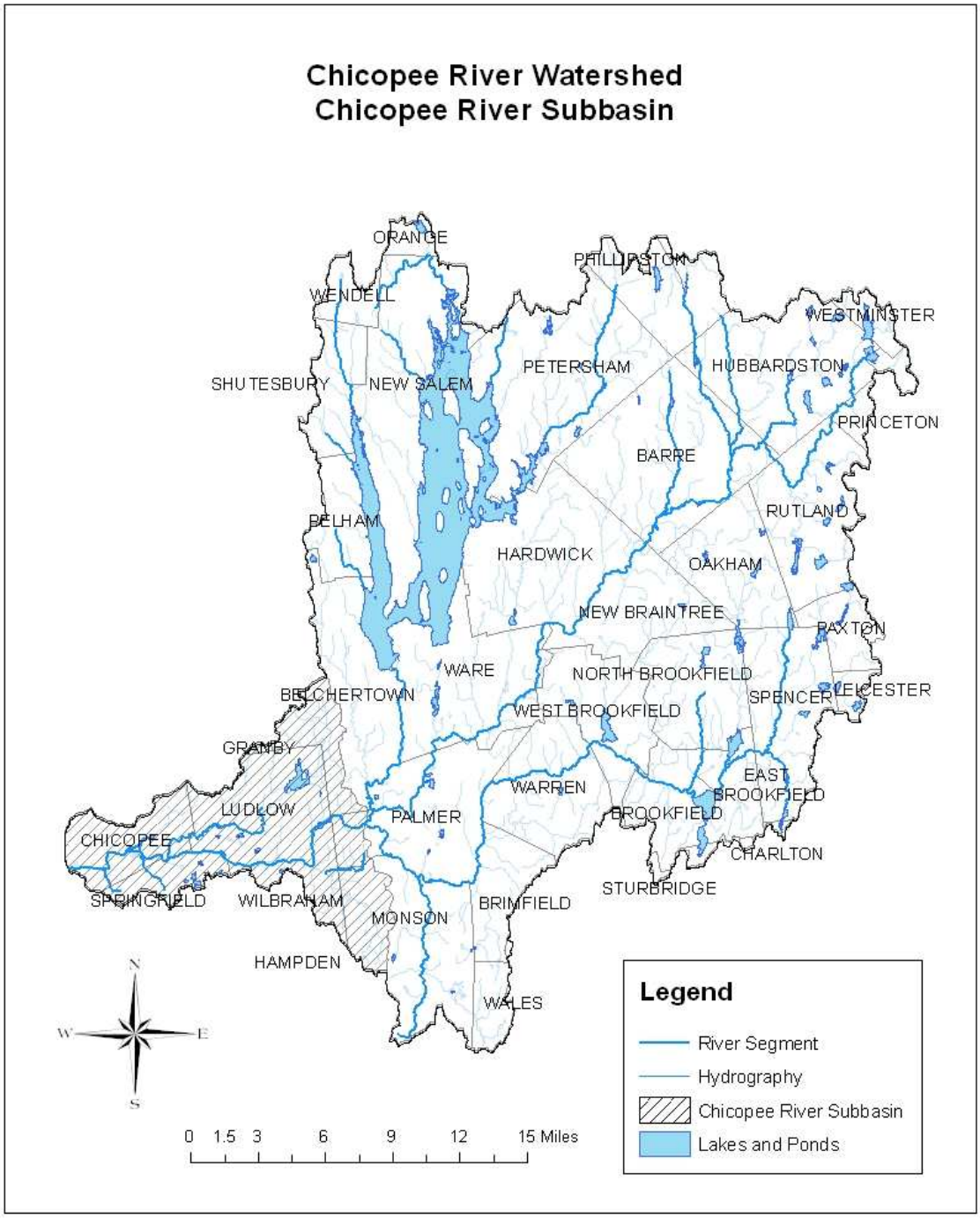


Figure 10: Chicopee River Subbasin

CHICOPEE RIVER (SEGMENT MA36-22)
Location: Source, confluence of Ware River and Quaboag River, Palmer, to Red Bridge Impoundment Dam, Wilbraham/Ludlow
Segment Length: 2.8 miles
Classification: Class B, Warm Water Fishery, CSO

Red Bridge Impoundment (MA36171) will no longer be reported as an approximately 73 acre lake segment since the estimated retention time of this waterbody is approximately one day. It will be considered a run of the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from USGS two stream gages in the Chicopee River Basin (01177000 and 01176000) and the normal storage volume of the dam reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D2, D4)
Palmer Waste Water Treatment Plant (WWTP) (MA0101168)
Town of Palmer (MAR041017)
Town of Wilbraham (MAR041025)

Palmer WWTP (MA0101168) is authorized to discharge 5.6 MGD of treated wastewater to the Chicopee River via Outfall 027. The Town's permit was reissued in September 2000. The Palmer WWTP is also permitted to discharge an estimated 4 MG per year of combined sewage via three wet weather CSOs in this segment of the Chicopee River. As of September 2000 CSO #015 (Springfield St., Three Rivers) was blocked. Palmer's May 1999 Final Long Term Control Plan for CSO Abatement identified four phases of sewer separation throughout Palmer to eliminate CSO discharges. Sewer separation work to eliminate two of these three CSO discharges to the Chicopee River is included in the first three phases of work (Appendix E). In 1999 Palmer submitted a request for MA SRF financing for the first three phases of work and in November 1999 was selected to receive financing for $7.1 million dollars. Sewer separation was approved by the MassDEP in December 2000 as part of CW SRF-423. As part of this work all three CSOs in this segment have been blocked in 2003 (Boisjolie, 2005) .The sewer separation work began in 2002 and was completed in spring 2004 (Boisjolie 2007b). In August 2004 an illicit connection to CSO Outfall #014 was removed (Boisjolie 2005). The Town continues to monitor for illicit connections.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Flow is influenced by the Red Bridge Dam hydropower project (see Segment MA36-23 for details).

Toxicity
Effluent
Whole effluent toxicity tests have been conducted on the Palmer Water Pollution Control Facility treated effluent. Between July 2000 and March 2006, twenty-two valid chronic tests were conducted using *C. dubia.* Results of the chronic whole effluent toxicity tests using *C. dubia* ranged from 6.25% to 100% effluent (n=22). Results in June 2001 showed a significant difference in reproduction for 25% effluent. The LC_{50} results were all >100% effluent (n=24) with the exception of September 2004, which was 33.0% effluent (Appendix D).

Water Chemistry

DWM conducted water quality monitoring at one station (CH01 – near the intersection of New Hampshire Avenue and Springfield Street, Palmer) along this segment of the Chicopee River between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Dissolved oxygen, temperature and pH all met criteria. Ammonia-nitrogen concentrations in samples collected at Station CH01 were low, while total phosphorus concentrations were slightly elevated during the summer (Appendix B).

Given generally good water quality conditions the *Aquatic Life Use* is assessed as support for this segment.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (CH01 – near the intersection of New Hampshire Avenue and Springfield Street, Palmer) along this segment of the Chicopee River between April and October 2003 (Appendix B*).* The DWM station is downstream from numerous CSOs and the Palmer WWTP discharge.

DWM sampling dates included both wet weather and dry weather sampling. *E.coli* counts were generally elevated during wet weather sampling but no strong pattern was found relating *E. coli* counts and sampling conditions. Both high and low *E. coli* counts were measured on dry weather sampling dates. The highest *E. coli* count of 1520 cfu/100 mL was found on 15 October 2003, a wet weather sampling date. The geometric mean for *E. coli* was 194.5 cfu/100 mL.

Parameter	DWM 2003 (n=16)
Fecal coliform (cfu/100mL)	20 –1800
Geometric mean	304.7
E. coli (cfu/100mL)	30 - 1520
Geometric mean	194.5

Currently without the exact dates when CSOs were eliminated it is impossible to determine what impacts CSOs would have on bacteria levels during the 2003 sampling season. It is known, though, that CSO #014 had an illicit connection removed in 2004.

No objectionable deposits, scums or water odor were recorded by DWM field crews. Water clarity was generally noted to be clear although on two occasions it was noted to be slightly turbid. Erosion was noted on one occasion only. Aquatic vegetation, periphyton and phytoplankton were unobservable or not observed.

Given the elevated *E. coli* counts, the *Primary Contact Recreation Use* is assessed as impaired. Since the geometric mean for *E. coli* meets the *Secondary Recreation Contact Use* criterion the *Secondary Contact Recreation Use* is assessed as support. The *Secondary Contact Recreation Use* is given an “Alert Status” due to CSO discharges upstream and the one high *E. coli* count. Given the general lack of objectionable conditions along this segment the *Aesthetics Use* is assessed as support.

Chicopee River (Segment MA36-22) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Combined sewer overflows Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Continue to collect bacteria data during wet and dry weather to evaluate the effectiveness of CSO abatement work and assess the *Primary* and *Secondary Contact Recreational Uses*.

Conduct water quality sampling (chemistry and multiprobe) along this segment to assess *Aquatic Life Use.*

CHICOPEE RIVER (SEGMENT MA36-23)
Location: Red Bridge Impoundment Dam to Wilbraham Pumping Station (old WWTP), Wilbraham/Ludlow
Segment Length: 3.8 miles
Classification: Class B, Warm Water Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens (MassDEP 2007b).

The MassDEP awarded money for the 604(b) grant entitled Chicopee River Watershed Basin Assessment. This project will address watershed assessment needs in the communities of Chicopee, Ludlow, Springfield, and Wilbraham that fall within the Chicopee River Basin. Stormwater infrastructure components will be identified, compiled into a database, and mapped; existing BMPs will be mapped and recommendations for future BMP implementation will be generated; existing water quality data will be compiled into a comprehensive database and analyzed to determine data gaps and to recommend future sampling efforts; and local water quality protection ordinances and bylaws will be reviewed and draft water protection bylaws prepared for communities within the study area.

FERC
Western Mass Electric Co. (Consolidated Edison Energy), Red Bridge Impoundment Station, is a FERC-exempt facility (FERC Exempt #10676) operating a 3,600-Kilowatt hydroelectric power station on the Chicopee River in Wilbraham (FERC 20 December 2000). Under its exempt status, the facility is required to release a continuous flow of 237 cfs from the Red Bridge Impoundment Dam. This facility is permitted to draw down the Red Bridge Impoundment to one-foot below crest from April to June and two-feet below crest during the remainder of the year. In 1997 MA DFW reached agreement with Consolidated Edison Energy, MA, on an interim measure, that their Red Bridge Impoundment Station could use between 140 – 300 cfs if a constant spillage is maintained over the spillway. The water levels at Red Bridge Impoundment are monitored and recorded and fluctuations are limited to three inches with a minimum flow released over the entire width of the spillway (Kleinschmidt Associates and CEEI 1999). In a 1998 letter to Consolidated Edison Energy, Inc. the USFWS described the minimum continuous flow release method at the Red Bridge Impoundment Station as inadequate (McCollum 2001). A slide gate has been installed at the Red Bridge Impoundment to ensure a more reliable minimum continuous flow release (Slater 2007).

I. Maxmat Co. (176 Cottage St., Wilbraham), Collins Dam Station, is a FERC-exempt facility (FERC Exempt #6544) operating a 1,500-Kilowatt hydroelectric power station on this segment of the Chicopee River (FERC 20 December 2000). The dam has a hydroelectric facility leased by Swift River Co., which, for the most part, maintains minimum flows of approximately 200 cfs. The Collins Dam was built in 1985 and is eight feet tall with four-foot flashboards.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1)
Consolidated Edison Energy Massachusetts Inc. (CEEMI) (MA0035823)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Flow is regulated by two hydropower projects (discussed above) on this segment.

Water Chemistry

DWM conducted water quality monitoring at one station (CH02B–Miller Street/Cottage Avenue bridge, Ludlow/Wilbraham) along this segment of the Chicopee River between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Dissolved oxygen, temperature and pH at Station CH02B all met criteria. Ammonia-nitrogen concentrations in samples collected at Station CH02B were low, while total phosphorus concentrations were slightly elevated during the summer (Appendix B).

Given the generally good water quality conditions, the *Aquatic Life Use* is assessed as support. Due to the potential impacts of hydropower operations this segment is identified with an "Alert Status."

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (CH02B–Miller Street/Cottage Avenue bridge, Ludlow/Wilbraham) along this segment of the Chicopee River between April and October 2003 (Appendix B*).*

E. coli bacteria counts were low on both dry and wet weather sampling dates. The highest *E. coli* count was 160 cfu/100mL on 15 October 2003, a wet weather sampling date. The geometric mean of the *E. coli* counts was 20.8 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 -120
Geometric mean	28.2
E. coli (cfu/100mL)	<2 - 160
Geometric mean	20.8

No objectionable deposits, odors or scums were noted by DWM field crews with the exception of one occasion when an oily sheen and rusty flow was noticed on the downstream left bank. Water clarity, although sometimes unobservable, was generally noted to be clear with one occasion of slight turbidity. Aquatic plant density, periphyton and plankton were generally noted as unobservable.

Given the low bacteria counts, both *Primary* and *Secondary Recreation Contact Uses* are assessed as support. Given the general lack of objectionable conditions along this segment, the *Aesthetics Use* is assessed as support.

Chicopee River (Segment MA36-23) Use Summary Table

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

RECOMMENDATIONS

Fish population and benthic invertebrate monitoring in this segment to assess the *Aquatic Life Use* should be conducted.

Conduct multiprobe monitoring upstream from the Collins Dam to collect more representative data and determine *Aquatic Life Use.*

Monitor the effects of hydropower activities on the Chicopee River.

Fish passage plans should be considered at the hydropower dams along this segment.

CALKINS BROOK (SEGMENT MA36-26)
Location: Headwaters, southeast of Baptist Hill, Palmer, to confluence with Twelvemile Brook, Wilbraham
Segment Length: 2.7 miles
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No recent quality-assured data are available for Calkins Brook. All designated uses are not assessed.

Calkins Brook (Segment MA36-26) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Conduct water quality sampling (water chemistry, multiprobe and bacteria) to assess the *Aquatic Life Use* and the *Primary* and *Secondary Recreational Contact Uses*.

CHICOPEE RIVER (SEGMENT MA36-24)
Location: Wilbraham Pumping Station, Wilbraham/Ludlow, to Chicopee Falls, Chicopee
Segment Length: 9.1 miles
Classification: Class B, Warmwater Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1):
Dauphinais & Son Inc. registration (10833901)

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLES D1,D2,D4)
Connecticut Valley Sanitary Waste Disposal Inc. (MA0033847)
Consolidated Edison Energy Massachusetts Inc. (CEEMI) (MA0035815) (MA0035831)
Solutia Inc. (MA0001147)
Town of Ludlow (MA0101338)
City of Chicopee, Chicopee Water Pollution Control (MA0101508)
Springfield Water and Sewer Commission (MA0103331)
Town of Ludlow (MAR041014)
City of Springfield (MAR041023)
City of Chicopee (MAR041003)
Town of Wilbraham (MAR041025)

Ludlow Sewage Collection System (MA0101338) permit was issued in August 1985. The permit authorized the discharge of combined sewer overflows via five outfalls to the Chicopee River. The sewage has been tied into Springfield's collection system and four of the five outfalls were blocked as of December 1998. The single outfall described as "south of the primary plant" (referred to as Outfall #005 in the compliance evaluation inspection report, which is likely Outfall #007 in the NPDES permit) still remains physically connected to the river (McCollum 2000). The inspection report indicated there was no evidence of dry weather overflows. Since the permit's expiration the Town of Ludlow has worked with the City of Springfield to craft a Long Term CSO Plan. CSO #005 is the only CSO now active and it is currently scheduled to be eliminated by May 2009 (Boisjolie, 2007b).

The City of Chicopee, Chicopee Water Pollution Control (MA0101508), is permitted to discharge via CSO #037 (East Main Street-House 227) to this segment. The estimated discharge from this CSO is 0.1 MG/year.

The Springfield Water and Sewer Commission (SWSC) NPDES permit (MA0103331) issued in 2003 allows the discharge from six CSOs into this segment (CS0#033-0037, CSO#043, CSO#044). The estimated discharge from these CSOs is 22.6 MG/year. The status of the remaining CSOs and their estimated CSO discharge is listed below. All discharge estimates listed below are from the SWSC Long Term Control Plan. Springfield is currently scheduled to begin its Chicopee River Abatement Project in 2007 and will reduce CSO discharges by May 2009. The goal of this 31 million dollar project will be to limit CSO discharges from Springfield's permitted CSOs to twice per year or less, with the cumulative volume of CSO discharge reduced from 22.6 MG/yr to less than 1.0 MG/yr (Boisjolie 2007b). A summary of Springfield CSOs is below.

NAME	ADDRESS	NO_	Estimated CSO Discharge Million Gallons/year (MG/yr)
SPRINGFIELD CSO	Front St.	033	*Eliminated*
SPRINGFIELD CSO	Main St.	034	9.8 MG/yr
SPRINGFIELD CSO	Front & Oak St.	035	0.2 MG/yr

NAME	ADDRESS	NO_	Estimated CSO Discharge Million Gallons/year (MG/yr)
SPRINGFIELD CSO	Pinevale & Water St.	036	0.7 MG/yr
SPRINGFIELD CSO	Cedar St.	037	10.8 MG/yr
SPRINGFIELD CSO	Banner St.	043	0.7 MG/yr
SPRINGFIELD CSO	Rogers Ave.	044	0.4 MG/yr

FERC

Western Mass Electric Co. (Consolidated Edison Energy, Inc.), Putts Bridge Dam Station, is a FERC-exempt facility (FERC Exempt #10677) operating a 3,200-Kilowatt hydroelectric power station on the Chicopee River in Ludlow/Springfield (FERC 20 December 2000). Under its exempt status, the dam is not subject to Part 12 FERC Inspections and is operating within the exemption conditions for one-foot drawdown of the pool. The dam has 1.7' high flashboards. There are no current provisions to allow fish passage (Kleinschmidt Associates and CEEI 1999).

Western Mass Electric Co. (Consolidated Edison Energy), Indian Orchard Station, is a FERC-exempt facility (FERC Exempt #10678) operating a 3,700-Kilowatt hydroelectric power station on the Chicopee River in Ludlow/Springfield (FERC 20 December 2000). Under its exempt status, the dam is subject to FERC Part 12 Inspection requirements. The license exemption requires a continuous minimum flow release of 247 cfs, or inflow, at the base of the dam. The order also limits pond drawdown to one foot below the top to the flashboards, or to permanent crest during flashboard outage. There are no current provisions to allow fish passage (Kleinschmidt Associates and CEEI 1999).

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Habitat and Flow

The USGS maintains a gage in Springfield, MA, on the Chicopee River (Gage 01177000) 1000 ft downstream from West Street Bridge at Indian Orchard and 1.1 mi upstream from Fuller Brook. The drainage area of this gage is 689 mi^2 and the period of record is August 1928 to present (pre-Nov. 1938 published as "at Bircham Bend") (Socolow 2005). The average discharge is 909 cfs (1928-2005) and the maximum discharge occurred on 21 September 1938 (45,200 cfs) while the minimal discharge of 16 cfs occurred several times in 1929-31 (USGS 2007 and Soclolow *et al.* 2005).

The USGS remarks that flow diversion has occurred since 1941 from 186 mi^2 in Swift River basin and at times since 1931 from 97 mi^2 in Ware River Basin for Boston Metropolitan District (now MA DCR) (Socolow *et al* 2005). Diversions have also occurred since 1950 for Chicopee, since 1952 for South Hadley, at times since 1966 for Worcester, and at times since 1955 from 6.5 mi^2 in Ware River Basin for Fitchburg. Diversion from Ludlow Reservoir for Springfield and, prior to 1952, for Chicopee has also occurred. Flow is regulated by powerplants upstream, by Quabbin Reservoir 21 mi upstream on the Swift River since 1939, by Barre Falls Reservoir on the Ware River since 1958, by Conant Brook Reservoir since 1966, and by smaller reservoirs (Socolow 2005). Discharge records are considered to be good except for estimated daily discharges, which are poor. (Socolow *et al* 2005).

There are two dams on this segment of the Chicopee River: Putts Bridge Dam at Route 21 between Ludlow and Indian Orchard (part of Springfield) and the Indian Orchard Dam north of Route 141 adjacent to an old mill on Front Street. The Putts Bridge Dam was constructed in 1918 as a concrete gravity structure. It rises 22' from the bed of the Chicopee River. The Indian Orchard Dam is a cut stone dam with 28' of height above the river. Both dams are owned and operated by CEEI as hydroelectric power plants. They generate and release minimum flows depending on the release from the Red Bridge Dam (located further upstream on the Chicopee River) (Kleinschmidt Associates and CEEI 1999). This segment of the Chicopee River ends at the Chicopee Falls Dam, which is a hydroelectric facility owned by the City of Chicopee.

Water Chemistry

DWM conducted water quality monitoring at one station (CH06– River Street/West Street bridge, Springfield/Ludlow) along this segment of the Chicopee River between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Dissolved oxygen, pH and temperature met criteria on all sampling dates. It should be noted though that the DWM station was below the Indian Orchard Impoundment. Total phosphorus concentrations during June and August 2003 sampling dates were slightly elevated. Ammonia-nitrogen concentrations were low on all sampling dates.

The *Aquatic Life Use* is assessed as support for this segment of the Chicopee River based on the good water quality conditions but is given an "Alert Status" due to the presence of CSOs and the potential impacts of hydromodification due to hydropower operations.

Primary and Secondary Contact Recreation and Aesthetics Uses

Metcalf and Eddy (2006), as part of CSO work for the Connecticut River Bacteria Monitoring Project, collected bacteria samples at the Route 21 bridge on the Springfield/Ludlow border. This station is upstream from the Indian Orchard Impoundment and upstream from the DWM sampling site. Metcalf and Eddy staff collected two samples along a transect. Samples were taken from the river bank east of the bridge on both sides of the river. Dry weather sampling was conducted on 8 August 2001 and wet weather sampling on three occasions: between 25 -27 September 2001; 15-16 September 2002 and 16-18 October 2002. This project had a MassDEP-approved Quality Assurance Project Plan. The sampling conducted between 25-27 September 2001 had quality control issues and the data for this sampling are not used for purposes of this assessment report nor detailed in this report. Six samples were collected during one sampling occasions in 2001 and the *E. coli* geometric mean was 22.8 cfu/100 mL. In 2002 sixteen samples were collected during two wet weather sampling events and the *E. coli* geometric mean was 61.8 cfu/100 mL. None of the *E. coli* counts reported by Metcalf and Eddy (2006) and used in this report were greater than 235 cfu/ 100 mL. High fecal coliform counts were found in numerous samples but the corresponding *E. coli* counts were not high.

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (CH06– River Street/West Street bridge, Springfield/Ludlow) along this segment of the Chicopee River between April and October 2003 (Appendix B*).* This site is downstream from 13 CSOs and located just upstream from the USGS gage at Indian Orchard. There is a dam and a mill upstream from this station. The river channel is large and wide. Samples were collected by the bridge drop method at this station.

The *E. coli* bacteria counts in samples collected by DWM at Station CH06 were generally low. The highest *E. coli* bacteria count of 126 cfu/100 mL was found in the sample collected on 15 October 2003, a wet weather sampling date. It appears the elevated streamflow was largely due to rain in the upper Chicopee watershed as no significant rainfall was recorded at the NOAA rain gauge in Springfield. This wet weather sampling date may not have captured local CSO discharges. The *E. coli* geometric mean for Station CH06 was 35.4 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	2 - 248
Geometric mean	39.4
E. coli (cfu/100mL)	4 - 126
Geometric mean	35.4

No objectionable deposits, scums or water odor were recorded by DWM field crews although conditions were often unobservable. Water clarity was clear on all days when noted. When observable there were no phytoplankton noted and on the one occasion when periphyton was observable it was characterized as sparse. On three occasions (July 30th, July 31st and August 20th) dense submerged aquatic plants were noted (principally grasses) while on the rest of sampling days aquatic plants were unobservable.

Given the low *E. coli* bacteria counts the *Primary* and *Secondary Contact Recreation Uses* are assessed as support. Due to the presence of CSOs both *Primary* and *Secondary Contact Recreation Uses* are listed with an "Alert Status." Given the lack of objectionable conditions the *Aesthetics Use* is assessed as support.

Chicopee River (Segment MA36-24) 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

Conduct bacteria sampling at multiple stations along this segment to document the progress of Ludlow, Chicopee, and Springfield's CSO abatement activities.

Monitor the effects of hydropower activities on the Chicopee River. This may involve fish population sampling or benthic invertebrate sampling.

Fish passage plans should be considered at the hydropower dams along this segment.

HIGHER BROOK (SEGMENT MA36-42)
Location: Headwaters south of Route 21, Ludlow, thru Harris Pond (formerly reported as Segment MA36067) to the Ludlow/Chicopee corporate boundary where the stream name changes to Fuller Brook
Segment Length: 6.3 miles
Classification: Class B

Harris Pond (MA36067) will no longer be reported on as an approximately 14 acre lake segment since the estimated retention time of this waterbody is less than two days. It will be considered a run of the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from USGS two stream gages in the Chicopee River Basin (01177000 and 01176000) and the normal storage volume of the dams reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

This is a newly designated segment by MassDEP and as such has not been reported on before in a Massachusetts Integrated List of Waters on the condition of waters in Massachusetts.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals from this segment but the management of Springfield Reservoir would affect this waterbody. Currently the reservoir is not in use.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2, D4)
Springfield Water and Sewer Commission (MAG640022)
Town of Ludlow (MAR041014)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Water Chemistry
DWM conducted water quality monitoring at one station (FULL02–West Street bridge, south of Roy Street, Ludlow) along Higher Brook between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All the temperature, dissolved oxygen and pH measurements at Station FULL02 met criteria. Ammonia-nitrogen concentrations were low in samples collected by the DWM. Total phosphorus concentrations were generally low but were elevated on one occasion (wet weather sampling event) at Station FULL02 (Appendix B).

The *Aquatic Life Use* is assessed as support based on the generally good water quality conditions.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (FULL02–West Street bridge, south of Roy Street, Ludlow) along Higher Brook between April and October 2003 (Appendix B). The *E. coli* bacteria counts showed no absolute correlation with rainfall, but the two highest counts were measured during wet weather sampling. The highest *E. coli* count of 800 cfu/100mL was recorded on 15 October 2003 and the next highest count of 370 cfu/100 mL was measured on 18 June 2003. The *E. coli* geometric mean was 83.3 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	10 - 1800
Geometric mean	168.6
E. coli (cfu/100mL)	4 - 800
Geometric mean	83.3

With the exception of one day on which small amounts of trash were found, no objectionable deposits were noted at this site. No water odors or scums were observed. Sparse coverage of moss was found in June while in August and October burreed (*Sparganium* sp.) was noted at this station. The presence of phytoplankton was not noted. Sparse coverage of green filamentous algae was found on substrates on the first two survey dates while in July and August respectively sparse and moderate algal coverage was found (Appendix B).

The geometric mean for *E. coli* meets the criteria for both the *Primary* and *Secondary Contact Recreation Use* criteria so these uses are assessed as support. The *Aesthetics Use* is assessed as support due to the lack of objectionable conditions.

Higher Brook (Segment MA36-42) Use Summary Table

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

RECOMMENDATIONS

Conduct bacteria monitoring to assess the contact recreational uses.

Conduct water chemistry and multiprobe monitoring along this segment to assess *Aquatic Life Use*.

FULLER BROOK (SEGMENT MA36-41)
Location: From the Ludlow/Chicopee corporate boundary where the stream name changes from Higher Brook to the confluence with the Chicopee River, Chicopee
Segment Length: 1.9 miles
Classification: Class B

This is a newly designated segment by MassDEP and as such has not been reported on before in a Massachusetts Integrated List of Waters on the condition of waters in Massachusetts.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1, D4)
Connecticut Valley Sanitary Waste Disposal, Inc. (MA0033847/ MAR05C657)
City of Chicopee (MAR041003)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks Fuller Brook with trout (MA DFG 2007). MA DFG conducted fish population sampling in Fuller Brook from the mouth of Fuller Brook to Shawinigan Drive (Site 96) on April 20, 2000 using a backpack electro-shocker (Richards 2006). Sixty-nine fallfish, forty-one common shiner, thirty-eight eastern blacknose dace, fourteen white sucker, fourteen tessellated darter, fourteen longnose dace, two yellow bullhead, two brook trout, one American eel, one rock bass, one pumpkinseed, and one brown trout were collected (198 total fish). Sampling was conducted in a sandy stretch between two beaver dams.

The sample was heavily dominated by fluvial specialist/dependent species (98%). While most species present are classified as tolerant or moderately tolerant to pollution, brook trout and brown trout (n=3) were also collected and the brook trout appear to be part of a reproducing population. MA DFG identifies Fuller Brook as a Coldwater Fishery Resource (Richards 2006). The aforementioned dominance by fluvial species and the presence of brook and brown trout are indicative of a stable flow regime and excellent water quality. It should be noted that brook trout numbers were very low and that beaver activity may be affecting habitat within the sampled reach.

DWM conducted water quality monitoring at one station (FULL01) in Fuller Brook (Station 96) between April and October 2003 (Appendix B). DWM crews made notes of conditions at this site throughout the sampling season. When observable no phytoplankton was found and only on June 18th was a sparse coverage of moss noted; otherwise no aquatic plants were found. Sparse coverage of thin green films on substrates was noted on April 16th and a sparse coverage of green filamentous algae was noted on June 18th. Later, on June 30th and August 20th, a dense coverage of green and brown algae was found attached to the rocks.

Toxicity
Ambient
The Connecticut Valley Sanitary Waste Disposal, Inc. staff collected water from the Fuller Brook just upstream from New Lombard Road for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and September 2004 survival of *C. dubia* exposed (48 hours) to the Fuller Brook water was 100% (n=9). Between May 2000 and September 2004 survival of *P. promelas* exposed (48 hours) to the Fuller Brook water ranged from 95 to 100% (n=9).

Effluent
Whole effluent toxicity tests have been conducted on the Connecticut Valley Sanitary Waste Disposal, Inc. treated effluent. Between May 2000 and September 2004 nine valid tests were conducted using *C. dubia* and *P. promelas*. The LC_{50} resuts were all $\geq$100% effluent for both test species (n=9).

Water Chemistry
DWM conducted water quality monitoring at one station (FULL01–between Route 90 and Shawinigan Drive, Chicopee) along Fuller Brook between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All the temperature, dissolved oxygen and pH measurements at Station FULL01 met criteria. Ammonia-nitrogen concentrations ranged from <0.10 to 0.20 mg/L in samples collected at this site. Total phosphorus concentrations in samples collected by DWM were slightly elevated to elevated at this site. The highest total phosphorus concentration (0.088 mg/L) was found on 18 June 2003, a wet weather sampling date.

Given the good ambient and effluent whole effluent toxicity results, the good water quality conditions, and fish population information Fuller Brook is assessed as support for *Aquatic Life Use*. This use is identified with an "Alert Status" due to elevated total phosphorus concentrations.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (FULL01–between Route 90 and Shawinigan Drive, Chicopee) along Fuller Brook between April and October 2003 (Appendix B*).* The *E. coli* bacteria counts were generally low during dry weather but elevated during wet weather. The highest *E. coli* bacteria count of 1120 cfu/100 mL was found in the sample collected 15 October 2003, a wet weather sampling date. The second highest E. coli count of 450 cfu/100 mL was found in the 18 June 2003 sample, a wet weather sampling date. The geometric mean of *E. coli* counts was 152.2 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	20 - 5500
Geometric mean	365.9
E. coli (cfu/100mL)	14 - 1120
Geometric mean	152.2

The Fuller Brook station (FULL01) is downstream from a large landfill and Interstate 90. On April 16th and August 20th trash and debris were noted at this station. Additionally, sedimentation likely due to adjacent roadwork was noticed on April 16th. Objectionable deposits were not noted on any other sampling dates. No scums or water odors were noted during the sampling season. Water clarity was generally described as slightly turbid at this station during the sampling season except on the first two sampling dates when the water was clear. Minimal erosion was noted on two occasions and the presence of riprap was recorded. DWM field crews noted sparse to moderate coverage of algae on substrates at this location during the summer of 2003.

The geometric mean of *E. coli* counts did not meet the *Primary Contact Recreation Use* criterion, so the *Primary Contact Recreation Use* is assessed as impaired. The *Secondary Contact Recreation Use* is assessed as support based on the geometric mean of *E. coli* counts meets the criterion. It is believed that the negative aesthetic conditions found at Station FULL01 are limited in extent so the *Aesthetics Use* is assessed as support.

Fuller Brook (MA36-41) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Unknown Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Conduct bacteria monitoring to assess the *Contact Recreational Uses*.

Conduct water chemistry sampling and multiprobe monitoring along this segment to assess *Aquatic Life Use*.

Conduct field reconnaissance and a habitat walk along this segment to evaluate current conditions.

UNNAMED TRIBUTARY TO THE CHICOPEE RIVER (SEGMENT MA36-39)
Location: Unnamed tributary to the Chicopee River, locally known as "Poor Brook," from headwaters near the Conrail tracks in Springfield to the confluence with the Chicopee River, Chicopee
Segment Length: 2.2 miles
Classification: Class B

This is a newly designated segment by MassDEP and as such has not been reported on before in a Massachusetts Integrated List of Waters on the condition of waters in Massachusetts.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1, D4)
Doncasters Inc. MAG250947
City of Springfield (MAR041023)
City of Chicopee (MAR041003)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Geosyntec Consultants (Geosyntec Consultants, undated), as part of the Chicopee River Watershed Degraded Stream Survey, made field observations downstream from Route 141 (East Main Street bridge) on 16 May 2003. They found bank erosion, sand deposits and point bar formations, undercut banks and exposed roots. Erosion was noted at the DWM sampling station (POOR01–Route 141 (East Main Street bridge, Chicopee) throughout the 2003 sampling survey.

Toxicity
Effluent
Downcasters Inc. conducted a whole effluent toxicity test using *C. dubia* on 14 May 2001 on their non-contact cooling water using soft reconstituted freshwater as diluent. The forty-eight hour LC_{50} test was >100% and A-NOEC was 100% effluent. The C-NOEC test was 50%. Ammonia-nitrogen was <0.20 mg/L while total residual chlorine (TRC) was 0.19 mg/L.

Water Chemistry
DWM conducted water quality monitoring at one station (POOR01–Route 141 (East Main Street bridge) in Chicopee) along Poor Brook between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

All the temperature, dissolved oxygen and pH measurements at Station POOR01 met criteria. The conductivity measured at this site was elevated throughout the sampling season. Ammonia-nitrogen concentrations were elevated in the April, May and June samples collected by DWM but not at toxic levels. Total phosphorus concentrations in the samples collected at this station were generally low but were elevated on one wet weather survey date (Appendix B).

Given generally good water quality conditions Poor Brook is assessed as support for *Aquatic Life Use*. The elevated ammonia-nitrogen concentrations measured at this site, elevated conductivity and habitat quality degradation associated with erosion and sedimentation at the sampling location are a cause for concern, so this segment is identified with an "Alert Status." The concentration of TRC in the Doncasters Inc. discharge is also of concern.

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (POOR01–Route 141 (East Main Street bridge), Chicopee, along Poor Brook between April and October 2003 (Appendix B*)*.

E. coli bacteria counts were generally low during dry weather sampling but were high during wet weather sampling. The highest *E. coli* count of 4200 cfu/100 mL was measured on 18 June 2003, a wet weather sampling date. The second highest *E. coli* count of 1880 cfu/100 mL was measured on 15 October, 2003, a wet weather sampling date. The geometric mean of *E. coli* counts was 246.2 cfu/ 100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	6 - 6100
Geometric mean	279.9
E. coli (cfu/100mL)	30 - 4200
Geometric mean	246.2

On April 16th and July 30th objectionable deposits of silt and sand were found covering bottom substrate, but no objectionable conditions were noted on other survey dates. No water odors were noted with the exception of a musty water smell on two occasions and no scums were found. Erosion, principally on the left bank, was noted throughout the survey. Generally, water clarity was high at this site, although on June 18th the water was highly turbid. Aquatic plants and phytoplankton were not noted at this site. Moderate and sparse green filamentous algae were noted on substrates on the first two survey dates, respectively, but periphyton cover, when observable, was not found on the remaining days.

Due to the elevated *E. coli* geometric mean, the *Primary Contact Recreation Use* is assessed as impaired. The *Secondary Contact Recreation Use* is assessed as support given a geometric mean of E. coli counts below the criterion. Given the two counts > 1260 cfu/100 mL this use is identified with an "Alert Status". It is believed that objectionable conditions are localized, so the *Aesthetics Use* is assessed as support.

Poor Brook (MA36-39) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Unknown Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		SUPPORT*
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Conduct bacteria sampling to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Conduct field reconnaissance and a habitat walk along this segment to determine current conditions and assess the extent of habitat degradation. Where appropriate develop and implement best management practices to reduce erosion and sedimentation.

Conduct benthic invertebrate monitoring along this segment to assess *Aquatic Life Use*. There is evidence of degraded habitat along this segment and indications that the benthic community may be impacted (Geosyntec Consultants, undated).

Doncasters Inc.'s NPDES permit should be reissued with appropriate limits for TRC.

COOLEY BROOK (SEGMENT MA36-38)
Location: From the outlet of the Chicopee Reservoir, Chicopee, to the confluence with the Chicopee River, Chicopee (segment includes "braid" that confluences with the Chicopee River upstream from the mouth of Cooley Brook)
Segment Length: 1.2 miles
Classification: Class B

This is a newly designated segment by MassDEP and as such has not been reported on before in a Massachusetts Integrated List of Waters on the condition of waters in Massachusetts.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals affecting this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D2,D4)
City of Chicopee (MA0101508)
Westover Airforce Base (MAR05B973)
City of Chicopee (MAR041003)

Westover Air Force Base's individual permit (MA0005444) has been terminated. Multi-sector general stormwater permits (MAR05A820 and MAR05A728) were issued to Westover Air Reserve Base and Westover Metro Airport in Chicopee for outfalls 003-008. An artificial wetland was constructed near Outfall 001 to treat stormwater discharge affected by aircraft deicing. Outfall 001 and Outfall 002 both have oil water separators in-line in the event of a fuel spill. These two outfalls are now covered by multi-sector general permit number MA05B973 issued in 2002.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG stocks Chicopee Reservoir upstream from this segment of Cooley Brook with trout (MA DFG 2007). DWM conducted water quality monitoring at one station (COOL01) in Cooley Brook between April and October 2003 (Appendix B). DWM crews made notes of conditions at this site throughout the sampling season. No aquatic plants or phytoplankton were noted during the sampling season at this location and the water was clear with the exception of April 16th when water clarity was slightly turbid. Undercutting of both banks was noted throughout the sampling season. Periphyton cover was described as moderate on April 16th, August 20th and October 15th and sparse on May 14th and July 30th;none was observed on June 18th. The periphyton consisted of brown thin films attached on rocks and an orange floc on April 16th while green periphyton on rocks and green filamentous algae were found on May 14th. On other sampling dates the periphyton was described as brown algae attached on rocks.

Water Chemistry
DWM conducted water quality monitoring at one station (COOL01– apparent diversion of Cooley Brook at Fuller Road, approximately 1100 feet northwest of Haynes Circle, Chicopee) in this Cooley Brook segment between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Temperature, pH and dissolved oxygen measurements at Station COOL01 met criteria on all DWM sampling dates. Ammonia-nitrogen concentrations at this station were generally low while total phosphorus concentrations were slightly elevated during the May and June sampling dates and very high (0.23 mg/L) on the August sampling date (Appendix B).

The Aquatic Life Use is assessed as support given the generally good water quality conditions. The one sample with a high total phosphorus concentration is a cause for concern, so this segment is identified with an "Alert Status" for *Aquatic Life Use.*

Primary and Secondary Contact Recreation and Aesthetics Uses
DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (COOL01– apparent diversion of Cooley Brook at Fuller Road, approximately 1100 feet northwest of Haynes Circle, Chicopee) between April and October 2003 (Appendix B*).*

E. coli counts at Station COOL01 were generally low during dry weather sampling events. The highest *E. coli* count of 1100 cfu/100 mL was found on 15 October 2003 a wet weather sampling event. The second highest *E. coli* count of 300 cfu/100 mL was found on 20 August 2003, a dry weather sampling event. The geometric mean of *E. coli* counts was 61.9 cfu/ 100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 - 4700
Geometric mean	101.3
E. coli (cfu/100mL)	10 – 1100
Geometric mean	61.9

On April 16th the DWM field crews observed heavy siltation at Station COOL01 on the river bottom. No other objectionable deposits were noted at this station. With the exception of April 16th, when the water was noted to have both a septic and rotting vegetable odor, DWM field crews did not note water odors. No scums, aquatic plants or phytoplankton were noted during the sampling season at this location and the water was clear with the exception of April 16th when water clarity was slightly turbid.

Given the low geometric mean of *E. coli* counts, the *Primary Contact Recreation Use* is assessed as support. Two samples were greater than 235 cfu/100 mL, so this use is given an "Alert Status". Given the low geometric mean of *E. coli* counts and the fact that none of the counts were greater than 1260 cfu/100 mL, the *Secondary Contact Recreation Use* is assessed as support. Given the general lack of objectionable conditions the *Aesthetics Use* is assessed as support.

Cooley Brook (Segment MA36-38) 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
Conduct bacteria monitoring to assess *Primary* and *Secondary Contact Recreational Uses*.

Conduct field reconnaissance and a habitat walk along this segment to determine current conditions.

Benthic invertebrate monitoring could be conducted along this segment to assess *Aquatic Life Use*.

CHICOPEE RIVER (SEGMENT MA36-25)
Location: Chicopee Falls to confluence with Connecticut River, Chicopee
Segment Length: 3.0 miles
Classification: Class B, Warm Water Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals in this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D1, D2, D4)
City of Chicopee (MA0101508)
City of Chicopee (MAR041003)
Consolidated Edison Energy Massachusetts Inc. (CEEMI) (MA0035777)
Eastern Etching & Manufacturing Company (MA0000647)

The City of Chicopee, under NPDES Permit MA0101508, is authorized to discharge via 12 CSOs (10 currently active) into this segment of the Chicopee River. Cumulatively the active CSOs discharge an estimated 76.0 MG/year. Two CSOs have been plugged. CSO #023 was plugged in early 2002, while CSO #025 was plugged on June 29, 2005. The following CSOs are considered active and the best current estimates of their discharge are also listed below. Updated estimates and an abatement schedule for the remaining CSOs will be completed in the Final Long Term Control Plan due to be completed in 2008 (Boisjolie 2007b).

Address	CSO ID Number	Estimated CSO Discharge Million Gallons/year (MG/yr)
Bell & Front St.	26	0.1 MGD
Topors & Front St	27.1	8.0 MG/yr
Chicopee Elec. Light -	29	0.1 MG/yr
Chicopee Elec. Light -	31.1	1.1 MG/yr
Easment N of Front St.	31.3	30.7 MG/yr
Under Deady Bridge	32	Cumulative = 6.1 MG/yr from CSO Regulators #32.2, 32.3, 32.4, and 32.5
Grove & Oak St.	32.1	2.5 MG/yr
Grattan & Hearthstone	34.1	7.7 MG/yr
Hearthstone Terrace	34.2	0.2 MG/yr
Old Fuller	34.3	19.5 MG/yr**
All CSOs		76.0 MG/yr

** This discharge is estimated from the 2002 Notice of Project Change, which reduced the estimated annual discharge from previously estimated 60.7 MG/yr in the 2001 Draft Long Term Control Plan (DLTCP). All other estimates are from the 2001 DLTCP.

This segment begins at the Chicopee Falls Dam at Route 33 in Chicopee Falls. This dam is a 10' high masonry stone dam that was constructed in the late 1800s. It is currently owned by the City of Chicopee and used as a hydroelectric facility. A second dam, the Dwight Station Dam, was constructed in 1920 and is a 15' high masonry dam that is owned and operated by CEEMI as a hydroelectric power plant. The dam generates and releases a minimum flow depending on the flows released at the upstream Red Bridge Impoundment Dam (Kleinschmidt Associates and CEEI 1999).

The former Uniroyal Complex is listed as a Tier 1A Hazardous Waste Site (#1-0000436). This site was listed for oil and hazardous material. This site is currently a Phase 4 site and cleanup work has been conducted and is ongoing.

DESIGNATED USE ASSESSMENT

Aquatic Life Use

Habitat and Flow

The hydroelectric power plant at the Chicopee Falls Dam is a FERC exempt facility (FERC-exempt #6522). The facility operates a 2,500-Kilowatt hydroelectric power station on this segment of the Chicopee River (FERC 20 December 2000). Under its exempt status, the facility releases 127 cfs in the bypass reach and 230 cfs downstream. The dam has 18-inch flashboards and has all flow releases and power generation are automated. There are no current provisions to allow fish passage (Kleinschmidt Associates and CEEI 1999).

Consolidated Edison Energy Massachusetts Inc. (CEEMI) Dwight Station is a FERC-exempt facility (FERC-exempt #10675) operating a 3,700-Kilowatt hydroelectric power station on the Chicopee River in Chicopee (FERC 20 December 2000). Under its exempt status, the dam is not subject to FERC Part 12 Inspection requirements. The dam had 2.3' high flashboards that have been removed to assist in the passage of minimum flow. The canal system is currently in disrepair and the hydraulic capacity is limited because of unreliable canal head gates. During the spring the Station is shut down. Since the 1998 Chicopee WQAR report, an eelway has been built at the Dwight Dam through a USFWS grant and cooperation from the Chicopee River Watershed Council Silvio O. Conte Anadromous Fish Research Center and CEEMI (MA EOEA, 2007).

Biology

DWM conducted water quality monitoring at one station (CTO3 – Route 116 Bridge, Chicopee) in this Chicopee River segment between April and October 2003 (Appendix B). DWM crews made notes of conditions at this site throughout the sampling season. Although aquatic plant density was characterized as unobservable on the majority of sampling days, on August 20th aquatic plant density was noted to be moderate and composed of submerged plants, principally moss on rocks and milfoil (*Myriophyllum* sp.). Sparse periphyton coverage was noted on two occasions (April 16th and July 30th) while moderate coverage was noted on May 15th and August 20th. On the remaining sampling days periphyton coverage was unobservable or not recorded. On June 18th phytoplankton presence was described as sparse while the majority of occasions when observable or recorded no phytoplankton were noted.

Toxicity

Ambient

The Eastern Etching & Manufacturing Company staff collected water from the Chicopee River approximately 100 feet upstream from the Eastern Etching east parking lot, off of Riverview Terrace, for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and May 2002 survival of *C. dubia* exposed (48 hours) to the Chicopee River water ranged from 90 to 100% (n=5). Between May 2000 and May 2002 survival of *P. promelas* exposed (48 hours) to the Chicopee River water was all 100% (n=5). Hardness ranged from 19.0 mg/L to 29.0 mg/L (n=5).

Effluent

Acute whole effluent toxicity tests have been conducted on the Eastern Etching & Manufacturing Company treated effluent. Between May 2000 and May 2002 five valid tests were conducted using *C. dubia* and *P. promelas*. The LC_{50} using *C. dubia* ranged from 56.10% to >100% effluent (n=5). The LC_{50} tests using *P. promelas* were all >100% (n=5). All of the tests met the limit of $\geq$50%.

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2000 and May 2002 ranged from 0.17 mg/L to 3.40 mg/L (n=5). Total residual chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and May 2002

ranged from <0.020 to 0.150 mg/L (n=5). Between May 2000 and May 2002 the total aluminum limit was exceeded once on May 10, 2000 when the effluent had an aluminum concentration of 5.3 mg/L (n=5).

Water Chemistry

DWM conducted water quality monitoring at one station (CTO3 – Route 116 Bridge, Chicopee) in this Chicopee River segment between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Temperature, pH and dissolved oxygen measurements at the DWM station all met criteria on DWM sampling dates (Appendix B). It should be noted, though, that this station is below the Dwight Dam and this may affect dissolved oxygen concentrations. Ammonia-nitrogen concentrations measured in DWM samples were low while total phosphorus concentrations ranged from 0.024 mg/L to 0.057 mg/L with the highest concentrations found on 18 June 2003, a wet weather sampling date (Appendix B).

Given the good survival of test organism and the generally good water quality conditions, the *Aquatic Life Use* is assessed as support. The *Aquatic Life Use* is identified with an "Alert Status" due to potential impacts of hydropower operations and CSOs.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* bacteria monitoring at one station (CTO3 – Route 116 Bridge, Chicopee) between April and October 2003 (Appendix B*)*. This station is approximately 900 feet below Chicopee CSO #025, which was active during the time of DWM sampling. This station was also below eleven other Chicopee CSOs (during time of sampling). *E. coli* counts were generally low with the exception of one sample collected on 15 October 2003, which had an *E*. *coli* count of 2980 cfu/ 100 mL. This high bacteria sample was collected on a wet weather sampling date.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	8 – 7700
Geometric mean	151.1
E. coli (cfu/100mL)	4 - 2980
Geometric mean	91.6

Metcalf and Eddy (2006), as part of CSO work for the Connecticut River Bacteria Monitoring Project, collected bacteria samples at the Route 116 bridge in Chicopee which was downstream from 12 Chicopee CSOs at the time of sampling. Metcalf and Eddy staff sampled three points (equidistant from one another) along a transect going from both banks of the river. They conducted dry weather sampling on 8 August 2001 and wet weather sampling on three occasions: 25 September 2001; 15 September 2002 and 16 October 2002. This project had a MassDEP-approved Quality Assurance Project Plan. Eighteen samples were collected in 2001 by Metcalf and Eddy (1 dry weather event, 1 wet weather event- two days total) and the *E. coli* geometric mean was 400 cfu/100 mL. Eight of the nine *E. coli* bacteria counts were greater than 235 cfu/100 mL on 8 August 2001 while none were greater than 1260 cfu/100 mL. Six of the nine *E. coli* counts collected on 25 September 2001 were greater than 235 cfu/100 mL while three of the nine *E. coli* counts were greater than 1260 cfu/100 mL. Eighteen samples were collected in 2002 by Metcalf and Eddy (2 wet weather events-2 days total) and the *E. coli* geometric mean was 412.8 cfu/100 mL. Seven of the *E. coli* bacteria counts collected on 15 September 2002 were greater than 235 cfu/100 ml and one sample was greater than 1260 cfu/100 mL. Eight of the nine *E. coli* counts collected on 16 October 2002 were greater than 235 cfu/100 mL and two *E. coli* counts were greater than 1260 cfu/100 mL.

No objectionable deposits, scums or water odor were recorded by DWM field crews. The water clarity was described as clear or slightly turbid when noted. Minimal erosion was observed on two occasions. Although aquatic plant density was characterized as unobservable on the majority of sampling days, on August 20th aquatic plant density was noted to be moderate and composed of submerged plants, principally moss on rocks and milfoil (*Myriophyllum sp*.). Sparse periphyton coverage was noted on two occasions (April 16th and July 30th) while moderate coverage was noted on May 15th and August 20th. On the remaining sampling days periphyton coverage was unobservable or not recorded. On June 18th phytoplankton presence was described as sparse while the majority of occasions when observable or recorded no phytoplankton were noted. On April 16th the water level was noted to be extremely high and the storm drains under the bridge were observed to be flowing. On June 18th a storm drain near the bridge on the right bank was flowing.

The *Primary* and *Secondary Contact Recreation Uses* are assessed as impaired because of elevated *E. coli* counts. The highest bacteria counts were collected during wet weather events. Given the lack of objectionable conditions the *Aesthetics Use* is assessed as support.

Chicopee River (Segment MA36-25) Use Summary Table

Designated Uses		Status
Aquatic Life		SUPPORT*
Fish Consumption		NOT ASSESSED
Primary Contact		IMPAIRED Cause: Elevated *E. coli* Sources: Combined sewer overflows Suspected Sources: Illicit connections/hook-ups to storm sewers, unspecified urban stormwater
Secondary Contact		
Aesthetics		SUPPORT

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

RECOMMENDATIONS

Track progress of the City of Chicopee's CSO abatement activities. Conduct bacteria sampling to evaluate the effectiveness of the CSO abatement and to assess *Primary* and *Secondary Contact Recreation Uses.* Wet weather sampling will give the best gage of CSO abatement activities, as *E. coli* counts in dry weather samples were low at this site.

Additional data are needed to evaluate the impact of hydropower activities on aquatic life conditions. This may include monitoring streamflow conditions and conducting fish population or benthic invertebrate monitoring.

Fish passage at the hydropower dams especially should be considered.

ABBEY BROOK (SEGMENT MA36-40)
Location: Headwaters west of Saint James Avenue, Springfield, thru Bemis Pond (formerly reported as segment MA36011) to the confluence with the Chicopee River, Chicopee
Segment Length: 1.5 miles
Classification: Class B

Bemis Pond (MA36011) will no longer be reported on as an approximately 4 acre lake segment since the estimated retention time of this waterbody is less than nine days. It will be considered a run of the river impoundment (McVoy 2006). The retention time estimate was based on the annual historical mean discharge from two USGS stream gages in the Chicopee River Basin (01177000 and 01176000) and the normal storage volume of the dams reported by MA DCR in their Massachusetts Dam Safety Program Database (Socolow et al. 2004 and MA DCR 2002).

In 2000 MA DEM (MA DEM 2002a) awarded the City of Chicopee a $10,000 grant for Bemis Pond to repair the auxiliary spillway wall at the Bemis Pond dam, which stabilized the shoreline and prevent further erosion in the area. In 2002 DEM (DEM 2002b) awarded the City of Chicopee a $15, 000 grant to repair a wall of the auxiliary spillway on lower Bemis Pond to stabilize shoreline and control erosion. This work also removed fallen trees in the channel, which impeded flow between the two ponds.

Bemis Pond is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters requiring a TMDL". Pollutants needing TMDLs: Suspended Solids (MassDEP 2007b).

Abbey Brook itself is a newly designated segment by MassDEP and as such has not been reported on before in a Massachusetts Integrated List of Waters on the condition of waters in Massachusetts.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated water withdrawals from this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D4)
City of Chicopee (MAR041003)
City of Springfield (MAR041023)

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Geosyntec Consultants (Geosyntec undated) as part of the Chicopee River Watershed Degraded Stream Survey, made field observations of Abbey Brook downstream from the Front Street bridge on 19 May 2003. They found bank erosion and substrate fouling. DWM field crews made observations throughout the 2003 field season at Station AB01 (Front Street Bridge, upstream side, Chicopee). They noted minimal erosion, especially on the right bank, on three occasions. Riprap was found along the banks.

Biology
DWM conducted water quality monitoring at one station (AB01, Front Street Bridge, Chicopee) in Abbey Brook between April and October 2003 (Appendix B). DWM crews made notes on conditions at this site throughout the sampling season. No aquatic plants or phytoplankton were found or recorded. Periphyton was noted on five occasions and described as dense on May 14, 2003. In April thin film algae and filamentous algae were noted, while in May a filamentous periphyton was noted. On the rest of the observable occasions a brown periphyton was noted. Water clarity was noted to be slightly turbid on five occasions and clear on three other occasions.

Water Chemistry

DWM conducted water quality monitoring at one station (AB01, Front Street Bridge, Chicopee) in Abbey Brook between April and October 2003 (Appendix B). *In-situ* parameters were measured on seven occasions, including two pre-dawn occasions. Grab samples were also collected and analyzed for TSS, turbidity, ammonia-nitrogen, and total phosphorus (Appendix B).

Temperature, pH and dissolved oxygen measurements at the DWM station all met criteria on DWM sampling dates (Appendix B). Conductivity was slightly elevated at this station. Ammonia-nitrogen concentrations were low. Total phosphorus concentrations ranged from 0.035 to 0.079 mg/L with the two highest concentrations found on the sampling dates in July and August 2003 (Appendix B).

The *Aquatic Life Use* is assessed as support based primarily on the limited water quality data, which indicates generally good water quality conditions. This use is identified with an "Alert Status" due erosion and sedimentation (Geosyntec undated) particularly in the lower reach near the confluence with the Chicopee River.

Primary and Secondary Contact Recreation and Aesthetics Uses

DWM conducted fecal coliform and *E. coli* monitoring at one station (AB01, Front Street Bridge, Chicopee) between April and October 2003 (Appendix B*). E. coli* counts were generally low with the exception of 15 October 2003, a wet weather sampling date, when the *E. coli* count was 10,000 cfu/100 mL. The geometric mean of *E. coli* counts was 90 cfu/100 mL.

Parameter	DWM 2003 (n=6)
Fecal coliform (cfu/100mL)	<2 -13500
Geometric mean	168.6
E. coli (cfu/100mL)	2 - 10000
Geometric mean	90

Objectionable deposits consisting of trash were noted on April 14th, July 30th and August 20th by DWM field crews. It is believed that the garbage and trash were localized. In addition to the trash noted on April 14th sand and silt were noted at this station. No scums were noted and, with the exception of one occasion on which a musty water odor was recorded, no odors were noted.

The *Primary and Secondary Recreation Contact Uses* area assessed as support based on the geometric mean of E. coli counts. Due to the one very high *E. coli* count both *Primary* and *Secondary Contact Recreation Uses* are identified with an "Alert Status." Given the general lack of extensive objectionable conditions the *Aesthetics Use* is assessed as support.

Abbey Brook (Segment MA36-40) 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

Conduct bacteria sampling to evaluate to assess the status of the *Primary* and *Secondary Contact Recreational* uses.

Conduct field reconnaissance and a habitat walk along this segment to determine current conditions and assess the extent of habitat degradation. Where appropriate develop and implement best management practices to reduce erosion and sedimentation.

Conduct water quality sampling in Bemis Pond to address a TMDL for TSS.

Chicopee River Watershed - Lake Assessments

A number of Chicopee River Watershed Lakes have no updated or pertinent information to report (TMDL completion, WMA withdrawals, NPDES permit, etc.) and lack new information with which to make an assessment of designated uses. Information on these waterbodies is summarized below. All these waterbodies are not assessed for all uses.

Lake	Location	WBID	Size (Arces)	Class	2006 Integrated List Category
Brooks Pond	Petersham	MA36022	86	A	3
Carter Pond	Petersham	MA36029	44	A	3
Crystal Lake	Palmer	MA36043	16	B	2
Knights Pond	Belchertown	MA36077	36	A	2
Town Barn Beaver Pond	Petersham	MA36156	20	B	3
Alden Pond	Ludlow	MA36003	4	B	5
Haviland Pond	Ludlow	MA36069	25	B	2
Murphy Pond	Ludlow	MA36103	6	B	3
Adams Pond	Oakham	MA36001	30	B	3
Asnacomet Pond	Hubbardston	MA36005	126	A	2
Bemis Road Pond	Hubbardston	MA36012	17	B	3
Bennett Street Pond	Palmer	MA36014	6	B	3
Cloverdale Street Pond	Rutland	MA36036	19	A, Public Water Supply	3
Cunningham Pond	Hubbardston	MA36044	27	A	3
Edson Pond	Rutland	MA36180	36	A	3
Lovewell Pond	Hubbardston	MA36085	82	A	3
Muddy Pond	Oakham/Rutland	MA36102	23	A	3
Old Reservoir	Barre	MA36114	37	B	4c
Pattaquattic Pond	Palmer	MA36117	18	B	2
Peppers Mill Pond	Ware	MA36121	11	B	3
Queen Lake	Phillipston	MA36132	139	A	2
Stone Bridge Pond	Templeton	MA36148	32	A	3
Thayer Pond	Rutland	MA36181	45	A	3
Waite Pond	Hubbardston	MA36161	34	A	2

Lake	Location	WBID	Size (Arces)	Class	2006 Integrated List Category
Brookhaven Lake	West Brookfield	MA36021	34	B	5
Cranberry Meadow Pond	Spencer/Charlton	MA36040	69	B	3
Cusky Pond	New Braintree	MA36045	28	B	3
Eames Pond	Paxton	MA36056	58	B	5
Lake Whittemore	Spencer	MA36165	52	B	5
Moose Hill Reservoir	Spencer/Leicester	MA36179	52	B	3
Paradise Lake	Monson	MA36116	18	B	2
Shaw Pond	Leicester	MA36138	64	B	2

Swift River Subbasin Lakes

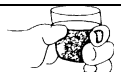
GASTON POND (SEGMENT MA36065)
Location: Barre
Segment Size: 15 acres
Classification: Class A

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3- No Uses Assessed (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
One aquatic macrophyte species, *Myriophyllum sp.*, was identified in Gaston Pond in 1997 (MassDEP 1997). No recent quality-assured data are available for Gaston Pond. All designated uses are not assessed. Due to the possible presence of a non-native form of *Myriophyllum* Gaston Pond is given an "Alert Status" for *Aquatic Life Use*.

Gaston Pond (Segment MA36065) Use Summary Table

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

*Alert Status issues identified, see details in use assessment section
** The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence, if any, of non-native species.

POTTAPAUG POND (SEGMENT MA36125)
Location: Petersham
Segment Size: 568 acres
Classification: Class A.

This segment is on the Massachusetts Year 2006 Integrated List of Waters- Category 5- "Pollutants Needing a TMDL" – Metals (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
The Quabbin Reservoir Dam influences the level of water in this segment.

Biology
Geosyntec Consultants (undated) conducted an aquatic macrophytes survey in Pottapaug Pond on July 18, 2006. They found the highest plant densities in the northeastern and eastern parts of the north basin and in the shallow littoral areas along the western and northern parts of the main pond. Biovolume was found to be highest in shallow littoral zones. At 21% of the stations surveyed plant density was found to be dense (51-75%) while at another 21% of the stations surveyed it was found to be very dense (76-100%). Plant biomass was found to be high at 22% of stations and very high at 19% of stations.

Geosyntec Consultants (undated) surveyed 58 stations in the pond and found that a non-native species, variable milfoil (*Myriophyllum heterophyllum*), was the most dominant and spatially distributed plant in the pond. They found variable milfoil at 74% of the stations sampled and the plant was dominant at 24% of all sampling stations. The plant was especially dominant in stations located in the north basin. Floating-leaf vegetation, including White Water Lily (*Nymphaea odorata*), Yelllow Water Lilly (*Nuphar* sp.), Little Floating Heart (*Nymphoides cordata*), Watershield (*Brasenia schreberi*), was also abundant in the pond with White Water Lily being dominant at 21% of all stations. Other commonly observed species included: Common Bladderwort (*Utricularia vulgaris*), Purple Bladderwort (*Utricularia purpurea*) and a number of pondweed species (*Potamogeton* spp.).

Due to the presence of a non-native macrophyte, Pottapaug Pond is assessed as impaired for the *Aquatic Life Use*. The high plant density and biomass at this pond is a cause of concern, but it's shallow nature and probable role as a filter for the Quabbin Reservoir, a major drinking water supply must be noted.

Fish Consumption Use
It has been determined that the fish consumption advisory for the Quabbin Reservoir also applies to Pottapuag Pond (Celona 2007). The fish consumption advisory for the Quabbin Reservoir is detailed below.

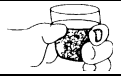
> "*Children younger than 12, pregnant women, and nursing women should refrain from consuming all fish in Quabbin Reservoir except Lake Trout less than 24 inches long and Salmon.*
> *The general population should refrain from consuming Smallmouth Bass, Largemouth Bass, and Lake Trout greater than 24 inches long. The general public may consume unlimited Salmon and lake trout less than 24 inches long. The general public should limit consumption of all other fish species to one five-ounce meal per week."*

Because MA DPH recommends that the site-specific fish consumption advisory for Quabbin Reservoir due to mercury should also apply to Pottapuag Pond (Celona 2007) this pond is assessed as impaired for the *Fish Consumption Use*.

A TMDL, a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for regional waterbodies to meet and maintain compliance with state and federal water quality standards, was recently approved for mercury by the U.S. EPA. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont (Northeast States 2007).

The TMDL covers waterbodies including Pottapuag Pond that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007).

Pottapaug Pond (Segment MA36125) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-Native Aquatic Plants Source: Introduction of non-native organisms
Fish Consumption		IMPAIRED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition-toxics
Drinking Water*		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

Conduct fish toxics monitoring in Pottapaug Pond to more fully assess the *Fish Consumption Use.*

QUABBIN RESERVOIR (SEGMENT MA36129)
Location: Petersham/Pelham/Ware/Hardwick/Shutesbury/Belchertown/New Salem
Segment Size: 24012 acres
Classification: Class A, Public Water Supply

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5-Pollutants Needing a TMDL – Metals (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
MWRA (registration #10830901)
The Massachusetts Water Resources Authority (MRWA) is allowed to withdraw (WMA Registration Number 10830901) 186.7 MGD from the reservoir. The majority of this water is transferred out of the Chicopee River Basin to supply potable water to 44 communities in the Metropolitan Boston area and three Western Massachusetts communities.

NPDES SURFACE WATER DISCHARGES
There are no permitted discharges to this drinking water supply reservoir.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
Geosyntec Consultants (2006) conducted aquatic macrophytes surveys in the Quabbin Reservoir between July 17, 2006 and August 16, 2006. They conducted surveys in a number of littoral areas in the reservoir including: northern settling pond, Fishing Area 3 & Shaft 11A, Fishing Area 2, Fishing Area 1, Quabbin-North Dana, Quabbin-Millington and Quabbin-Mt. Russ.

The northern settling pond, a small 47 acre area directly north of Fishing Area 2, was surveyed on July 24, 2006. Fifty-one stations were sampled. Forty-three percent of the stations in the northern settling pond were found to have moderate to very dense plant densities, although only 5% of that total was very dense. Moderate plant biomass was found at 43% of stations and high plant biomass was found at 19% of stations, while the remaining stations had low or zero biomass. Plant species in order of dominance (number of stations at which they were the most abundant) include: White Water Lily (*Nymphaea odorata)*, Pickerelweed (*Pontederia cordata*),Variable Milfoil (*Myriophyllum heterophyllum*), Purple Bladderwort (*Utricularia purpurea*), various pondweeds (*Potamogeton* spp.), Low Watermilfoil (*Myriophylum humile*) and Watershield (*Brasenia schreberi*).

In addition to the northern settling pond, Geosyntec sampled for aquatic macrophytes at 327 stations in the Quabbin Reservoir. Aquatic plant growth was found to be sparse and when found, it was mainly located in shallow areas in coves and along the shores of the Quabbin (Geosyntec Consultants 2006). Eighty-three percent of all stations sampled had low plant densities (0-25%) and dense and very dense plant growth was located at only 17% of stations (Geosyntec Consultants 2006). High plant densities were found in “coves along the northern and eastern portions of North Dana, the area north of Mount L in Millington and the southeast cove near Shaft 11A of Fishing Area 3” (Geosyntec Consultants 2006). It is important to note that 60% of the stations sampled were characterized as having virtually no plants or very sparse densities (1-5%) (Geosyntec Consultants 2006). Plant biomass was also found to be low in the littoral areas surveyed in the Quabbin Reservoir. Seventy-nine percent of the stations surveyed were characterized as having low or zero plant biomass (Geosyntec Consultants 2006). Moderate biomass was present at 12% of sampled stations, while 9% of the stations had high to very high biomass (Geosyntec Consultants 2006). Fifty-two plant species were observed with golden hedge hyssop (*Gratiola aurea*) dominant at 31% of stations. Other plant species commonly found include: Bur-reed (*Sparganium* sp.), Robbin’s Spike Rush (*Eleocharis robbinsii*), Variable Milfoil (*Myriophyllum heterophyllum*), numerous bladderwort species (*Utricularia sp*.), and Mermaid Weed (*Proserpinaca palustris*).

The non-native species Variable Milfoil (*Myriophyllum heterophyllum*) was dominant at 7% of all stations sampled and largely found in coves (Geosyntec Consultants 2006). Geosyntec staff found Variable Milfoil in coves near Shaft 11, Albertine's Cove, a cove directly west of Albertine's Cove, in coves near Leveau Island, a cove near Pittman Hill, and in a shallow area near Bassett and Fairview Hills (Geosyntec Consultants 2006). Generally the densities and biovolume of aquatic macrophytes in the Quabbin Reservoir is low.

Water Chemistry

MA DCR collects water quality data at numerous locations in the Quabbin Reservoir and its tributaries, although a QAPP and field duplicates were not available for their reservoir sampling.

2003

MA DCR (2004) collected water chemistry data and water column profiles at three stations in 2003. MA DCR documented low turbidity, low color and low specific conductance; the pH ranged from 5.6 –7.2 SU in their samples (MA DCR 2004). Secchi disk depth ranged from 3.8 to 13 m. Dissolved oxygen levels were near saturation or over-saturated in the metalimion and epilimion. At the Shaft #12 sampling site the minimum dissolved oxygen reading was 49.2 % saturation, while the minimum found at Site 202 was 75.9% saturation in the hypoliminion. The average pH of all 54 reservoir samples was 6.64 SU while the average alkalinity of samples from the three MA DCR sampling sites was 4.0 mg/L as CaC03 (MA DCR 2004). Quarterly nutrient sampling was also conducted by MA DCR scientists. Low ammonia, low nitrate and low total phosphorus concentrations were measured at all three sampling stations (MA DCR 2004).

2004

MA DCR (2005) collected water chemistry data and water column profiles at three stations in 2004. MA DCR documented low turbidity and low specific conductance. The pH ranged from 5.5 –7.0 SU in their samples. Secchi disk depth ranged from 5.8 to 13.1 m. At the Shaft #12 sampling site, the minimum dissolved oxygen reading was 48% saturation while the minimum found at Site 202 was 73% saturation in the hypoliminion. The average pH of all 46 reservoir samples was 6.54 SU while the average alkalinity of samples from the three MA DCR sampling sites was 4.4 mg/l as CaC03. MA DCR scientists also conducted quarterly nutrient sampling. Low ammonia, low nitrate and low total phosphorus concentrations were measured at all three sampling stations (MA DCR 2005).

2005

MA DCR collected water chemistry data and water column profiles at three stations in 2005. MA DCR documented low turbidity, and the pH ranged from 5.5 –7.0 SU in their samples (MA DCR 2006a). Secchi disk depth ranged from 3.7 to 11.8 m. At the Den Hill sampling site the minimum dissolved oxygen reading was 31% saturation while the minimum found at Site 202 was 55% saturation in the hypoliminion (MA DCR 2006b). The average pH across the three reservoir stations was 6.61 SU while the average alkalinity of samples was 4.85 mg/l as CaC03. MA DCR scientists also conducted quarterly nutrient sampling. Low ammonia, low nitrate and low total phosphorus concentrations were measured at all three sampling stations (MA DCR 2006b).

2006

MA DCR collected water chemistry data and water column profiles at three stations in 2006. MA DCR documented low turbidity, and the pH ranged from 5.5 –7.7 SU in their samples (MA DCR 2007). Secchi disk depth ranged from 4.0 to 12.6 m. At the Den Hill sampling site the minimum dissolved oxygen reading was 20% saturation while the minimum found at Site 202 was 58% saturation in the hypoliminion (MA DCR 2007). The average pH across the three reservoir stations was 6.34 SU while the average alkalinity of samples was 5.31 mg as CaC03 (MA DCR 2007). Quarterly nutrient sampling was also conducted by MA DCR scientists in 2006. Low ammonia, low nitrate and low total phosphorus concentrations were measured at all three sampling stations (MA DCR 2007).

The *Aquatic Life Use* is assessed as impaired based on the presence of the non-native macrophyte (*Myriophyllum heterophyllum*). The Quabbin Reservoir and its tributaries, including flow diversion from the Ware River, are subject to acid deposition. Acid deposition effects on the reservoir and its tributaries is a cause of concern. MA DCR (2007) notes that productivity within the reservoir is limited by phosphorus, which is found in low concentrations in the reservoir.

Fish Consumption Use

MDPH has issued a fish consumption advisory due to mercury contamination for Quabbin Reservoir as follows.

> "*Children younger than 12, pregnant women, and nursing women should refrain from consuming all fish in Quabbin Reservoir except Lake Trout less than 24 inches long and Salmon.*
>
> *The general population should refrain from consuming Smallmouth Bass, Largemouth Bass, and Lake Trout greater than 24 inches long. The general public may consume unlimited Salmon and lake trout less than 24 inches long. The general public should limit consumption of all other fish species to one five-ounce meal per week."*

Fish were collected from the Quabbin Reservoir by MassDEP for mercury analysis on April 20th, 2005 as part of an Office of Research and Standards long term trend study (MassDEP 2005). The largemouth bass samples had an average mercury concentration around the 0.5 µg/g Hg trigger level that MA DPH uses to issue no consumption advisories for sensitive population groups and limited consumption general population advisories. The data are summarized below.

Fish Species	Number Collected	Average Length (mm)	Range Length (mm)	Average Wet Weight Whole Specimen(g)	Range Wet Weight Whole Weight (g)	Average Hg of individual fillets(µg/g)	Range Hg-individual fillets (µg/g)
Largemouth Bass	12	385	250-470	927.7	227-1765	0.51	0.17-0.88
Lake Trout	7	550	480-590	1434.3	1029-1770	0.38	0.2-0.51
Yellow Perch	6	218	140-330	146.2	28-347	0.31	0.11-0.63

A TMDL, a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for regional waterbodies to meet and maintain compliance with state and federal water quality standards, was recently approved for mercury by the U.S. EPA. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont (Northeast States 2007).

The TMDL covers waterbodies including Pottapuag Pond that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007).

Primary and Secondary Contact Recreation Uses

In 2003 MA DCR sampled at three sites for fecal coliform bacteria and found very low fecal bacteria counts. Only 14 of the 60 samples taken tested positive for fecal coliform bacteria and the greatest count was 3 cfu/100 mL (MA DCR 2004). In 2004 fecal coliform counts were very low with a range from 0 to 1 cfu/100 mL (n=90) (MA DCR 2005). In 2005 MA DCR monitored bacteria levels between May 25 and December 13 (MA DCR 2006b). Fecal coliform counts in 2005 were very low with a range from 0 to 5 cfu/100 mL (n=73) (MA DCR 2006). In 2006 MA DCR monitored bacteria levels between April 20 and December 14 (MA DCR 2007). Fecal coliform counts in 2006 were very low with a range from 0 to 19 cfu/100 mL (n=129, 9 sampling days) (MA DCR 2007). Of the 129 total samples taken, fifty one samples were taken at the three

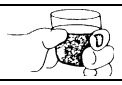
stations on five sampling days during the primary contact season. The majority of the samples did not show the presence of fecal coliform bacteria. Of the 129 samples taken, *E. coli* was only detected in two samples. These samples, taken on October 19 and November 15, had *E. coli* counts at the minimum detection limit of 10 MPN/100 mL (MA DCR 2007). MA DCR (2007) notes that a "season gull population that roosts on the reservoir overnight has been identified as the primary contributor of fecal coliform bacteria contamination to the reservoir".

Given the very low fecal coliform counts in 2006 and reported historically at the Quabbin Reservoir the *Primary* and *Secondary Contact Recreational Uses* are assessed as support.

Aesthetics Use

No objectionable conditions have been reported in the Quabbin Reservoir, which is a protected public water supply and managed by MA DCR as part of the Quabbin Watershed (Bishop 2006). Given the lack of objectionable conditions, the *Aesthetics Use* is assessed as support.

Quabbin Reservoir (Segment MA36129) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of non-native
Fish Consumption		IMPARIED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition toxics
Drinking Water*		NOT ASSESSED
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		SUPPORT

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

Coordinate future MassDEP sampling with the existing MA DCR sampling program.

Conduct additional fish toxics monitoring in the Quabbin Reservoir to evaluate Hg in response to TMDL implementation.

Conduct efforts to minimize and contain the spread of non-native plants.

Ware River Subbasin Lakes

BEAVER LAKE (SEGMENT MA36010)
Location: Ware
Segment Size: 150 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4c- *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
Two non-native species (*Myriophyllum heterophyllum* and *Myriophyllum spicatum*) were observed in Beaver Lake during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of non-native species. With the exception of *Aquatic Life Use* no other quality-assured data are available, the remaining designated uses are not assessed.

Beaver Lake (Segment MA36010) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-Native aquatic plants *Myriophyllum spicatum* Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current macrophyte conditions.

Management to control and prevent the spread of non-native macrophytes should be conducted.

BICKFORD POND (SEGMENT MA36015)
Location: Hubbardston/Princeton
Segment Size: 163 acres
Classification: Class A

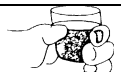
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Fitchburg Water Department registration/permit (20809701/9P20809701)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Bickford Pond. All designated uses are not assessed

Bickford Pond (Segment MA36015) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

BRIGHAM POND (SEGMENT MA36020)
Location: Hubbardston
Segment Size: 47 acres
Classification: Class A

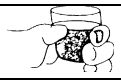
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One potential non-native aquatic macrophyte species, *Myriophyllum sp.*, was identified in Brigham Pond (MassDEP 1998). The *Aquatic Life Use* is not assessed for Brigham Pond. However, this use is identified with an "Alert" Status because of the potential infestation of non-native form of *Myriophyllum*.

No recent quality-assured data are available for Brigham Pond. All designated uses are not assessed.

Brigham Pond (Segment MA36020) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
**Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

DEMOND POND (SEGMENT MA36051)
Location: Rutland
Segment Size: 120 acres
Classification: Class A

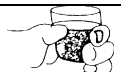
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One potential non-native aquatic macrophyte species, *Myriophyllum sp*., was identified in Demond Pond (MassDEP 1998). The *Aquatic Life Use* is not assessed for Demond Pond. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*.

No recent quality-assured data are available for Demond Pond. All designated uses are not assessed.

Demond Pond (Segment MA36051) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
**Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

FOREST LAKE (SEGMENT MA36063)
Location: Palmer
Segment Size: 45 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4c- *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Myriophyllum spicatum*) was observed in Forest Lake during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species. No recent quality-assured data are available for Forest Lake. All designated uses with the exception of the *Aquatic Life Use* are not assessed.

Forest Lake (Segment MA36063) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: *Myriophyllum spicatum* Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

HARDWICK POND (SEGMENT MA36066)
Location: Hardwick
Segment Size: 67 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4c- *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No recent quality-assured data are available for Hardwick Pond. All designated uses with the exception of *Aquatic Life Use* are not assessed.

Aquatic Life Use
Biology
Two non-native species (*Cabomba caroliniana*, *Myriophyllum heterophyllum*) were observed in Hardwick Pond during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of two non-native species. No recent quality-assured data are available for Forest Lake. All designated uses with the exception of *Aquatic Life Use* are not assessed.

Hardwick Pond (Segment MA36066) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of a non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS
An aquatic macrophyte survey should be considered to determine the extent of impairment.

Actions to control non-natives should be taken to minimize their impact in this pond.

LONG POND (SEGMENT MA36082)
Location: Rutland
Segment Size: 167 acres
Classification: Class A

This segment is on the 2006 Integrated List of Waters in Category 4c- *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Myriophyllum heterophyllum*) was observed in Long Pond during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species. No recent quality-assured data are available for Long Pond. All designated uses with the exception of *Aquatic Life Use* are not assessed.

Long Pond (Segment MA36082) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of a non-native organism
Drinking Water*		NOT ASSESSED
Fish Consumption		
Primary Contact		
Secondary Contact		
Aesthetics		

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
An aquatic macrophyte survey should be considered to determine the extent of non-native plant species.

Actions to control non-natives should be taken to minimize their impact in this pond.

MARE MEADOW RESERVOIR (SEGMENT MA36090)
Location: Westminster/Hubbardston
Segment Size: 240 acres
Classification: Class A

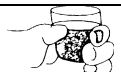
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Fitchburg Water Department registration/permit (20809701/9P20809701)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Mare Meadow Reservoir. All designated uses are not assessed.

Mare Meadow Reservoir (Segment MA36090) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Monitor water withdrawals by the Fitchburg Water Department.

MARE MEADOW RESERVOIR NORTH (SEGMENT MA36178)
Location: Westminster
Segment Size: 38 acres
Classification: Class A

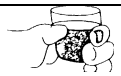
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Fitchburg Water Department registration/permit (20809701/9P20809701)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Mare Meadow Reservoir North. All designated uses are not assessed.

Mare Meadow Reservoir North (Segment MA36178) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
Monitor water withdrawals by the Fitchburg Water Department.

MOOSEHORN POND (SEGMENT MA36097)
Location: Hubbardston
Segment Size: 67 acres
Classification: Class A

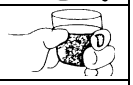
This segment is on the 2006 Integrated List of Waters in Category 4c- *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Biology
A non-native species (*Myriophyllum heterophyllum*) was observed in Moosehorn Pond during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species. No recent quality-assured data are available for Moosehorn Pond. All designated uses with the exception of the *Aquatic Life Use* are not assessed.

Moosehorn Pond (Segment MA36097) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of a non-native organism
Fish Consumption		NOT ASSESSED
Drinking Water*		
Primary Contact		
Secondary Contact		
Aesthetics		

* The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS
An aquatic macrophyte survey should be considered to determine the extent of non-native plant species.

Actions to control non-natives should be taken to minimize their impact in this pond.

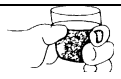
MOULTON POND (SEGMENT MA36098)
Location: Rutland
Segment Size: 65 acres
Classification: Class A

This segment is on the 2006 Integrated List of Waters in Category 3 - *No Uses Assessed* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One potential non-native aquatic macrophyte species, *Myriophyllum sp.*, was identified in Moulton Pond (MassDEP 1998). The *Aquatic Life Use* is not assessed. However this use is identified with an "Alert" Status because of the potential infestation of non-native form of *Myriophyllum*. No recent quality-assured data are available for Moulton Pond. All designated uses are not assessed.

Moulton Pond (Segment MA36098) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
**Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine the presence if any of non-native species.

PERRY HILL POND (SEGMENT MA36122)
Location: Hubbardston
Segment Size: 23 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 3 - *No Uses Assessed* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One potential non-native aquatic macrophyte species, *Myriophyllum sp.*, was identified in Perry Hill Pond during the 1998 synoptic lake survey (MassDEP 1998). This macrophyte may be a non-native and confirmation of the species is needed. The *Aquatic Life Use* is not assessed. However this use is identified with an "Alert" Status because of the potential infestation of non-native form of *Myriophyllum*. No recent quality-assured data are available for Perry Hill Pond. All designated uses are not assessed.

Perry Hill Pond (Segment MA36122) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

THOMPSON LAKE (SEGMENT MA36154)
Location: Palmer
Segment Size: 35 acres
Classification: Class A

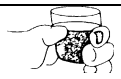
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
The presence of *Myriophyllum heterophyllum* was listed in the herbicide permit files and the lake has been treated with herbicides.

Confirmation of the presence of non-natives macrophytes by DWM personnel is needed. The *Aquatic Life Use* is not assessed for Thompson Lake. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*. No recent quality-assured data are available for Thompson Lake. All designated uses are not assessed.

Thompson Lake (Segment MA36154) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.
**Alert Status issues identified, see details in use assessment section

Quaboag River Subbasin Lakes

BROOKS POND (SEGMENT MA36023)
Location: N. Brookfield/New Braintree/Spencer/Oakham
Segment Size: 86 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5- *Waters Requiring a TMDL* because of pathogens (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A milfoil species (*Myriophyllum sp.*) was observed in Brooks Pond during the 1998 synoptic surveys (MassDEP 1998). A private company, Aquatic Control Technologies has reported *Myriophyllum heterophyllum* in Brooks Pond (ACT 2000) and the pond has been treated with herbicides in the past.

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species.

Primary and Secondary Contact Recreation and Aesthetics Uses
There is one beach along the shoreline of Brooks Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Brooks Pond with the exception of macrophytes information. All designated uses are not assessed with the exception of *Aquatic Life Use*.

Brooks Pond (Segment MA36023) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of a non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS

Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

Conduct water quality monitoring to evaluate designated uses.

BROWNING POND (SEGMENT MA36025)
Location: Oakham/Spencer
Segment Size: 106 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of pathogens (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.015 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Browning Pond please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The current estimated phosphorous loading of 200 kg/ha/year does not have to be reduced to meet the target estimated loading (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Myriophyllum heterophyllum*) was observed in Browning Pond during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species.

Browning Pond (Segment MA36025) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS
Consult Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

COMINS POND (SEGMENT MA36037)
Location: Warren
Segment Size: 26 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 3 - *No Uses Assessed* (MassDEP 2007b).

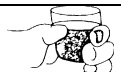
WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Warren Water Department registration/permit (20831102/9P220831102)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreation and Aesthetics Uses
There is one beach along the shoreline of Comins Pond (no postings). Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Comins Pond. All designated uses are not assessed.

Comins Pond (Segment MA36037) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

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CONANT BROOK RESERVOIR (SEGMENT MA36038)
Location: Monson
Segment Length: 4.4 acres
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2 - Attaining Some Uses; Other Uses Not Attained. Uses attained are *Secondary Contact Recreation* and *Aesthetics* (Mass DEP 2005a).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
The Town of Monson municipal water supply, which included a large dug well (72 feet wide by 23 feet deep, one of the largest in the country)(US ACOE 2007a) and this 115-acre surface water reservoir, was located here historically. When the U.S. Army Corps of Engineers (ACOE) built the Conant Brook Dam in 1966, this system was replaced by a well field in northern Monson in the Chicopee Brook watershed. The Conant Brook system was officially abandoned as a public drinking water supply and all infrastructure connections were severed in 1996 (Mass DEP 2007c).

Based on the available information, there are no WMA regulated groundwater or surface water withdrawals from or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Historically this water body was approximately 115 acres (Ackerman 1989). The current Conant Brook Reservoir is impounded by the ACOE Conant Brook Dam. This project was built to reduce flooding in the Conant Brook, Chicopee and Connecticut rivers. The earth and rockfill dam is 85 feet high and 1,050 feet long, with a 36-inch reinforced concrete pipe outlet with no gate. It controls a drainage area of 7.8 square miles. The Conant Brook Dam Project is a dry bed reservoir and does not maintain a permanent recreational pool. During flood control activities the 2.25-acre reservoir can increase to a maximum 158 acres, with a storage capacity of 3,740 acre-feet. Water level at Conant Brook Dam is controlled by thirty-six inch diameter conduit without gates (US ACOE 2006). When the dam is not in use for flood control it is operated in a run-of-river mode.

No other water quality data are available for Conant Brook Reservoir so the *Aquatic Life Use* is not assessed.

Primary and Secondary Contact Recreation and Aesthetics Uses
As at all Army Corps projects, primary and secondary contact recreation uses are allowed unless specifically prohibited; swimming, boating, and similar uses are not prohibited at the Conant Brook Dam Project. However, there is no public beach or boat launch located here. Given the lack of recent quality-assured data the *Primary* and *Secondary Contact Recreation Uses* are not assessed for Conant Brook Reservoir.

The Conant Brook Dam Project encompasses 471 acres and is managed by the ACOE for flood control, recreation, and habitat. Recreational opportunities include hunting, fishing, mountain biking, hiking, cross-country skiing, snowshoeing, sightseeing, and photography. Off road vehicles are prohibited, as are dumping and littering, loud noises, and any form of vandalism. These rules are enforced by Army Corps staff (US ACOE 2007b). The Monson-Brimfield-Wales Trail traverses the property; a total of 24 trail miles traverse the project. The ACOE web site for the dam states, “The natural environment of Conant Brook Dam reflects the diverse nature and beauty of New England. Forested, rolling hills frame the river valley in which numerous wildlife species find a home” (US ACOEc).

Based on this and the largely undeveloped watershed surrounding the Conant Brook Reservoir, noted scenic views and active management of the property, the *Aesthetics Use* is assessed as support.

Conant Brook Reservoir (Segment MA36050) Use Summary Table

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

RECOMMENDATIONS

Conduct water quality monitoring to evaluate designated uses.

DEAN POND (SEGMENT MA36049)
Location: Brimfield/Monson
Segment Size: 10 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One potential non-native aquatic macrophyte, *Myriophyllum sp.*, was identified in Dean Pond during the 1998 synoptic lake surveys (MassDEP 1998). In 2003 the MA DCR Lakes and Ponds Program confirmed the presence of the non-native *Myriophyllum heterophyllum* in Dean Pond.

The *Aquatic Life Use* for this waterbody is assessed as impaired based on the presence of a non-native species. No quality-assured data are available for Dean Pond with the exception of macrophytes information. All designated uses are not assessed with the exception of *Aquatic Life Use.*

Primary and Secondary Contact Recreation and Aesthetics Uses
There is one beach along the shoreline of Dean Pond: Dean Pond Beach. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

Dean Pond (Segment MA36049) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non native aquatic plant Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS
An aquatic macrophyte survey should be considered to determine the extent of non-native plant species.

DEAN POND (SEGMENT MA36050)
Location: Oakham
Segment Size: 64 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of noxious aquatic plants and turbidity (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
Myriophyllum heterophyllum and *Myriophyllum sp*. were listed as found in Dean Pond in herbicide permit applications between 2003 to 2006 and the pond has been treated with herbicides.

The *Aquatic Life Use* is not assessed for Dean Pond. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*. Confirmation of the presence of non-natives macrophytes by DWM personnel is needed.

Primary and Secondary Contact Recreation and Aesthetics Uses
There are two beaches along the shoreline of Dean Pond: Dean Campground and Pine Acres Campground. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Dean Pond with the exception of macrophyte information. All designated uses are not assessed.

Dean Pond (Segment MA36050) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

DOANE POND (SEGMENT MA36054)
Location: North Brookfield
Segment Size: 28 acres
Classification: Class A

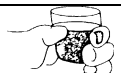
This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of noxious aquatic plants (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
North Brookfield Water Department registration (20821201)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Doane Pond. All designated uses are not assessed.

Doane Pond (Segment MA36054) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

HORSE POND (SEGMENT MA36072)
Location: North Brookfield
Segment Size: 63 acres
Classification: Class A

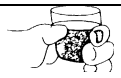
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
North Brookfield Water Department registration (20821201)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Horse Pond. All designated uses are not assessed.

Horse Pond (Segment MA36072) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

LAKE LASHAWAY (SEGMENT MA36079)
Location: North Brookfield/East Brookfield
Segment Size: 274 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters- Category 5 - Pollutants Needing a TMDL – Metals and exotic (non-native) species* (MassDEP 2007b).
*It should be noted that exotic species are not considered a pollutant.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Carbomba caroliniana*) was observed in Lake Lashaway during the 1998 synoptic survey (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native plant species.

Fish Consumption Use
MDPH has issued a fish consumption advisory due to Mercury contamination for Lake Lashaway, East Brookfield/North Brookfield as follows:

> *"Children under 12, pregnant women, women of childbearing age who may become pregnant and nursing mothers should refrain from consuming any fish from Lake Lashaway in order to prevent exposure to developing fetuses, nursing infants and young children to Mercury.*
> *The general public should limit consumption of Largemouth Bass fish from Lake Lashaway to two meals per month."*

The *Fish Consumption Use* is assessed as impaired for this waterbody due to a site specific fish consumption advisory.

A TMDL was recently approved for mercury by the U.S. EPA. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont (Northeast States 2007).

The TMDL covers waterbodies including Lake Lashaway that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007).

Primary and Secondary Contact Recreation and Aesthetics Uses
There are two beaches along the shoreline of Lake Lashaway. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary or Secondary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. The *Aesthetics Use* is also not assessed.

No recent quality-assured data are available for Lake Lashaway with the exception of macrophyte information and a fish consumption advisory. All designated uses are not assessed with the exception of *Aquatic Life Use* and *Fish Consumption*.

Lake Lashaway (Segment MA36079) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of non-native organism
Fish Consumption		IMPAIRED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Conduct water quality monitoring to evaluate designated uses.

PALMER RESERVOIR (SEGMENT MA36115)
Location: Palmer
Segment Size: 8 acres
Classification: Class A

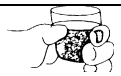
This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2 - Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Palmer Water Department registration (10822702)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No quality-assured data are available for Palmer Reservoir. All designated uses are not assessed.

Palmer Reservoir (Segment MA36115) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

QUABOAG POND (SEGMENT MA36130)
Location: Brookfield/East Brookfield
Segment Size: 544 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of noxious aquatic plants, nutrients, metals and exotic species* (MassDEP 2007b).
*It should be noted that exotic species are not considered a pollutant. EPA approved a total phosphorus TMDL for Quaboag and Quacumquasit Ponds on 6 December 2007 (Perkins 2007).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Brookfield Water Department registration (20804501)

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

A 319 grant entitled "Phosphorus and Sediment Load Reduction at Quaboag and Quacumquasit Ponds" has been awarded. The goal of this project is to support the TMDL development and implementation by prioritizing and addressing pollutant sources within the shared watershed of the two lakes. Target pollutants are nutrients and TSS. Some implementation work that has been previously recommended will be undertaken, and plans will be developed for future implementation that will further reduce the NPS coming into the lakes.
Project tasks include:

1. development and implementation of a Quality Assurance Project Plan (QAPP);
2. prioritization of pollutant sources;
3. development of conceptual plans for two or more high-priority BMPs;
4. evaluation of additional control measures, including the backflow between the two lakes; and
5. aquatic vegetation management.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
According to field notes there was a fish kill after a July 21st, 2004 herbicide treatment. A blue-green bloom that may have been exacerbated by the herbicide treatment was later noted in July 2004. After the herbicide treatment the blue-green bloom was extensive, although high nutrient loading also likely contributed to the bloom.

In August 2003, during baseline TMDL sampling, three non-native species (*Myriophyllum heterophyllum, Cabomba caroliniana,* and *Myriophyllum spicatum*) were observed in Quaboag Pond (MassDEP 2006b). The macrophytes density and biovolume was very dense for the majority of the pond in August 2003 (MassDEP 2006b). The density and biovolume of macrophytes was much larger than found in the 1980's and macrophytes also occurred deeper in the water column (3 m versus <2 m) (MassDEP 2006b). These same non-native species were also observed in Quaboag Pond during the 1998 synoptic surveys (MassDEP 1998).

MA DFG conducted fish population sampling in Quaboag Pond (Site 1018) in Brookfield using a boat shocker on 30 June 2004. One hundred and twenty-nine chain pickerel and one alewife were collected (130 fish total) (Richards 2006). MA DFG fish biologists noted the targeted fish, *Escocidae* (chain pickerel and pike), only during their collection. Given the target nature of this sampling no conclusions on the fish population dynamics in Quaboag Pond can be made.

Water Chemistry
The selected target phosphorus concentration and loads necessary to achieve surface water

quality standards for Quaboag Pond are 30 ppb (June through September) and 2588 kg/year, respectively (MassDEP 2006b). For the complete detailing of estimated nutrient loading to Quaboag Pond see the Total Maximum Daily Loads of Total Phosphorus for Quaboag Pond & Quacumquasit Pond (MassDEP 2006b). For the most recent water quality data see Appendix C.

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of non-native plant species and excessive algal growth resulting from high total phosphorus. The TMDL estimates nutrient loading from the municipal point source discharge (Spencer WWTP), multiple nonpoint sources, and internal nutrient recycling.

Fish Consumption Use

MA DPH (2005) has issued a fish consumption advisory due to Mercury contamination for Quaboag Pond, Brookfield/East Brookfield as follows:

> "*Children under 12, pregnant women, women of childbearing age who may become pregnant and nursing mothers should refrain from consuming any fish from Powder Mill Pond in order to prevent exposure to developing fetuses, nursing infants and young children to Mercury.*
> *The general public should refrain from consumption of Largemouth Bass fish from Quaboag Pond. The general public should limit consumption of non-affected fish from Quaboag Pond to two meals per month*".

Due to the site specific fish consumption advisory this waterbody is assessed as impaired for the *Fish Consumption Use*.

Primary and Secondary Contact Recreation Uses

Large populations of the non-native Eurasian milfoil (M*yriophyllum spicatum*) and fanwort (*Cabomba carolinina)* were found in August 2003 (MassDEP 2006b). Macrophyte density in the range of 75-100% was found over the majority of the pond. Macrophytes also occupied 50 to 75% of the biovolume in the majority of the pond and around the edges macrophytes often occupied 75-100% of the biovolume, especially along the northeastern and northwestern shores of the pond. In July 2003 the macrophyte density and biovolume were so great that frequent cleaning of the outboard motor was needed to traverse the pond although conditions improved in August. In July of 2004 an herbicide treatment occurred on Quaboag Pond.

According to MassDEP (2006b), "A bloom of algae was reported to be in the water at the time, but this bloom expanded to become a large, persistent surface bloom of blue-green algae (cyanobacteria) that raised concerns about health impacts." It was estimated that the herbicide treatment likely released a sufficient amount of nutrients to significantly contribute to a large bloom, although it was also noted that phosphorus concentrations in East Brookfield River (an upstream tributary to Quaboag Pond) were also high (50 *u*g/L) in July (MassDEP 2006b).

The *Recreational Uses* are impaired due to high density and biovolume of aquatic macrophytes, including non-natives and excessive algal growth.

Aesthetics Use

MassDEP DWM field crews noted objectionable deposits on two occasions during field visits conducted in 2003 and 2004. Noxious weeds were noted on the two occasions and a bloom of blue-greens (cyanobacteria) was noted in July 2003. On three occasions surface scums were noted, consisting of pollen sheen on one occasion, streaks of foam on one occasion and a blue-green bloom on another occasion. Water odors or other objectionable deposits were not noted during field sampling. The *Aesthetic Use* is impaired due to high density and biovolume of aquatic macrophytes including non-natives and excessive algal growth.

Quaboag Pond (Segment MA36130) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants, excessive algal growth, high total phosphorus Source: Introduction of non-native organism, municipal point source discharge, non-point sources, internal nutrient recycling
Fish Consumption		IMPARIED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition toxics
Primary Contact		IMPAIRED Cause: Non-native aquatic plants, excessive algal growth Source: Introduction of non-native organism, municipal point source discharges, internal nutrient recycling Suspected Sources: Pesticide application
Secondary Contact		
Aesthetics		

RECOMMENDATIONS

Follow aquatic macrophytes management plan outlined in TMDL (MassDEP 2006b).

Follow TMDL recommendations in terms of nutrient loading with specif ic emphasis on non-point source loading reductions (MassDEP 2006b).

Conduct monitoring to assess the progress of TMDL implementation.

QUACUMQUASIT POND (SEGMENT MA36131)
Location: Brookfield/East Brookfield/Sturbridge
Segment Size: 223 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of metals and exotic species* (MassDEP 2007b).

*It should be noted that exotic species are not considered a pollutant. EPA approved a total phosphorus TMDL for Quaboag and Quacumquasit Ponds on 6 December 2007 (Perkins 2007). The target load listed for Quacumquasit Pond is considered a preventative TMDL.

A 319 grant entitled "Phosphorus and Sediment Load Reduction at Quaboag and Quacumquasit Ponds" has been awarded. The goal of this project is to support the TMDL development and implementation by prioritizing and addressing pollutant sources within the shared watershed of the two lakes. Target pollutants are nutrients and TSS. Some implementation work that has been previously recommended will be undertaken, and plans will be developed for future implementation that will further reduce the NPS coming into the lakes.
Project tasks include:

1. development and implementation of a Quality Assurance Project Plan (QAPP);
2. prioritization of pollutant sources;
3. development of conceptual plans for two or more high-priority BMPs;
4. evaluation of additional control measures, including the backflow between the two lakes; and
5. aquatic vegetation management.

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Habitat and Flow
Flow of water out of Quacumquasit Pond is controlled by means of a gate structure and the backflow of water from Quaboag Pond to Quacumquasit Pond has been noted (MassDEP 2006b). This backflow of water from Quaboag has been identified as a source of nutrient loading to Quacumquasit Pond (MassDEP 2006b).

Biology
Three non-native species (*Myriophyllum heterophyllum, Myriophyllum spicatum,* and *Cabomba caroliniana*) were observed in Quacumquasit Pond during the 1998 synoptic surveys (MassDEP 1998). Macrophyte mapping was not conducted at this pond in 2003.

Water Chemistry
For a complete detailing of estimated nutrient loading to Quacumquasit Pond please see the Draft Total Maximum Daily Loads of Total Phosphorus for Quaboag Pond & Quacumquasit Pond (MassDEP 2006b). For the most recent water quality data for this pond see Appendix C.

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species.

Fish Consumption Use
MA DPH (2005) has issued a fish consumption advisory due to Mercury contamination for Quacumquasit Pond, Brookfield/East Brookfield as follows:

> "*Children under 12, pregnant women, women of childbearing age who may become pregnant and nursing mothers should refrain from consuming any fish from Quacumquasit*

Pond in order to prevent exposure to developing fetuses, nursing infants and young children to Mercury. The general public should limit consumption of all fish species from Quacumquasit Pond to two meals per month".

Due to the site-specific fish consumption advisory this waterbody is assessed as impaired for the *Fish Consumption Use*.

A TMDL was recently approved for mercury by the U.S. EPA. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

The TMDL covers waterbodies including Quacumquasit Pond that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007).

Primary and Secondary Contact Recreation and Aesthetics Uses
There are two beaches along the shoreline of Quacumquasit Pond: South Pond Beach and Camp Frank A Day. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No objectionable deposits, scum or odors were noted by DWM field crews during baseline TMDL sampling in 2003. Macrophyte mapping was not conducted at this pond.

Due to the lack of recent quality-assured bacteria information the *Recreation Uses* are not assessed. Due to the lack of objectionable conditions noted at Quacumquasit Pond by DWM field crews, the *Aesthetics Use* is supported for Quacumquasit Pond.

Quacumquasit Pond (Segment MA36131) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Cause: Non-native aquatic plants Source: Introduction of non-native organism
Fish Consumption		IMPAIRED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		SUPPORT

RECOMMENDATIONS
Follow aquatic macrophytes management plan outlined in TMDL (MassDEP 2006b).

Efforts should be taken through appropriate gate management and/or raising the gate height to prevent unnecessary nutrient fluxes into the pond (MassDEP 2006b).

SUGDEN RESERVOIR (SEGMENT MA36150)
Location: Spencer
Segment Size: 85 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4a - *TMDL is Completed* for organic enrichment/low DO and nutrients (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.015 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Sugden Reservoir see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 372 kg/ha/year to a target load of 230 kg/ha/year (38% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Primary and Secondary Contact Recreation and Aesthetics Uses
There is one beach along the shoreline of Sugden Reservoir. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Sugden Reservoir. All designated uses are not assessed.

Sugden Reservoir (Segment MA36150) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence if any of non-native species.

Consult Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

THOMPSONS POND (SEGMENT MA36155)
Location: Spencer
Segment Size: 116 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4c - *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

In 2000 the Town of Spencer and Concern Citizens Association of Thompsons Pond received a $2,250 grant. The Thompson Pond project goal was to control the spread of Eurasian milfoil, a non-native nuisance aquatic plant, with the use of herbicides. The aquatic plant was affecting recreational pursuits and the ecosystem of the lake. In 2002 an additional $3,750 was awarded to control Eurasian milfoil with the use of herbicides and conduct public education.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
No non-natives aquatic macrophytes were observed by DWM field crews during the 1998 synoptic survey, although abutters claimed Eurasian milfoil (*Myriophyllum spicatum*) was present. The presence of *Myriophyllum* sp. and *Myriophyllum heterophyllum* was listed in the herbicide permit files and the pond has been treated with herbicides.

The *Aquatic Life Use* is not assessed for Thompsons Pond. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*. Confirmation of the presence of non-natives macrophytes by DWM personnel is needed.

Primary and Secondary Contact Recreation and Aesthetics Uses
There are two beaches along the shoreline of Thompsons Pond: Camp Marshall and Thompsons Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Thompsons Pond. All designated uses are not assessed.

Thompsons Pond (Segment MA36155) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to determine current conditions and determine the presence, if any, of non-native species.

TURKEY HILL POND (SEGMENT MA36157)
Location: Rutland/Paxton
Segment Size: 90 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4c - *Impairment Not Caused by a Pollutant* due to the presence of exotic (non-native) species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Myriophyllum heterophyllum*) was observed in Turkey Hill Pond during the 1998 synoptic surveys (MassDEP 1998).

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species. With the exception of macrophytes information, no quality-assured data are available for Turkey Hill Pond. All designated uses are not assessed with the exception of aquatic life use.

Turkey Hill Pond (Segment MA36157) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

WICKABOAG POND (SEGMENT MA36166)
Location: West Brookfield
Segment Size: 315 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 5 - *Waters Requiring a TMDL* because of metals, noxious aquatic plants (CN118.0) and turbidity (CN118.0) (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.015 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Wickaboag Pond please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 1049 kg/ha/year to a target load of 729 kg/ha/year (31% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
The presence of *Myriophyllum* sp. and *Myriophyllum heterophyllum* were listed in herbicide permit files. Aquatic macrophytes are managed with yearly herbicide applications.

The *Aquatic Life Use* is not assessed for Wickaboag Pond. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*. Confirmation of the presence of non-natives macrophytes by DWM personnel is needed.

Fish Consumption Use
MDPH has issued a fish consumption advisory due to Mercury contamination for Wickaboag Pond, West Brookfield as follows:

> "*Children under 12, pregnant women, women of childbearing age who may become pregnant and nursing mothers should refrain from consuming any fish from Wickaboag Pond in order to prevent exposure to developing fetuses, nursing infants and young children to Mercury. The general public should limit consumption of Largemouth Bass fish from Wickaboag Pond to two meals per month*".

Due to the site-specific fish consumption advisory this waterbody is assessed as impaired for the *Fish Consumption Use*."

A TMDL was recently approved for mercury by the U.S. EPA. The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont (Northeast States 2007).

The TMDL covers waterbodies including Wickaboag Pond that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007).

Primary and Secondary Contact Recreation and Aesthetics Uses
There are two beaches along the shoreline of Wickaboag Pond: Main Beach and Small Beach. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure

information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody. The *Aesthetics Use* is also not assessed.

With the exception of a fish consumption advisory, no recent quality-assured data are available for Wickaboag Pond. All designated uses are not assessed except fish consumption.

Wickaboag Pond (Segment MA36166) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		IMPAIRED Cause: Mercury in fish tissue Source: Unknown Suspected Source: Atmospheric deposition toxics
Primary Contact		NOT ASSESSED
Secondary Contact		
Aesthetics		

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

RECOMMENDATIONS

Consult Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

Implement the Northeast Regional Mercury Total Maximum Daily Load (TMDL).

Chicopee River Subbasin Lakes

CHICOPEE RESERVOIR (SEGMENT MA36033)
Location: Chicopee
Segment Size: 22 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact and Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment.

NPDES SURFACE WATER DISCHARGES (APPENDIX D, TABLE D4)
Westover Air Force Base (MAR05B973)
City of Chicopee (MAR041003)

DESIGNATED USE ASSESSMENT

Primary and Secondary Contact Recreation Uses
There is one beach along the shoreline of Chicopee Reservoir, Chicopee Beach. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Chicopee Reservoir. All designated uses are not assessed.

Chicopee Reservoir (Segment MA36033) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Attention should be paid to bacteria monitoring in Cooley Brook above Chicopee Reservoir as this is upstream from the bathing beach at the reservoir.

DIMMOCK POND (SEGMENT MA36053)
Location: Springfield
Segment Size: 9 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3 -No Uses Assessed (MassDEP 2007b).

DESIGNATED USE ASSESSMENT
The *Aquatic Life Use* for this segment is not assessed, however, it is identified with an "Alert Status" because of the possible presence of a non-native species (*Myriophyllum sp.)*, that requires further confirmation when flowering heads are evident.

No quality-assured data are available for Dimmock Pond. All designated uses are not assessed.

Dimmock Pond (Segment MA36053) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to assess *Aquatic Life Use* and determine the presence, if any, of a non-native plant species.

FIVEMILE POND (SEGMENT MA36061)
Location: Springfield
Segment Size: 36 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact and Aesthetics* (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
1998 DWM field sheets state that *Myriophyllum heterophyllum* was found although a note made on the field sheets by Richard McVoy, dated 01/03/01, indicates the species found could also be *M. verticillatum* (MassDEP 1998). Due to the lack of confidence in the identification at this site, the *Aquatic Life Use* is not assessed for Fivemile Pond. However, this use is identified with an "Alert Status" because of the potential infestation of a non-native form of *Myriophyllum*.

Primary and Secondary Contact Recreation Uses
There is one beach along the shoreline of Fivemile Pond. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Fivemile Pond. All designated uses are not assessed.

Fivemile Pond (Segment MA36061) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to assess *Aquatic Life Use* and determine the presence if any, of non-native species.

FIVEMILE POND SOUTH (SEGMENT MA36182)
Location: Springfield
Segment Size: 4 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3 - No Uses Assessed (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
1998 DWM field sheets state that *Myriophyllum heterophyllum* was found, although a note made on the field sheets by Richard McVoy, dated 01/03/01, indicates the species found could also be *M. verticillatum* (MassDEP 1998). Due to the lack of confidence in the identification at this site, the *Aquatic Life Use* is not assessed for Fivemile Pond. However, this use is identified with an "Alert" Status because of the potential infestation of a non-native form of *Myriophyllum*.

No quality-assured data are available for Fivemile Pond. All designated uses are not assessed.

Fivemile Pond South (Segment MA36182) Use Summary Table

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

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

RECOMMENDATIONS
Conduct aquatic macrophyte mapping to assess *Aquatic Life Use* and determine the presence if any of non-native species.

LONG POND (SEGMENT MA36083)
Location: Springfield
Segment Size: 14 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4a - *TMDL is Completed* (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.030 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Long Pond please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 163 kg/ha/year to a target load of 68 kg/ha/year (58% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
One aquatic macrophyte species, *Myriophyllum* sp., was identified in Long Pond during 1998 synoptic surveys (MassDEP 1998). This macrophyte may be a non-native and therefore will require further identification when flowering heads are present. However, this use is identified with an "Alert Status" because of the potential infestation of non-native form of *Myriophyllum*.

No quality-assured data are available for Long Pond. All designated uses are not assessed

Long Pond (Segment MA36083) Use Summary Table

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

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

RECOMMENDATIONS
Consult and follow recommendations in Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

Confirm species of *Myriophyllum* when flowering heads are present.

LAKE LORRAINE (SEGMENT MA36084)
Location: Springfield
Segment Size: 28 acres
Classification: Class B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4c-Impairment caused by something other than a pollutant – exotic species (MassDEP 2007b).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
A non-native species (*Myriophyllum heterophyllum*) was noted on 1998 synoptic surveys field sheets (MassDEP 1998). It wasn't exactly found during 1998 survey, it was noted on 1998 field sheet that it was found during a 1978 field survey (DWPC undated). Confirmation of the current presence of this species is needed.

Water Chemistry
Lake Lorraine was sampled by DWM as part of the nutrient criteria development project in July 2003 and again in September 2005. In July 2003 oxygen depletion was recorded only at a depth of 10m (Appendix C). The profile data collected in September 2005 indicate oxygen depletion at approximately 8m and below which represents approximately 20% of the lake area. However the data collected in 2005 have not yet been reviewed for quality.

The *Aquatic Life Use* for this segment is assessed as impaired based on the presence of a non-native species.

Primary and Secondary Contact Recreation Uses
There are two beaches along the shoreline of Lake Lorraine: Lake Lorraine and Knights of Columbus beach. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No quality-assured data are available for Lake Lorraine. All designated uses with the exception of the *Aquatic Life Use* are not assessed.

Lake Lorraine (Segment MA36084) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Non-native aquatic plants Source: Introduction of non-native organism
Fish Consumption		NOT ASSESSED
Primary Contact		
Secondary Contact		
Aesthetics		

RECOMMENDATIONS

Conduct macrophyte mapping in Lake Lorraine to determine the presence of any non-native aquatic macrophytes.

Review the data collected for Lake Lorraine as part of the nutrient criteria development project in 2005 to better evaluate the status of the *Aquatic Life Use* and the need for additional monitoring.

MINECHOAG POND (SEGMENT MA36093)
Location: Ludlow
Segment Size: 21 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4a - *TMDL is Completed* for noxious aquatic plants (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.030 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Minechoag Pond please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 110 kg/ha/year to a target load of 53 kg/ha/year (52% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No recent quality-assured data are available for Minechoag Pond. All designated uses are not assessed.

Minechoag Pond (Segment MA36093) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Consult and follow recommendations in Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

MONA LAKE (SEGMENT MA36094)
Location: Springfield
Segment Size: 11 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4a - *TMDL is Completed* (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.030 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Mona Lake please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 47 kg/ha/year to a target load of 19 kg/ha/year (60% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
No recent quality-assured data are available for Mona Lake. All designated uses are not assessed.

Mona Lake (Segment MA36094) Use Summary Table

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				
NOT ASSESSED				

RECOMMENDATIONS
Consult and follow recommendations in Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

SPECTACLE POND (SEGMENT MA36142)
Location: Wilbraham
Segment Size: 9 acres
Classification: Class B

This segment is on the 2006 Integrated List of Waters in Category 4a - *TMDL is Completed* (MassDEP 2007b).

There is a proposed site-specific total phosphorous criterion of 0.020 mg/L for this water body (MassDEP 2006c).

For a complete detailing of estimated nutrient loading to Spectacle Pond please see the Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002). The phosphorous loads should be reduced from the current estimate loading of 16.8 kg/ha/year to a target load of 8.7 kg/ha/year (48% reduction) (MassDEP 2002).

WATER WITHDRAWALS AND PERMITTED DISCHARGES
Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
An unconfirmed species of *Myriophyllum* is present in Spectacle Pond. Whether or not it is non-native needs to be determined.

The *Aquatic Life Use* is not assessed for Spectacle Pond. However, this use is identified with an "Alert Status" because of the potential infestation of a non-native form of *Myriophyllum*.

Primary and Secondary Contact Recreation Uses
There are two beaches along the shoreline of Spectacle Pond: Spectacle Pond Camp and Spectacle Pond Beach. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the Massachusetts DPH, which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

No recent quality-assured data are available for Spectacle Pond. All designated uses are not assessed.

Spectacle Pond (Segment MA36142) Use Summary Table

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

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

RECOMMENDATIONS
Consult and follow recommendations in Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes (MassDEP 2002).

Confirm species of *Myriophyllum* when flowering heads are present.

SPRINGFIELD RESERVOIR (SEGMENT MA36145)
Location: Ludlow
Segment Size: 393 acres
Classification: Class A

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2-Attaining Some Uses; Other Uses Not Assessed. Uses attained are *Secondary Contact* and *Aesthetics* (MassDEP 2007b).

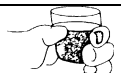
WATER WITHDRAWALS AND PERMITTED DISCHARGES
WMA (Appendix E, Table E1)
Springfield Water Department Registration #10828101

NPDES SURFACE WATER DISCHARGES (APPENDIX D)
Based on the available information there are no permitted surface water discharges to this segment.

DESIGNATED USE ASSESSMENT
Aquatic Life Use
Biology
MA DFG conducted fish population sampling in Springfield Reservoir (Station 494) on 13 July 2001. Forty-four bluegill, forty-two largemouth bass, forty-one yellow perch, thirty white perch, eight pumpkinseed, four black crappie, two smallmouth bass, one rock bass and one redbreast sunfish were collected (173 fish total) (Richards 2006). All of these species are macrohabitat generalists and would be expected in a lentic environment. The fish population data is not sufficient to assess the *Aquatic Life Use*.

No quality-assured data with the exception of fish population data are available for Springfield Reservoir. All designated uses are not assessed.

Springfield Reservoir (Segment MA36145) Use Summary Table

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

* The MassDEP Drinking Water Program maintains current drinking water supply data.

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APPENDIX C
DWM 2003 LAKE SURVEY DATA IN THE CHICOPEE RIVER WATERSHED

In the Chicopee River Watershed, baseline lake surveys were conducted in July, August, and September 2003 to coincide with maximum growth of aquatic vegetation, highest recreational use, and highest lake productivity. Lake Lorraine, Quaboag Pond, and Quacumquasit Pond were sampled.

In situ measurements using the Hydrolab® (measures dissolved oxygen, water temperature, pH, conductivity, and depth and calculates total dissolved solids and % oxygen saturation) were recorded. At deep hole stations measurements were recorded at various depths creating profiles. In-lake samples were also collected and analyzed for alkalinity, total phosphorus, apparent color, and chlorophyll *a* (an integrated sample). Macrophyte mapping was also conducted at select lakes during 2003. The aquatic plant cover (native and non-native) and species distribution was mapped and recorded.

Procedures used for water sampling and sample handling are described both in an Assurance Project Plan (MassDEP 2003) and Baseline Lake Survey Quality Assurance Project Plan (MassDEP 2003b), and Lakes Nutrient Criteria Quality Assurance Project Plan (Mass2003c). The QAPP written for DWM Monitoring included monitoring to develop Total Maximum Daily Loads (TMDLs) for specific waterbodies (MassDEP 2003). All methods and complete Standard Operating Procedures are included in the above QAPPs and are available from MassDEP. Information about data quality objectives (accuracy, precision, detection limits, holding times, representativeness and comparability) is available in the 2003 Data Validation Report (MassDEP 2005b). Methods used to determine data quality are detailed in *Data Validation and Usability (*MassDEP 2005). Data were excerpted from the *Baseline Lake Survey 2003 Technical Memo* and presented in tables C1 and C2 (MassDEP 2007). Quality assurance and quality control data are presented in table C3.

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Table C1 (continued): 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes physico-chemical data

Lake Lorraine (PALIS: 36084)
Unique_ID: W1083 Station: A
Description: [deep hole, southeastern lobe, Springfield]

Date	Secchi	Secchi Time	Station Depth	OWMID	QAQC	Time	SmpTyp	RelDepth	Depth	Chl-a	NO3-NO2-N	TKN	TN	TP	AppColor
	m	24hr	m			24hr			m	mg/m3	mg/L	mg/L	mg/L	mg/L	PCU
07/10/03	5.1	12:50	11.0												
				LC-0094	--	12:45	VDOR	nb	9.5	--	--	--	--	##* m	--
				LC-0093	LC-0307	12:35	MNGR	--	--	--	--	--	--	##* m	<15*
				LC-0307	LC-0093	12:35	MNGR	--	--	--	--	--	--	##* m	<15*
				LC-0095	LC-0096	13:00	DINT	--	0 - 7.0	6.0*	--	--	--	--	--
				LC-0096	LC-0095	13:05	DINT	--	0 - 7.0	5.3*	--	--	--	--	--

Table C1 (continued): 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes physico-chemical data

Quaboag Pond (PALIS: 36130)
Unique_ID: W1004 Station: A, Mile Point: -9
Description: [deep hole, East Brookfield]

Date	Secchi	Secchi Time	Station Depth	OWMID	QAQC	Time	SmpTyp	RelDepth	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
	m	24hr	m			24hr			m	mg/m3	mg/L	mg/L	mg/L	mg/L	mg/L	PCU
12/11/02	1.8	11:45	4.6													
				LB-2465	--	11:45	MNGR	--	--	--	--	--	--	--	0.019 h	--
01/30/03	**	**	**													
				LB-2467	LB-2468	12:05	MNGR	--	--	--	--	--	--	--	0.019	--
				LB-2468	LB-2467	12:05	MNGR	--	--	--	--	--	--	--	0.017	--
03/04/03	**	**	**													
				LB-2470	--	10:55j	MNGR	--	--	--	--	--	--	--	0.019	--
04/15/03	2.9	10:40	3.0													
				LB-2476	--	10:46	MNGR	--	--	--	<0.02	--	--	--	0.014	--
05/13/03	2.0	10:45	4.2													
				LB-2492	LB-2493	10:41	MNGR	--	--	--	--	--	--	--	0.028 h	--
				LB-2493	LB-2492	10:42	MNGR	--	--	--	--	--	--	--	0.029 h	--
06/17/03	1.8	11:00	4.4													
				LB-2605	--	11:15	VDOR	nb	4.0	--	--	--	--	--	0.056	--
				LB-2496	LB-2497	11:00	MNGR	--	--	--	--	--	--	--	0.029	50*
				LB-2497	LB-2496	11:00	MNGR	--	--	--	--	--	--	--	0.025	60*
				LB-2601	LB-2602	11:05	DINT	--	0 - 4.0	10.2* m	--	--	--	--	--	--
				LB-2602	LB-2601	11:05	DINT	--	0 - 4.0	9.7* m	--	--	--	--	--	--
07/30/03	1.8	11:40	4.0													
				LB-2502	--	11:35	VDOR	nb	3.5	--	--	--	--	--	##* fm	--
				LB-2500	LB-2501	11:30	MNGR	--	--	--	--	--	--	--	##* fm	65*
				LB-2501	LB-2500	11:30	MNGR	--	--	--	--	--	--	--	##* fm	60*

Table C1 (continued): 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes physico-chemical data

Quaboag Pond (PALIS: 36130) (continued)
Unique_ID: W1004 Station: A, Mile Point: -9
Description: [deep hole, East Brookfield]

Date	Secchi	Secchi Time	Station Depth	OWMID	QAQC	Time	SmpTyp	RelDepth	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
				LB-2503	LB-2504	11:45	DINT	--	0 - 3.5	24.9*	--	--	--	--	--	--
				LB-2504	LB-2503	11:45	DINT	--	0 - 3.5	27.3*	--	--	--	--	--	--
08/20/03	1.4	12:40	4.2													
				LB-2520	--	12:40	VDOR	nb	3.8	--	--	--	--	--	##* m	--
				LB-2518	LB-2519	12:25	MNGR	--	--	--	--	<0.02	0.55	--	##* m	75*
				LB-2519	LB-2518	12:25	MNGR	--	--	--	--	<0.02	0.52	--	0.041	65*
				LB-2522	--	12:30	DINT	--	0 - 3.8	35.1*	--	--	--	--	--	--
09/24/03	0.8	12:30	4.3													
				LB-2536	--	12:35	VDOR	nb	3.8	--	--	<0.06 h	--	0.75 bh	0.056 bh	--
				LB-2534	LB-2535	12:30	MNGR	--	--	--	--	<0.06 h	--	0.97 bh	0.060 bh	70* h
				LB-2535	LB-2534	12:31	MNGR	--	--	--	--	<0.06 h	--	1.0 bh	0.062 bh	70* h
				LB-2538	--	12:41	DINT	--	0 - 2.4	32.8*	--	--	--	--	--	--
10/22/03	1.6	12:30	4.0													
				LB-2555	--	12:10	VDOR	nb	3.5	--	--	--	--	--	0.035 fh	--
				LB-2553	LB-2554	12:00	MNGR	--	--	--	--	--	--	--	0.040 h	** *
				LB-2554	LB-2553	12:00	MNGR	--	--	--	--	--	--	--	0.037 h	** *
				LB-2556	LB-2557	12:15	DINT	--	0 - 3.5	** *	--	--	--	--	--	--
				LB-2557	LB-2556	12:15	DINT	--	0 - 3.5	** *	--	--	--	--	--	--
11/25/03	1.2	12:20	4.4													
				LB-2620	LB-2670	10:21	MNGR	--	--	--	--	--	--	--	0.048 h	55*
				LB-2670	LB-2620	10:22	MNGR	--	--	--	--	--	--	--	0.049 h	60*

Table C1 (continued): 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes physico-chemical data

Quacumquasit Pond (PALIS: 36131)
Unique_ID: W1005 Station: A, Mile Point: -9
Description: [deep hole, East Brookfield]

Date	Secchi	Secchi Time	Station Depth	OWMID	QAQC	Time	SmpTyp	RelDepth	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
	m	24hr	m			24hr			m	mg/m3	mg/L	mg/L	mg/L	mg/L	mg/L	PCU
01/30/03	**	**	**													
				LB-2466	--	12:45	MNGR	--	--	--	--	--	--	--	0.013	--
03/04/03	**	**	**													
				LB-2474	LB-2471	11:10j	MNGR	--	--	--	--	--	--	--	0.007	--
				LB-2471	LB-2474	11:40	MNGR	--	--	--	--	--	--	--	0.010	--
04/15/03	3.1	12:00	22.9													
				LB-2477	LB-2478	12:05	MNGR	--	--	--	<0.02	--	--	--	0.015	--
				LB-2478	LB-2477	12:05	MNGR	--	--	--	<0.02	--	--	--	0.013	--
05/13/03	3.8	11:15	22.2													
				LB-2494	--	11:15	MNGR	--	--	--	--	--	--	--	0.011 h	--
06/17/03	3.3	11:45	21.9													
				LB-2604	--	12:00	VDOR	nb	20.6	--	--	--	--	--	0.059	--
				LB-2498	--	11:45	MNGR	--	--	--	--	--	--	--	0.018	19*
				LB-2603	--	12:01	DINT	--	0 - 8.0	7.0* m	--	--	--	--	--	--
07/30/03	4.5	12:50	22.0													
				LB-2508	--	12:45	VDOR	nb	21.0	--	--	--	--	--	##* fm	--
				LB-2507	--	12:40	MNGR	--	--	--	--	--	--	--	##* fm	<15*
				LB-2606	LB-2607	13:00	DINT	--	0 - 8.0	10.6* d	--	--	--	--	--	--
				LB-2607	LB-2606	13:01	DINT	--	0 - 8.0	6.8* d	--	--	--	--	--	--
08/20/03	4.8	13:50	22.0													
				LB-2526	--	14:25	VDOR	nb	21.0	--	--	--	--	--	##* m	--
				LB-2524	LB-2525	13:55	MNGR	--	--	--	--	--	--	--	0.007	--

Table C1 (continued): 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes physico-chemical data

Quacumquasit Pond (PALIS: 36131) (continued)
Unique_ID: W1005 Station: A, Mile Point: -9
Description: [deep hole, East Brookfield]

Date	Secchi	Secchi Time	Station Depth	OWMID	QAQC	Time	SmpTyp	RelDepth	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
				LB-2525	LB-2524	13:55	MNGR	--	--	--	--	<0.02	0.23	--	##* m	<15*
				LB-2609	LB-2610	14:05	DINT	--	0 - 7.0	5.1*	--	--	--	--	--	--
				LB-2610	LB-2609	14:05	DINT	--	0 - 7.0	5.4*	--	--	--	--	--	--
09/24/03	4.2	13:30	21.5													
				LB-2542	--	13:25	VDOR	nb	21.0	--	--	<0.02 h	--	1.1 bh	0.055 bh	--
				LB-2541	--	13:15	MNGR	--	--	--	--	<0.02 h	--	0.23 bh	0.011 bh	19* h
				LB-2612	LB-2613	13:35	DINT	--	0 - 12.6	7.8*	--	--	--	--	--	--
				LB-2613	LB-2612	13:40	DINT	--	0 - 12.6	6.8*	--	--	--	--	--	--
10/22/03	5.0	13:00	20.0													
				LB-2615	--	13:20	VDOR	nb	19.0	--	--	--	--	--	0.071 fh	--
				LB-2559	--	13:10	MNGR	--	--	--	--	--	--	--	0.014 h	** *
				LB-2616	LB-2617	13:30	DINT	--	0 - 14.0	** *	--	--	--	--	--	--
				LB-2617	LB-2616	13:30	DINT	--	0 - 14.0	** *	--	--	--	--	--	--
11/25/03	1.4	13:15	22.6													
				LB-2625	--	13:15	MNGR	--	--	--	--	--	--	--	0.020 h	25*

Table C2: 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes *in-situ* data

Lake Lorraine (PALIS: 36084)
Unique_ID: W1083 Station: A
Description: [deep hole, southeastern lobe, Springfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
07/10/03									
	LC-0097	11:11	0.5	26.8 u	7.0 c	165	106	8.2	104
	LC-0097	11:18	1.5	26.6	6.9 c	165	105	8.0	101
	LC-0097	11:24	2.5	26.5	6.9 c	165	105	7.8	99
	LC-0097	11:30	3.3	24.8 u	7.0 c	164	105	8.5	104
	LC-0097	11:36	4.0	22.4 u	6.8 u	167	107	7.8 u	91 u
	LC-0097	11:42	5.0	17.7 u	7.5 c	172	110	10.9	116
	LC-0097	11:50	5.9	13.0 u	7.5 cu	173	111	11.9	115
	LC-0097	11:59	7.4	9.1 u	7.1 uc	171	110	11.1	98
	LC-0097	12:05	8.4	7.7	6.7 u	172	110	10.0	85
	LC-0097	12:11	10.0	7.1	6.2 u	177 u	113 u	1.5 u	12 u

Quaboag Pond (PALIS: 36130)
Unique_ID: W1004 Station: A
Description: [deep hole, East Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
08/20/03									
	LB-2523	12:17	0.5	27.1	7.5 c	127	81.2	8.5	108
	LB-2523	12:26	1.5	26.7	7.5 cu	127	81.2	8.2 u	103 u
	LB-2523	12:34	2.0	24.9	6.4	122 u	77.8 u	2.3 u	28 u
	LB-2523	12:38	2.5	23.9 u	6.3	148 u	94.7 u	## u	## u
	LB-2523	12:43	3.6	20.7 u	7.2 c	214 u	137 u	<0.2	<2

Quacumquasit Pond (PALIS: 36131)
Unique_ID: W1005 Station: A
Description: [deep hole, East Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
08/20/03									
	LB-2611	13:41	0.5	26.9	7.4 c	89.8	57.5	8.2	104
	LB-2611	13:45	2.5	26.3	7.4 c	89.8	57.5	8.2	103
	LB-2611	13:53	4.0	25.2	7.0 c	89.2	57.1	8.6	106
	LB-2611	13:59	5.0	20.2 u	6.9 c	87.3	55.9	9.5 u	106 u
	LB-2611	14:06	9.0	8.4 u	6.2	84.2	53.9	5.0 u	43 u
	LB-2611	14:12	14.0	6.2	6.1	85.1	54.5	2.3	18
	LB-2611	14:21	18.0	5.8	6.2	89.3	57.1	<0.2	<2
	LB-2611	14:27	21.0	5.7	7.2 c	158 u	101 u	<0.2	<2

Table C3: 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes Quality Assurance/Quality control data

Lake Lorraine (PALIS: 36084)
Unique_ID: W1083 Station: A
Description: [deep hole, southeastern lobe, Springfield]

Date	OWMID	QAQC	Time	Depth	Chl-a	NO3-NO2-N	TKN	TN	TP	AppColor
	--	--	(24hr)	(m)	mg/m3	mg/L	mg/L	mg/L	mg/L	PCU
7/10/2003	LC-0093	LC-0307	12:35	--	--	--	--	--	##* m	<15*
7/10/2003	LC-0095	LC-0096	13:00	0 - 7.0	6.0*	--	--	--	--	--
7/10/2003	LC-0096	LC-0095	13:05	0 - 7.0	5.3*	--	--	--	--	--
7/10/2003	LC-0307	LC-0093	12:35	--	--	--	--	--	##* m	<15*
Relative	*Percent*	*Difference*			*12.4%*	--	--	--	--	*0.0%*

Table C3: 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes Quality Assurance/Quality control data

Quaboag Pond (PALIS: 36130)

Unique_ID: W1004 Station: A

Description: [deep hole, East Brookfield]

Date	OWMID	QAQC	Time	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
	--	--	(24hr)	(m)	mg/m3	mg/L	mg/L	mg/L	mg/L	mg/L	PCU
1/30/2003	LB-2467	LB-2468	12:05	--	--	--	--	--	--	0.019	--
1/30/2003	LB-2468	LB-2467	12:05	--	--	--	--	--	--	0.017	--
Relative	*Percent*	*Difference*			--	--	--	--	--	*11.1%*	--
5/13/2003	LB-2492	LB-2493	10:41	--	--	--	--	--	--	0.028 h	--
5/13/2003	LB-2493	LB-2492	10:42	--	--	--	--	--	--	0.029 h	--
Relative	*Percent*	*Difference*			--	--	--	--	--	*3.5%*	--
6/17/2003	LB-2496	LB-2497	11:00	--	--	--	--	--	--	0.029	50*
6/17/2003	LB-2497	LB-2496	11:00	--	--	--	--	--	--	0.025	60*
6/17/2003	LB-2601	LB-2602	11:05	0 - 4.0	10.2* m	--	--	--	--	--	--
6/17/2003	LB-2602	LB-2601	11:05	0 - 4.0	9.7* m	--	--	--	--	--	--
Relative	*Percent*	*Difference*			*5.0%*	--	--	--	--	*14.8%*	*18.2%*
7/30/2003	LB-2500	LB-2501	11:30	--	--	--	--	--	--	##* fm	65*
7/30/2003	LB-2501	LB-2500	11:30	--	--	--	--	--	--	##* fm	60*
7/30/2003	LB-2503	LB-2504	11:45	0 - 3.5	24.9*	--	--	--	--	--	--
7/30/2003	LB-2504	LB-2503	11:45	0 - 3.5	27.3*	--	--	--	--	--	--
Relative	*Percent*	*Difference*			*9.2%*	--	--	--	--	--	*8.0%*
8/20/2003	LB-2518	LB-2519	12:25	--	--	--	<0.02	0.55	--	##* m	75*
8/20/2003	LB-2519	LB-2518	12:25	--	--	--	<0.02	0.52	--	0.041	65*
Relative	*Percent*	*Difference*			--	--	*0.0%*	*5.6%*	--	--	*14.3%*
9/24/2003	LB-2534	LB-2535	12:30	--	--	--	<0.06 h	--	0.97 bh	0.060 bh	70* h
9/24/2003	LB-2535	LB-2534	12:31	--	--	--	<0.06 h	--	1.0 bh	0.062 bh	70* h
Relative	*Percent*	*Difference*			--	--	*0.0%*	--	*3.0%*	*3.3%*	*0.0%*
10/22/2003	LB-2553	LB-2554	12:00	--	--	--	--	--	--	0.040 h	** *
10/22/2003	LB-2554	LB-2553	12:00	--	--	--	--	--	--	0.037 h	** *
10/22/2003	LB-2556	LB-2557	12:15	0 - 3.5	** *	--	--	--	--	--	--
10/22/2003	LB-2557	LB-2556	12:15	0 - 3.5	** *	--	--	--	--	--	--
Relative	*Percent*	*Difference*			--	--	--	--	--	*7.8%*	--
11/25/2003	LB-2620	LB-2670	10:21	--	--	--	--	--	--	0.048 h	55*
11/25/2003	LB-2670	LB-2620	10:22	--	--	--	--	--	--	0.049 h	60*
Relative	*Percent*	*Difference*			--	--	--	--	--	*2.1%*	*8.7%*

Table C3: 2003 MassDEP DWM Chicopee River Watershed Baseline Lakes Quality Assurance/Quality control data

Quacumquasit Pond (PALIS: 36131)
Unique_ID: W1005 Station: A
Description: [deep hole, East Brookfield]

Date	OWMID	QAQC	Time	Depth	Chl-a	NH3-N	NO3-NO2-N	TKN	TN	TP	AppColor
	--	--	(24hr)	(m)	mg/m3	mg/L	mg/L	mg/L	mg/L	mg/L	PCU
3/4/2003	LB-2471	LB-2474	11:40	--	--	--	--	--	--	0.010	--
3/4/2003	LB-2474	LB-2471	11:10j	--	--	--	--	--	--	0.007	--
Relative	*Percent*	*Difference*			--	--	--	--	--	*35.3%*	--
4/15/2003	LB-2477	LB-2478	12:05	--	--	<0.02	--	--	--	0.015	--
4/15/2003	LB-2478	LB-2477	12:05	--	--	<0.02	--	--	--	0.013	--
Relative	*Percent*	*Difference*			--	*0.0%*	--	--	--	*14.3%*	--
7/30/2003	LB-2606	LB-2607	13:00	0 - 8.0	10.6* d	--	--	--	--	--	--
7/30/2003	LB-2607	LB-2606	13:01	0 - 8.0	6.8* d	--	--	--	--	--	--
Relative	*Percent*	*Difference*			*43.7%*	--	--	--	--	--	--
8/20/2003	LB-2524	LB-2525	13:55	--	--	--	--	--	--	0.007	--
8/20/2003	LB-2525	LB-2524	13:55	--	--	--	<0.02	0.23	--	##* m	<15*
8/20/2003	LB-2609	LB-2610	14:05	0 - 7.0	5.1*	--	--	--	--	--	--
8/20/2003	LB-2610	LB-2609	14:05	0 - 7.0	5.4*	--	--	--	--	--	--
Relative	*Percent*	*Difference*			*5.7%*	--	--	--	--	--	--
9/24/2003	LB-2612	LB-2613	13:35	0 - 12.6	7.8*	--	--	--	--	--	--
9/24/2003	LB-2613	LB-2612	13:40	0 - 12.6	6.8*	--	--	--	--	--	--
Relative	*Percent*	*Difference*			*13.7%*	--	--	--	--	--	--
10/22/2003	LB-2616	LB-2617	13:30	0 - 14.0	** *	--	--	--	--	--	--
10/22/2003	LB-2617	LB-2616	13:30	0 - 14.0	** *	--	--	--	--	--	--
Relative	*Percent*	*Difference*			--	--	--	--	--	--	--

Data Qualifiers

The following data qualifiers or symbols are used in the MassDEP/DWM Water Quality Database (WQD) for qualified and censored water quality and multi-probe data. Decisions regarding censoring vs. qualification for specific, problematic data are made based on a thorough review of all pertinent information related to the data.

General Symbols (applicable to all types):

" ## " = Censored data (i.e., data that has been discarded for some reason). NOTE: Prior to 2001 data,

"**" denoted either censored or missing data.

" ** " = Missing data (i.e., data that should have been reported). See NOTE above.

" -- " = No data (i.e., data not taken/not required)

* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

[ ] = A result reported inside brackets has been "censored", but is shown for informational purposes (e.g., high blank results).

Multi-probe-specific Qualifiers:

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey calibration readings outside typical acceptance range for the low ionic check and for the deionized blank water check, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses.

"i" = General Depth Criteria: Apply to each OWMID#
- Clearly erroneous readings due to faulty depth sensor: Censor (i)
- Negative and zero depth readings: Censor (i); (likely in error)
- 0.1 m depth readings: Qualify (i); (potentially in error)
- 0.2 and greater depth readings: Accept without qualification; (likely accurate)

Specific Depth Criteria: Apply to entirety of depth data for survey date

- If zero and/or negative depth readings occur more than once per survey date, censor all negative/zero depth data, and qualify all other depth data for that survey (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, ie. that all positive readings may be in error.)

" m " = method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed, ie. operator error (eg. less than 3 readings per station (rivers) or per depth (lakes), or instrument failure not allowing method to be implemented.

" s " = field sheet recorded data were used to accept data, not data electronically recorded in the Multi-probe surveyor unit, due to operator error or equipment failure.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 for acceptance criteria.

" r " = data not representative of actual field conditions.

" ? " = Light interference on Turbidity sensor (Multiprobe error message). Data is typically censored.

Sample-Specific Qualifiers:

" a " = accuracy as estimated at WES Lab via matrix spikes, PT sample recoveries, internal check standards and lab-fortified blanks did not meet project data quality objectives identified for program or in QAPP.

" b " = blank Contamination in lab reagant blanks and/or field blank samples (indicating possible bias high and false positives).

" d " = precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected.

" e " = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

" f " = frequency of quality control duplicates did not meet data quality objectives identified for program or in QAPP.

" h " = holding time violation (usually indicating possible bias low)

" j " = 'estimated' value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the 'reporting' limit or RDL and greater than the method detection limit or MDL (mdl< x <rdl). Also used to note where values have been reported at levels less than the mdl.

" m " = method SOP not followed, only partially implemented or not implemented at all, due to complications with sample matrix (eg. sediment in sample, floc formation), lab error (eg. cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, and missing data.

" p " = samples not preserved per SOP or analytical method requirements.

" r " = samples collected may not be representative of actual field conditions, including the possibility of "outlier" data and flow-limited conditions (e.g., pooled).

Sample codes for sampling:

OWMID: Office of Watershed Management Identification Code for the bottle.

QAQC: the OWMID codes (e.g. LB-1903) refer to the field duplicate sample (usually immediately above or below in the table) to be compared with the current sample.

Time: Local time.

SymTyp: Sample Type- VDOR= Van Dorn; DINT= Depth integrated by vertical hose; MNGR= Manual Grab; NR= not recorded.

RelDepth: Relative Depth- s= Near Surface; m= middle depth; nb= near bottom.

References

MassDEP. 2003a. CN 127.0 *DWM Monitoring Quality Assurance Project Plan.* Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP. 2003b. CN 128.0 *Baseline Lake Survey Quality Assurance Project Plan.* Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP. 2003c. CN 165.0 *Lakes Nutrient Criteria Quality Assurance Project Plan.* Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP. 2005a. CN 56.2 *Data Validation and Usability.* Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP. 2005b. *CN 211.0 Data Validation Report for Year 2003 Project Data.* MassDEP, Division of Watershed Management, Worcester, MA. Nov. 2005.

MassDEP. 2007. *Baseline Lake Survey 2003, CN 205.0.* TM-S-16. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

Massachusetts Department of ENVIRONMENTAL PROTECTION

APPENDIX B

CHICOPEE RIVER WATERSHED: 2003 WATER QUALITY TECHNICAL MEMOMORANDUM (TM36-3)

Prepared by Greg DeCesare

2006

DWM Control Number CN 106.2

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Robert W. Golledge Jr., Secretary
Massachusetts Department of Environmental Protection
Arleen O'Donnell Acting Commissioner
Bureau of Resource Protection
Glenn Haas, Acting Assistant Commissioner
Division of Watershed Management
Glenn Haas, Director

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INTRODUCTION AND PROJECT OBJECTIVES

The Division of Watershed Management (DWM) 2003 water quality monitoring plan for the Chicopee River Watershed was developed by DWM in consultation with the former Executive Office of Environmental Affairs (EOEA) Chicopee Watershed Team, a coalition of government and non-government groups. The monitoring strategy was guided primarily by suggestions of members of the EOEA Chicopee Watershed Team and DWM's review of previous surveys. Priority monitoring needs addressed by DWM included sampling for water chemistry, bacteria, macroinvertebrate biomonitoring, fish population studies, and fish toxics monitoring. This technical memorandum presents the DWM lotic water quality sampling component of the survey. Results of the other monitoring efforts mentioned above are described in separate DWM memoranda or reports.

The 1998 DWM Chicopee Assessment Report (MassDEP, 2001a) identified several segments that lacked sufficient water quality data for evaluation and also flagged several sites with potential water quality problems that needed more water chemistry data for adequate assessment. Several sites were also included in order to evaluate impacts from known or suspected sources of pollution to specific areas of the watershed. To address some of these water quality sampling needs, DWM conducted water quality sampling surveys from June through October 2003, which included *in-situ* water quality measurements and collection of water quality samples. Three water quality sampling surveys were pre-dawn surveys intended to capture dissolved oxygen minima. In order to address a Total Maximum Daily Load for Quaboag Pond and Quamcuasit Pond additional sampling also occurred during 2003. The following stations were part of that study: QAOBO, QA100, EB04, CRN01, SM02, SMG, EB04A, SM01, and two stations not located on segments. These two stations are QP011 (the connection between Quaboag and Quamcuasit Pond) and SPEFF (the Spencer wastewater treatment plant's final effluent channel). TMDL stations often had different sampling parameters and frequency. For a complete list of all sampling sites, parameters measured, and their frequency see Table 1.

QUALITY ASSURANCE AND QUALITY CONTROL

A Quality Assurance Project Plan (MassDEP 2003a;CN 127.0) was written for the DWM water quality sampling surveys in 2003. Procedures used were consistent with the prevailing DWM sampling protocols that are described in the *Sample Collection Techniques for DWM Surface Water Quality Monitoring, Standard Operating Procedure* (MassDEP 2003b; CN 1.2). For all water quality surveys, quality control samples (field blanks and sample duplicates) were taken at a minimum of one each per analyte per crew per survey. All water quality and bacteria samples were delivered to the Wall Experiment Station (WES), the department's analytical laboratory in Lawrence or Severn Trent Laboratory (STL) within holding time allowances for analysis.

DWM quality assurance and database management staff reviewed lab data reports and all multi-probe data. The data were validated and finalized per data validation procedures outlined in DWM SOP CN 56.2 (MassDEP, 2005a). In general, all water sample data were validated by reviewing Quality Control (QC) sample results, analytical holding time compliance, QC sample frequency and related ancillary data/documentation (at a minimum). A complete summary of censoring and qualification decisions for all 2003 DWM data is provided in the CN 211.0 – Draft DWM Data Validation Report for Year 2003 Project Data (MassDEP, 2005b).

Appendix 1 of this technical memorandum contains data censoring/qualification decisions for the 2003 Chicopee Watershed data. Definitions for the data qualifiers are also included in Appendix 1. This information was excerpted from the CN211. 0 – Draft DWM Data Validation Report for Year 2003 Project Data (MADEP, 2005b).

SURVEY METHODS

Information pertaining to station location, rationale, and objectives is available in the 2003 QAPP (CN 127.0, MADEP 2003a). As part of the core 2003 sampling effort, personnel from DWM and Mass DEP's CERO, Strategic Monitoring and Assessment for River basin Teams (SMART) performed daytime *in-situ*

water quality measurements and collected water quality samples at 35 stations in total for each of six surveys. *In- situ* parameters measured using a multiprobe included dissolved oxygen, percent saturation, pH, conductivity, temperature, and total dissolved solids. All stations were sampled by four different crews on each day of the survey. Surveys were conducted on the following dates in 2003: April 16, May 14, June 18, July 30, August 20, and October 15. In addition, pre-dawn *in-situ* water quality measurements were made at all stations on the following mornings in 2003: June 19, July 31, and August 21. A different sampling frequency was used at some stations included in this report (see Table 1 for complete details).

Water quality samples were analyzed at WES for turbidity and nutrients (nitrogen as NH3, and total phosphorus) with the exception of the October 15th survey when the nutrient samples were analyzed by STL. Samples collected for total suspended solids, fecal coliform bacteria, and *E. coli* were analyzed at STL. Each survey crew also took a minimum of one ambient field blank and one field duplicate sample per analyte during each survey for quality control purposes.

Prior to the collection of samples, riparian vegetation, observed uses, potential pollution sources, the presence/absence of objectionable deposits (trash and debris and scum), the percentage of periphyton/algae/aquatic plants covering the sampling reach, and sampling conditions were recorded on DWM field sheets.

Procedures used for water sampling and sample handling are described in the *Sample Collection Techniques for DWM Surface Water Quality Monitoring, Standard Operating Procedure* (MassDEP, 2003b) and *Hydrolab Series 3/Series 4 Multiprobe Standard Operating Procedure* (MassDEP 2001b). WES supplied all sample bottles and field preservatives, which were prepared according to the WES *Laboratory Quality Assurance Plan and Standard Operating Procedures* (MassDEP 2003c). Samples were transported on ice to WES and STL where they were analyzed by methods according to each laboratory's standard operating procedures. A summary of the analytical methods employed in 2003 can be found in Table 2.

Sampling Sites, Descriptions, Rationale, Parameters and Frequency for Chicopee River Watershed Monitoring

Waterbody (Segment)	Station ID# (Unique ID)	Site Description	Justification	Parameters	Frequency (# occasions)
Chicopee River (MA36-25)	CT03 (W0475)	Rt. 116 Bridge (alt sta. Rt. 33 bridge), Chicopee	Not assessed in 1998/downstream from Uniroyal Hazardous waste site, Eastern Etching, several other NPDES dischargers/12 CSOs,	1,2,3,4	Single grab samples (6) and Multiprobe (7 including 2 predawn).
Chicopee River (MA36-24)	CH06 (W1031)	West St. Bridge, Indian Orchard; Springfield	Not assessed in 1998/ 13 CSOs	1,2,3,4	Same as above
Chicopee River (MA36-23)	CH02B (W1032)	Miller Street bridge, Wilbraham	Not assessed in 1998/downstream from Red Bridge Impoundment/FERC hydromodification issues for Aquatic Life	1,2,3,4	Same as above
Chicopee River (MA36-22)	CH01 (W1033)	Near Intersection New Hampshire Ave and Springfield Street, Palmer	Not assessed in 1998/ CSOs present/downstream from Palmer WWTP discharge/upstream from Red Bridge FERC	1,2,3,4	Same as above
Abbey Brook (MA36-40)	AB01 (W1026)	Front Street bridge, Chicopee	Previously unassessed/PVPC identified as "likely contributing contaminants having a negative effect on water quality and habitat"	1,2,3,4	Same as above
Cooley Brook (MA36-38)	COOL01 (W1028)	Fuller Road bridge, Chicopee	Previously unassessed/PVPC also identified as "likely contributing contaminants…"/downstream of Westover AFB	1,2,3,4	Same as above
Poor Brook MA36-39)	POOR01 (W1027)	East Main Street bridge (141), Chicopee	Previously unassessed/PVPC also identified as "likely contributing contaminants…"/very urban-industrial disturbed watershed	1,2,3,4	Single grab samples (12) and Multiprobe (7 including 2 predawn).
Fuller Brook MA36-41)	FULL01 (W1029)	Shawinigan Dr., Chicopee	Previously unassessed/PVPC also identified as "likely contributing contaminants…"/Downstream from Chicopee Sanitary Landfill and the Mass Pike	1,2,3,4	Single grab samples (6) and Multiprobe (7 including 2 predawn).
Higher Brook (natural extension of fuller brook) (MA36-42)	FULL02 (W1030)	West St. @ Roy St., Ludlow	Previously unassessed/PVPC also identified as "likely contributing contaminants…"/upstream from Chicopee Sanitary Landfill and the Mass Pike	1,2,3,4	Same as above
[1]Quaboag River (MA36-17)	QA09A (W1015)	Palmer St. bridge, Palmer	Unassessed in 1998/CSOs	1,2,3,4	Single grab samples (6) and Multiprobe (9 including 3 predawn)
Quaboag River (MA36-16)	QRG (W0491)	Off Rt 67 @ USGS flow gage, SMART station, West Brimfield/ Palmer	Downstream from Warren WWTP, mostly non-support 1998, high bacteria during dry conditions, also dyes pass through the WWTP untreated turning the river red	1,2,3,4	Single grab sample (1) and Multiprobe (4 including 3 predawn)

1 = multiprobe day (DO, %DO, pH, specific conductance, temp), 2 = multiprobe predawn, 3 = nutrients/solids (Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus, turbidity), 4 = bacteria (Fecal Coliform and *E. coli*), 5= Chloride, Alkalinity, Hardness, 6-Nitrogen (N03-NO2-N, TKN, TN)

Waterbody (Segment)	Station ID# (Unique ID)	Site Description	Justification	Parameters	Frequency (# occasions)
Quaboag River (MA36-15)	QA06A (W1011)	Gilbert Road bridge, West Warren	Upstream of Warren WWTP and downstream from Wm. E. Wright NPDES discharge, DWM bio in 1998, but no water quality in 1998	1,2,3,4	Single grab samples (6) and Multiprobe (9 including 3 predawn)
Quaboag River (MA36-14)	QAOBO (W1010)	Davis Road (Long Hill Road Bridge), West Brookfield	Not assessed in 1998, downstream from Brookfield Wire Co. NPDES discharge, SPENCER WWTP/TMDL station	1,2,3,4	Same as above
Quaboag River (MA36-14)	QA100 (W1041)	Rt. 148 bridge, Brookfield	Not assessed in 1998, upstream of Brookfield Wire Co. NPDES discharge, SPENCER WWTP/TMDL station	1,2,3,4	Single grab samples (14) and Multiprobe (8 including 3 predawn)
Forget-Me-Not Brook (MA36-18)	DB08 (W1040)	E. Brookfield Rd. bridge (north), N. Brookfield	Upstream of North Brookfield WWTP	1,2,3,4	Single grab samples (6) and Multiprobe (8 including 3 predawn)
Forget-Me-Not Brook (MA36-28)	DB07 (W1039)	E. Brookfield Rd. bridge (south), N. Brookfield	Downstream from North Brookfield WWTP	1,2,3,4	Single grab samples (6) and Multiprobe (8 including 3 predawn)
Dunn Brook (MA36-19)	DUN01 (W1042)	Quaboag St. bridge, Brookfield	Downstream from North Brookfield WWTP	1,2,3,4	Single grab samples (7) and Multiprobe (8 including 3 predawn)
Ware River (MA36-07)	WA12 (W1014)	Palmer St. bridge, Palmer	Most downstream station on the Ware before Three Rivers, downstream from 4 WWTPs and other NPDES discharges; only Aquatic Life assessed in 1998 (support)	1,2,3,4	Single grab samples (6) and Multiprobe (9 including 3 predawn)
Ware River (MA36-06)	WA09A (W0492)	Rt. 32 bridge – Gibbs Crossing, Ware	Below Ware WWTP (& others), SMART station, CSO #19 for Palmer plugged in 2003, downstream USGS gage	1,2,3,4	Single grab samples (2) and Multiprobe (4 including 3 predawn)
Ware River (MA36-05)	WA06A (W1009)	Upper Church St. bridge, Ware	Upstream of Ware WWTP, downstream from Gilbertville and Wheelwright WWTPs (& others)	1,2,3,4	Single grab samples (6) and Multiprobe (9 including 3 predawn)
Ware River (MA36-05)	WAX (W1008)	Creamery Road bridge, New Braintree	Upstream of Gilbertville WWTP, below Wheelwright WWTP	1,2,3,4	Same as above
Ware River (MA36-04)	WAIR (W1007)	Airport Road (alt. Hardwick Rd), Barre	Upstream of Wheelwright WWTP, downstream from Barre WWTP; mostly unassessed in 1998	1,2,3,4	Single grab samples (12) and Multiprobe (9 including 3 predawn)
Ware River (MA36-03)	CBG (W094)	Off Rt. 122 @ USGS flow gage, Barre	Just upstream Powder Mill Pond/Martone Landfill, downstream from MDC intake, SMART station	1,2,3,4	Single grab samples (1) and Multiprobe (4 including 3 predawn)
[2]Ware River (MA36-03)	WAWV (W1006)	New Braintree Rd. bridge, White Valley, S. Barre	Just downstream Powder Mill Pond/Martone Landfill	1,2,3,4,5,6	Single grab samples (6) and Multiprobe (9 including 3 predawn)

1 = multiprobe day (DO, %DO, pH, specific conductance, temp), 2=multiprobe night, 3 = nutrients/solids (Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus , turbidity), 4 = bacteria (Fecal Coliform and E. coli), 5= Chloride, Alkalinity, Hardness, 6-Nitrogen (N03-NO2-N, TKN, TN)

Waterbody (Segment)	Station ID# (Unique ID)	Site Description	Justification	Parameters	Frequency (# occasions)
Swift River (MA36-10)	SR02 (W1013)	Rt 181/State St., Palmer	Downstream from Bondsville Dam, Old Bondsville Factory-hazardous waste site, CSO's, not assessed in 1998	1,2,3,4	Single grab samples (6) and Multiprobe (9 including 3 predawn)
Swift River (MA36-09)	SRG (W0493)	off River Road, at USGS flow gage, west of River Road, Ware/ Belchertown	SMART station, upstream from Old Bondsville Factory hazardous waste site and McLaughlin Fish Hatchery, downstream of Quabbin Reservoir	1,2,3,4	Single grab sample(1) and Multiprobe (4 including 3 predawn
Swift River (MA36-09)	SR03 (W1012)	Cold Spring Road, Belchertown/ Ware	Above Old Bondsville Factory Hazardous Waste Site, below McGlaughlin Hatchery	1,2,3,4,5,6	Single grab samples (6) and Multiprobe (9 including 3 predawn)
East Brookfield River (MA36-13)	EB04 (W1038)	Rt. 9 bridge, E. Brookfield	Outlet of Lake Lashaway, SPENCER WWTP/TMDL station, not assessed in 1998	1,2,3,4	10 grab samples, Multiprobe (8 including 3 predawn)
Cranberry Brook (MA36-20)	CRN01 (W1035)	So. Spencer Rd., Spencer	Above Spencer WWTP, SPENCER WWTP/TMDL station, not assessed in 1998	1,2,3,4	Same as above
Seven Mile River (MA36-12)	SM02 (W1037)	Rt. 49 bridge, Spencer	Below Spencer WWTP, SPENCER WWTP/TMDL station, not assessed in 1998	1,2,3,4	Same as above
Seven Mile River (MA36-11)	SMG (W0490)	Cooney Road bridge, Spencer	Above Spencer WWTP, SPENCER WWTP/TMDL station, not assessed in 1998, SMART station	1,2,3,4	2 grab samples, Multiprobe (4 including 3 predawn)
Quaboag/ Quacumquasit Ponds - flow gate (not a segment)	QP011 (W1267)	Lake Road, Brookfield/ E. Brookfield	Water flow & direction controlled	3,4	2 grab samples
East Brookfield River (MA36-13)	EB04A (W1016)	Shore Rd. bridge, E. Brookfield	Inlet to Quaboag Pond, SPENCER WWTP/TMDL station, not assessed in 1998	1,2,3,4	Grab samples (10) Multiprobe (8 including 3 predawn)
Seven Mile River (MA36-11)	SM01 (W1036)	Rt. 9 bridge, Spencer	Above Spencer WWTP, SPENCER WWTP/TMDL station, not assessed in 1998	1,2,3,4	Same as above
Spencer WWTP discharge	SPEFF (W1034) also called station MA0100919	Treatment Plant off Rt. 9, Spencer	SPENCER WWTP/TMDL station, sample the discharge before mixing	3,4	, Grab samples (10)

1 = multiprobe day (DO, %DO, pH, specific conductance, temp), 2=multiprobe night, 3 = nutrients/solids (Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus , turbidity), 4 = bacteria (Fecal Coliform and E. coli), 5= Chloride, Alkalinity, Hardness, 6-Nitrogen (N03-NO2-N, TKN, TN)

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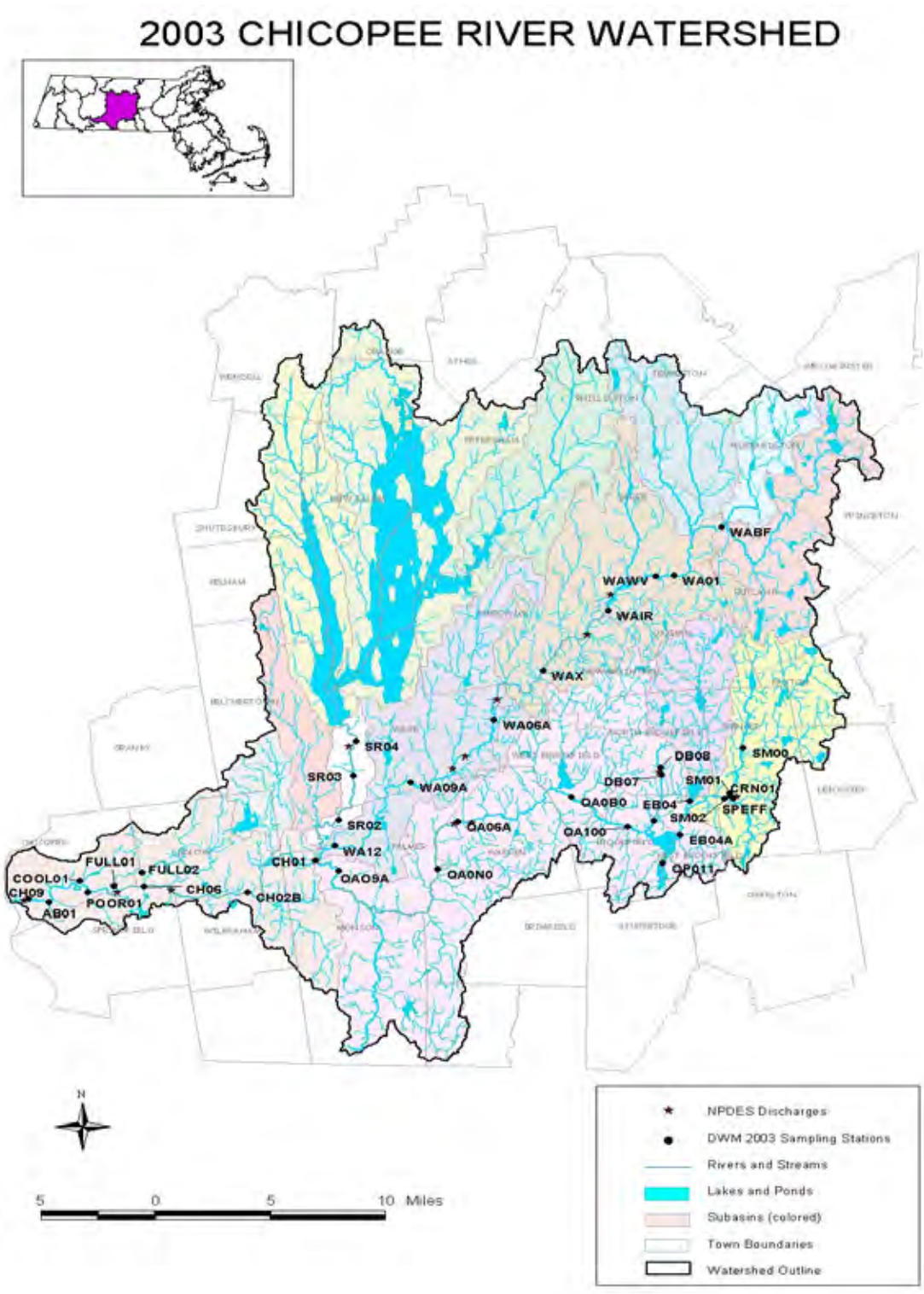


Figure 1: Location of 2003 DEP/DWM Water Quality Sampling Stations in the Chicopee Watersheds**.**

Table 2. WES/DWM Analytical Methods & MDLs for 2003 Water Quality Analytes

Water Quality Analyte	Method *	MDL **	RDL **
Hydrolab® Multiprobe Series 3 and (4)	DWM SOP (CN 4.2)	NA	NA
YSI 600 XLM	DWM SOP (CN 4.2)	NA	NA
Apparent Color (DWM)	SM 2120 B	15 PCU	15 PCU
Total Phosphorus	SM 4500-P-E	0.005 mg/l	0.015 mg/l
Dissolved Reactive P	SM 4500-P-A, B1, E	0.010 mg/l	0.020 mg/l
Alkalinity	SM 2320 B	2 mg/l	2 mg/l
Hardness	SM 2340 B; EPA 200.7	0.66 mg/l	2.0 mg/l
Chloride	SM 4500 Cl B	1 mg/l	1 mg/l
TSS	SM 2540 D	1.0 mg/l	1.0 mg/l
NH3-N	EPA 350.1	0.02 mg/l	0.06 mg/l
NO3-NO2-N	EPA 353.1	0.02 mg/l	0.06 mg/l
TKN	EPA 351.2	0.10 mg/l	0.30 mg/l
Total Nitrogen	USGS 1265003	0.040 mg/l	0.12 mg/l
Turbidity	SM 2130 B	0.10 NTU	0.36 NTU
Turbidity (DWM)	SM 2130 B	0.1 NTU	0.2 NTU
Chlorophyll a (DWM)	SM 10200 H	1 ug/l	1 ug/l
Fecal Coliform ***	SM 9222D	6 CFU/100mls	6 CFU/100mls
E. coli ***	EPA 1603 (also modified 1103.1)	6 CFU/100mls	6 CFU/100mls
Total Phosphorus	SM 4500-P-E	0.005 mg/l	0.02 mg/l
TSS (STL)	EPA 160.2	ND	2 mg/l
NH3-N (STL)	LAC 107061B	ND	0.10 mg/l
Turbidity (STL)	EPA 180.1	ND	0.10 NTU
Fecal Coliform (STL)	SM 9222D	0 CFU/100mls	0 CFU/100mls
E. coli (STL)	EPA 1103.1 modified	0 CFU/100mls	0 CFU/100mls
Total Phosphorus (STL)	SM 4500-P-E	0.002 mg/l	0.002 mg/l

***** = "Methods for Chemical Analysis of Water and Wastes", Environmental Protection Agency, Environmental Monitoring Systems Laboratory – Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1983 and 1979 where applicable.
****** = Standard Methods, Examination of Water and Wastewater, 20th edition
*** = Method used for samples analyzed on 10/24/01

STATION OBSERVATIONS
Station observations were recorded on field sheets for each survey by a DWM investigator. Station observations are described below for each DWM sampling event (see Table 1 for survey frequency).

CT03, Chicopee River, Rte. 116 Bridge, Chicopee, MA (MA36-25)

This site is downstream from the Uniroyal hazardous waste site, Eastern Etching's NPDES discharge and several other NPDES dischargers as well as 12 combined sewer overflows (CSOs) The surrounding land use is urban development and potential sources of pollution include storm drains under bridge, urban runoff, and upstream industries. The site was accessed on the north side of the bridge (the upstream side) by walking down the path next to the bridge. On the left bank of the river there is the Abbott mill building. The left bank had minimal vegetation and a mill wall with an approximate length of 400 meters. The right bank is steep and both banks had some hardwood trees and shrubs.

No objectionable deposits, scums or water odor were recorded by DWM field crews. The water clarity was described as clear or slightly turbid when noted. Minimal erosion was noted on two occasions. Although aquatic plant density was characterized as unobservable on the majority of sampling days, on August 20th aquatic plant density was noted to be moderate and composed of submerged plants, principally moss on rocks and milfoil (*Myriophyllum sp*.). Sparse periphyton coverage was noted on two occasions (April 16th and July 30th) while moderate coverage was noted on May 15th and August 20th. On the remaining sampling days periphyton coverage was unobservable or not recorded. On June 18th phytoplankton presence was described as sparse while the majority of occasions when observable or recorded no phytoplankton were noted. On April 16th the water level was noted to be extremely high and the storm drains under the bridge were observed to be flowing. On June 18th a storm drain near the bridge on the right bank was flowing.

CH06, Chicopee River, West St. Bridge, Indian Orchard, Springfield, MA (MA36-24)

This site is downstream from 13 CSOs and located just upstream from the USGS gage at Indian Orchard. There is a dam and a mill upstream from this station. The river channel is large and wide. Samples were collected by the bridge drop method at this station.

No objectionable deposits, scums or water odor were recorded by DWM field crews. This station was a bridge drop so instream conditions were often unobservable. Water clarity was clear on all days when noted. When observable there was no phytoplankton noted and on the one occasion when periphyton was observable it was characterized as sparse. On three occasions (July 30th, July 31st and August 20th) dense submerged aquatic plants were noted (principally grasses) while on the rest of sampling days aquatic plants were unobservable.

CH02B, Chicopee River, Miller Street Bridge, Wilbraham (MA36-23)

This site is immediately downstream from the Red Bridge Impoundment (FERC hydroplant). This station was accessed by parking on left before bridge, walking down a closed sidewalk and dropping a basket into the Chicopee River at mid-channel. The surrounding land use is urban.

No objectionable deposits, odors or scums were noted by DWM field crews with the exception of one occasion when an oily sheen and rusty flow was noticed on the downstream left bank. Water clarity, although sometimes unobservable, was generally noted to be clear with one occasion of slight turbidity. Aquatic plant density, periphyton and plankton were generally noted as unobservable.

CH01, Chicopee River, Just west of 128 Springfield St (near intersection of New Hampshire Ave and Springfield St., Palmer, MA) (MA36-22)

This site is downstream of the Palmer WWTP discharge and upstream from the Red Bridge Impoundment (FERC plant). The surrounding land use is commercial, residential, and forest. The 100 meter riparian area on the left bank is characterized by low and medium residential development and forest downstream of the sampling station and high-density residential land use upstream of the sampling station. The right bank is largely forested downstream of the sampling station but is commercial and high density residential upstream of the sampling station towards the Three Rivers area in Palmer. The site was accessed by parking at a right of way dirt driveway and walking down a path to a cement slab and sampling upstream

of this cement slab. The right bank is steep and vegetated with shrubs and hardwoods. The left bank was noted to have a lot of sand and the river is wide and deep at this location.

No objectionable deposits, scums or water odor were recorded by DWM field crews. Water clarity was generally noted to be clear although on two occasions it was noted to be slightly turbid. Erosion was noted on one occasion only. Aquatic vegetation, periphyton and phytoplankton was unobservable or absent.

AB01, Abbey Brook, Front Street Bridge, Chicopee, MA

This station is located downstream from Bemis Pond and an unnamed pond. The surrounding land use for this station is the urban area of Chicopee. The immediate land use in the 100 meter area around this station is commercial, high-density residential, recreational, roads, industrial and some forest. The station was located upstream of Front Street bridge on the eastern bank and sampling was performed midstream and upstream of a storm drainpipe. Steep banks on both sides covered with leaf litter were found at this station. On the left bank residences abut the river with somewhat of a wetland habitat on left bank as well. The right bank is a steep drop from the road.

Objectionable deposits consisting of garbage and trash were noted on April 14th, July 30th and August 20th by DWM field crews. In addition to the trash noted on April 14th sand and silt were noted at this station. No scums were noted and with the exception of one occasion on which a musty water odor was recorded, no odors were noted. Water clarity was noted to be slightly turbid on five occasions and clear on three other occasions. Erosion especially on the right bank was noted on three occasions but was described as minimal. Riprap was found along the banks. No aquatic plants or phytoplankton were found or recorded. Periphyton was noted on five occasions and its presence was once described as dense on May 14th. In April thin film algae and filamentous algae was noted while in May filamentous periphyton was noted. On the rest of the observable occasions a brown periphyton was noted. The storm drain was running on April 16th, May 14th, June 18th, and October 15th while it was noted to be dry on July 30th and August 20th. On April 16th and May 14th the water in the storm drain was noted to be clear.

COOL01, Cooley Brook, Fuller Road Bridge, Chicopee, MA

This station is located downstream of Westover Air Force Base. This station is called Cooley Brook although it is actually a diversion of Cooley Brook. The immediate land use is cropland, woody vegetation, forest and low and medium density residential. The surrounding land use includes the aforementioned categories as well as commercial, industrial and other residential uses.

On April 16th heavy siltation was observed on the river bottom but otherwise no objectionable deposits were noted at this station. With the exception of April 16th when the water was noted to have both a septic and rotting vegetable odor, DWM field crews did not note water odors. No scums, aquatic plants or phytoplankton were noted during the sampling season at this location and the water was clear with the exception of April 16th when water clarity was slightly turbid. Undercutting of both banks was noted throughout the sampling season. Periphyton cover was described as moderate on April 16th, August 20th and October 15th and sparse on May 14th and July 30th. Periphyton was not observed on June 18th. The periphyton consisted of brown thin films attached on rocks and an orange floc on April 16th while green periphyton on rocks and green filamentous algae were found on May 14th. The rest of the season the periphyton was described as brown algae attached on rocks.

POOR01, Poor Brook, East Main Street Bridge, Chicopee, MA

This station is located in an urban area and the surrounding land use consists of residential, forest, commercial and open space recreational as well as having major highways located nearby. The immediate land use in the 100 meter area along this stream is forested, low-density residential, roadways, residential and urban open space. The brook begins in a wetland area near Berkshire Ave and the Conrail Line in Chicopee and drains into the Chicopee River. Riprap is present at this site. The site was accessed on the southern upstream side of the bridge.

On April 16th and July 30th objectionable deposits of silt and sand were found covering bottom substrate but no objectionable conditions were noted on other survey dates. No water odors were noted with the exception of a musty water smell on two occasions and no scums were found. Erosion principally on the

left bank was noted throughout the survey. Generally water clarity was clear at this site although on June 18th the water was highly turbid. Aquatic plants and phytoplankton were not noted at this site. Moderate and sparse green filamentous algae were noted on the first two survey dates respectively but periphyton cover, when observable, was not found on the remaining days.

FULL01, Fuller Brook, Shawinigan Drive, Chicopee, MA

The surrounding land use is roadways (Interstate 90), residential, forested, gravel pit and largely urban. The immediate land use at this station in the 100 meter riparian area is forest, roads, residential and gravel pit. This station is downstream of a large landfill and Interstate 90. The site was accessed at the Shawinigan Drive Bridge by walking down a sandy embankment and sampling at a concrete culvert.

On April 16th and August 20th trash and debris were noted at this station. Additionally, sedimentation likely due to adjacent roadwork was noticed on April 16th. Objectionable deposits were not noted on all other sampling dates. No scums or water odors were noted during the sampling season. Water clarity was generally described as slightly turbid at this station during the sampling season except the first two sampling dates when the water was clear. Minimal erosion was noted on two occasions and the presence of riprap was recorded. When observable no phytoplankton was found and only on June 18th was a sparse coverage of moss noted, otherwise no aquatic plants were found. Sparse coverage of green thin films was noted on April 16th while a sparse coverage of green filamentous algae was noted on June 18th while later on June 30th and August 20th a dense coverage of green and brown algae attached on the rocks was found.

FULL02, Higher Brook (natural extension of Fuller Brook), West Street at Roy Street, Ludlow, MA

This site is in an urban area and the surrounding land use at this station is residential, forest, roadways and commercial. The immediate land use in the 100 meter riparian buffer is residential, forest, and infrastructure (powerlines). This site was accessed on the upstream side of the West Ave Bridge at Roy Street by wading into the brook and sampling mid-stream.

With the exception of one day on which small amounts of trash were found, no objectionable deposits were noted at this site. No water odors or scums were found. Sparse coverage of moss was found in June while in August and October burreed (*Sparganium sp*.) was noted at this station. The presence of phytoplankton was not noted during the sampling season. Sparse coverage of green filamentous algae were found on the first two survey dates while in July and August respectively sparse and moderate algal coverage was found.

QA09A, Quaboag River, Palmer St bridge, Palmer, MA

The site is in a developed area and the surrounding land use is residential, forest, commercial, roadways (includes Interstate 90), industrial and cropland. The immediate land use in the 100 meter riparian area is residential, forest, roadways, cropland and industrial. This site was accessed by going over the railroad tracks and down the upstream right bank of Palmer St. bridge.

Garbage and trash were noted on the stream banks on two occasions and instream trash was noted on two occasions while on four occasions no objectionable deposits were noted. No water odor was found. On three occasions white foam was noted while on the majority of occasions no scums were found. Water clarity was generally clear or slightly turbid during the sampling season. A sparse coverage of Irises (*Iris sp.*) was found throughout the sampling season but no periphyton or phytoplankton was observed. Erosion was found on the right bank, which was undercut at this site.

QRG, Quaboag River off Rte 67 at USGS flow gage, West Brimfield, MA

This site is in an undeveloped area and the surrounding land use is forest, residential, roadways (includes Interstate 90), and cropland. The immediate land use in the 100 meter riparian area is forest, residential, roadway (Interstate 90) and cropland. This site is below the Warren WWTP. Hartwick Knitters and Wm. E. Wright both have industrial discharges that go to the Warren WWTP plant (Kimball, 2006). Both companies use dyes and attempt to pre-treat their discharge before the Warren WWTP (Kimball 2006). Non-point sources of pollution include a dirt road with heavy use and washout. This site was accessed by going to the USGS gage near the Route 67 bridge and sampling in the reach at the gaging station.

Both DWM and DEP CERO SMART crews found garbage and trash throughout 2003 survey season at this site (tires, old appliances, metals, floatables, assorted trash, etc) and on two occasions May 14th and October 22nd sand and silt deposits were noted. Water odor was not noted by DWM or CERO SMART crews during 2003. Scums were not noted with the exception of small isolated patches of foam found on three occasions by CERO SMART crews. MassDEP field crews noted some minor erosion. Water clarity was generally clear although slightly turbid on two occasions. Generally no aquatic plant coverage or phytoplankton were noted in the 2003 and on only one occasion (April 16th) was periphyton in the form of a sparse coverage of green filamentous algae found.

QA06A, Quaboag River, Gilbert Road (Long Hill Road Bridge), West Warren, MA

This site is in a largely undeveloped area downstream of Warren and upstream of the Warren waste water treatment plant (WWTP). This site is downstream from the Wm. E. Wright NPDES discharge (non-contact cooling and stormwater). A dam is also located near the Wm E. Wright facility. The surrounding land use is forest, residential, commercial, industrial and roadways. Land use in the 100 meter riparian buffer is mostly forested with residential, roadways, municipal (WWTP) and industrial uses. The site was accessed upstream of the bridge on the right bank.

With the exception of May 14th when garbage and trash were noted on the banks, no objectionable deposits were found. No water odor was found and a white foam was found approximately 50 percent of the time and likely the result of the upstream dam. No other scums were noted and the white foam is considered innocuous. Water clarity was generally clear or slightly turbid during the sampling season. DEP field crews did not find phytoplankton and on only once was a sparse coverage of aquatic plants found. In May a sparse coverage of green filamentous algae was found while in July a moderate coverage of brown thin films was noted. In August a sparse coverage of periphyton was found.

QAOBO, Quaboag River, Davis Road (Long Hill Road Bridge), West Brookfield, MA

This site is located south of downtown West Brookfield and the surrounding land use is residential, forested, non-forested wetland, industrial, commercial and cropland. The immediate land use in the 100 meter riparian buffer is forest, residential, non-forested wetland, and woody vegetation. This site was a bridge drop station.

Objectionable deposits in the form of siltation on the left bank from a stormdrain and sand deposits on the right bank coming from the road were noted on three occasions. Water odor was not noted by DWM field crews and no scums were found with the exception of two occasions when limited patches of scum were noted. Water clarity was clear on all sampling occasions and no erosion was noted. Sparse to moderate density of aquatic plants was found throughout the sampling season and included arrowhead, lily pads and grass and rush-like plants. A moderate amount of phytoplankton was found on August 20th although generally phytoplankton was not noted. No periphyton coverage was recorded early in the sampling season but by July a moderate coverage of green filamentous algae was found. A moderate coverage of green algae was also found in August but in October periphyton coverage was not found.

QA100, Quaboag River, Route 148 Bridge, Brookfield, MA

This site is located south of downtown Brookfield and was accessed on the upstream side of the Rte 148 bridge by wading in. This site is downstream of extensive wetlands and Quaboag Pond.

No objectionable deposits were found with the exception of one occasion when limited amounts of plastic bags were noted. DWM field crews noted no scums or water odors. Some limited erosion around a boat launch area was noted early in the sampling season but generally erosion was not noted. Phytoplankton was not found with the exception of May 14th when a moderate amount was found. Early in the field season sparse coverage of emergent aquatic plants was found. Between June and October a moderate density of aquatic plants (emergent, submerged, and floating) was found at this site. Many pond species were found at this site due to its wide shallow nature with extensive wetlands and location below Quaboag Pond. During the first three survey dates moderate coverage of green algae was found while during the remainder of the sampling season sparse to moderate coverage of brown thin films were noted.

DB08, Forget-Me-Not Brook, East Brookfield Road bridge (north), North Brookfield, MA

This site is located south of downtown North Brookfield and upstream of the North Brookfield WWTP. The surrounding land use is largely forested along with residential, industrial, cropland, commercial and non-forest wetland land use. The immediate land use in the 100 meter riparian buffer is forested, non-forested wetland, residential, industrial, commercial and cropland. Powerlines also cross the stream close to this station.

No objectionable deposits were found with the exception of one occasion when a heavy rusty brown bottom floc was noted. No scums were found and no water odors were found with exception of one date when a musty water smell was noted. Water clarity was generally slightly turbid at this location and no erosion was noted. Early in the season sparse amounts of moss and emergent grasses were noted but later in the sampling season no aquatic plants were noted. Sparse to moderate coverage of brown thin films was noted at this site during the sampling season while on May 14th a moderate coverage of green filamentous algae was found and on July 30th a moderate coverage of rusty-brown floc was found on the stream bottom at this site. Phytoplankton was not noted at this site with the exception of a sparse amount on June 18th.

DB07, Forget-Me-Not Brook, East Brookfield Road bridge (south), North Brookfield, MA

This site is located south of downtown North Brookfield and downstream from the North Brookfield WWTP. The surrounding land use is largely forested along with residential, industrial, cropland, commercial and non-forest wetland. The immediate land use in the 100 meter riparian buffer is forested, non-forested wetland, residential, industrial, commercial and cropland. The site was accessed by parking at a gate in the fence approximately 80 meters north of mailbox number 75.

No objectionable deposits or scums were noted although the water was often found to have either a septic or musty smell. The water clarity was clear, slightly turbid and highly turbid on two occasions each. No erosion was noted at this site. Moderate densities of green algae and sparse to moderate densities of brown thin film algae were found at this site during the sampling season. A brown floc on the stream bottom was also found on August 20th. Sparse and moderate amounts of phytoplankton were found on May 14th and June 18th respectively although none was found on other the survey dates. Sparse densities of grasses were found early in the sampling season but later no aquatic plants were noted.

DUN01, Dunn Brook, Quaboag St. bridge, Brookfield, MA

This site is located in a generally undeveloped area of Brookfield just off Route 9. The surrounding land use includes forest, non-forest wetland, residential, commercial and a solid waste handling facility. The immediate land use in the 100 meter riparian buffer is forest, residential, commercial, non-forested wetlands, and a solid waste handling facility. The wetlands upstream from this site are sizeable. A beaver dam is located just upstream of this site and the North Brookfield WWTP is also located upstream.

No objectionable deposits or scums were noted by DWM field crews at this location. No water odors were found with the exception of one occasion when the water had a musty odor. Water clarity was generally slightly turbid. Sparse to moderate amounts of aquatic plants were found throughout the sampling season and included mosses, duckweed and various emergents and pond plants. Dense green filamentous algae were found in April and July while green filamentous coverage was sparse in May. Moderate densities of a brown algae were found on the June, August and October survey dates. Sparse to moderate abundances of phytoplankton were noted throughout the sampling season.

WA12, Ware River, Palmer St. Bridge, Palmer, MA

This site is located on the Ware River upstream of the village of Three Rivers. The surrounding land use includes forest, non-forest wetland, residential and commercial. The immediate land use in the 100 meter riparian buffer is forest, cropland and residential. The site was accessed at the sewage pumping station by going down an asphalt swale to the right bank, upstream of the bridge.

No objectionable deposits or water odors were noted by DWM field crews at this site. A white foam was noted on the majority of occasions during the sampling season. Water clarity was generally either clear

or slightly turbid. DWM field crews noted that the banks are slightly undercut at this location. Moderate to dense amounts of an unidentified grass-like plants were found throughout the sampling season. No phytoplankton was noted at this site while sparse to moderate densities of green filamentous algae were found throughout the sampling season.

WA09A, Ware River, Route 32 Bridge-Gibbs Crossing, Ware, MA

This site is located near downtown Ware. This site is downstream from four wastewater treatment plants and other NPDES discharges. The surrounding land use includes forest, residential, cropland and commercial. The immediate land use in the 100m riparian buffer is forest, commercial, cropland and residential. The site was accessed by wading in from the eastern shore downstream of the Route 32 bridge.

Both DWM field crews and CERO SMART crews found objectionable deposits in the form of garbage and trash on the stream banks and in the stream (including tire, metals, bottles etc) throughout the sampling season. On April 16th the CERO Smart crew noticed heavy sand deposits near the bridge that were later also noticed by DWM field crews on May 16th. Beaudoin (2006) states the "bottom at this site shows ever-increasing embeddedness but not yet covered in sand". Water odors were not noted by either field crew. DWM field crews did not notice any scums although CERO Smart crews noticed small quarter size patches of foam in June, July, August and October. Water clarity was generally clear. Field crews also noted undercut banks. Generally no aquatic plants were noted but sparse amounts were noted in July and August. In April moderate amounts of filamentous algae and moss were found while in May moderate densities of brown thin films were noted. The field crews did not notice periphyton after May. DEP field crews did not note any phytoplankton during the sampling season.

WA06A, Ware River, Upper Church Street Bridge, Ware, MA

The surrounding land use includes forest, residential, cropland and an airplane landing strip. The immediate land use in the 100m riparian buffer is forest, cropland, residential and an airplane landing strip. The station was sampled upstream of the bridge on the left bank. The trees on the left bank included maples (*Acer sp*.) while on the right bank there is a farm field with no tree canopy. This site is below the Gilbertville WWTP.

DWM field crews noted no objectionable deposits during the sampling season. A white foam was generally noted at this site and water clarity was generally clear or slightly turbid. DWM field crews noted no water odor. Erosion was also not found at this site. No aquatic macrophytes or phytoplankton were noted at this site. Generally no periphyton was noted at this station although a sparse coverage of green filamentous algae was found on May 14th and a moderate coverage of thin films was noted on July 30th.

WAX, Ware River, Creamery Road bridge, New Braintree, MA

This site is in a rural area and the surrounding landuse includes forest, cropland and residential uses. The immediate land use in the 100m riparian buffer is cropland, residential and forest. This site was accessed at the Creamery Road Bridge, a bridge-drop sampling location.

DWM field crews did not note objectionable deposits at this station during the sampling season. A white foam was generally noted at this site and water clarity was generally clear or slightly turbid with the exception of one occasion when water clarity was highly turbid. No water odor was noted. DWM field crews noted that the left bank was undercut although the severity was not noted. Sparse coverage of emergent aquatic plants was found throughout the sampling season. Phytoplankton was not noted at this station. Periphyton was generally unobservable (as this was a bridge-drop location) or not noted.

WAIR, Ware River, Airport Road, Barre, MA

This site is in a rural area and the surrounding land use includes forest, cropland, residential use, an airport, wetlands, a sand and gravel pit and Department of Public Works (DPW) dump. The immediate land use in the 100 meter riparian buffer is forest, wetland, an airport, a sand and gravel pit and the DPW dump. The site was accessed by driving down a dirt road through the gravel pit and DPW dump to the river. Samples were collected by wading into the river.

DWM field crews did not find objectionable deposits at this site with the exception of one occasion when trash was noted. A pollen sheen was noted on three occasions and an oily sheen was noted once although generally no scums were noted. DWM field crews did not note any water odor. Slight undercut banks were noted on the left bank at this station. Water clarity was generally clear or slightly turbid. No aquatic plants were noted at this station during the sampling season. No periphyton was noted at this station with the exception of July 30th when a sparse coverage of green thin films was found. Phytoplankton was not noted at this site with the exception of one occasion when a sparse amount of phytoplankton was found.

CBG, Ware River, off Route 122 at USGS flow gage, Barre, MA

This site is in a rural area and the surrounding landuse includes forest, residential, wetland, cropland, recreational and a landfill and solid waste handling facility. The immediate land use in the 100m riparian buffer is forest, wetland and a landfill and sold waste handling facility. This site was accessed by wading in at the Route 122 rest stop at the USGS flow gaging station. This site was sampled by both DWM and CERO field crews.

DWM and CERO SMART field crews did not note objectionable deposits at this site. A white foam was generally noted at this site and water clarity was generally clear. DWM and CERO SMART field crews did not note any water odor at this site. No shoreline erosion was noted at this site. A sparse coverage of moss was noted on May 14th and a sparse coverage of wild celery (*Vallisneria Americana)* was found on June 18th. Generally no aquatic plants were found or their presence was not recorded. Although generally unobservable, periphyton cover was noted on two occasions. On April 16th a dense coverage of moss was noted and on June 18th a moderate amount of thin films were noted. Phytoplankton was not noted at this site.

WAWV, Ware River, New Braintree Road bridge, White Valley, South Barre, MA

This site is in a rural area and immediately downstream of Powder Mill Pond and Martone Landfill. The surrounding land use includes forest, cropland, residential, commercial, and a landfill. The immediate land use in the 100m riparian buffer is forest, landfill and residential uses. This site was accessed by walking down a footpath on the south side of the road to the river and sampling half way between the bridge and the dam.

Minor trash deposits were noted on two occasions but generally DWM field crews noted no objectionable deposits at this site. Patches of white foam were found at this site throughout the sampling season and it is believed to be natural. DWM field crews did not note any water odors at this site. Minor erosion in the form of undercut banks was noted at this site. Water clarity was generally clear. Sparse coverage of submerged and emergent aquatic plants was found at this site throughout the sampling season. A dense brown film of periphyton was found on one occasion but generally either periphyton was not found or its coverage was not recorded. Phytoplankton was not noted at this site.

SR02, Swift River, Route 181/State Street, Palmer, MA

This station is in a developed area of Bondsville in Palmer. The surrounding land use includes residential, forest, cropland, industrial, commercial, mining and non-forested wetlands. The immediate land use in the 100m riparian buffer is residential, commercial, industrial, and forest. This site was accessed by parking in a dirt access area on the right after crossing the Rte 181 bridge and crossing the street to walk down an embankment to the river. Samples were collected by wading to the center of the river. This site is downstream of a dam and there is a stone wall on the left bank and large boulders on the right bank.

DWM field crews found trash on four occasions (mainly cans and bait worm containers) although the extent of the trash was not extensive. White foam was noted on three occasions but generally no scums were noted. No water odor was noted with the exception of one occasion when the water had a rotting vegetable smell. No shoreline erosion was found at this station as the banks were armored. Sparse to moderate amounts of moss were found at this station throughout the sampling season. In April and May, respectively, moderate and dense coverage of green filamentous algae was found. From June to August no periphyton was noted and in October sparse amount of green filamentous algae was found. Phytoplankton was not noted at this site.

SRG, Swift River, off River Road at USGS flow gage, Ware/Belchertown, MA

This site is in the Swift River Wildlife Management Area. The surrounding land use is mainly forest with some residential, commercial, cropland, and non-forested wetland land uses. The immediate land use in the 100m riparian buffer is forest, cropland and residential. A beaver dam was located approximately 200 meters upstream from this station. This site was accessed at a fisherman's access road and samples were collected from the center of the stream at the USGS flow gaging station.

Both DWM and CERO SMART field crews did not note any objectionable deposits at this site during the sampling season. No scums or water odors were noted. On July 31st the air had a septic smell. Water clarity was clear at this station throughout the sampling season. Minor erosion in the form of undercut banks was found at this station. Sparse to moderate abundances of submerged aquatic plants (moss and other submerged plants) were found at this site throughout the sampling season. Periphyton was generally unobservable at this site but on May 14th a sparse coverage of brown thin films were found. Phytoplankton was not noted at this site.

SR03, Swift River, Cold Spring Road, Belchertown/Ware, MA

This site is in the Swift River Wildlife Management Area. The surrounding land use is mainly forest with cropland, pasture, residential and non-forested wetland land uses. The immediate land use in the 100m riparian buffer is forest, residential, and pasture. There is also a fish hatchery upstream of this site. The site was accessed on the upstream side of the Cold Spring Road bridge.

DWM field crews did not note any objectionable deposits at this site during the sampling season. Pollen blankets were noted on the water on three occasions although generally no scums were noted. The water generally had no odor except on two occasions when the water smelled like manure. Sparse coverage of submerged aquatic plants was noted beginning in May and by October the station had a moderate coverage of submerged aquatic plants. On April 16th dense amounts of green thin films and filamentous algae were found while on May 14th moderate amounts of brown thin films were noted at this station. DWM field crews did not note periphyton coverage at this location for the rest of the field sampling season. With the exception of May 14th, when a sparse amount of phytoplankton was noted, phytoplankton was not noted at this site by DWM field crews.

EB04, East Brookfield River, Route 9 bridge, East Brookfield, MA

This site is located in downtown East Brookfield and at the outlet of Lake Lashaway. The surrounding land use is mainly residential along with commercial, cropland, non-forested wetland, industrial and landfill land uses. The immediate land use in the 100m riparian buffer is residential, commercial, forest and downstream of the station the immediate land use includes non-forested wetlands, forest, cropland and the East Brookfield landfill.

On four occasions DWM field crews noted objectionable deposits. Limited trash was found on one occasion, sunken concrete debris on another occasion and two flocculent masses on two occasions (one rust colored). On the majority of occasions though no objectionable deposits were noted by DWM field crews. Generally no water odor was noted with the exception of a musty smell on one occasion and a fishy smell on two occasions. White foam was generally noted at this station. Water clarity was often slightly turbid, otherwise it was clear. The west bank was observed to be eroding according to DWM field crews. DWM field crews noted sparse emergent and submerged aquatic plants throughout the sampling season. In April, May and November sparse amounts of green algae were noted at this station. Thin film algae were sparse in June, moderate in July and dense in August and by October thin film algae were moderate again. The thin film algae were generally brown but in July included both green and brown thin films. Generally no phytoplankton was noted with the exception of two occasions when sparse amounts were found.

CRN01, Cranberry Brook, South Spencer Road, Spencer, MA

This station is southwest of downtown Spencer and upstream of the Spencer WWTP discharge. The surrounding land use is residential, forest, non-forested wetland, industrial, commercial, cropland, landfill, and municipal wastewater treatment. The immediate land use in the 100m riparian buffer is non-forested

wetlands, forest, residential, landfill, and municipal waste treatment. The site was accessed on the upstream side of the bridge over Cranberry Brook on South Spencer Road. A beaver dam was noted in May near this station and by November it was breached with the installation of a culvert.

DWM field crews did not find any objectionable deposits with the exception of trash on one occasion and sand from the road on two occasions. No water odors or scums were noted by DWM field crews. Slight shoreline erosion was noted at this site. Generally a sparse coverage of emergent aquatic plants was found at this site, although on some occasions both emergent and submerged plants were found. In August moderate coverage of aquatic plants including emergent, submerged and floating plants was found. A sparse coverage of algae was found at this site throughout the sampling season. The periphyton types included green filamentous algae and green and brown thin film algae. On November 25th the algal coverage was moderate. With the exception of October 15th when a sparse amount of phytoplankton was noted, DWM field crews did not note phytoplankton at this site.

SM02, Seven Mile River, Route 49 Bridge, Spencer, MA

This site is located southwest of downtown Spencer and is downstream of the Spencer wastewater treatment plant. The surrounding land use is residential, forest, non-forested wetland, industrial, commercial, cropland, landfill, and municipal wastewater treatment. The immediate land use in the 100m riparian buffer is residential, forest, commercial, non-forested wetland and municipal wastewater treatment. The site was accessed off the Route 49 bridge by parking on bridge and walking down the bank to the upstream side. Samples were collected by wading into the stream.

DWM field crews did not find any objectionable deposits with the exception of two occasions where sand deposits coming from Route 49 were found. Slight erosion was noted at this site in addition to sand deposits. On April 16th the sand deposits were characterized as "forming large delta from route 49" and it was noted that the road lacks a catch basin. No water odors or scums were noted except on one occasion when a chlorine smell was noted and an oil sheen was found. Water clarity was generally slightly turbid. Sparse to moderate coverage of aquatic plants was found throughout the sampling season and included both submerged and emergent plants. In April a sparse coverage of brown algae was found while in May and June a moderate coverage of green filamentous algae was found. In July and August moderate coverage of brown algae was noted. The remainder of the season periphyton cover was unobservable or not found. Sparse amounts of phytoplankton were noted in May, June and July.

SMG, Seven Mile River, Cooney Road Bridge, Spencer, MA

This site is located north of downtown Spencer and is above the Spencer wastewater treatment plant. The surrounding land use is residential, forest, cropland, non-forested wetland, and mining/quarry. The immediate land use in the 100m riparian buffer is residential, forest, cropland, non-forested wetland and mining/quarry. The site was accessed by going down the upstream side of the Cooney Road Bridge and wading to center stream to collect samples.

CERO SMART crews noted that sunken granite blocks from a partially dismantled dam were present at this site. Neither DWM field crews nor CERO SMART crews noted any objectionable deposits. No water odors were noted but a white foam was commonly observed at this site. This site appears to be a depositional area for sand/gravel, possibly from extraction activities upstream. A large gravel bar has formed on the western bank and has blocked flow through the western culvert except on extreme high flows. Water clarity was generally clear, only once it was found to be slightly turbid. Both field crews generally found sparse coverages of aquatic plants (often mosses and grasses) throughout the growing season. In April and June sparse coverage of filamentous algae was found while in May, July and August moderate coverage of filamentous algae was found. In August the moderate coverage of algae also included thin films while in October the coverage of thin films was sparse. Phytoplankton was not noted at this site.

QP011, Connection between Quaboag and Quacumquasit Pond, Lake Road, Brookfield/E. Brookfield, MA

This site is the culvert/connection between Quaboag Pond and Quacumquasit Pond and was sampled as part of a TMDL development project for both lakes. DWM field crews did not note any objectionable

deposits, scums or water odors. On September 24th it was noted that there was backflooding from Quaboag due to the previous day's heavy rain.

EB04A, East Brookfield River, Shore Road Bridge, East Brookfield, MA

This site is located near the mouth of the East Brookfield River before it flows into Quaboag Pond. The surrounding land use is forest, residential, non-forested wetlands, cropland, commercial, and a sand pit. The immediate land use in the 100m riparian buffer is non-forested wetland, forest and residential. There are extensive wetlands upstream of this site. The site was accessed by wading in to the river at the Shore Road bridge.

DWM field crews did not find any objectionable deposits at this site during the sampling season. No water odors or scums were noted. No shoreline erosion was found and water clarity was generally slightly turbid. Field crews found sparse to dense amounts of many different types of aquatic plants (submerged, emergent and floating) during the sampling season. In July and August the invasive species fanwort (*Cabomba carolinia)* was found. The close proximity to Quaboag Pond also explains the presence of many pond plant species found here. From May to July periphyton coverage was either sparse or moderate and included thin film and filamentous algae. For the remainder of the sampling season periphyton coverage was either not recorded or unobservable. Sparse green algae was often found floating in the water column from May to October.

SM01, Seven Mile River, Route 9 Bridge, Spencer, MA

This site is located on the western edge of Spencer and is in a developed commercial area. The surrounding land use is residential, forest, non-forested wetland, industrial, commercial, cropland, and municipal wastewater treatment. The immediate land use in the 100m riparian buffer is commercial, forest, non-forested wetland, municipal wastewater treatment, and residential. This site was accessed by walking down the west side of the bridge on the upstream side and wading in mid-stream.

DWM field crews did not find any objectionable deposits with the exception of minimal trash on one occasion. No scums were noted at this station and no water odor was noted with the exception of one occasion when a musty smell was noted. Slight bank erosion and undercut banks were noted at this station. Water clarity was generally clear or slightly turbid. Sparse to moderate densities of aquatic plants were found throughout the sampling season and included both emergent and submerged plants, principally moss and burreed (*Sparganium* sp.). In April and May respectively sparse and moderate coverage of green algae was found while between June and August moderate coverage of brown thin films was found. In October the coverage of brown thin films was sparse. No phytoplankton was noted at this site.

SPEFF, Spencer Wastewater Treatment Plant discharge, Spencer, MA

This station is at the Spencer Wastewater Treatment plant. The plant's discharge (final effluent channel) was sampled as part of TMDL development for Quaboag Pond and Quacumquasit Pond.

SURVEY CONDITIONS

To fulfill the assessment guidance, information on precipitation and stream discharge (Socolow *et al.* 2004 and 2005) were analyzed to estimate hydrological conditions during water quality sampling events. Rainfall data from the NOAA/National Weather Service precipitation station in Springfield was reviewed for the five days prior to and on the sampling dates (Table 3) (NOAA, 2006). Rainfall records were used to determine whether the fecal coliform bacteria data were representative of "wet" or "dry weather" sampling conditions. The USGS streamflow data were used to estimate the streamflow condition in relation to the 7-day, 10-year (7Q10) low flow.

There were nine stream gages active during 2003 in the Chicopee River Watershed (Figure 2). Streamflow data from all these gages (Table 4) were used principally to estimate hydrological conditions for the water quality sampling events and were also used to determine "wet or dry" sampling status. The major stream discharges in the Chicopee River Watershed are routinely regulated for municipal supplies; therefore, gage data throughout the basin should be interpreted with caution. Three stream gages located on the Ware River near Barre, MA (01172500), at the Ware River at Intake Works, Barre, MA (01173000), and on the Ware River downstream of the Barre Falls Reservoir at Gibbs Crossing, MA (01173500) are all affected by municipal withdrawals. The Ware Intake Works, which diverts water to the Quabbin Reservoir for use by the MWRA, is located upstream of the gage on Ware River at Gibbs Crossing (01173500) further affecting flow recorded at this gage. The USGS gage on the Swift River at West Ware (01175500) is affected by diversions of water from Quabbin Reservoir to the Wachusett Reservoir, the Chicopee Valley Aqueduct, and the City of Worcester. This gage show little variation in flows and was not used to determine "wet" or "dry weather" sampling conditions (Table 4). Upstream ponds occasionally regulate flow at the USGS gage on the Sevenmile River near Spencer, MA (01175670). The USGS gage on the Quaboag River (01176000) is slightly affected during high flows by reservoirs. The USGS gage on the Chicopee River at Indian Orchard, MA (01177000) is the most downstream gage in the basin and consequently the most regulated. It is affected especially by withdrawals in the Swift River, Ware River, and Quaboag River subbasins; thus, data from the Chicopee River gage while included in Table 4, are not used as the sole determinant of wet or dry conditions during sampling. A synthesis of the various gages in the watershed was used secondarily to rainfall information. Two gages do not have estimated 7Q10 values (Table 4).

Streamflow conditions for the Chicopee watershed between April 2003 and October 2003 were characterized as either normal or above normal by USGS (Socolow et al. 2004 and 2005). These data should be relatively indicative of conditions for the watershed. Conditions prior to each survey were characterized by analyzing precipitation and streamflow data.

Survey conditions are described below for each DWM sampling event:

April 16, 2003: This survey represents relatively average flow conditions and dry weather. Although a significant rain event of 0.61 inches was recorded in Springfield five days prior to the survey (Table 3), the flows as recorded at the USGS Gage on the Chicopee River in Indian Orchard was approximately equal to pre-rain levels (Table 3). Streamflow diminished from 2,630 cfs four days before the survey down to 1,700 cfs on the survey day (Table 4). This should be considered consistent with the 2003 Mean monthly flow of 1,733 cfs as well as the Period of Record (POR) Monthly Mean for April of 1,830. The remaining gages in the Chicopee Watershed also indicated dry weather conditions. Flow at the Chicopee River gage at Indian Orchard was well above the 7-day, 10-year low-flow (7Q10) value of 126 cfs during this survey. Flow at all other gages was above their respective 7Q10 values.

May 14, 2003: This survey represents relatively average flow conditions but appears to be a wet-weather sampling event. A significant rain event of 0.64 inches was recorded in Springfield on May 11, three days prior to the survey (Table 3). This rain resulted in an increase of flow on the Chicopee River at Indian Orchard from 808 cfs on May 11 to 1,150 cfs on May 12 (Table 4). However, for the next two days the flows decreased to 981 cfs on the survey day (Fig. 3). The stream gages in the Ware River Subbasin also show a pattern of increased streamflow 2 days prior to sampling while the gages in the Quaboag show no pattern of increased flow (Table 4). The East Branch Swift River and the West Branch Swift River both show elevated streamflow due to the previous precipitation (Fig. 4). Given the altered

hydrology in the watershed it is difficult to interpret the streamflow pattern but it is believed that wet-weather conditions were present during sampling. Flow during the survey was above 7Q10 at all gages.

June 18 & 19, 2003: The two-day water quality survey was conducted during and immediately after a significant rainfall. On June 18, the day that the water quality samples were taken, 0.42 inches of rain was recorded in Springfield (Table 3). Field crews reported overcast, drizzle and rainy conditions while sampling on the 18th and the 19th. Although the stream flow recorded for the Chicopee River at Indian Orchard reflected a receding flow pattern during the four-day period before the survey, it should be recognized that the flows at this station, and for the Chicopee watersheds in general, are highly varied due to anthropogenic manipulations such as power generators, dams, withdrawals and diversions. The Chicopee River at this point also has a very large amount of contributing watershed area and may take days for the flow to respond to input from precipitation. Therefore the recorded discharge rate at the gage may be misleading for this survey date. This survey should be considered representative of "first flush" conditions for wet weather. Flow during the survey was above the 7-day, 10-year low-flow (7Q10) value at all gages.

July 30 & 31, 2003: Dry weather conditions prevailed during this survey as sampling was performed after a long antecedent dry period. No significant rain had fallen for the five days prior to the survey as recorded in Springfield (Table 3). This survey was conducted at a flow (256 cfs) below both the July 2003 monthly average (624.2 cfs) and the July POR flow (481 cfs) for the Chicopee River gage at Indian Orchard (Table 4). Survey flow conditions were above the 7Q10 values of 126 cfs in the Chicopee River at Indian Orchard (01177000). All other gages were also above 7Q10 (Table 4).

August 20 & 21, 2003: This survey was conducted during relatively dry weather conditions. Very little rainfall was reported at the Springfield rain gage prior to this survey. A small event resulted in 0.31 inches of rainfall on August 16, four days prior to the survey and no additional rain was reported until after the survey (Table 3). A dry weather pattern is obviously demonstrated by the hydrograph at the Chicopee River gage at Indian Orchard (01177000). Flow decreased from 904 cfs on August 15 to 380 cfs on August 21. (Table 4). Decreasing stream flows were also found leading up to this survey at all other gages in the Chicopee Watershed with the exception of Swift River at West Ware, MA (011775500) (Table 4). The water quality sampling survey on August 20th was conducted at a flow of 456 cfs, which is below the August 2003 monthly average of 570.5 cfs and just slightly above the August POR flow of 446 cfs for the Chicopee River gage at Indian Orchard (01177000) (Table 4). Survey flow conditions were above the 7Q10 value of 126 cfs in the Chicopee River at Indian Orchard. All other gages were also above 7Q10 (Table 4).

October 15, 2003: No significant rain was reported at Springfield during the five-day period preceding the survey. However, the flow recorded at the Chicopee River Gage rose from 257 cfs on October 14th to 576 cfs on October 15th, the day of the survey (Table 4). Although not in the Chicopee Watersheds, a review of rainfall data in towns just outside of the watershed boundaries to the north and east (Worcester, Orange, Fitchburg) demonstrate rainfall of about 1.5 inches on October 15th suggesting that there was a significant amount of rainfall in the northern and eastern portions of the Chicopee watersheds that flow south and west contributing flow to downstream portions of the watersheds. The three gages in the Ware River subbasin all showed a marked increase in streamflow on the survey date (Table 4). The gaged rivers in the Quaboag River subbasin and the East Branch Swift River and West Branch Swift River also showed a marked increase in streamflow during the survey day (Table 4). Conditions during this survey are considered to represent wet-weather conditions. All the gages were above 7Q10 conditions (Table 4).

Table 3. Estimated Chicopee Watersheds 2003 Precipitation Data Summary Based on NOAA rain gauge in Springfield, MA. (NOAA, 2006)

Chicopee Watershed Survey							
Precipitation Data Summary (reported in inches of rain)							
Survey Dates	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Survey Date	Monthly Total
April 16	0.61	0.03	0	0	0	0	2.91
May 14	0.01	0	0.64	0.03	0.01	0.04	4.69
June 18	0.74	0	0	0	0	0.42	5.0
June 19	0	0	0	0	0.42	0	5.0
July 30	T	0	0	0	0	0	1.13
July 31	0	T	0	0	0	0	1.13
August 20	0	0.31	0	0	0	0	2.64
August 21	0.31	0	0	0	0	0	2.64
October 15	0	0	0.03	0	0	T	2.14

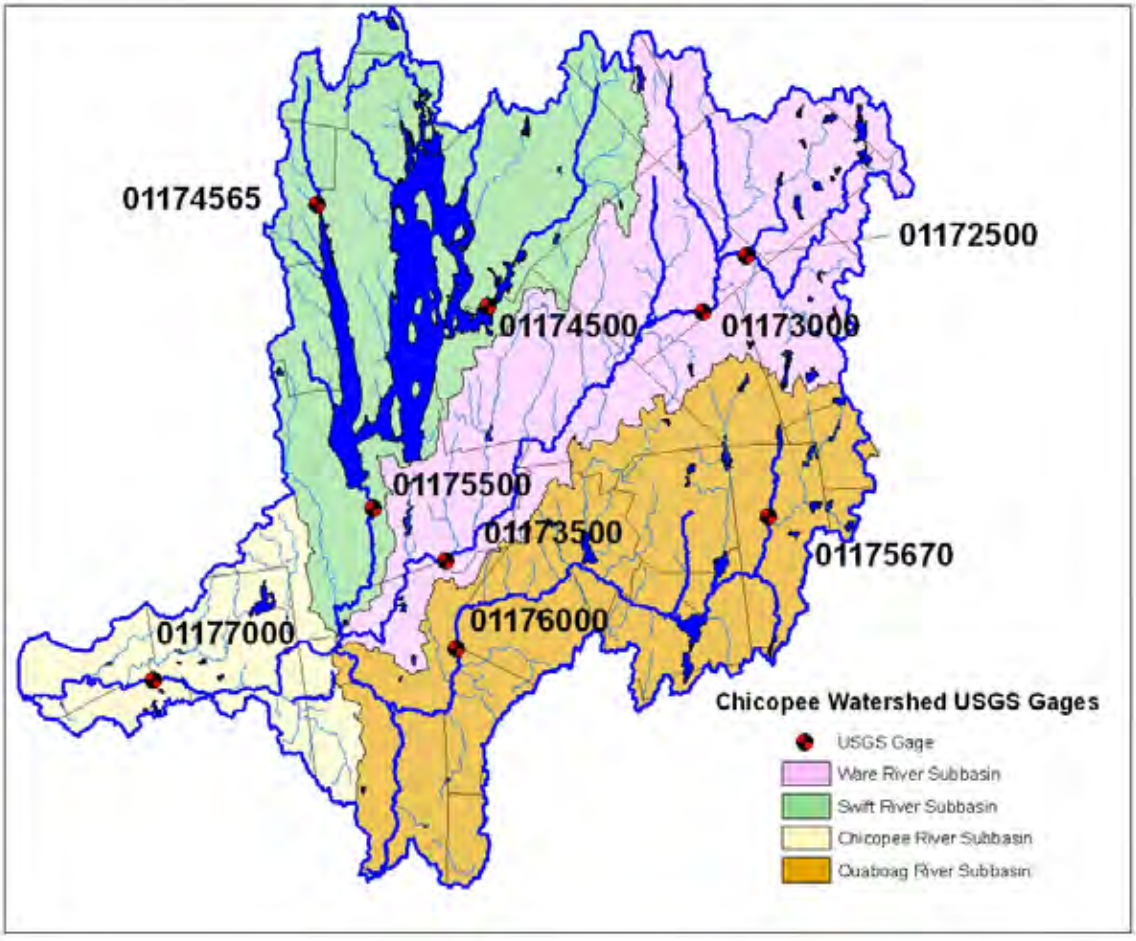


Figure 2: Location of USGS Stream Gages in Chicopee River Basin

Table 4. USGS gage data summaries in Chicopee Watershed for 2003 MassDEP DWM surveys (Socolow et al. 2004, Socolow et al. 2005)

Chicopee River Watershed Survey
USGS Flow Data Summary (reported in cubic feet per second)

Survey Date	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Survey Date	Monthly Mean 2003	POR* Monthly Mean
Ware River Subbasin								
01172500 Ware River Near Barre, MA (Provisional 7Q10 = 1.235 cfs, USGS 1998) **								
4/16/03	199	338	390	305	245	211	252.3	231
5/14/03	106	100	93	110	120	112	130.9	121
6/18/03	124	137	131	132	115	101	143.9	77.2
6/19/03	137	131	132	115	101	98	143.9	77.2
7/30/03	15	13	12	11	11	17	30.1	32.5
7/31/03	13	12	11	11	17	23	30.1	32.5
8/20/03	152	140	78	54	47	39	49.4	28.9
8/21/03	140	78	54	47	39	32	49.4	28.9
10/15/03	32	27	25	29	28	46	81.7	52.1
01173000 Ware River At Intake Works Near Barre, MA (Provisional 7Q10 = 6.500 cfs, USGS 1998)								
4/16/03	451	863	751	573	449	392	440.7	405
5/14/03	194	155	173	225	222	223	203.4	217
6/18/03	252	276	234	194	162	151	265.2	141
6/19/03	276	234	194	162	151	152	265.2	141
7/30/03	35	31	26	25	29	37	59.2	67.7
7/31/03	31	26	25	29	37	53	59.2	67.7
8/20/03	282	255	123	104	98	86	101	53.8
8/21/03	255	123	104	98	86	64	101	53.8
10/15/03	44	39	39	44	44	89	123.9	86.6
01173500 Ware River At Gibbs Crossing, MA (Provisional 7Q10 = 22.373 cfs, USGS 1998)								
4/16/03	537	1210	870	634	518	440	516.8	596
5/14/03	349	314	318	387	364	335	344.2	373
6/18/03	639	704	628	500	387	350	579	259
6/19/03	704	628	500	387	350	358	579	259
7/30/03	110	108	66	69	54	68	136.5	140
7/31/03	108	66	69	54	68	81	136.5	140
8/20/03	403	358	308	184	174	154	185.8	122
8/21/03	358	308	184	174	154	128	185.8	122
10/15/03	68	120	73	95	82	166	251.5	166

* Period of Record

** USGS notes that records above 200 cfs are poor at this gage (Socolow *et al.*, 2004)

Table 4. Continued. USGS gage data summaries in Chicopee Watershed for 2003 MassDEP DWM surveys (Socolow et al. 2004, Socolow et al. 2005)

Chicopee River Watershed Survey
USGS Flow Data Summary (reported in cubic feet per second)

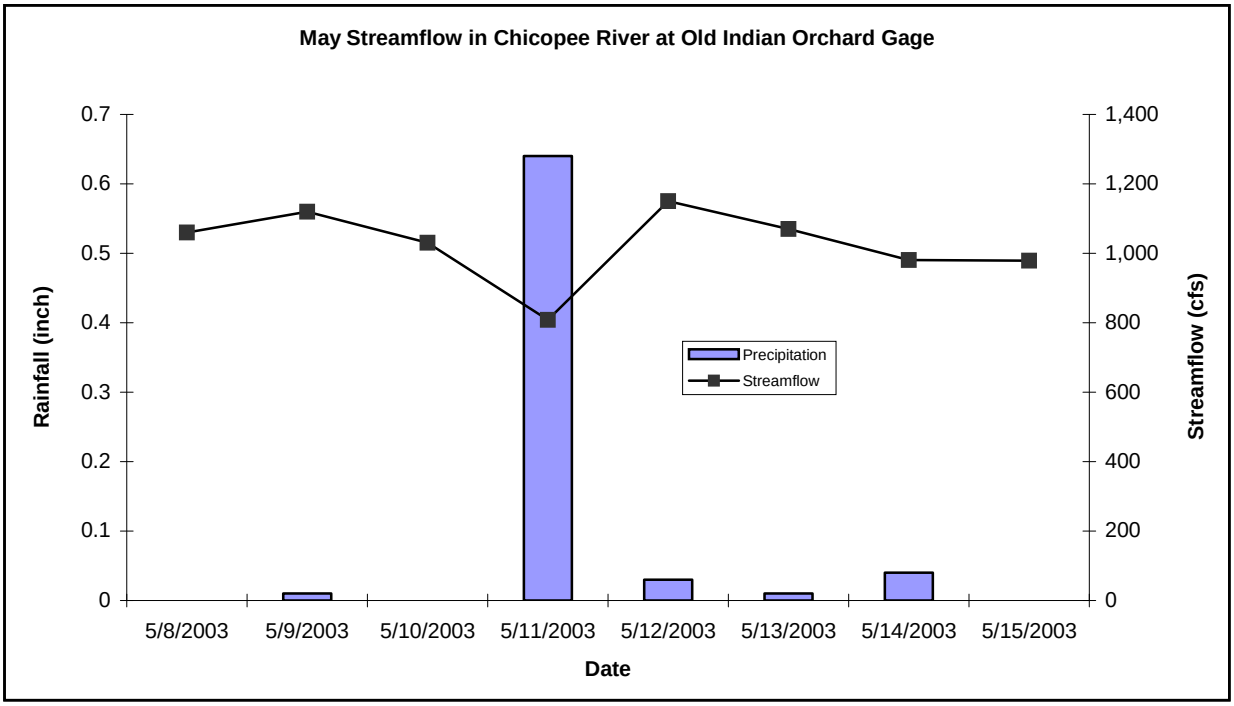
Survey Date	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Survey Date	Monthly Mean 2003	POR* Monthly Mean
Quaboag River Subbasin								
01175670 Sevenmile River Near Spencer, MA (Provisional 7Q10 = 0.227 cfs, USGS 1998)								
4/16/03	38	52	45	37	31	28	32.8	31.9
5/14/03	15	15	13	14	16	14	16	18
6/18/03	33	35	28	32	18	14	24.9	12.4
6/19/03	35	28	32	18	14	15	24.9	12.4
7/30/03	9.7	8.8	6.8	4.8	3.5	2.9	8.89	5.05
7/31/03	8.8	6.8	4.8	3.5	2.9	2.5	8.89	5.05
8/20/03	9.9	8	7.1	6.4	6	4.9	6.08	4.05
8/21/03	8	7.1	6.4	6	4.9	4.5	6.08	4.05
10/15/03	3.7	3.6	4.1	4.2	3.8	15	13	7.69
01176000 Quaboag River At West Brimfield, MA (Provisional 7Q10 = 15.847 cfs, USGS 1998)								
4/16/03	744	808	785	761	720	670	658.2	548
5/14/03	334	303	284	281	265	252	282.5	315
6/18/03	572	539	484	440	402	390	444.3	193
6/19/03	539	484	440	402	390	383	444.3	193
7/30/03	111	106	101	94	84	79	151.7	103
7/31/03	106	101	94	84	79	74	151.7	103
8/20/03	138	135	129	121	114	104	112.6	103
8/21/03	135	129	121	114	104	95	112.6	103
10/15/03	109	103	96	91	93	179	199.5	127
Swift River Subbasin								
01174500 East Branch Swift River Near Hardwick, MA								
4/16/03	181	400	397	286	221	188	194.5	161
5/14/03	104	97	93	133	165	152	120.9	91.6
6/18/03	200	233	190	134	107	97	167.5	61.1
6/19/03	233	190	134	107	97	104	167.5	61.1
7/30/03	27	23	20	19	17	15	36	28.7
7/31/03	23	20	19	17	15	14	36	28.7
8/20/03	72	50	40	34	31	26	43.1	23
8/21/03	50	40	34	31	26	22	43.1	23
10/15/03	25	23	21	22	23	48	73.1	38.3
01174565 West Branch Swift River Near Shutesbury, MA								
4/16/03	58	120	95	69	60	55	50.5	42.3
5/14/03	24	22	23	34	30	24	25.1	29.1
6/18/03	52	42	28	21	19	19	30	24.7
6/19/03	42	28	21	19	19	19	30	24.7
7/30/03	7.1	6	5	4.3	3.8	3.6	6.94	9.23
7/31/03	6	5	4.3	3.8	3.6	3.3	6.94	9.23
8/20/03	18	15	15	19	13	10	15.8	6.85
8/21/03	15	15	19	13	10	8.3	15.8	6.85
10/15/03	12	12	11	10	9.6	62	29.3	12.8

Table 4. Continued. USGS gage data summaries in Chicopee Watershed for 2003 MassDEP DWM surveys (Socolow et al. 2004, Socolow et al. 2005)

Chicopee River Watershed Survey
USGS Flow Data Summary (reported in cubic feet per second)

Survey Date	5 Days Prior	4 Days Prior	3 Days Prior	2 Days Prior	1 Day Prior	Survey Date	Monthly Mean 2003	POR* Monthly Mean
01175500 Swift River At West Ware, MA (Provisional 7Q10 = 27.824 cfs, USGS 1998)								
4/16/03	41	41	39	37	37	36	37.1	166
5/14/03	35	34	35	36	35	35	35.1	159
6/18/03	42	37	35	35	34	34	36.7	124
6/19/03	37	35	35	34	34	31	36.7	124
7/30/03	41	36	33	34	34	82	94.8	76.5
7/31/03	36	33	34	34	82	114	94.8	76.5
8/20/03	35	35	35	35	35	35	46.9	78.9
8/21/03	35	35	35	35	35	35	46.9	78.9
10/15/03	38	38	38	38	38	42	39.8	71.3
Chicopee River Subbasin								
01177000 Chicopee River At Indian Orchard, MA (Provisional 7Q10 = 125.963 cfs, USGS 1998)								
4/16/03	1790	2630	2560	2070	1860	1700	1733	1810
5/14/03	1120	1030	808	1150	1070	981	1034	1180
6/18/03	1700	2010	1800	1410	1240	1150	1534	824
6/19/03	2010	1800	1410	1240	1150	1230	1534	824
7/30/03	469	432	484	403	341	256	624.2	481
7/31/03	432	484	403	341	256	250	624.2	481
8/20/03	904	809	733	587	481	456	570.5	446
8/21/03	809	733	587	481	456	380	570.5	446
10/15/03	368	273	331	325	257	576	673.4	523

Figure 3: May Precipitation and Streamflow in Chicopee River at Indian Orchard



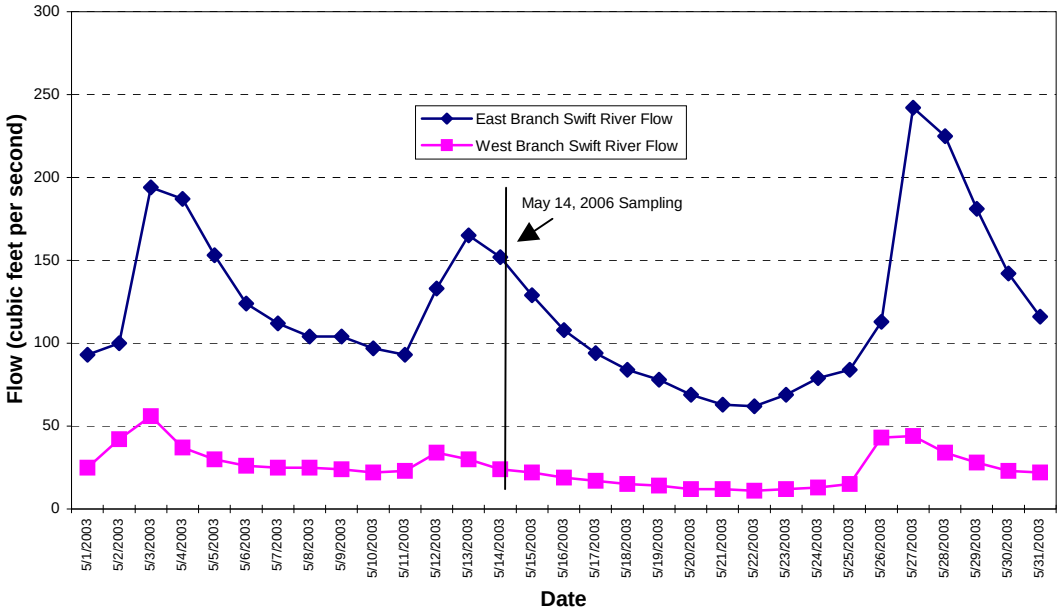


Figure 4: May 2003 Flow in East Branch Swift River and West Branch Swift River

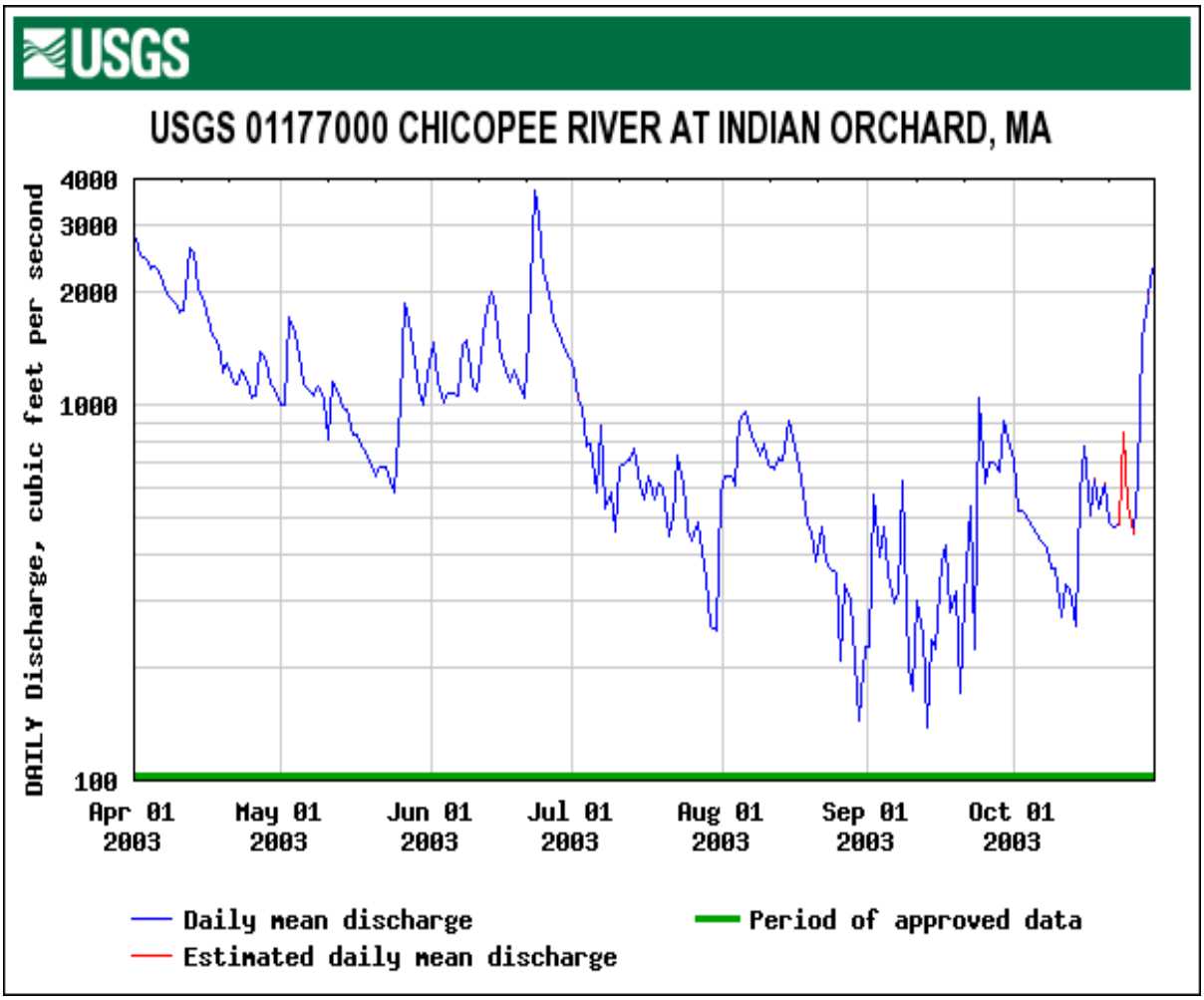


Figure 5. Hydrograph of Daily Mean Discharge at USGS Gage 01177000 during the 2003 Chicopee Survey Season.

WATER QUALITY DATA

Raw data files, field sheets, lab reports and chain of custody (COC) records are stored in open files at the Division of Watershed Management (DWM) in Worcester. All DEP DWM water quality data are managed and maintained in the *Water Quality Data Access Database*.

Table 5. 2003 MassDEP Chicopee Watersheds *in-situ* Hydrolab® Data.
Temperature, pH, Conductivity, Total Dissolved Solids (TDS), Salinity, Dissolved Oxygen (DO), Dissolved Oxygen Percent Saturation (Data qualifiers listed at end of table and in Appendix 1)

Chicopee, (2003) (QC Status: 4)

Unnamed Tributary
Unique_ID: W1027 Station: POOR01, Mile Point: 0.356
Description: [unnamed tributary to the Chicopee River (locally known as Poor Brook), Route 141 (East Main Street) bridge, Chicopee]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0199	09:59	## i	13.0	7.4 cu	606	388	9.7 u	94 u
05/14/03	36-0263	09:45	## i	12.4	7.3 c	556	356	9.5	91
07/30/03	36-0444	10:05	0.2	16.7	7.9 c	643	411	8.4 u	87 u
07/31/03	36-0478	02:13	## i	20.4	7.5 c	377 u	241 u	7.5	84
08/20/03	36-0572	10:11	0.1 i	17.1	7.4 c	602	385	8.2	86
08/21/03	36-0599	02:05	## i	17.3	7.3 c	600	384	8.1	86
10/15/03	36-0675	10:50	## i	14.7	7.0 c	143	91.5	8.9	91

Unnamed Tributary
Unique_ID: W1026 Station: AB01, Mile Point: 0.111
Description: [unnamed tributary to the Chicopee River (locally considered part of Abbey Brook) upstream of storm drain discharge, Front Street, Chicopee]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0198	09:41	## i	13.4	7.4 c	624	399	10.2	101
05/14/03	36-0262	09:17	## i	13.7	7.2 c	467	299	9.5	95
07/30/03	36-0443	09:45	0.1 i	24.7	7.5 c	502	321	6.9	84
07/31/03	36-0477	01:53	## i	24.9	7.5 c	509	326	6.9	84
08/20/03	36-0571	09:50	0.1 i	24.1	7.4 c	467	299	7.0 u	84 u
08/21/03	36-0598	01:43	0.1 i	24.8	7.4 c	468	300	6.8	83
10/15/03	36-0674	10:25	0.2 i	14.3	7.1 c	354	227	9.2	94

Unnamed Tributary
Unique_ID: W1028 Station: COOL01, Mile Point: 0.061
Description: [unnamed tributary to the Chicopee River (an apparent diversion of Cooley Brook) at Fuller Road, approximately 1100 feet northwest of Haynes Circle, Chicopee]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0200	10:30	## i	12.4	6.6	220	141	7.2 u	69 u
05/14/03	36-0730	10:10	## i	14.2	6.9 c	129	82.5	8.8	88
07/30/03	36-0445	10:23	## i	19.3	7.0 c	136	87.0	7.5 u	83 u
07/31/03	36-0479	02:33	## i	19.1	6.9 u	133 u	85.0 u	6.9	76
08/20/03	36-0573	10:35	0.1 i	19.8	6.8	132	84.4	7.3	81
08/21/03	36-0600	02:26	## i	19.4	6.8	133	85.0	7.1 u	78 u
10/15/03	36-0676	11:07	## i	13.2	6.5	158	101	7.6	76

Unnamed Tributary
Unique_ID: W1267 Station: QP011, Mile Point: 0.011
Description: [Lake Road/South Pond Road (culvert between Quaboag Pond and Quacumquasit Pond when flowing north to Quaboag Pond), Brookfield/East Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
12/11/02	Ice Out	12:15j	--	--	--	--	--	--	--

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1033 Station: CH01, Mile Point: 17.725
Description: [near the intersection of New Hampshire Avenue and Springfield Street, Palmer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0205	12:42	0.5 i	12.9	6.7 u	118	75.2	10.3 u	100 u
05/14/03	36-0268	12:18	1.1 i	14.0	6.7 u	132	84.3	9.9 u	99 u
07/30/03	36-0450	12:16	0.5	22.7	7.6 c	171 u	109 u	8.4 u	99 u
07/31/03	36-0484	04:25	0.4 i	22.2	6.9 c	164 u	105 u	7.9	92
08/20/03	36-0578	12:27	0.4	22.8	7.2 c	170	109	8.1 u	96 u
08/21/03	36-0605	04:14	0.4 i	23.2	7.1 c	171	109	7.6	90
10/15/03	36-0681	12:54	0.4 i	13.8	6.9 cu	154	98.0	9.0 u	91 u

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1032 Station: CH02B, Mile Point: 12.802
Description: [Miller Street/Cottage Avenue bridge, Ludlow/Wilbraham]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0204	12:15	## i	12.0	6.7	115	73.8	10.5	100
05/14/03	36-0267	11:47	0.2 i	14.6	6.6	123	78.7	9.3	94
07/30/03	36-0449	11:50	0.3	24.3	7.1 cu	142	90.6	7.9	96
07/31/03	36-0483	04:01	0.6 i	24.4	6.8	142	91.1	8.2	100
08/20/03	36-0577	11:58	0.7	23.6	7.0 cu	129	82.2	7.7 u	92 u
08/21/03	36-0604	03:41	1.0 i	24.0	6.8	133	85.1	7.4	89
10/15/03	36-0680	12:30	1.4 i	13.7	6.8	141	89.9	9.5 u	95 u

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1031 Station: CH06, Mile Point: 7.494
Description: [River Street/West Street bridge, Springfield/Ludlow]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0203	11:39	## i	10.3	6.9 c	117	74.8	11.0 u	101 u
05/14/03	36-0266	11:10	0.1 i	14.5	6.6	128	82.2	9.3	94
07/30/03	36-0448	11:22	0.2	24.9	7.2 c	151	96.0	8.6	105
07/31/03	36-0482	03:35	0.4 i	24.4	6.8	155	99.0	7.6	92
08/20/03	36-0576	11:28	0.6	25.1	6.9 uc	133	84.9	7.6	94
08/21/03	36-0603	03:15	0.2 i	24.8	6.8	133	85.4	7.1	87
10/15/03	36-0679	11:56	0.5 i	13.6	6.9 c	151	97.0	9.5	95

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W0475 Station: CT03, Mile Point: 0.839
Description: [Route 116 bridge, Chicopee.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0197	09:20	0.3 i	10.8	7.7 cu	126	80.7	11.1	103
05/14/03	36-0261	08:53	0.8 i	14.6	7.2 uc	140	89.6	10.0	101
07/30/03	36-0442	09:28	0.3	25.0	7.4 c	169	108	8.1	99
07/31/03	36-0476	01:34	0.2 i	24.6	7.2 c	179	114	7.4	90
08/20/03	36-0570	09:28	0.1 i	24.4 u	7.1 cu	150	96.0	8.1 u	98 u
08/21/03	36-0597	01:25	0.1 i	25.2	7.0 c	149	95.5	7.3 u	90 u
10/15/03	36-0673	10:04	0.5 i	14.4	7.1 uc	186	119	9.7	99

FULLER BROOK (SARIS: 3625075)
Unique_ID: W1029 Station: FULL01, Mile Point: 0.227
Description: [between Route 90 and Shawinigan Drive, Chicopee]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0201	10:48	1.1 i	13.2	6.9 c	205	131	9.8	96
05/14/03	36-0264	10:27	0.2 i	13.2	7.0 c	219	140	9.5 u	93 u
07/30/03	36-0446	10:41	0.1 i	20.7	7.3 c	354	227	7.6 u	86 u
07/31/03	36-0480	02:55	## i	21.8	7.1 c	359	230	7.5	87
08/20/03	36-0574	10:50	0.1 i	20.6	7.2 c	298	191	7.7	87
08/21/03	36-0601	02:43	0.1 i	22.1	7.2 c	308	197	7.3	85
10/15/03	36-0677	11:25	## i	13.6	7.0 c	252	161	8.4 u	84 u

HIGHER BROOK (SARIS: 3625100)
Unique_ID: W1030 Station: FULL02, Mile Point: 0.562
Description: [West Street bridge, south of Roy Street, Ludlow (stream name change at Ludlow/Chicopee corporate boundry, natural extension of Fuller Brook with station 2.5 miles up "Fuller route")]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0202	11:07	## i	14.7	6.9 c	185	118	10.2	104
05/14/03	36-0265	10:44	## i	14.0	6.9	193	123	9.0 u	90 u
07/30/03	36-0447	11:04	0.1 i	21.0	7.2 c	263	168	6.6	75
07/31/03	36-0481	03:21	## i	21.0	6.9 c	268	172	6.1	69
08/20/03	36-0575	11:08	0.1 i	20.7	7.0 c	255	163	6.6	75
08/21/03	36-0602	03:00	## i	21.0	7.0 c	258	165	6.0	68
10/15/03	36-0678	11:40	## i	13.9	6.8	178	114	7.3	74

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1041 Station: QA100, Mile Point: 23.956
Description: [Route 148 (Fiskdale Road), Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0283	11:24	0.3	15.0	6.7	125	79.9	8.8	90
06/18/03	36-0353	11:55	0.9	20.5	6.6	123	80.0	7.1	79
06/19/03	36-0383	02:34	0.4	20.2	6.1	119	75.8	6.9	78
07/30/03	36-0466	11:28	0.8	25.6	6.7	131	85.0	6.0	73
07/31/03	36-0500	03:39	1.2	25.3	6.7	129	84.0	5.4	66
08/20/03	36-0594	11:30	0.4	25.3	6.5	130	85.0	4.9 u	60 u
08/21/03	36-0621	03:47	0.8	25.5	6.1	130	83.3	4.4	54
10/15/03	36-0696	11:59	0.5	14.2	6.7	117	76.0	8.4 u	82 u

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1010 Station: QAOBO, Mile Point: 20.627
Description: [Long Hill Road bridge, West Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0192	10:44	1.7	12.1	6.2	107	68.8	9.6	91
05/14/03	36-0272	10:27	0.8	14.8	6.7	128	83.0	9.2	91
06/18/03	36-0342	10:44	1.1	20.3	6.3	119	77.0	5.2	58
06/19/03	36-0372	02:05	0.5	20.1	6.3	118	76.0	5.1	57
07/30/03	36-0454	10:55	1.3	25.2	6.7	130	85.0	7.4	90
07/31/03	36-0488	02:10	0.6	25.4	6.5	131	85.0	3.8	47
08/20/03	36-0582	10:28	0.5	24.4	6.3	130	84.0	2.5	30
08/21/03	36-0609	02:29	1.0	24.5	6.3	130	84.0	1.9	22
10/15/03	36-0685	11:39	0.9	14.4	6.7 u	125	81.0	8.3	81

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1011 Station: QA06A, Mile Point: 13.687
Description: [Gilbert Road bridge, Warren]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0193	11:22	0.5	12.4	6.6 u	104	66.2	10.4	100
05/14/03	36-0273	11:04	0.2	14.6	7.1 uc	120	78.0	10.7	106
06/18/03	36-0343	11:11	0.2	19.3	6.9 c	114	74.0	9.3	101
06/19/03	36-0373	02:29	0.2	19.5	6.9 c	109	71.0	9.2	100
07/30/03	36-0455	11:29	0.2	25.0	7.4 c	129	84.0	8.4 u	102 u
07/31/03	36-0489	02:34	0.3	24.3	7.4 c	129	84.0	8.1	97
08/20/03	36-0583	10:56	0.4	24.3	7.3 c	134	87.0	8.5	102
08/21/03	36-0610	02:55	0.3	24.3	7.3 c	130	84.0	8.2	98
10/15/03	36-0686	12:09	0.6	14.1	7.1 c	114	74.0	10.1	98

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W0491 Station: QRG, Mile Point: 10.931
Description: [east of Route 67, (near USGS flow gauging station #01176000), Palmer/Brimfield.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0292	12:00	0.7	15.3	7.4 c	133	86.0	10.7	107
06/19/03	36-0387	04:36	0.8	19.2	7.0 c	117	76.0	9.2	99
07/31/03	36-0504	03:20	0.2	23.4	7.2 uc	173	110	7.4 u	89 u
08/21/03	36-0625	03:03	0.2 i	23.5	7.2 c	167	109	7.9	93

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1015 Station: QA09A, Mile Point: 1.469
Description: [Palmer Street bridge, Palmer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0196	12:51	0.9	13.0	6.7	119	76.0	10.5 u	102 u
05/14/03	36-0276	12:12	0.3	14.0	7.0 uc	169	110	11.1	107
06/18/03	36-0346	12:16	0.3 i	18.2	6.9 c	134	87.0	9.4	99
06/19/03	36-0376	03:27	0.6	18.1	6.9 c	129	84.0	9.4	99
07/30/03	36-0458	12:50	0.2	22.6	7.2 c	185	120	9.0	104
07/31/03	36-0492	03:36	0.6	22.9	7.1 c	187	121	7.3	85
08/20/03	36-0586	11:58	0.7	22.1	7.1 c	184	120	8.6	99
08/21/03	36-0613	04:00	0.6 u	23.3	7.0 c	184	120	7.4	87
10/15/03	36-0689	13:29	0.7	13.7	6.9 c	157	102	9.4	91

DUNN BROOK (SARIS: 3626175)
Unique_ID: W1042 Station: DUN01, Mile Point: 0.681
Description: [Quaboag Street, Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0284	11:49	0.5	14.3	6.5	217	139	7.5	75
06/18/03	36-0354	11:38	0.8	17.5	6.4	133	87.0	5.3	55
06/19/03	36-0384	02:18	0.7	17.2	6.0	132	84.5	4.1 u	43 u
07/30/03	36-0467	10:51	0.9	23.2	6.7	230	149	2.6 u	31 u
07/31/03	36-0501	02:47	0.8	24.5	6.8	232	151	4.4	52
08/20/03	36-0595	10:57	0.1 i	22.7	6.7	237	154	5.0	59
08/21/03	36-0622	04:01	0.6	23.7	6.6	238	152	4.4	53
10/15/03	36-0697	11:17	0.6	12.8	6.4	197	128	5.8 u	55 u

FORGET-ME-NOT BROOK (SARIS: 3626200)
Unique_ID: W1040 Station: DB08, Mile Point: 1.522
Description: [East Brookfield Road/Donovan Road intersection (approximately 1100 feet upstream of the North Brookfield WWTP (MA0101061) discharge), North Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0282	12:27	0.1 i	13.8	6.6 u	188	120	8.9 u	88 u
06/18/03	36-0352	11:19	0.4	14.2	6.6	202	131	8.9	86
06/19/03	36-0382	03:12	## i	14.5	6.3	170	109	7.7	77
07/30/03	36-0465	10:31	0.2	22.4	6.7	231	150	5.7	65
07/31/03	36-0499	02:24	0.2	20.6	6.7	230	149	5.4	60
08/20/03	36-0593	10:37	0.1 i	22.3	6.7	261	170	6.9 u	79 u
08/21/03	36-0620	03:27	## i	21.2	6.5	266	170	5.6 u	63 u
10/15/03	36-0695	11:00	0.3	13.5	6.5	111 u	72.0 u	8.7 u	83 u

FORGET-ME-NOT BROOK (SARIS: 3626200)
Unique_ID: W1039 Station: DB07, Mile Point: 1.072
Description: [west of East Brookfield Road approximately 1300 feet downstream of North Brookfield WWTP (MA0101061) discharge, North Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0281	12:13	0.2	13.4	7.0 c	285	183	10.2	101
06/18/03	36-0351	11:08	0.4	14.4	6.9 c	244 u	158 u	10.1	99
06/19/03	36-0381	02:55	0.1 i	14.7	6.6	216	138	8.8	88
07/30/03	36-0464	10:17	0.3	20.8	7.3 c	458	298	8.3	92
07/31/03	36-0498	02:07	0.3	19.8	7.2 uc	406	264	8.2	90
08/20/03	36-0592	10:25	0.3	21.0	7.0 c	429	279	8.4	95
08/21/03	36-0619	03:15	0.2	20.6	6.9 c	413	264	7.7	87
10/15/03	36-0694	10:50	0.3	14.0	6.7	178	116	9.4 u	91 u

EAST BROOKFIELD RIVER (SARIS: 3626225)
Unique_ID: W1038 Station: EB04, Mile Point: 2.416
Description: [below all Lake Lashaway outlet structures, approximatley 100 feet downstream of Route 9 bridge, East Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0280	10:22	0.2	15.4	6.8	68.6	43.9	9.5 u	97 u
06/18/03	36-0350	10:51	0.6	20.1	7.1 c	72.0	47.0	9.4	103
06/19/03	36-0380	01:44	0.1 i	20.0	6.6 u	70.2	44.9	8.8	98
07/30/03	36-0463	10:00	1.3	25.1	7.2 c	77.0	50.0	8.0	96
07/31/03	36-0497	01:48	1.2	24.4	7.1 c	78.0	51.0	7.8	94
08/20/03	36-0591	10:05	0.2	25.7	7.2 c	79.0	52.0	8.2	100
08/21/03	36-0618	03:00	0.1 i	26.1	7.4 c	76.1	48.7	7.9	99
10/15/03	36-0693	10:33	0.6	14.6	7.0 c	77.0	50.0	9.6	94

EAST BROOKFIELD RIVER (SARIS: 3626225)
Unique_ID: W1016 Station: EB04A, Mile Point: 0.004
Description: [Shore Road, East Brookfield]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0285	10:46	1.6	13.7	6.4	127	81.0	8.2	81
06/18/03	36-0355	10:31	0.9 u	18.5	6.3	119	77.0	5.2	55
06/19/03	36-0385	02:04	0.3	18.6	6.0 u	122	78.3	5.6	61
07/30/03	36-0468	11:07	1.8	23.0	6.3	145	94.0	1.7	20
07/31/03	36-0502	03:07	1.9	23.6	6.3	148	96.0	1.7	20
08/20/03	36-0596	11:11	0.3 u	23.0	6.3 u	144	94.0	2.3 u	26 u
08/21/03	36-0623	04:15	1.3	23.4	6.0 u	148	94.7	1.5	18
10/15/03	36-0698	11:34	0.9	13.5	6.6	144	93.0	8.0	77

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W0490 Station: SMG, Mile Point: 5.866
Description: [Cooney Road at USGS flow gauging station #01175670, Spencer.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0286	08:29	0.2 i	12.7	6.7	87.0	57.0	10.2	97
06/19/03	36-0386	05:16	0.2	17.5	6.6	86.0	56.0	8.6	90
07/31/03	36-0503	04:04	## i	21.4	6.7	102	65.5	7.3 u	83 u
08/21/03	36-0624	03:46	## i	22.3	6.8	98.0	64.0	7.6	87

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W1036 Station: SM01, Mile Point: 2.857
Description: [approximately 200 feet upstream of Route 9 (West Main Street) bridge, Spencer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0278	09:34	## i	12.7	6.1 u	150	95.7	6.7 u	65 u
06/18/03	36-0348	09:49	0.3	17.5	6.3	139	90.0	5.0	53
06/19/03	36-0378	01:08	0.1 i	17.8	6.0	135	86.5	4.3	45
07/30/03	36-0461	09:25	0.5	20.9	6.4	162	106	3.4	38
07/31/03	36-0495	01:11	1.5	22.8	6.4	170	111	4.4	51
08/20/03	36-0589	09:24	0.1 ui	20.3	6.3	153	99.0	3.1 u	35 u
08/21/03	36-0616	02:27	0.2	22.7	6.1	153	98.0	3.0	35
10/15/03	36-0691	10:04	0.5	12.8	6.3	134	87.0	5.3 u	50 u

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W1037 Station: SM02, Mile Point: 2.301
Description: [Route 49 (Podunk Pike) bridge, Spencer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0279	09:58	0.3	12.9	6.3	153	98.0	7.9	77
06/18/03	36-0349	10:07	0.7	17.3	6.4	144	94.0	6.2	65
06/19/03	36-0379	01:24	0.7	17.8	6.0	140	89.6	5.3	56
07/30/03	36-0462	09:40	0.5	20.8	6.6	179	116	5.9	66
07/31/03	36-0496	01:26	0.7	22.0	6.6	190	123	5.6	64
08/20/03	36-0590	09:42	0.1 i	20.4	6.5	168	109	5.5	61
08/21/03	36-0617	02:42	0.5	22.4	6.3	176	112	4.8	57
10/15/03	36-0692	10:17	0.4 u	12.8	6.4	149	97.0	6.7 u	64 u

CRANBERRY RIVER (SARIS: 3626300)
Unique_ID: W1035 Station: CRN01, Mile Point: 0.252
Description: [South Spencer Road, Spencer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0277	08:56	0.1 i	13.2	6.3 u	103	66.0	7.8	76
06/18/03	36-0347	09:31	0.5	17.6	6.4	95.0	62.0	5.9	62
06/19/03	36-0377	00:49	0.3	18.5	6.2	95.3	61.0	4.9	53
07/30/03	36-0460	09:08	0.4	21.8	6.6	118	77.0	5.6	63
07/31/03	36-0494	00:55	0.4	23.1	6.5	118	77.0	5.0	58
08/20/03	36-0588	09:08	0.2 u	21.2	6.5 u	124	80.0	5.5	62
08/21/03	36-0615	02:14	0.3	23.0	6.3	115	73.6	4.7	56
10/15/03	36-0690	09:50	0.5	13.5	6.4 u	98.0	64.0	7.6	72

WARE RIVER (SARIS: 3626500)
Unique_ID: W0494 Station: CBG, Mile Point: 30.472
Description: [south of Route 122 at weir downstream of Shaft #8 water supply intake, Barre.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0287	09:11	0.7	12.5	6.2	92.0	60.0	10.1	95
06/19/03	36-0390	00:41	0.3	17.7	6.2	94.0	61.0	8.6	90
07/31/03	36-0507	00:57	0.3	22.6	6.3	105	67.3	7.2	85
08/21/03	36-0628	00:59	0.5 i	23.4	6.2 u	118	76.0	8.2	96

WARE RIVER (SARIS: 3626500)
Unique_ID: W1006 Station: WAWV, Mile Point: 29.645
Description: [approximately 150 feet upstream of Vernon Avenue, Barre]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0207	10:55	0.7	11.3	5.6	89.8	57.5	9.8	92
05/14/03	36-0288	09:31	0.8	12.9	6.2	93.0	61.0	10.1	96
06/18/03	36-0328	10:39	0.6	18.6	5.8	92.9	59.5	8.1	88
06/19/03	36-0391	00:55	0.8	18.2	6.2	95.0	61.0	8.6	91
07/30/03	SM-0798	10:45	0.8	23.5	6.7	113	72.1	8.1	96
07/31/03	36-0508	01:18	0.1 i	23.3	6.7	120	76.8	7.9	94
08/20/03	SM-0814	09:42	0.6	22.8	6.1	114	73.0	7.6 u	89 u
08/21/03	36-0629	01:13	0.3 i	23.9	6.6	116	76.0	8.2	97
10/22/03	SM-0857	10:42	0.9	8.4	6.4	92.0	60.0	12.5	106

WARE RIVER (SARIS: 3626500)
Unique_ID: W1007 Station: WAIR, Mile Point: 24.523
Description: [between the confluence of Pine Hill Brook and Broadmeadow Brook, Hardwick]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0189	08:58	0.7	10.3	5.9	107	68.3	9.7	89
05/14/03	36-0269	08:41	0.3	12.6	6.2	108	71.0	9.4	88
06/18/03	36-0339	09:03	0.3 u	17.9	6.2	102	66.0	7.9	83
06/19/03	36-0369	00:53	0.3	17.9	6.3	107	69.0	8.3	87
07/30/03	36-0451	09:04	0.2 u	23.7	6.6	154	100	6.9	82
07/31/03	36-0485	01:00	0.4 u	25.0	6.9 c	154	100	8.5	103
08/20/03	36-0579	09:06	0.7	22.4	6.2	122	79.0	6.5	75
08/21/03	36-0606	01:00	0.2 u	23.8	6.3	123	80.0	6.6	78
10/15/03	36-0682	10:00	0.3 u	12.0	6.1	115	75.0	8.9	83

WARE RIVER (SARIS: 3626500)
Unique_ID: W1008 Station: WAX, Mile Point: 20.194
Description: [Creamery Road/Unitas Road, Hardwick/New Braintree]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0190	09:35	1.9	11.1	6.1	104	66.5	10.3	96
05/14/03	36-0270	09:24	1.2	13.1	6.4	107	69.0	10.5	100
06/18/03	36-0340	09:50	0.4 u	17.9	6.4	104	68.0	8.8	93
06/19/03	36-0370	01:16	0.4	17.7	6.4	101	66.0	8.7	91
07/30/03	36-0452	09:52	0.6	21.2	6.7	145	94.0	7.9	89
07/31/03	36-0486	01:23	0.4	22.8	6.8	147	95.0	7.2	84
08/20/03	36-0580	09:31	1.4	22.0	6.4	118	76.0	7.7	88
08/21/03	36-0607	01:30	0.9	22.1	6.4	120	78.0	7.5	86
10/15/03	36-0683	10:37	0.8	12.7	6.4	109	71.0	9.4	89

WARE RIVER (SARIS: 3626500)
Unique_ID: W1009 Station: WA06A, Mile Point: 14.951
Description: [Upper Church Street, Ware]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0191	10:09	0.7	11.7	6.4	107	68.3	10.4	98
05/14/03	36-0271	09:56	0.2	13.0	6.8	109	71.0	11.1	106
06/18/03	36-0341	10:16	0.2 u	17.5	6.7 u	104	68.0	9.4	98
06/19/03	36-0371	01:40	0.2	17.4	6.7	103	67.0	9.3	97
07/30/03	36-0453	10:22	0.2 u	21.8	7.3 uc	143	93.0	9.2 u	104 u
07/31/03	36-0487	01:44	0.5	22.8	7.1 c	149	97.0	7.8	91
08/20/03	36-0581	09:58	0.7	21.3	6.8	99.0	64.0	8.8	100
08/21/03	36-0608	01:57	0.6	23.2	6.8	121	79.0	7.9	92
10/15/03	36-0684	11:05	0.5	12.9	6.9 u	120	78.0	10.2	97

WARE RIVER (SARIS: 3626500)
Unique_ID: W0492 Station: WA09A, Mile Point: 8.559
Description: [Route 32 at Gibbs Crossing, Ware.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0291	11:16	0.4	14.1	6.8	104	68.0	10.5	102
06/19/03	36-0388	04:10	0.5	17.7	6.6 u	107	69.0	9.0 u	94 u
07/31/03	36-0505	02:48	0.2	23.8	6.8 u	144	92.4	6.9 u	83 u
08/21/03	36-0626	02:37	## i	22.5	6.7	126	82.0	7.4	85

WARE RIVER (SARIS: 3626500)
Unique_ID: W1014 Station: WA12, Mile Point: 1.321
Description: [Route 181, Palmer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0195	12:24	0.5	12.8	6.6	107	68.3	10.1 u	97 u
05/14/03	36-0275	11:52	0.2	14.1	6.8	108	70.0	10.5	102
06/18/03	36-0345	11:56	0.2 u	18.4	6.7	106	69.0	9.1	97
06/19/03	36-0375	03:09	0.2	18.3	6.7	106	69.0	9.4	100
07/30/03	36-0457	12:23	0.2	25.0	7.3 c	139	90.0	8.4	101
07/31/03	36-0491	03:19	0.4	23.4	7.2 c	141	92.0	7.7	90
08/20/03	36-0585	11:40	0.6	24.2	6.8	119	78.0	8.1	97
08/21/03	36-0612	03:44	0.5	23.2	6.9 c	123	80.0	8.0	94
10/15/03	36-0688	13:02	0.3	13.8	7.0 uc	121	79.0	10.4	100

SWIFT RIVER (SARIS: 3626525)
Unique_ID: W0493 Station: SRG, Mile Point: 8.191
Description: [at USGS flow gauging station #01175500 west of River Road, Ware/Belchertown.]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
05/14/03	36-0289	10:30	0.5	8.3	6.6	56.0	36.0	12.5	106
06/19/03	36-0389	01:43	0.5	10.5	6.5	67.0	44.0	11.3 u	101 u
07/31/03	36-0506	02:03	0.3	11.1	6.5	41.9	26.8	10.8 u	99 u
08/21/03	36-0627	02:00	0.1 i	11.4	6.5 u	49.0	32.0	10.9	100

SWIFT RIVER (SARIS: 3626525)
Unique_ID: W1012 Station: SR03, Mile Point: 6.057
Description: [Cold Spring Road/Old Belchertown Road, Belchertown/Ware (bridge under repair in 2003)]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0206	12:42	0.9	8.9	6.2	62.1	39.9	9.5	84
05/14/03	36-0290	10:52	0.8	9.7	6.4	63.0	41.0	10.3 u	91 u
06/18/03	36-0329	12:03	1.7	12.0	5.9	58.8	37.6	8.7	82
06/19/03	36-0392	02:01	1.7	11.2	6.5 u	61.0	40.0	11.1	101
07/30/03	SM-0800	12:09	0.6	13.3 u	6.3	50.7	32.4	9.2	89
07/31/03	36-0509	02:24	0.4	12.2 u	6.4	43.5	27.9	9.7 u	91 u
08/20/03	SM-0816	11:03	0.4	14.6	6.1	53.2	34.1	8.2	82
08/21/03	36-0630	02:16	## i	14.5	6.6	53.0	34.0	11.1	108
10/22/03	SM-0859	12:07	1.0	11.0	6.3	57.0	37.0	9.2	83

SWIFT RIVER (SARIS: 3626525)
Unique_ID: W1013 Station: SR02, Mile Point: 3.191
Description: [Route 181, Belchertown/Palmer]

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
04/16/03	36-0194	11:57	0.4	11.9	6.7 u	64.1	41.1	10.7	101
05/14/03	36-0274	11:33	0.2	13.2	6.9 c	63.0	41.0	11.1	105
06/18/03	36-0344	11:37	0.3	16.2	6.9 c	66.0	43.0	10.0	102
06/19/03	36-0374	02:54	0.2	15.6	6.8	66.0	43.0	10.1	101
07/30/03	36-0456	12:03	0.2	19.5	7.0 c	57.0	37.0	9.4	103
07/31/03	36-0490	03:02	0.5	17.9	6.9 uc	56.0	36.0	9.7	102
08/20/03	36-0584	11:23	0.3	18.9	6.9 c	58.0	37.0	9.5	102
08/21/03	36-0611	03:24	0.5	19.3	6.9 c	59.0	38.0	9.2	99
10/15/03	36-0687	12:40	0.3 u	13.9	6.8 u	58.0	38.0	10.2	98

" ## " = Censored data (i.e., data that have been discarded for some reason).
" c " = Greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. See Section Appendix 2 for acceptance criteria
" i " = Inaccurate readings from multiprobe likely
" m " = Method SOP not followed. (only partially implemented or not implemented at all) due to complications with sample matrix (e.g. sediment in sample, floc formation), lab error (e.g. cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, missing data or deviations from field sampling SOPs.
" u " = Unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc

Table 6. 2003 MassDEP Chicopee Watersheds Instream Bacteria and Physico/Chemical Data.
Fecal coliform, E. coli, Turbidity, Ammonia Nitrogen (NH3-N), Total Phosphorus (TP), and Total Suspended Solids (TSS) (Data qualifiers listed at the end the Table and in Appendix 1)

Unnamed Tributary
Unique_ID: W1027 Station: POOR01, Mile Point: 0.356
Description: [unnamed tributary to the Chicopee River (locally known as Poor Brook), Route 141 (East Main Street) bridge, Chicopee]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0137	36-0138	09:55	6* e	30* e	3.3*	2.2	--	0.030	5.0*
04/16/03	36-0138	36-0137	09:55	16*	12*	3.2*	2.1	--	0.029	5.5*
05/14/03	36-0212	36-0213	09:40	54*	49*	3.6*	1.3	--	0.047 j	5*
05/14/03	36-0213	36-0212	09:40	39*	38*	3.7*	1.3	--	0.042 j	5*
06/18/03	36-0297	36-0298	10:25	6100*	4200*	17*	1.4	--	0.21	38*
06/18/03	36-0298	36-0297	10:25	4400*	3100*	18*	1.4	--	0.21	41*
07/30/03	36-0402	36-0403	10:03	190*	160*	2.6*	0.48	--	0.017	2*
07/30/03	36-0403	36-0402	10:03	200*	180*	2.7*	0.57	--	0.015	3*
08/20/03	36-0522	36-0523	10:05	600* d	120*	3.1*	0.33	--	0.020	3*
08/20/03	36-0523	36-0522	10:05	300* d	200*	3.0*	0.33	--	0.019	2*
10/15/03	36-0642	36-0643	10:48	3100*	1880*	--	--	0.70*	##* b	18*
10/15/03	36-0643	36-0642	10:48	3600*	2330*	--	--	0.83*	##* b	18*

Unnamed Tributary
Unique_ID: W1026 Station: AB01, Mile Point: 0.111
Description: [unnamed tributary to the Chicopee River (locally considered part of Abbey Brook) upstream of storm drain discharge, Front Street, Chicopee]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0136	--	09:37	<2*	2*	6.2*	0.14	--	0.035	6.0*
05/14/03	36-0211	--	09:20	76*	72*	4.8*	0.20	--	0.045	6*
06/18/03	36-0296	--	09:50	140*	112*	5.3*	0.16	--	0.046	5*
07/30/03	36-0401	--	09:46	200*	30*	3.1*	0.14	--	0.079	5*
08/20/03	36-0521	--	09:45	400*	110*	3.5*	0.07	--	0.063	8*
10/15/03	36-0641	--	10:20	13500*	10000*	--	--	<0.10*	##* b	12*

Unnamed Tributary
Unique_ID: W1028 Station: COOL01, Mile Point: 0.061
Description: [unnamed tributary to the Chicopee River (an apparent diversion of Cooley Brook) at Fuller Road, approximately 1100 feet northwest of Haynes Circle, Chicopee]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0140	--	10:25	<2* e	10* e	6.9*	<0.06	--	0.030	7.5*
05/14/03	36-0215	--	10:08	17*	9*	1.6*	<0.02	--	0.042 j	4*
06/18/03	36-0300	--	10:50	270*	190*	2.6*	0.06	--	0.060	8*
07/30/03	36-0405	--	10:24	50*	10*	2.1*	0.10	--	0.037	3*
08/20/03	36-0525	--	10:30	500*	300*	1.8*	0.12	--	0.23	2*
10/15/03	36-0645	--	11:10	4700*	1100*	--	--	0.29*	##* b	<2*

Unnamed Tributary
Unique_ID: W1043 Station: QP011, Mile Point: 0.022
Description: [Lake Road/South Pond Road (culvert between Quaboag Pond and Quacumquasit Pond when flowing south to Quacumquasit Pond), Brookfield/East Brookfield]

Date	OWMID	QAQC	Time	NO3-NO2-N	TKN	TN	TP
			(24hr)	mg/L	mg/L	mg/L	mg/L
12/23/02	36-0102	--	13:45	--	--	--	0.030 h
09/24/03	LB-2539	--	13:00	<0.06 h	--	0.61 h	0.043 h

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1033 Station: CH01, Mile Point: 17.725
Description: [near the intersection of New Hampshire Avenue and Springfield Street, Palmer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0145	--	12:35	20* e	30* e	0.70*	<0.02	--	0.031	4.5*
05/14/03	36-0220	--	12:20	77*	64*	1.1*	<0.02	--	0.033	6*
06/18/03	36-0305	--	12:39	1330*	290*	1.8*	<0.02	--	0.064	9*
07/30/03	36-0410	--	12:10	310*	160*	1.7*	<0.06	--	0.051	2*
8/20/03	36-0530	--	12:24	700*	400*	1.6*	<0.02	--	0.049	2*
10/15/03	36-0650	--	12:53	1800*	1520*	--	--	<0.10*	##* b	13*

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1032 Station: CH02B, Mile Point: 12.802
Description: [Miller Street/Cottage Avenue bridge, Ludlow/Wilbraham]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0144	--	12:10	<2*	<2*	0.62*	<0.02	--	0.021	<2.0*
05/14/03	36-0219	--	11:53	26*	20*	1.0*	<0.02	--	0.032	2*
06/18/03	36-0304	--	12:17	80*	32*	1.2*	<0.02	--	0.055	4*
07/30/03	36-0409	--	11:46	100*	40*	1.9*	<0.02	--	0.040	<2*
08/20/03	36-0529	--	11:58	<10*	<10*	1.5*	<0.02	--	0.049	2*
10/15/03	36-0649	--	12:30	120* e	160* e	--	--	<0.10*	##* b	2*

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W1031 Station: CH06, Mile Point: 7.494
Description: [River Street/West Street bridge, Springfield/Ludlow]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0143	--	11:37	2* e	4* e	0.66*	<0.02	--	0.021	<2.0*
05/14/03	36-0218	--	11:05	20*	18*	0.96*	<0.02	--	0.033	3*
06/18/03	36-0303	--	11:47	248*	90*	1.2*	<0.02	--	0.056	5*
07/30/03	36-0408	--	11:22	30*	30*	1.3*	<0.02	--	0.035	2*
08/20/03	36-0528	--	11:26	100*	80*	1.4*	<0.02	--	0.045	<2*
10/15/03	36-0648	--	11:56	126*	126*	--	--	<0.10*	##* b	<2*

CHICOPEE RIVER (SARIS: 3625000)
Unique_ID: W0475 Station: CT03, Mile Point: 0.839
Description: [Route 116 bridge, Chicopee.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0135	--	09:18	8*	4*	0.75*	<0.02	--	0.024	3.0*
05/14/03	36-0210	--	08:55	26*	20*	0.98*	0.21	--	0.039	3*
06/18/03	36-0295	--	09:20	310*	190*	1.4*	<0.02	--	0.057	5*
07/30/03	36-0400	--	09:25	120*	100*	1.5*	<0.02	--	0.034	<2*
08/20/03	36-0520	--	09:25	200*	130*	1.4*	<0.02	--	0.044	<2*
10/15/03	36-0640	--	10:03	7700*	2980*	--	--	0.15*	##* b	7*

FULLER BROOK (SARIS: 3625075)
Unique_ID: W1029 Station: FULL01, Mile Point: 0.227
Description: [between Route 90 and Shawinigan Drive, Chicopee]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0141	--	10:44	20*	14*	1.3*	0.10	--	0.022	3.2*
05/14/03	36-0216	--	10:27	62*	55*	1.9*	0.20	--	0.045	4*
06/18/03	36-0301	--	11:12	2200*	450*	6.9*	0.15	--	0.088	6*
07/30/03	36-0406	--	10:40	400*	160*	6.1*	0.13	--	0.046	4*
08/20/03	36-0526	--	10:46	400*	200*	4.1*	0.14	--	0.039	2*
10/15/03	36-0646	--	11:22	5500*	1120*	--	--	<0.10*	##* b	93*

HIGHER BROOK (SARIS: 3625100)
Unique_ID: W1030 Station: FULL02, Mile Point: 0.562
Description: [West Street bridge, south of Roy Street, Ludlow (stream name change at Ludlow/Chicopee corporate boundry), natural extension of Fuller Brook.

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0142	--	11:05	10*	4*	0.66*	<0.02	--	0.020	2.0*
05/14/03	36-0217	--	10:44	71*	64*	1.3*	<0.02	--	0.037	4*
06/18/03	36-0302	--	11:36	450*	370*	2.8*	<0.02	--	0.077	6*
07/30/03	36-0407	--	11:01	400*	110*	1.8*	<0.06	--	0.037	3*
08/20/03	36-0527	--	11:08	100*	40*	1.3*	<0.02	--	0.030	<2*
10/15/03	36-0647	--	11:40	1800*	800*	--	--	<0.10*	##* b	6*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1041 Station: QA100, Mile Point: 23.956
Description: [Route 148 (Fiskdale Road), Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0098	36-0099	12:20	--	--	--	--	--	0.023 h	--
12/11/02	36-0099	36-0098	12:20	--	--	--	--	--	0.021 h	--
04/16/03	36-0163	36-0164	11:55	<2*	<2*	0.74*	<0.02	--	0.020	** *
04/16/03	36-0164	36-0163	11:55	<2*	<2*	0.75*	<0.02	--	0.016	** *
05/14/03	36-0238	36-0239	11:24	5*	1*	1.5*	## d	--	0.035 h	5*
05/14/03	36-0239	36-0238	11:24	4*	<0.9*	1.3*	## d	--	0.035 h	5*
06/18/03	36-0323	36-0324	11:55	20*	8*	1.3*	<0.02	--	0.046	4* h
06/18/03	36-0324	36-0323	11:55	20*	8*	1.4*	<0.02	--	0.048	4* h
07/30/03	36-0428	36-0429	11:30	<10*	<10*	1.8*	<0.02	--	0.046	2*
07/30/03	36-0429	36-0428	11:30	10*	<10*	1.7*	<0.02	--	0.044	2*
08/20/03	36-0556	36-0557	11:35	<10*	<10*	1.1*	<0.02	--	0.050	2*
08/20/03	36-0557	36-0556	11:35	<10*	<10*	1.3*	<0.02	--	0.047	2*
10/15/03	36-0668	36-0669	12:00	800* d	460*	--	--	<0.10*	##* bd	<2*
10/15/03	36-0669	36-0668	12:00	400* de	430* e	--	--	<0.10*	##* bd	<2*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1010 Station: QAOBO, Mile Point: 20.627
Description: [Long Hill Road bridge, West Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0151	--	10:37	<2*	<2*	0.62*	<0.02	--	0.017	3.5*
05/14/03	36-0226	--	10:30	9*	3*	1.4*	0.11	--	0.042	6*
06/18/03	36-0311	--	10:49	50*	40*	1.4*	<0.02	--	0.052	5* h
07/30/03	36-0416	--	10:53	200*	20*	1.9*	<0.02	--	0.045	3*
08/20/03	36-0536	--	10:23	410*	100*	1.5*	<0.02	--	0.048	2*
10/15/03	36-0656	--	11:31	300*	120*	--	--	<0.10*	##* b	<2*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1011 Station: QA06A, Mile Point: 13.687
Description: [Gilbert Road bridge, Warren]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0152	--	11:15	<2*	<2*	0.64*	<0.02	--	0.019	4.5*
05/14/03	36-0227	--	11:05	43*	41*	1.4*	<0.02	--	0.043	6*
06/18/03	36-0312	--	11:11	284*	182*	2.1*	<0.02	--	0.058	7* h
07/30/03	36-0417	--	11:30	200*	90*	2.3*	<0.02	--	0.045	2*
08/20/03	36-0537	--	10:52	500*	12*	1.7*	<0.02	--	0.040	<2*
10/15/03	36-0657	--	12:05	800*	690*	--	--	<0.10*	##* b	4*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W0491 Station: QRG, Mile Point: 10.931
Description: [east of Route 67, (near USGS flow gauging station #01176000), Palmer/Brimfield.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
05/14/03	36-0250	--	11:50	83*	43*	1.3*	<0.02	0.049	5*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1015 Station: QA09A, Mile Point: 1.469
Description: [Palmer Street bridge, Palmer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0155	--	12:38	10*	<2*	0.71*	<0.02	--	0.028	5.0*
05/14/03	36-0230	--	12:07	55*	50*	1.1*	<0.02	--	0.045	8*
06/18/03	36-0315	--	12:14	736*	400*	1.8*	<0.02	--	0.078	9* h
07/30/03	36-0420	--	12:46	700*	400*	1.9*	<0.02	--	0.043	2*
08/20/03	36-0540	--	11:51	700*	430*	1.6*	<0.02	--	0.049	3*
10/15/03	36-0660	--	13:25	2300*	2160*	--	--	0.10*	##* b	12*

DUNN BROOK (SARIS: 3626175)
Unique_ID: W1042 Station: DUN01, Mile Point: 0.681
Description: [Quaboag Street, Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0097	--	12:35	--	--	--	--	--	0.053 h	--
04/16/03	36-0166	--	12:10	<2* e	4* e	1.0*	<0.02	--	0.038	** *
05/14/03	36-0241	--	11:50	28*	23*	2.4*	<0.02 d	--	0.093 h	4*
06/18/03	36-0326	--	11:40	210*	160*	3.2*	<0.02	--	0.17	5* h
07/30/03	36-0431	--	10:45	70*	20*	4.7*	<0.02	--	0.17	4*
08/20/03	36-0559	--	10:55	10*	10*	6.4*	<0.02	--	0.23	7*
10/15/03	36-0671	--	11:20	1400*	960*	--	--	0.15*	##* b	8*

FORGET-ME-NOT BROOK (SARIS: 3626200)
Unique_ID: W1040 Station: DB08, Mile Point: 1.522
Description: [East Brookfield Road/Donovan Road intersection (approximately 1100 feet upstream of the North Brookfield WWTP (MA0101061) discharge), North Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0162	--	12:30	<2*	<2*	0.76*	0.10	--	0.023	** *
05/14/03	36-0237	--	12:25	81*	40*	1.5*	0.14 d	--	0.036 h	6*
06/18/03	36-0322	--	11:20	1220*	1050*	2.4*	<0.06	--	0.062	12* h
07/30/03	36-0427	--	10:30	400*	100*	11*	0.15	--	0.085	17*
08/20/03	36-0555	--	10:35	80*	30*	11*	0.16	--	0.060	10*
10/15/03	36-0667	--	11:00	6000*	4100*	--	--	0.17*	##* b	20*

FORGET-ME-NOT BROOK (SARIS: 3626200)
Unique_ID: W1039 Station: DB07, Mile Point: 1.072
Description: [west of East Brookfield Road approximately 1300 feet downstream of North Brookfield WWTP (MA0101061) discharge, North Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0161	--	12:25	96*	60*	0.60*	0.60	--	0.14	** *
05/14/03	36-0236	--	12:10	17*	16*	0.98*	<0.06 d	--	0.20 h	3*
06/18/03	36-0321	--	11:05	770*	560*	2.3*	<0.02	--	0.23	50* h
07/30/03	36-0426	--	10:13	200*	200*	2.1*	<0.02	--	0.13	3*
08/20/03	36-0554	--	10:24	100*	100*	1.5*	<0.06	--	0.16	<2*
10/15/03	36-0666	--	10:50	5200*	5100*	--	--	0.32*	##* b	17*

EAST BROOKFIELD RIVER (SARIS: 3626225)
Unique_ID: W1038 Station: EB04, Mile Point: 2.416
Description: [below all Lake Lashaway outlet structures, approximatley 100 feet downstream of Route 9 bridge, East Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0096	--	11:00	--	--	--	--	--	0.023 h	--
01/30/03	36-0107	--	11:45	--	--	--	--	--	0.013 f	--
03/04/03	36-0111	--	10:30	--	--	--	--	--	0.015 f	--
04/16/03	36-0160	--	10:22	<2*	<2*	0.87*	<0.02	--	0.018	** *
05/14/03	36-0235	--	10:20	<0.9*	<0.9*	1.1*	<0.02 d	--	0.014 h	2*
06/18/03	36-0320	--	10:50	<2*	<2*	1.3*	<0.02	--	0.025	6* h
07/30/03	36-0425	--	09:55	100*	70*	3.4*	<0.02	--	0.022	4*
08/20/03	36-0553	--	10:03	90*	30*	4.7*	<0.02	--	0.018	5*
10/15/03	36-0665	--	10:35	100*	90*	--	--	0.38*	##* b	6*
11/25/03	36-0704	--	11:20	--	--	--	--	--	0.031 fh	--

EAST BROOKFIELD RIVER (SARIS: 3626225)
Unique_ID: W1016 Station: EB04A, Mile Point: 0.004
Description: [Shore Road, East Brookfield]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0101	--	11:20	--	--	--	--	--	0.021 h	--
01/30/03	36-0108	--	13:00	--	--	--	--	--	0.017 f	--
03/04/03	36-0109	--	10:45	--	--	--	--	--	0.016 f	--
04/16/03	36-0167	--	11:10	<2*	<2*	0.56*	<0.02	--	0.014	** *
05/14/03	36-0242	--	10:48	19*	18*	1.3*	<0.02 d	--	0.024 h	3*
06/18/03	36-0327	--	10:30	30*	8*	1.9*	<0.02	--	0.036	4* h
07/30/03	36-0432	--	11:05	10*	<10*	2.9*	<0.02	--	0.042	3*
08/20/03	36-0560	--	11:10	100*	10*	3.4*	<0.02	--	0.039	<2*
10/15/03	36-0672	--	11:35	152*	100*	--	--	<0.10*	##* b	17*
11/25/03	36-0705	--	11:40	--	--	--	--	--	0.021 fh	--

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W0490 Station: SMG, Mile Point: 5.866
Description: [Cooney Road at USGS flow gauging station #01175670, Spencer.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
12/11/02	36-0090	--	09:20	--	--	--	--	0.009 h	--
05/14/03	36-0243	--	08:30	11*	10*	0.77*	<0.02	0.017	2*

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W1036 Station: SM01, Mile Point: 2.857
Description: [approximately 200 feet upstream of Route 9 (West Main Street) bridge, Spencer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0091	--	09:40	--	--	--	--	--	0.013 h	--
01/30/03	36-0103	--	11:00	--	--	--	--	--	0.011 f	--
03/04/03	36-0113	--	10:00	--	--	--	--	--	0.014 f	--
04/16/03	36-0158	--	09:25	<2*	<2*	0.52*	<0.02	--	0.011	** *
05/14/03	36-0233	--	09:36	17*	12*	1.2*	<0.06 d	--	0.019 h	2*
06/18/03	36-0318	--	09:50	170*	148*	2.3*	<0.02	--	0.039	3* h
07/30/03	36-0423	--	09:15	100*	60*	5.7*	<0.06	--	0.038	6*
08/20/03	36-0551	--	09:22	200*	90*	6.8*	<0.02	--	0.037	6*
10/15/03	36-0663	--	10:00	1000*	1000*	--	--	0.25*	##* b	9*
11/25/03	36-0702	--	10:55	--	--	--	--	--	0.025 fh	--

SEVENMILE RIVER (SARIS: 3626275)
Unique_ID: W1037 Station: SM02, Mile Point: 2.301
Description: [Route 49 (Podunk Pike) bridge, Spencer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0092	--	10:25	--	--	--	--	--	0.019 h	--
01/30/03	36-0106	--	11:15	--	--	--	--	--	0.015 f	--
03/04/03	36-0110	--	10:15	--	--	--	--	--	0.019 f	--
04/16/03	36-0159	--	09:46	<2*	<2*	0.44*	<0.02	--	0.017	** *
05/14/03	36-0234	--	10:00	33*	21*	1.2*	<0.02 d	--	0.022 h	3*
06/18/03	36-0319	--	10:05	1100*	74*	2.9*	<0.02	--	0.047	5* h
07/30/03	36-0424	--	09:40	100*	80*	4.1*	<0.02	--	0.037	4*
08/20/03	36-0552	--	09:41	100*	50*	5.1*	<0.02	--	0.039	6*
10/15/03	36-0664	--	10:15	700*	440*	--	--	0.13*	##* b	14*
11/25/03	36-0703	--	11:07	--	--	--	--	--	0.025 fh	--

CRANBERRY RIVER (SARIS: 3626300)
Unique_ID: W1035 Station: CRN01, Mile Point: 0.252
Description: [South Spencer Road, Spencer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0094	--	10:15	--	--	--	--	--	0.019 h	--
01/30/03	36-0105	--	10:30	--	--	--	--	--	0.011 f	--
03/04/03	36-0112	--	09:50	--	--	--	--	--	0.013 f	--
04/16/03	36-0157	--	08:35	<2*	<2*	0.76*	<0.02	--	0.021	** *
05/14/03	36-0232	--	08:56	86*	66*	1.2*	0.10 d	--	0.026	4*
06/18/03	36-0317	--	09:30	56*	30*	1.5*	<0.02	--	0.030	3* h
07/30/03	36-0422	--	09:04	100*	100*	2.8*	<0.02	--	0.035	4*
08/20/03	36-0550	--	09:08	300*	120*	2.3*	<0.02	--	0.030	4*
10/15/03	36-0662	--	09:50	500*	480*	--	--	<0.10*	##* b	4*
11/25/03	36-0701	--	09:55	--	--	--	--	--	0.014 fh	--

Pipe/Discharge to CRANBERRY RIVER (SARIS: 3626300)
Unique_ID: W1034 Station: MA0100919, Mile Point: 0.125
Description: [Spencer WWTP final effluent channel, Spencer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0093	--	10:00	--	--	--	--	--	0.016 h	--
01/30/03	36-0104	--	10:45	--	--	--	--	--	0.15 f	--
03/04/03	36-0114	--	09:45	--	--	--	--	--	0.12 f	--
04/16/03	36-0156	--	09:00	40*	22*	0.24*	0.12	--	0.18 h	<2.0*
05/14/03	36-0231	--	09:16	171*	108*	0.42*	0.18 d	--	0.32	<2*
06/18/03	36-0316	--	09:15	<2*	<2*	0.28*	0.10	--	0.21	<2* h
07/30/03	36-0421	--	09:00	<10*	<10*	0.47*	0.09	--	0.24	<2*
08/20/03	36-0549	--	09:00	<10*	<10*	0.24*	0.07	--	0.23	<2*
10/15/03	36-0661	--	09:45	<2*	<2*	--	--	<0.10*	##* b	<2*
11/25/03	36-0700	--	10:20	--	--	--	--	--	0.20 fh	--

WARE RIVER (SARIS: 3626500)
Unique_ID: W0494 Station: CBG, Mile Point: 30.472
Description: [south of Route 122 at weir downstream of Shaft #8 water supply intake, Barre.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
05/14/03	36-0244	--	09:15	15*	13*	0.85*	<0.02	0.020	2*

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WARE RIVER (SARIS: 3626500)
Unique_ID: W1006 Station: WAWV, Mile Point: 29.645
Description: [approximately 150 feet upstream of Vernon Avenue, Barre]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	Turb	Chloride	Alk	Hard	NH3-N	NH3-N	NO3-NO2-N	TKN	TN	TP	TSS	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0169	--	11:00	<2*	<2*	0.51*	--	--	--	--	<0.02	--	--	--	--	0.012	--	** *
05/14/03	36-0245	--	09:30	14*	10*	0.91*	--	--	--	--	0.12	--	--	--	--	0.024	--	3*
06/18/03	36-0328	--	10:35	40*	20*	1.4*	--	--	--	--	<0.02	--	--	--	--	0.031	--	3* h
07/30/03	SM-0798	--	10:35	20*	10*	--	5.5	22	5	14	<0.02	--	<0.06	0.57	--	0.053	3.2	--
08/20/03	SM-0814	--	09:40	100*	70*	--	3.7	23	5	14	<0.02	--	<0.06	0.69	--	0.042	9.3	--
10/22/03	SM-0857	--	10:35	--	--	--	2.4*	--	--	--	--	<0.01 h	<0.02 h	--	0.21 h	0.022 h	--	--

WARE RIVER (SARIS: 3626500)
Unique_ID: W1007 Station: WAIR, Mile Point: 24.523
Description: [between the confluence of Pine Hill Brook and Broadmeadow Brook, Hardwick]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0146	36-0147	08:45	<2*	2*	0.60*	<0.02	--	0.018	2.0*
04/16/03	36-0147	36-0146	08:45	2* e	8* e	0.58*	<0.02	--	0.015	<2.0*
05/14/03	36-0221	36-0222	08:33	64*	64*	1.1*	<0.02	--	0.033	6*
05/14/03	36-0222	36-0221	08:33	84*	73*	1.1*	<0.02	--	0.036	4*
06/18/03	36-0306	36-0307	09:13	40*	32*	1.7*	<0.06	--	0.044	7* h
06/18/03	36-0307	36-0306	09:13	46*	20*	1.6*	<0.02	--	0.049	5* h
07/30/03	36-0411	36-0412	09:17	300* d	100*	4.2*	0.12	--	0.10	9*
07/30/03	36-0412	36-0411	09:17	110* d	100*	4.2*	0.12	--	0.095	10*
08/20/03	36-0531	36-0532	09:00	400*	200*	2.1*	<0.06	--	0.051	6*
08/20/03	36-0532	36-0531	09:00	300*	100*	2.0*	<0.06	--	0.051	4*
10/15/03	36-0651	36-0652	10:00	156*	140*	--	--	<0.10*	##* bd	2*
10/15/03	36-0652	36-0651	10:00	200*	102*	--	--	<0.10*	##* bd	2*

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WARE RIVER (SARIS: 3626500)
Unique_ID: W1008 Station: WAX, Mile Point: 20.194
Description: [Creamery Road/Unitas Road, Hardwick/New Braintree]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0149	--	09:31	8*	2*	0.55*	<0.02	--	0.020	2.5*
05/14/03	36-0224	--	09:35	75*	68*	1.0*	<0.02	--	0.035	4*
06/18/03	36-0309	--	09:50	150*	90*	1.4*	<0.02	--	0.053	4* h
07/30/03	36-0414	--	09:54	600*	230*	3.7*	<0.02	--	0.050	3*
08/20/03	36-0534	--	09:29	130* e	200* e	2.1*	<0.02	--	0.045	4*
10/15/03	36-0654	--	10:29	1200*	880*	--	--	<0.10*	##* b	6*

WARE RIVER (SARIS: 3626500)
Unique_ID: W1009 Station: WA06A, Mile Point: 14.951
Description: [Upper Church Street, Ware]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0150	--	10:00	4*	2*	0.62*	<0.02	--	0.028	3.5*
05/14/03	36-0225	--	09:59	134*	101*	1.1*	<0.02	--	0.037	4*
06/18/03	36-0310	--	10:14	300*	152*	1.5*	<0.02	--	0.053	6* h
07/30/03	36-0415	--	10:23	400*	310*	3.0*	<0.02	--	0.049	2*
08/20/03	36-0535	--	09:52	1300*	1100*	2.1*	<0.02	--	0.057	3*
10/15/03	36-0655	--	11:00	3700*	830*	--	--	<0.10*	##* b	6*

WARE RIVER (SARIS: 3626500)
Unique_ID: W0492 Station: WA09A, Mile Point: 8.559
Description: [Route 32 at Gibbs Crossing, Ware.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
05/14/03	36-0248	36-0249	11:15	54*	42*	1.1*	0.06	0.033	4*
05/14/03	36-0249	36-0248	11:15	98*	72*	1.1*	<0.06	0.031	4*

WARE RIVER (SARIS: 3626500)
Unique_ID: W1014 Station: WA12, Mile Point: 1.321
Description: [Route 181, Palmer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0154	--	12:16	2*	2*	0.60*	<0.02	--	0.018	2.5*
05/14/03	36-0229	--	11:50	93*	74*	1.1*	<0.06	--	0.044	4*
06/18/03	36-0314	--	11:57	80*	66*	1.4*	0.06	--	0.055	5* h
07/30/03	36-0419	--	12:25	480*	180*	2.4*	<0.02	--	0.050	5*
08/20/03	36-0539	--	11:37	510*	100*	1.6*	<0.02	--	0.043	2*
10/15/03	36-0659	--	12:56	300*	90*	--	--	<0.10*	##* b	<2*

SWIFT RIVER (SARIS: 3626525)
Unique_ID: W0493 Station: SRG, Mile Point: 8.191
Description: [at USGS flow gauging station #01175500 west of River Road, Ware/Belchertown.]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
05/14/03	36-0246	--	10:30	<0.9*	<0.9*	0.28*	<0.02	0.008	<2*

SWIFT RIVER (SARIS: 3626525)
Unique_ID: W1013 Station: SR02, Mile Point: 3.191
Description: [Route 181, Belchertown/Palmer]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0153	--	11:46	<2*	2*	0.37*	<0.02	--	0.023	<2.0*
05/14/03	36-0228	--	11:30	65*	46*	0.62*	<0.02	--	0.032	<2*
06/18/03	36-0313	--	11:35	64*	56*	0.65*	<0.02	--	0.033	<2* h
07/30/03	36-0418	--	12:00	140*	120*	0.63*	<0.02	--	0.025	<2*
08/20/03	36-0538	--	11:18	40*	30*	0.41*	<0.02	--	0.022	<2*
10/15/03	36-0658	--	12:32	94*	90*	--	--	<0.10*	##* b	<2*

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SWIFT RIVER (SARIS: 3626525)
Unique_ID: W1012 Station: SR03, Mile Point: 6.057
Description: [Cold Spring Road/Old Belchertown Road, Belchertown/Ware (bridge under repair in 2003)]

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	Turb	Chloride	Alk	Hard	NH3-N	NH3-N	NO3-NO2-N	TKN	TN	TP	TSS	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0168	--	12:35	<2*	2*	0.29*	--	--	--	--	<0.02	--	--	--	--	0.034	--	** *
05/14/03	36-0247	--	10:50	2*	1*	0.38*	--	--	--	--	<0.06	--	--	--	--	0.26	--	<2*
06/18/03	36-0329	--	12:05	80*	80*	0.52*	--	--	--	--	0.07	--	--	--	--	0.026	--	<2* h
07/30/03	SM-0800	--	12:05	100*	30*	--	0.89	6	3	10	0.15	--	<0.06	0.27	--	0.032	<1.0	--
08/20/03	SM-0816	--	11:00	<10*	<10*	--	0.68	6	5	11	0.07	--	<0.06	0.31	--	0.021	<1.0	--
10/22/03	SM-0859	--	12:05	--	--	--	0.5*	--	--	--	--	0.04 h	0.08 h	--	0.18 h	0.013 h	--	--

" ## " = Censored data (i.e., data that has been discarded for some reason)
" * " = Analysis performed by Laboratory other than DEP's Wall Experiment Station (WES)
" -- " = No data (i.e., data not taken/not required)
" a " = Accuracy as estimated at WES Lab via matrix spikes, PT sample recoveries, internal check standards and lab-fortified blanks did not meet project data quality objectives identified for program or in QAPP
" d " = Precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected
" e " = Not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria and for other incongruous or conflicting results
" f " = Frequency of quality control duplicates did not meet data quality objectives identified for program or in QAPP
" j " = Used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the 'reporting' limit or RDL and greater than the method detection limit or MDL (mdl< *x* <rdl). Also used to note where values have been reported at levels less than the mdl. Denotes an 'estimated' value' when used as a qualifier only (i.e., not censored). When solely used for censored data, it denotes censure at the lab
" h " = Holding time violation (usually indicating possible bias low)
" m " = Method SOP not followed (only partially implemented or not implemented at all) due to complications with sample matrix (e.g. sediment in sample, floc formation), lab error (e.g. cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, missing data or deviations from field sampling SOPs
" r " = Samples collected may not be representative of actual field conditions, based on documented or suspected field sampling error, or inexplicable or improbable ("outliers") values

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Table 7. 2003 MassDEP Chicopee Watersheds Quality Control Data - Duplicates
(Data qualifiers listed in Appendix 1)

Unnamed Tributary
Unique_ID: W1027 Station: POOR01, Mile Point: 0.356
Description: [unnamed tributary to the Chicopee River (locally known as Poor Brook), Route 141 (East Main Street) bridge, Chicopee]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0137	36-0138	09:55	0.778* e	1.477* e	3.3*	2.2	--	0.030	5.0*
04/16/03	36-0138	36-0137	09:55	1.204*	1.079*	3.2*	2.1	--	0.029	5.5*
Relative	*Percent*	*Difference*		*43.0%*	*31.1%*	*3.1%*	*4.7%*	--	*3.4%*	*9.5%*
05/14/03	36-0212	36-0213	09:40	1.732*	1.690*	3.6*	1.3	--	0.047 j	5*
05/14/03	36-0213	36-0212	09:40	1.591*	1.580*	3.7*	1.3	--	0.042 j	5*
Relative	*Percent*	*Difference*		*8.5%*	*6.8%*	*2.7%*	*0.0%*	--	*11.2%*	*0.0%*
06/18/03	36-0297	36-0298	10:25	3.785*	3.623*	17*	1.4	--	0.21	38*
06/18/03	36-0298	36-0297	10:25	3.643*	3.491*	18*	1.4	--	0.21	41*
Relative	*Percent*	*Difference*		*3.8%*	*3.7%*	*5.7%*	*0.0%*	--	*0.0%*	*7.6%*
07/30/03	36-0402	36-0403	10:03	2.279*	2.204*	2.6*	0.48	--	0.017	2*
07/30/03	36-0403	36-0402	10:03	2.301*	2.255*	2.7*	0.57	--	0.015	3*
Relative	*Percent*	*Difference*		*1.0%*	*2.3%*	*3.8%*	*17.1%*	--	*12.5%*	*40.0%*
08/20/03	36-0522	36-0523	10:05	2.778* d	2.079*	3.1*	0.33	--	0.020	3*
08/20/03	36-0523	36-0522	10:05	2.477* d	2.301*	3.0*	0.33	--	0.019	2*
Relative	*Percent*	*Difference*		*11.5%*	*10.1%*	*3.3%*	*0.0%*	--	*5.1%*	*40.0%*
10/15/03	36-0642	36-0643	10:48	3.491*	3.274*	--	--	0.70*	##* b	18*
10/15/03	36-0643	36-0642	10:48	3.556*	3.367*	--	--	0.83*	##* b	18*
Relative	*Percent*	*Difference*		*1.8%*	*2.8%*	--	--	*17.0%*	--	*0.0%*

QUABOAG RIVER (SARIS: 3625450)
Unique_ID: W1041 Station: QA100, Mile Point: 23.956
Description: [Route 148 (Fiskdale Road), Brookfield]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0098	36-0099	12:20	--	--	--	--	--	0.023 h	--
12/11/02	36-0099	36-0098	12:20	--	--	--	--	--	0.021 h	--
Relative	*Percent*	*Difference*			--	--	--	--	*9.1%*	--
04/16/03	36-0163	36-0164	11:55	0.301*	0.301*	0.74*	<0.02	--	0.020	** *
04/16/03	36-0164	36-0163	11:55	0.301*	0.301*	0.75*	<0.02	--	0.016	** *
Relative	*Percent*	*Difference*		*0.0%*	*0.0%*	*1.3%*	*0.0%*	--	*22.2%*	--
05/14/03	36-0238	36-0239	11:24	0.699*	0.000*	1.5*	## d	--	0.035 h	5*
05/14/03	36-0239	36-0238	11:24	0.602*	-0.046*	1.3*	## d	--	0.035 h	5*
Relative	*Percent*	*Difference*		*14.9%*	*-200.0%*	*14.3%*	--	--	*0.0%*	*0.0%*
06/18/03	36-0323	36-0324	11:55	1.301*	0.903*	1.3*	<0.02	--	0.046	4* h
06/18/03	36-0324	36-0323	11:55	1.301*	0.903*	1.4*	<0.02	--	0.048	4* h
Relative	*Percent*	*Difference*		*0.0%*	*0.0%*	*7.4%*	*0.0%*	--	*4.3%*	*0.0%*
07/30/03	36-0428	36-0429	11:30	1.000*	1.000*	1.8*	<0.02	--	0.046	2*
07/30/03	36-0429	36-0428	11:30	1.000*	1.000*	1.7*	<0.02	--	0.044	2*
Relative	*Percent*	*Difference*		*0.0%*	*0.0%*	*5.7%*	*0.0%*	--	*4.4%*	*0.0%*
08/20/03	36-0556	36-0557	11:35	1.000*	1.000*	1.1*	<0.02	--	0.050	2*
08/20/03	36-0557	36-0556	11:35	1.000*	1.000*	1.3*	<0.02	--	0.047	2*
Relative	*Percent*	*Difference*		*0.0%*	*0.0%*	*16.7%*	*0.0%*	--	*6.2%*	*0.0%*
10/15/03	36-0668	36-0669	12:00	2.903* d	2.663*	--	--	<0.10*	##* bd	<2*
10/15/03	36-0669	36-0668	12:00	2.602* de	2.633* e	--	--	<0.10*	##* bd	<2*
Relative	*Percent*	*Difference*		*10.9%*	*1.1%*	--	--	*0.0%*	--	*0.0%*

WARE RIVER (SARIS: 3626500)
Unique_ID: W1007 Station: WAIR, Mile Point: 24.523
Description: [between the confluence of Pine Hill Brook and Broadmeadow Brook, Hardwick]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
04/16/03	36-0146	36-0147	08:45	0.301*	0.301*	0.60*	<0.02	--	0.018	2.0*
04/16/03	36-0147	36-0146	08:45	0.301* e	0.903* e	0.58*	<0.02	--	0.015	<2.0*
Relative	*Percent*	*Difference*		*0.0%*	*100.0%*	*3.4%*	*0.0%*	--	*18.2%*	*0.0%*
05/14/03	36-0221	36-0222	08:33	1.806*	1.806*	1.1*	<0.02	--	0.033	6*
05/14/03	36-0222	36-0221	08:33	1.924*	1.863*	1.1*	<0.02	--	0.036	4*
Relative	*Percent*	*Difference*		*6.3%*	*3.1%*	*0.0%*	*0.0%*	--	*8.7%*	*40.0%*
06/18/03	36-0306	36-0307	09:13	1.602*	1.505*	1.7*	<0.06	--	0.044	7* h
06/18/03	36-0307	36-0306	09:13	1.663*	1.301*	1.6*	<0.02	--	0.049	5* h
Relative	*Percent*	*Difference*		*3.7%*	*14.5%*	*6.1%*	*100.0%*	--	*10.8%*	*33.3%*
07/30/03	36-0411	36-0412	09:17	2.477* d	2.000*	4.2*	0.12	--	0.10	9*
07/30/03	36-0412	36-0411	09:17	2.041* d	2.000*	4.2*	0.12	--	0.095	10*
Relative	*Percent*	*Difference*		*19.3%*	*0.0%*	*0.0%*	*0.0%*	--	*5.1%*	*10.5%*
08/20/03	36-0531	36-0532	09:00	2.602*	2.301*	2.1*	<0.06	--	0.051	6*
08/20/03	36-0532	36-0531	09:00	2.477*	2.000*	2.0*	<0.06	--	0.051	4*
Relative	*Percent*	*Difference*		*4.9%*	*14.0%*	*4.9%*	*0.0%*	--	*0.0%*	*40.0%*
10/15/03	36-0651	36-0652	10:00	2.193*	2.146*	--	--	<0.10*	##* bd	2*
10/15/03	36-0652	36-0651	10:00	2.301*	2.009*	--	--	<0.10*	##* bd	2*
Relative	*Percent*	*Difference*		*4.8%*	*6.6%*	--	--	*0.0%*	--	*0.0%*

WARE RIVER (SARIS: 3626500)
Unique_ID: W0492 Station: WA09A, Mile Point: 8.559
Description: [Route 32 at Gibbs Crossing, Ware.]

Date	OWMID	QAQC	Time	Log10(Fecal)	Log10(E.coli)	Turb	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L
05/14/03	36-0248	36-0249	11:15	1.732*	1.623*	1.1*	0.06	0.033	4*
05/14/03	36-0249	36-0248	11:15	1.991*	1.857*	1.1*	<0.06	0.031	4*
Relative	*Percent*	*Difference*		*13.9%*	*13.5%*	*0.0%*	*0.0%*	*6.3%*	*0.0%*

Table 8. 2003 MassDEP Chicopee Watersheds Quality Control Data – Blanks (Data qualifiers listed in Appendix 1)

Date	OWMID	QAQC	Time	Fecal	E.coli	Turb	NH3-N	NH3-N	TP	TSS
			(24hr)	CFU/100mL	CFU/100mL	NTU	mg/L	mg/L	mg/L	mg/L
12/11/02	36-0100	Blank	12:05j	--	--	--	--	--	<0.005 h	--
04/16/03	36-0139	Blank	09:50j	<2*	<2*	<0.10*	<0.02	--	<0.005	<2.0*
04/16/03	36-0148	Blank	08:40j	<2*	<2*	<0.10*	<0.02	--	<0.005	<2.0*
04/16/03	36-0165	Blank	15:04j	<2*	<2*	<0.10*	<0.06	--	<0.005	<2.0*
05/14/03	36-0214	Blank	09:42j	<0.9*	<0.9*	<0.10*	<0.02	--	<0.005 j	<2*
05/14/03	36-0223	Blank	08:25j	<0.9*	<0.9*	<0.10*	<0.02	--	<0.005	<2*
05/14/03	36-0240	Blank	11:24j	<0.9*	<0.9*	<0.10*	<0.02 d	--	<0.005 h	<2*
05/14/03	36-0251	Blank	11:45j	<0.9*	<0.9*	<0.10*	<0.02	--	<0.005	<2*
06/18/03	36-0299	Blank	10:25j	<2*	<2*	<0.10*	<0.02	--	<0.005	<2*
06/18/03	36-0308	Blank	08:59j	<2*	<2*	<0.10*	<0.02	--	<0.005	<2* h
06/18/03	36-0325	Blank	11:55j	<2*	<2*	<0.10*	<0.02	--	<0.005	<2* h
07/30/03	36-0404	Blank	10:00j	<10* m	<10* m	<0.10*	<0.02	--	<0.005	<2*
07/30/03	36-0413	Blank	09:06j	<10*	<10*	<0.10*	<0.02	--	<0.005	<2*
07/30/03	36-0430	Blank	11:25j	<10*	<10*	<0.10*	<0.06	--	<0.005	<2*
08/20/03	36-0524	Blank	10:07j	<10*	<10*	<0.10*	<0.02	--	<0.005	<2*
08/20/03	36-0533	Blank	09:00j	<10*	<10*	<0.10*	<0.02	--	<0.005	<2*
08/20/03	36-0558	Blank	11:35j	<10*	<10*	<0.10*	<0.02	--	<0.005	<2*
10/15/03	36-0644	Blank	10:45j	<2*	<2*	--	--	<0.10*	[0.93*] b	<2*
10/15/03	36-0670	Blank	12:00j	<2*	<2*	--	--	<0.10*	[0.93*] b	<2*
10/15/03	36-0653	Blank	09:50	<2*	<2*	--	--	<0.10*	[1.0*] b	<2*

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Appendix 1

Selected Excerpts from:

DRAFT

DATA VALIDATION REPORT
for Year 2003 Project Data

CN 211.0

November, 2005

Department of Environmental Protection
Division of Watershed Management
627 Main Street, Second Floor
Worcester, MA

Data Validation For The
Chicopee Watersheds 2003 Water Quality Survey

1.0 Introduction

The purpose of this report is to document the review and validation of environmental data gathered by MADEP/DWM in 2003, including decisions to censor and qualify data.

The report includes review of field-recorded information, internal DWM laboratory data, and lab-validated data from DEP's analytical laboratory, Wall Experiment Station (WES) and 2003 contract lab (Severn Trent Laboratory, Westfield, MA). See Section 3 for 2003 projects.

2.0 Validation Process for 2003 Data

The procedures used to accept, accept with qualification or censor data are based on the DWM SOP for data validation (CN 56.2), and are in addition to separate quality assurance activities and laboratory validation performed by WES and the STL Lab.

The **specific validation criteria** applied to the 2003 data include, but are not limited to:

- Conformance to DWM-project and DWM-programmatic Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs)

- Precision (review of overall precision, including field precision and lab precision, for duplicate samples)

- Accuracy (review of lab quality control data regarding analysis of single-blind and/or double-blind performance evaluation samples, internal check standards, blanks and matrix spike samples)

- Representativeness (review of field data sheets and field SOPs used to collect the data for the evidence of the potential for non-representative conditions at the time of sampling)

- Holding Times and Preservation (review for conformance to method holding times and preservation requirements for samples)

- Frequency of Field QC samples (review for conformance to standard DWM requirements for the number of field blank and split/duplicate samples taken per total number of samples taken by survey crews)

- Contamination of Field Blanks (review of lab and ambient field blank results for detectable analyte concentrations)

- Documentation (review of Chain-of-Custody, fieldsheets, notebooks, etc. for sample mishandling, improper procedures, inaccurate or missing information)

Data falling outside established QA/QC acceptance criteria were investigated and may have been subject to censoring or qualification. Specific symbols and qualifiers used to censor and qualify 2003 data are provided in Appendix A.

Completion of 2003 data validation results in the generation of usable environmental data and long-term data management within DWM's monitoring databases.

3.0 2003 Projects, QAPPS, SOPS AND SERVICES

2003 Lab Services were provided by:

Lab	Services	Contact
Wall Experiment Station, Lawrence, MA (MADEP)	Sample analysis for monitoring in the Blackstone and Nashua watersheds	Oscar Pancorbo
Severn Trent Laboratories, Westfield, MA.	Sample analysis for monitoring in the Chicopee, Connecticut and Blackstone watersheds	Steve Hartman

4.0 2003 In-Situ *Multiprobe Data*

4.1 QA/QC OBJECTIVES AND CRITERIA FOR 2003* IN-SITU *MULTI-PROBE DATA

Trained DWM staff members (and their designees) conducted *in-situ* measurements using Hydrolab® Series 3/4 and YSI 6000 Series multi-probe instruments. These simultaneously measure dissolved oxygen, temperature, pH, conductivity, and depth, and provide calculated estimates for total dissolved solids and % oxygen saturation.

NOTE: no unattended multi-probe sonde deployments were conducted in 2003.

To ensure the quality of the data, the following QA/QC steps were taken before, during and after use:

- Pre-Survey Calibration and Check: Standard pre-survey calibration of each unit was conducted in accordance with the DWM SOP (CN 4.2). After the instrument was calibrated and before the instrument was released to field staff, an instrument check using both a low ionic standard and filtered de-ionized water was performed. The purpose of this check is to make sure that the instrument is providing stable readings as the waters in Massachusetts are typically of low ionic strength. If the instrument failed acceptance criteria, it was not released to field staff until the source of error was identified and corrected.

- Post-Survey Check: A standard post survey check of each unit was performed in accordance with the DWM SOP. Upon return to the lab, a visual inspection was performed to identify any physical damage that may have occurred in the field. The calibration of the unit was then checked against both a low ionic standard and filtered de-ionized water. The results of the post survey calibration check were compared to the pre-calibration results. If visual damage was observed and/or post calibration acceptance criteria were not achieved, the source of error was investigated and data collected in the field may have been subject to qualification or censoring.

- Data Reduction: The Multi-probe Coordinator, QC Analyst and Database Manager reviewed the multi-probe data for instability, instrument malfunction, operator error and aberrant trends. If any of these conditions were detected, the data was investigated and may have been recommended for censoring. The Database Manager electronically tagged all data recommended for censoring in the database. Measured data were also evaluated for the following:

• **Consistency with the SOP** (specifically, the requirement for three (minimum)-five (preferred) sequential readings one-minute-apart at appropriate depths, proper field use, etc.).

• **Accuracy and precision** of readings, as assessed through review of pre-survey calibration/check and post-survey check data, field notes for any information on faulty operation and/or unusual field conditions, and accuracy checks.

• **Representativeness** of data (review of fieldsheets and notes for any information that might indicate non-representativeness; eg. not taken at the deep hole).

• Check for **"outliers" or unreasonable data**, based on best professional judgement. Outliers are identified and flagged for scrutiny. For lake depth profiles, more leeway is given to apparently unstable multi-probe data, given that thermal stratification can cause rapid, natural changes in parameters within the thermocline.

• Multi-probe record **acceptance criteria**: Within each set of records for individual OWMID #s, automatically accept the final line of data for each depth where the change in depth from the previous accepted-record-depth is greater than 0.2 meters, subject to review and change by the multiprobe review team.

• The criterion used in 2003 to accept, qualify or censor **Conductivity (and the dependent, calculated estimates for TDS and Salinity)** readings was based on exceedance of the calibration standard concentration. For exceedances greater than two times the standard, the conductivity reading was typically censored. Readings above the calibration standard were qualified whenever the reading was less than two times the calibration standard. NOTE: In cases where readings fell far below the calibration standard concentration (e.g.,

measured value of 100 uS/cm using 6668 calibration standard), no censoring or qualification was imposed.

• For **D.O.** values less than 0.2 mg/l, 2003 data were accepted without qualification and reported as "<0.2". Similarly for % saturation, values less than 2% were accepted without qualification and reported as "<2%".

• For all parameters taken at the same location and whose range for 3-5 successive readings fluctuated beyond the range (+/-) of probe accuracy, the data was typically qualified or censored (depending on the degree of fluctuation) with "u" (**unstable**). Data exhibiting significant, continuous movement in one direction and that did not appear to reach equilibrium was also qualified or censored.

• For instances **where temperature has been censored, data for Conductivity, pH and D.O. are typically qualified.** (readings for Conductivity, pH and dissolved oxygen are internally-corrected for temperature; conductivity is temperature-compensated to 25 deg. C, D.O. readings are adjusted about 5% per degree C to account for changes in oxygen solubility and membrane permeability, and pH is compensated for electrode effects due to variable sample temperatures.) In cases where temperature has only been qualified, no qualification of data for conductivity, pH and D.O. is imposed.

• Depth criteria:

General Depth Criteria: Apply to each OWMID# for lakes and rivers

- Clearly erroneous readings due to faulty depth sensor: Censor (i)
- Negative and zero depth readings: Censor (i); (likely in error)
- 0.1 m depth readings: Qualify (i); (potentially in error)
- 0.2 and greater depth readings: Accept without qualification; (likely accurate)

Specific Depth Criteria: Apply to entirety of depth data for survey date

- If zero and/or negative depth readings occur more than once per survey date, censor all negative/zero depth data, and qualify all other depth data for that survey (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, ie. that all positive readings may be in error.)

4.2 2003 Censored/Qualified Multi-probe Data

See Appendix B (CN 211.1) for a complete presentation of all censoring and qualification decisions for multiprobe data.

4.3 2003 Corrective Actions Involving Multi-probe Use

Numerous sample ID#s for multiprobe data were duplicated in error in 2003. These were identified and corrected during the data entry QC process. Steps were taken in 2004/2005 to attempt to correct systematic and/or typical mistakes involving multi-probe ID allocation.

5.0 2003 Discrete Water Sample Data

5.1 QA/QC Objectives and Criteria for 2003 Discrete Water Sample Data

The collection and analysis of discrete water samples in 2003 followed the DWM Standard Operating Procedures and lab analyte-specific SOPs. The majority of river samples were taken via the manual grab and basket sampler techniques (where ambient water enters the sample bottle directly).

For river sampling, field quality control samples consisted of approx. 10% ambient blanks and 10% field duplicates (i.e., separate, co-located (side-by-side), simultaneous field duplicates).

Using the following criteria, as well as other considerations and input from data reviewers, individual datum were either:

1) Accepted
2) Accepted with qualification, or
3) Censored

In cases where poor quality control (e.g., blank/cross contamination, lab accuracy) affected batched analyses or entire surveys, censoring/qualification decisions were applied to groups of samples (e.g., a specific crew's samples, a specific survey's samples or all samples from a specific batch analysis).

Criteria for acceptance of discrete water quality sample data were as follows:

- For simplicity, samples that were **"lost", "missing", "spilled" and "not analyzed"** were denoted using the 'm' (method not followed) qualifier and ** symbol.

- **Sampling/Analysis Holding Time**: Each analyte has a standard holding time that has been established to ensure sample/analysis integrity. Refer to DWM Standard Operating Procedure CN# 1.2 for a complete listing. If the standard holding time was exceeded, this criterion is violated and the data may be censored, depending on the extent of exceedance. For minor exceedances (e.g., < than 20% of the holding time), the data is typically qualified ("h" for minor holding time violation).

- **Quality Control Sample Frequency**: At a minimum, one field blank and one replicate must be collected for every ten samples by any given sampling crew on any given date. If less than 10% blanks and replicates were collected, the data are typically qualified with "f". If blanks were omitted and duplicates taken, typically no data are qualified, as long as there are no documented historical problems for the survey-specific samplers or station locations with regard to field contamination. If blanks were taken but duplicates were not, the data may be qualified with "f". Typically, no censoring of data takes place for insufficient QC sample frequencies only.

- **Field Blanks:** Field blanks were prepared at the DWM Worcester Laboratory. Reagent grade water was transported into the field in a sample container where it was transferred into a different

sample container directly or via a sampling device (equipment blank) using the same methods as for its corresponding field sample (e.g., blank samples were preserved in the same way). All blanks were submitted to the WES laboratory "blind". If the field blank results were greater than the MDL (indicating potential sampling error, airborne contaminants, dirty equipment, etc.), the data may be censored or qualified, depending on extent and other factors.

- **Field Replicates:** In 2003, field duplicate samples for rivers were taken as co-located, simultaneous duplicates. As a result, these duplicate results include any spatial, natural variability present between side-by-side samples (which should be minimal in most cases where site selection has accounted for uniform mixing). Duplicate lake samples were sequential and therefore also include any temporal variability. Samples were submitted to WES laboratory "blind". Results were compared to specific criteria contained in a 2003 QAPP document. If the criteria are not met, the sample/duplicate data may be censored or qualified, depending on extent of exceedance and other factors. Arguably, very poor precision of field duplicate samples reflects poor reproducibility for entire surveys and/or analytical batch runs, and should result in censoring or qualification of the entire survey/batch data. Decisions related to poor precision for entire surveys/batchs were made on a case-by-case basis.

- Results of **Field and/or Lab Audits** and Miscellaneous Survey Information: If, based on the results of field evaluation of implementation of field sampling SOPs, samples are deemed to have been taken incorrectly or to not represent station conditions at the time of sampling, then individual or survey-based sample results may be qualified or censored. Likewise, the results of QC audits of lab(s) analytical accuracy (and precision) for specific parameters are evaluated. If results indicate poor accuracy or repeatability, batch run data may be qualified or censored. In addition, information from survey personnel regarding sample integrity and representativeness may lead to decisions to qualify or censor data.

- **Laboratory assessment of analytical precision and accuracy:** The WES Laboratory is solely responsible for the administration of its Quality Assurance Program and Standard Operating Procedures. WES staff release discrete water sample data when their established QA/QC criteria have been met. When the following criteria cannot be met, data are qualified using appropriate qualifiers:

• Low Calibration Standards – Checks the stability of the instrument's calibration curve; analyzes the *accuracy* of an instrument's calibration within a 5% range.

• Reference Standards – Generally, a second source standard (a standard different from the calibration stock standard) that analyzes the method *accuracy.*

• Laboratory Reagent Blank/Method Blank (LRB) – Reagent grade water (de-ionized) extracted with every sample set used to ensure that the system is free of target analytes (< MDL) and to assess potential blank contamination.

• Duplicate Sample – Measures the *precision* (as Relative Percent Difference or RPD) of the analytical process. The acceptable laboratory %RPD range is typically $\leq$ 25%. For bacteria, duplicate data are evaluated based the range of logged values.

• Spike Sample (Laboratory Fortified Blank - LFB, Laboratory Fortified Matrix - LFM)– Measures the *accuracy* (% Recovery) of an analytical method. The acceptable laboratory % recovery range is typically between 80 – 120% for LFB samples and 70 –130% for LFM discrete water samples.

5.2 Field and Lab Audit Results

Field Audits – In 2003, no field audits were completed for any Chicopee Watershed surveys.

Lab Audits – To provide external evaluation of lab performance with regard to sample analyses for specific analytes, the following lab audit was performed in 2003:

Proficiency Test for fecal coliform by membrane filtration (single-blind, semi-quantitative, via DWM contract with Microcheck, Inc., 4/15/03). Both WES and STL labs were provided with whole volume fecal coliform samples (blank, 0-1920 CFUs/100 mls.). Both labs reported "0" for the blanks. For the two 0-1920 range samples provided to each lab, WES reported 698 and 704, and STL reported 1400 and 2200. WES results indicate acceptable accuracy and precision. STL results indicate relatively **poor accuracy and precision** for the samples containing coliform, but results were within test acceptance limits.

5.3 QA/QC Issues and Considerations for 2003 Data

The following are particularly noteworthy regarding 2003 DWM/CERO surveys. The validation decisions contained in the tables below reflect these considerations.

1) **Duplicate and Misappropriated OWMIDs.** a) Coordination with WES was needed to make sure that all samples from the Lakes Baseline, Lakes Nutrient Criteria and Chicopee projects had the correct ID #s, because these numbers were often misallocated.

2) **WES "<RDL" and "ND" Results**: Since May, 2002, WES has reported data near detection limits in the following 3 ways: a) "ND" = <MDL ; b) result w/ qualifier "M" = result between MDL and RDL; and c) "<RDL" = result between MDL and RDL, but insufficient certainty to report a value (applicable for certain analyses). Users of 2003 data are cautioned that DWM reports "<RDL" WES lab results as less than the WES-specified RDL value, and that this should not be misconstrued to mean any value down to 0, but rather as defined, i.e., between MDL and RDL.. (see 9/29/04 email from Jim Sullivan to R. Chase)

3) **CERO/SMART Bucket Use**: The CERO/SMART monitoring program continued to use plastic bucket samplers off elevated sampling locations at several locations in 2003. Buckets use is inconsistent with DWM SOP for grab sampling. Therefore, these samples are **qualified with "m".**

4) **Continuous Temperature Monitoring Data**. Continuous (15 minute interval) temperature data from two projects (Nashua and Blackstone) were finalized and stored in a read-only electronic network folder (non-database as of 2005). Supporting documents justifying these data include the 2003 DWM QAPP, project-specific technical memoranda and this report. In general, most of these data met DQOs and were usable (after clipping the beginnings and ends of the data sets).

5) **STL-Westfield Lab bacteria bottles.** Sometime in July, 2003, the STL Lab changed its standard bacteria bottle (separate 120 ml. bottles for fecal coliform and *E. coli*) from a flip-top, locking tab type to a screw cap type. A few DWM staff persons using these new bottles noted that the threads did not always engage right away, which could lead to unsecured caps (if the threads were not engaged properly). (These bottles also made it more difficult to take co-located, simultaneous duplicates.) **The thread issue alone did not provide adequate justification to censor any of the STL Lab bacteria results.** There was no mention of partially-threaded caps on any of the STL lab reports.

6) **Rinse vs. No Rinse of WES Sample Bottles.** Based on small amounts of visible particles in some of the new, pre-cleaned sample bottles (for delivery to the WES lab), **a precautionary recommendation was made in mid-June, 2003 to begin field rinsing sample bottles with representative site water prior to sample collection.** A new procedure for doing this was forwarded to and implemented by field crews, and effectively avoided this problem if and when it occured. The particle problem was not evident in bottles from the STL lab.

   Based on staff input, the majority of WES samples in 2003 were taken after pre-rinsing with site water. Samples taken during nine surveys from April to mid June were not based on pre-rinsing.

   It is assumed that consistent application of this new approach improved data quality by removing the potential risk of sample contamination from visable-to-the-eye and/or less obvious particulates in the bottles. Due to uncertainty regarding the extent of this problem and lack of any comparison data to evaluate its effects on specific analytes, **it was decided NOT to qualify or censor data based on this issue.**

7) **Station Representativeness**. For this data validation effort, all station locations were assumed to have been located to be representative of river/stream and lake/pond conditions at the sampling time. This assumption is applied to both historic station locations, as well as new sampling stations.

8) **Sample Representativeness**. As detailed above, some specific sample data have been censored or qualified ("r") due to known or suspected non-representativeness of the sample. For example, some CERO/SMART samples taken from elevated crossings, such as at bridges, trestles and roads, were taken with plastic buckets attached to ropes, and have been qualified with "m". The use of plastic buckets as collection devices may potentially contaminate all samples, regardless of analytes, through station-station cross-contamination of the bucket and rope (even with rinsing), sampling location disturbance (in shallow conditions), and weather effects (precipitation entering bucket upon retrieval). Sample integrity may be especially compromised when sampling for bacteria and solids. Data users should use all CERO/SMART bucket-drop data with caution. Because most ambient river samples taken by DWM and CERO/SMART were via wade–in technique as described in CN 1.2, the majority of river samples taken in 2003 were assumed to be representative of in-situ water quality.

9) **Frequency and Type of Field QC Samples** (ambient field blanks and field duplicates/splits). DWM field sheet data were reviewed with respect to meeting the minimum frequency of survey QC samples (ambient field blanks and field duplicates/splits). Unless otherwise indicated in Sections 5, 6 and 7, all reported data from WES (and DWM for color and chl a) met the required minimum frequency of approx. 10% of the total sample number (and a minimum of one blank/analyte/survey and one duplicate/split per analyte per survey. In 2003, field duplicates were typically taken as co-located, simultaneous replicates.

10) **High NH3-N in ambient field blanks.** On more than one occasion, elevated levels of NH3-N were detected in ambient field blanks. The cause(s) for this could not be traced to the quality of DWM deionized water, WES/STL lab contamination, field effects (e.g., precipitation), or crew effects (high blanks observed for multiple crews). **While the cause remains unknown, all survey data related to high NH3-N in ambient field blanks have been qualified.**

11) **CERO-SMART Turbidity Data.** These data, based on use of DWM's lab turbidimeter, have not been entered into the WQD database and remain ancillary to project data.

12) **WES Lab TSS Data.** Lack of adherence to the WES lab SOP for TSS analysis resulted in WES' **qualification of TSS data from 5 batches.** These decisions have been carried through to the final DWM data.

13) **STL Lab TP results for 10/15/03 survey.** All STL lab results for **TP for samples from a 10/15/03 survey have been censored** due to extremely high P in blanks (and samples). Neither the survey coordinator nor the lab has been able to explain these results, where P in blanks were all approx. 1000 ug/l. Fortunately, these were the only survey samples analyzed by STL for TP.

5.4 2003 Censored/Qualified Discrete Water Sample Data

All Year 2003 data for discrete water samples that have been censored or qualified are listed below, except for missing data.

Exported from WQD2003 on 10/14/05, 3:45pm by T. Dallaire		QC4					
PROJNAME	**Analyte**	**DATE**	**OWMID**	**LabSNum**	**Result**	**DWMQual**	**Units**
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0137	206457-006	6*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0140	206457-012	<2*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0143	206457-018	2*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0145	206457-022	20*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0147	206457-026	2*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	4/16/2003	36-0166	206457-064	<2*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	7/30/2003	36-0404	208809-010	<10*	m	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	7/30/2003	36-0411	208809-024	300*	d	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	7/30/2003	36-0412	208809-026	110*	d	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	8/20/2003	36-0522	209322-006	600*	d	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	8/20/2003	36-0523	209322-008	300*	d	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	8/20/2003	36-0534	209322-030	130*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	10/15/2003	36-0649	210693-020	120*	e	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	10/15/2003	36-0668	210693-056	800*	d	CFU/100mL
Chicopee, (2003)	Fecal Coliforms	10/15/2003	36-0669	210693-058	400*	de	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0137	206457-006	30*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0140	206457-012	10*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0143	206457-018	4*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0145	206457-022	30*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0147	206457-026	8*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	4/16/2003	36-0166	206457-064	4*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	7/30/2003	36-0404	208809-010	<10*	m	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	8/20/2003	36-0534	209322-030	200*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	10/15/2003	36-0649	210693-020	160*	e	CFU/100mL
Chicopee, (2003)	E. Coli - Modified m-Tec	10/15/2003	36-0669	210693-058	430*	e	CFU/100mL
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0231	2003061-001	0.18	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0232	2003061-002	0.10	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0233	2003061-003	<0.06	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0234	2003061-004	<0.02	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0235	2003061-005	<0.02	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0236	2003061-006	<0.06	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0237	2003061-007	0.14	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0238	2003061-008	##	d	mg/L

Chicopee, (2003)	Ammonia-N	5/14/2003	36-0239	2003061-009	##	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0240	2003061-010	<0.02	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0241	2003061-011	<0.02	d	mg/L
Chicopee, (2003)	Ammonia-N	5/14/2003	36-0242	2003061-012	<0.02	d	mg/L
Chicopee, (2003)	Ammonia-N	10/22/2003	SM-0857	2004045-003	<0.01	h	mg/L
Chicopee, (2003)	Ammonia-N	10/22/2003	SM-0859	2004045-005	0.04	h	mg/L
Chicopee, (2003)	Nitrate/Nitrite-N	9/24/2003	LB-2539	2003189-007	<0.06	h	mg/L
Chicopee, (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0857	2004045-003	<0.02	h	mg/L
Chicopee, (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0859	2004045-005	0.08	h	mg/L
Chicopee, (2003)	Total Nitrogen	9/24/2003	LB-2539	2003189-007	0.61	h	mg/L
Chicopee, (2003)	Total Nitrogen	10/22/2003	SM-0857	2004045-003	0.21	h	mg/L
Chicopee, (2003)	Total Nitrogen	10/22/2003	SM-0859	2004045-005	0.18	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0090	2003003-002	0.009	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0091	2003003-003	0.013	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0092	2003003-004	0.019	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0093	2003003-005	0.016	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0094	2003003-006	0.019	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0096	2003003-007	0.023	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0097	2003003-008	0.053	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0098	2003003-009	0.023	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0099	2003003-010	0.021	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0100	2003003-011	<0.005	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/11/2002	36-0101	2003003-012	0.021	h	mg/L
Chicopee, (2003)	Total Phosphorus	12/23/2002	36-0102	2003003-013	0.030	h	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0103	2003015-001	0.011	f	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0104	2003015-002	0.15	f	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0105	2003015-003	0.011	f	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0106	2003015-004	0.015	f	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0107	2003015-005	0.013	f	mg/L
Chicopee, (2003)	Total Phosphorus	1/30/2003	36-0108	2003015-006	0.017	f	mg/L
Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0109	2003023-001	0.016	f	mg/L
Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0110	2003023-002	0.019	f	mg/L
Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0111	2003023-003	0.015	f	mg/L
Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0112	2003023-004	0.013	f	mg/L
Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0113	2003023-005	0.014	f	mg/L

Chicopee, (2003)	Total Phosphorus	3/4/2003	36-0114	2003023-006	0.12	f	mg/L
Chicopee, (2003)	Total Phosphorus	4/16/2003	36-0156	2003041-001	0.18	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0212	2003060-003	0.047	j	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0213	2003060-004	0.042	j	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0214	2003060-005	<0.005	j	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0215	2003060-006	0.042	j	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0233	2003061-003	0.019	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0234	2003061-004	0.022	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0235	2003061-005	0.014	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0236	2003061-006	0.20	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0237	2003061-007	0.036	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0238	2003061-008	0.035	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0239	2003061-009	0.035	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0240	2003061-010	<0.005	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0241	2003061-011	0.093	h	mg/L
Chicopee, (2003)	Total Phosphorus	5/14/2003	36-0242	2003061-012	0.024	h	mg/L
Chicopee, (2003)	Total Phosphorus	9/24/2003	LB-2539	2003189-007	0.043	h	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0640	210693-067	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0641	210693-068	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0642	210693-069	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0643	210693-070	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0644	210693-071	[0.93*]	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0645	210693-072	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0646	210693-073	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0647	210693-074	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0648	210693-075	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0649	210693-076	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0650	210693-077	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0651	210693-078	##*	bd	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0652	210693-079	##*	bd	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0653	210693-080	[1.0*]	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0654	210693-081	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0655	210693-082	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0656	210693-083	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0657	210693-084	##*	b	mg/L

Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0658	210693-085	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0659	210693-086	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0660	210693-087	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0661	210693-088	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0662	210693-089	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0663	210693-090	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0664	210693-091	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0665	210693-092	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0666	210693-093	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0667	210693-094	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0668	210693-095	##*	bd	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0669	210693-096	##*	bd	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0670	210693-097	[0.93*]	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0671	210693-098	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/15/2003	36-0672	210693-099	##*	b	mg/L
Chicopee, (2003)	Total Phosphorus	10/22/2003	SM-0857	2004045-003	0.022	h	mg/L
Chicopee, (2003)	Total Phosphorus	10/22/2003	SM-0859	2004045-005	0.013	h	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0700	2004281-001	0.20	fh	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0701	2004281-002	0.014	fh	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0702	2004281-003	0.025	fh	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0703	2004281-004	0.025	fh	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0704	2004281-005	0.031	fh	mg/L
Chicopee, (2003)	Total Phosphorus	11/25/2003	36-0705	2004281-006	0.021	fh	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0306	207836-023	7*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0307	207836-025	5*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0308	207836-027	<2*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0309	207836-029	4*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0310	207836-031	6*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0311	207836-033	5*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0312	207836-035	7*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0313	207836-037	<2*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0314	207836-039	5*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0315	207836-041	9*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0316	207836-043	<2*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0317	207836-045	3*	h	mg/L

Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0318	207836-047	3*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0319	207836-049	5*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0320	207836-051	6*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0321	207836-053	50*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0322	207836-055	12*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0323	207836-057	4*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0324	207836-059	4*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0325	207836-061	<2*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0326	207836-063	5*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0327	207836-065	4*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0328	207836-067	3*	h	mg/L
Chicopee, (2003)	Total Suspended Solids	6/18/2003	36-0329	207836-069	<2*	h	mg/L
SMART: Chicopee (2003)	Fecal Coliforms	4/16/2003	SM-0725	206457-075	<2*	e	CFU/100mL
SMART: Chicopee (2003)	Fecal Coliforms	8/20/2003	SM-0817	209322-072	100*	d	CFU/100mL
SMART: Chicopee (2003)	Fecal Coliforms	8/20/2003	SM-0818	209322-073	500*	d	CFU/100mL
SMART: Chicopee (2003)	E. Coli - Modified m-Tec	4/16/2003	SM-0725	206457-075	6*	e	CFU/100mL
SMART: Chicopee (2003)	E. Coli - Modified m-Tec	8/20/2003	SM-0817	209322-072	40*	d	CFU/100mL
SMART: Chicopee (2003)	E. Coli - Modified m-Tec	8/20/2003	SM-0818	209322-073	300*	d	CFU/100mL
SMART: Chicopee (2003)	Turbidity	7/30/2003	SM-0804	2003136-027	0.15	b	NTU
SMART: Chicopee (2003)	Turbidity	8/20/2003	SM-0820	2003160-027	0.15	b	NTU
SMART: Chicopee (2003)	Alkalinity	7/30/2003	SM-0801	2003136-024	11	d	mg/L
SMART: Chicopee (2003)	Alkalinity	7/30/2003	SM-0802	2003136-025	18	d	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0855	2004045-001	<0.01	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0856	2004045-002	<0.01	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0858	2004045-004	<0.01	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0860	2004045-006	<0.03	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0861	2004045-007	<0.01	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0862	2004045-008	<0.03	h	mg/L
SMART: Chicopee (2003)	Ammonia-N	10/22/2003	SM-0863	2004045-009	<0.01	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0855	2004045-001	<0.02	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0856	2004045-002	<0.02	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0858	2004045-004	<0.02	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0860	2004045-006	0.15	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0861	2004045-007	0.12	h	mg/L
SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0862	2004045-008	<0.02	h	mg/L

SMART: Chicopee (2003)	Nitrate/Nitrite-N	10/22/2003	SM-0863	2004045-009	<0.02	h	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	2/12/2003	SM-0686	2003020-012	0.14	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	4/16/2003	SM-0727	2003039-007	0.11	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0762	2003084-001	0.34	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0763	2003084-002	0.43	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0764	2003084-003	0.20	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0765	2003084-004	0.52	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0766	2003084-005	0.49	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	6/18/2003	SM-0767	2003084-006	0.55	b	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0796	2003136-001	0.43	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0797	2003136-002	0.49	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0799	2003136-004	0.16	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0801	2003136-006	##	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0802	2003136-007	##	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0803	2003136-008	0.51	d	mg/L
SMART: Chicopee (2003)	Kjeldahl-N	7/30/2003	SM-0804	2003136-009	<0.10	d	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0855	2004045-001	0.16	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0856	2004045-002	0.24	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0858	2004045-004	<0.040	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0860	2004045-006	0.38	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0861	2004045-007	0.33	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0862	2004045-008	0.28	h	mg/L
SMART: Chicopee (2003)	Total Nitrogen	10/22/2003	SM-0863	2004045-009	<0.040	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0855	2004045-001	0.010	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0856	2004045-002	0.020	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0858	2004045-004	0.006	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0860	2004045-006	0.027	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0861	2004045-007	0.026	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0862	2004045-008	0.026	h	mg/L
SMART: Chicopee (2003)	Total Phosphorus	10/22/2003	SM-0863	2004045-009	<0.005	h	mg/L

6.0 2003 FLOW SURVEY DATA

All DWM flow crew staff took part in flow measurement training prior to surveys. All work followed DWM's SOP for flow measurement (CN 68.0). Instrument maintenance, inspection and calibration were performed prior to each survey. Standard USGS-type flow fieldsheets were used to record field data. A standard spreadsheet calculator was used to perform all calculations and statistics. Velocity meter accuracy checks were performed using Sontek, Swoffer and Price AA meters in February, 2003.

Raw fieldsheet (and other) information was evaluated and spreadsheet data output was checked in order to validate the flow data.for all results. "Stage" readings relied on accurate, consistent measurement of distance from a fixed point to the water surface. Graphs of rating curves were checked for accuracy. NOTE: The number of data points needed to generate accurate, location-specific rating curves is greater than that collected at any location by DWM in 2003. Ratings containing more than five points, however, can be used to approximate flow from a stage recording.

The following streamflow surveys were conducted in 2003.

Project	Waterbody	No. of Surveys	Evaluation of Results *	Comments
Chicopee	Seven Mile River @ Rt. 49	3	All results valid	3 point rating curve
Chicopee	Inlet to Quaboag Pond	3	All results valid	3 point rating curve
Chicopee	Cranberry Brook	3	All results valid	3 point rating curve
Chicopee	Lake Lashaway Outlet	3	All results valid	3 point rating curve
Chicopee	Seven Mile River @ Rt. 9	3	All results valid	3 point rating curve

* Results for individual survey flow estimates only. Most ratings have too few points to be usable for anything other than "ballpark" estimates

9.0 OVERVIEW OF INFORMATION SOURCES FOR 2003 DATA VALIDATION

9.1 2003 Field Sheet Data

All 2003 DWM field sheet data and metadata were reviewed with respect to potential effects on data quality and to the need for data qualification or censoring. Effects on the validity of project data may be due to survey-level, station-level or sample-level fieldsheet information. (Approx. 50% of the information on DWM fieldsheets is entered directly into the WQD database.)

9.2 2003 DWM Lab Sheets (apparent color, Chl a)

DWM laboratory records (lab notebooks, lab bench sheets) for apparent color and chl a analysis were reviewed for potential effects on data quality and to the need for data qualification or censoring.

9.3 2003 Multi-probe Calibration Records

Calibration sheets for all multi-probe uses in 2003 were reviewed for potential effects on data quality and to assist decision-making related to data qualification or censoring.

9.4 WES and STL-Westfield Laboratory QC Data (lab duplicates, QC unknowns, matrix spikes, etc.)

The quality control results contained in the WES laboratory 2003 data reports were reviewed for potential implications to data quality and to determine if any data was or should have been qualified by WES (based on lab accuracy and precision data). Unless otherwise indicated in Section 5, all reported data from WES met analyte-specific acceptance limits of WES as well as the Data Quality Objectives (DQOs) of DWM.

9.5 WES and STL-Westfield Chain-of-Custody Forms

All 2003 COC forms for sample handling and delivery to the WES and STL-Westfield Labs were reviewed for potential implications to data quality.

9.6 Field Notebooks

Review of 2003 field notebook information was limited to that for the CERO-SMART surveys. DWM uses standard fieldsheet forms as the primary field data recording tool. Any individual DWM staff notebooks were not reviewed.

9.7 External Lab Performance Evaluations (QC Sample Results)

See Section 5.2.

9.8 Project Technical Memoranda

As available, project-specific and/or lab-specific technical memoranda were reviewed used for potential implications to data quality.

9.9 Misc. Information

Additional information, such as via personal communications, electronic mail and notes to file, was also used as available to evaluate 2003 data quality.

10.0 Analytical Methods and Detection Limits

The analytical methods, associated detection limits and project data quality objectives for water sample and fish tissue analyses at WES, DWM and STL were as follows in 2003.

Water Quality Analyte	Method *	MDL **	RDL **
Hydrolab® Multiprobe Series 3 and (4)	DWM SOP (CN 4.2)	NA	NA
YSI 600 XLM	DWM SOP (CN 4.2)	NA	NA
Apparent Color (DWM)	SM 2120 B	15 PCU	15 PCU
Total Phosphorus	SM 4500-P-E	0.005 mg/l	0.015 mg/l
Dissolved Reactive P	SM 4500-P-A, B1, E	0.010 mg/l	0.020 mg/l
Alkalinity	SM 2320 B	2 mg/l	2 mg/l
Hardness	SM 2340 B; EPA 200.7	0.66 mg/l	2.0 mg/l
Chloride	SM 4500 Cl B	1 mg/l	1 mg/l

Water Quality Analyte	Method *	MDL **	RDL **
TSS	SM 2540 D	1.0 mg/l	1.0 mg/l
NH3-N	EPA 350.1	0.02 mg/l	0.06 mg/l
NO3-NO2-N	EPA 353.1	0.02 mg/l	0.06 mg/l
TKN	EPA 351.2	0.10 mg/l	0.30 mg/l
Total Nitrogen	USGS 1265003	0.040 mg/l	0.12 mg/l
Turbidity	SM 2130 B	0.10 NTU	0.36 NTU
Turbidity (DWM)	SM 2130 B	0.1 NTU	0.2 NTU
Chlorophyll a (DWM)	SM 10200 H	1 ug/l	1 ug/l
Fecal Coliform ***	SM 9222D	6 CFU/100mls	6 CFU/100mls
E. coli ***	EPA 1603 (also modified 1103.1)	6 CFU/100mls	6 CFU/100mls
Total Phosphorus	SM 4500-P-E	0.005 mg/l	0.02 mg/l
TSS (STL)	EPA 160.2	ND	2 mg/l
NH3-N (STL)	LAC 107061B	ND	0.10 mg/l
Turbidity (STL)	EPA 180.1	ND	0.10 NTU
Fecal Coliform (STL)	SM 9222D	0 CFU/100mls	0 CFU/100mls
E. coli (STL)	EPA 1103.1 modified	0 CFU/100mls	0 CFU/100mls
Total Phosphorus (STL)	SM 4500-P-E	0.002 mg/l	0.002 mg/l

***** = "Methods for Chemical Analysis of Water and Wastes", Environmental Protection Agency, Environmental Monitoring Systems Laboratory – Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1983 and 1979 where applicable; Standard Methods, Examination of Water and Wastewater, 20th edition

** = WES typically reports results down to the MDL with a qualifier.

*** = MDL and RDL not listed for fecal and E. coli results; 6 CFUs/100 mls. was the practical RDL for WES, as no results were reported below 6 (these were reported as "<6")

NA = Not Applicable

ND = No Data

The following data qualifiers or symbols are used in the MADEP/DWM WQD database for qualified and censored water quality and multi-probe data. Decisions regarding censoring vs. qualification for specific, problematic data are made based on a thorough review of all pertinent information related to the data.

General Symbols (applicable to all types):

" ## " = Censored data (i.e., data that has been discarded for some reason). *NOTE: Prior to 2001 data, "**" denoted either censored or missing data.*

" ** " = Missing data (i.e., data that should have been reported). See NOTE above.

" -- " = No data (i.e., data not taken/not required)

* = Analysis performed by Laboratory OTHER than DEP's Wall Experiment Station (WES)

[ ] = A result reported inside brackets has been "censored", but is shown for informational purposes (e.g., high blank results).

Multi-probe-specific Qualifiers:

" i " = inaccurate readings from Multi-probe likely; may be due to significant pre-survey calibration problems, post-survey checks outside typical acceptance ranges for the low ionic and deionized water checks, lack of calibration of the depth sensor prior to use, or to checks against laboratory analyses. Where documentation on unit pre-calibration is lacking, but SOPs at the time of sampling dictated pre-calibration prior to use, then data are considered potentially inaccurate.

Qualification Criteria for Depth (i):

General Depth Criteria: Apply to each OWMID#

- Clearly erroneous readings due to faulty depth sensor: Censor (i)
- Negative and zero depth readings: Censor (i); (likely in error)
- 0.1 m depth readings: Qualify (i); (potentially in error)
- 0.2 and greater depth readings: Accept without qualification; (likely accurate)

Specific Depth Criteria: Apply to entirety of depth data for survey date

- If zero and/or negative depth readings occur more than once per survey date, censor all negative/zero depth data, and qualify all other depth data for that survey (indicates that erroneous depth readings were not recognized in the field and that corrective action (field calibration of the depth sensor) was not taken, ie. that all positive readings may be in error.)

" m " = method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed, ie. operator error (eg. less than 3 readings per station (rivers) or per depth (lakes), or instrument failure not allowing method to be implemented.

" s " = field sheet recorded data were used to accept data, not data electronically recorded in the Multi-probe surveyor unit, due to operator error or equipment failure.

" u " = unstable readings, due to lack of sufficient equilibration time prior to final readings, non-representative location, highly-variable water quality conditions, etc. See Section 4.1 for acceptance criteria.

" c " = greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard. Typically used for conductivity (>718, 1,413, 2,760, 6,668 or 12,900 uS/cm) or turbidity (>10, 20 or 40 NTU). It can also be used for TDS and Salinity calculations based on qualified ("c") conductivity data, or that the calculation was not possible

due to censored conductivity data (TDS and Salinity are calculated values and entirely based on conductivity reading). See Section 4.1 for acceptance criteria.

“ r ” = data not representative of actual field conditions.

“ ? ” = Light interference on Turbidity sensor (Hydrolab error message). Data is typically censored.

Sample-Specific Qualifiers:

“ a ” = accuracy as estimated at WES Lab via matrix spikes, PT sample recoveries, internal check standards and lab-fortified blanks did not meet project data quality objectives identified for program or in QAPP.

“ b ” = blank Contamination in lab reagant blanks and/or field blank samples (indicating possible bias high and false positives).

“ d ” = precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP. Batched samples may also be affected.

“ e ” = not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for e-coli bacteria > fecal coliform bacteria, for lake Secchi and station depth data where a specific Secchi depth is greater than the reported station depth, and for other incongruous or conflicting results.

“ f ” = frequency of quality control duplicates did not meet data quality objectives identified for program or in QAPP.

“ h ” = holding time violation (usually indicating possible bias low)

“ j ” = ‘estimated’ value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the ‘reporting’ limit or RDL and greater than the method detection limit or MDL (mdl< x <rdl). Also used to note where values have been reported at levels less than the mdl.

“ m ” = method SOP not followed, only partially implemented or not implemented at all, due to complications with sample matrix (eg. sediment in sample, floc formation), lab error (eg. cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, and missing data.

“ p ” = samples not preserved per SOP or analytical method requirements.

“ r ” = samples collected may not be representative of actual field conditions, including the possibility of “outlier” data and flow-limited conditions (e.g., pooled).

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APPENDIX A
ASSESSMENT METHODOLOGY GUIDELINES FOR EVALUATING DESIGNATED USE STATUS OF MASSACHUSETTS SURFACE WATERS

The Clean Water Act (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. By this process, states report on waterbodies within the context of meeting their designated uses. 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 Massachusetts Surface Water Quality Standards (SWQS): Cold Water Fishery – waters 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 (MassDEP 1996).

The SWQS, summarized in Table A1, prescribe minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MassDEP 1996). 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 Massachusetts Department of Environmental Protection (MassDEP) will determine by on a case-by-case basis the most severe hydrological condition for which the aquatic life criteria must be applied.

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 individual or group 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 the MassDEP are of known and documented quality and are suitable for their intended use. For external sources of information, MassDEP requires the following: 1) an appropriate Quality Assurance Project Plan (QAPP) including a laboratory Quality Assurance /Quality Control (QA/QC) plan; 2) use of a state certified lab (or as otherwise approved by DEP for a particular analysis); and 3) sample data, QA/QC and other pertinent sample handling information documented in a citable report. This information will be reviewed by MassDEP to determine its validity and usability to assess water use support. Data use could be modified or rejected due to poor or undocumented QAPP implementation, lack of project documentation, incomplete reporting of data or information, and/or project monitoring objectives unsuitable for MassDEP assessment purposes.

EPA provides guidelines to 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 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 A1) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance from available 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 SWQS.

Each designated use within a given segment is individually assessed as ***support*** or ***impaired***. When too little current data/information exist 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, and it is not “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 ponds, rivers, and estuaries have *never been assessed*; 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 waterbody system database (WBS) or the new assessment database (ADB).

Table A1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996, MA DPH 2002, and FDA 2003).

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 - 8.5 SU 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 A1 Continued. Summary of Massachusetts Surface Water Quality Standards (MassDEP 1996, MA DPH 2002, and FDA 2003).

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*.	<u>Class A:</u> Fecal coliform bacteria: An arithmetic mean of <20 cfu/100 ml in any representative set of samples and <10% of the samples >100 cfu/100 ml. <u>Class B:</u> 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 ml and the geometric mean of the most recent five *E. coli* samples within the same bathing season shall not exceed 126 *E. coli* / 100 ml. At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 61 *Enterococci* /100 ml and the geometric mean of the most recent five *Enterococci* samples within same bathing season shall not exceed 33 *Enterococci* /100 ml. 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 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) <u>Class C:</u> Fecal coliform bacteria: Shall not exceed a geometric mean of 1,000 cfu/100 ml, nor shall 10% of the samples exceed 2,000 cfu/100 ml. <u>Class SA:</u> Fecal coliform bacteria: Waters designated shellfishing shall not exceed a geometric mean (most probable number (MPN) method) of 14 MPN/100 ml, nor shall more than 10% of the samples exceed 28 MPN/100 ml, or other values of equivalent protection based on sampling and analytical methods used by the Massachusetts Division of Marine Fisheries and approved by the National Shellfish Sanitation Program in the latest version of the Guide for the Control of Molluscan Shellfish Areas (more stringent regulations may apply). At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 ml and the geometric mean of the five most recent *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 ml. 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 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) <u>Class SB:</u> Fecal coliform bacteria: Waters designated for shellfishing shall not exceed a fecal coliform median or geometric mean (MPN method) of 88 MPN/100 ml, nor shall <10% of the samples exceed 260 MPN/100 ml or other values of equivalent protection base on sampling and analytical methods used by the Massachusetts Shellfish Sanitation Program in the latest revision of the guide for the Control of Moluscan Shellfish (more stringent regulations may apply). At public bathing beaches, as defined by MA DPH, where *Enterococci* are the chosen indicator: No single *Enterococci* sample shall exceed 104 *Enterococci* /100 ml and the geometric mean of the most recent five *Enterococci* levels within the same bathing season shall not exceed 35 *Enterococci* /100 ml. 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 ml in any representative set of samples, nor shall more than 10% of the samples exceed 400 cfu/100 ml. (This criterion may be applied on a seasonal basis at the discretion of the MassDEP.) <u>Class SC:</u> Fecal coliform bacteria: Shall not exceed a geometric mean of 1,000 cfu/100 ml, nor shall 10% of the samples exceed 2,000 cfu/100 ml.

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 1996):

- *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; *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* and *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 A1) 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.* 2003)	Stable (No/minimal loss), BPJ	Loss/decline, BPJ
Non-native species	BPJ	Non-native 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**		
Dissolved oxygen (DO)/Percent saturation (MassDEP 1996, EPA 1997)	Infrequent excursion from criteria (Table A1), BPJ (minimum of three samples representing critical period)	Frequent and/or prolonged excursion from criteria [river and shallow lakes - exceedances >10% of representative measurements; deep lakes (with hypolimnion) - exceedances in the hypolimnetic area >10% of the surface area during maximum oxygen depletion].
pH (MassDEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table A1)	Criteria exceeded >10% of measurements.
Temperature **(**MassDEP 1996,EPA 1997)	Infrequent excursion from criteria (Table A1)[1]	Criteria exceeded >10% of measurements.
Toxic Pollutants (MassDEP 1996, EPA 1999a) Ammonia-N (MassDEP 1996, EPA 1999b) Chlorine (MassDEP 1996, EPA 1999a)	Infrequent excursion from criteria (Table A1) 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

*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 2005 and Krueger 2006). 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 2001, MA DPH issued new consumer advisories on fish consumption and mercury 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	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 suppliers currently report to MassDEP and EPA the status of the supplies 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 exceedances 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 http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers.

SHELLFISHING USE

This use is assessed using information from the Department of Fish and Game'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, and 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, therefore, 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.mass.gov/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 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 (105 CMR 445.000) Minimum Standards for Bathing Beaches State Sanitary Code) (MassDEP 1996)	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 A1). 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 A1).
Aesthetics (MassDEP 1996) - *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 (at least 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. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance (i.e., the geometric mean of five samples is <200 cfu/100 ml but one of the five sample exceeds 400 cfu/100 ml). 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/100 ml if the result is reported as <20 cfu/100 ml). 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 1996)	Other waters: Samples* collected must meet the Class C or SC criteria (see Table A1).	Other waters: Samples* collected do not meet the Class C or SC criteria (see Table A1).
Aesthetics (MassDEP 1996) - *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 (at least five samples per station recommended) over time. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance. 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.

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APPENDIX E: SUMMARY OF WMA PERMITTING INFORMATION IN THE CHICOPEE RIVER WATERSHED

Table 1: Summary WMA Permitting Information in the Chicopee River Watershed

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)	Segment	COMMENTS
Barre Water Department		20802101	2021000-01G (Well #1) 2021000-02G (Well # 2) 2021000-03G (South Barre well) 2021000-01S (Town reservoir)	0.26	MA36-08 MA36-08 MA36-04 Trib to MA36-08	In 2004 and 2005 the registered withdrawal amount was exceeded (0.33 MGD and 0.32 MGD respectively)
Bond Construction Company		20828002	Sevenmile River	0.27	MA36-11	
Bondsville Fire and Water Department	9P210822702	10822704	1227002-01G 1227002-02G 1227002-03G 1227002-04G 1227002-05G	0.36	MA36-10	Wells in Jabish Brook Subwatershed
Brookfield Water Department		20804501	2045000-02G 2045000-03G 2045000-04G 2045000-05G	0.09	MA36-13	
Cascades Diamond Inc.		10822705	Ware River Ware River Building #10	1.17	MA36-06	Cascades Diamond purchased by Energy Thorndike who have capped Ware River intakes. Typically low use and no use in 2005.
Cold Spring Golf Course	9P210802402		PW-1 PW-2 1024013-01G (PW-4) 1024013-02G (PW-5) Irrigation Pond	0.163	Swift River Subbasin (Jabish Brook Subwatershed)	
Dauphinais & Son Inc.		10833901	Chicopee River in Wilbraham at Route 20	0.34	MA36-24	
East Brookfield Water Department		20808401	2084000-01G	0.11	MA36-13	

Table 1 (continued): Summary WMA Permitting Information in the Chicopee River Watershed

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)	Segment	COMMENTS
Fitchburg Water Department	9P20809701	20809701	2097000-06S (Mare Meadow Reservoir) 2097000-09S (Bickford Reservoir)	0.67 (reg) +0.11 (perm) 0.77	MA36090 MA36015	Normal variation granted for Mare Meadow Reservoir authorizes a maximum withdrawal of 2.26 MGD. Permitted volume is not authorized prior to June 1, 2008.
Hardwick Knitted Fabrics	9P220831101	20831101	Quaboag River	0.23 (reg) +0.5 (perm) 0.73	MA36-15	Currently out of business.
McLaughlin& Palmer State Fish Hatchery	9P10802401	10802402	-01G -02G -03G -04G -05G -06G -01S -02S	6.43 (reg) +1.03(perm) 7.46	MA36-09	
MDC MWRA		10830901	Quabbin Aqueduct-Shaft 12 Chicopee Valley Aqueduct 6000000-06S (Ware River Intake	186.7	MA36129 MA36-03	
Monson Water and Sewer Department		10819101	1191000-03G 1191000-04G 1191000-05G 1191000-02S (Conant Pond)	0.92	MA36-21 MA36038	
North Brookfield Water Department		20821201	2212000-02S (North Pond)	0.43	MA36072	
Palmer Water Department		10822702	1227000-02G 1227000-01S (Upper Graves Brook Reservoir) 1227000-02S (Lower Graves Brook Reservoir)	0.65	MA36-17 MA36115 Non-segment	
Spencer Water Department	9P20828001	20828001	2280000-01G 2280000-02G 2280000-03G	0.48 (reg) +0.49(perm) 0.97	MA36-20 MA36-11 MA36-11	Permitted volume is based on the fourth 5-year block period of the 20-year permit.

Table 1 (continued): Summary WMA Permitting Information in the Chicopee River Watershed

Facility	WMA Permit Number	WMA Registration Number	Source (G = ground, S = surface)	Authorized Withdrawal (MGD)	Segment	COMMENTS
Springfield Water Department		10828101	1161000-01S (Ludlow Reservoir)	1.82	MA36145	Not currently in use.
Three Rivers Fire District	9P210822701	10822701	1227003-01G 1227003-03G	0.4 (reg)	MA36-17 MA36-17	
Ware Fiber Recovery Associates	9P10830901			0.5	Ware River Subwatershed	
Ware Water Department	9P210830903	10806101	1309000-01G (well #1) 1309000-01G (well #2) 1309000-01G (well#3) 1309000-02G (well #4) 1309000-03G	0.95 (reg) +0.44(perm) 1.39	MA36-06 MA36-06 MA36-06 MA36-05	Permitted volume is based on the fourth 5-year block period of the 20-year permit.
Warren Water District	9P210831102	10831102	1311000-01G 1311000-02G 1311000-03G	0.2	MA36037 MA36037 MA36037	
West Brookfield Water Department		20832301	2323000-01G 2323000-02G	0.26	MA36-15 MA36166	

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APPENDIX D – SUMMARY OF NPDES PERMITTING INFORMATION
CHICOPEE RIVER BASIN

Table D1. Chicopee River Basin Commercial and Industrial Surface Wastewater Discharges

PERMITTEE **Concrete Block Insulating System Inc.**	**NPDES #** **MAG250121**	Non-segment Coys Brook
The Concrete Block Insulating System Inc. is authorized (MA250121) issued in September 2000 to discharge from their facility in West Brookfield a flow of 0.040 gpd average monthly and 0.030 gpd daily average of non-contact cooling water via outfall #001 to wetlands leading to Coys Brook and the Quaboag River (36-14) in the Chicopee River watershed. The source of water for the facility is municipal. This permit expired 4/25/2005.		

PERMITTEE **Connecticut Valley Sanitary Waste Disposal, Inc.**	**NPDES #** **MA0033847**	**SEGMENT** **MA36-41**
The Connecticut Valley Sanitary Waste Disposal, Inc. is authorized (MA0033847) issued in September 1994 to discharge from the Chicopee Sanitary Landfill a flow of 144,000 GPD average monthly and 290,000 GPD daily maximum of uncontaminated groundwater via outfall #001 to Fuller Brook. The discharge pH limit is 6.5 to 8.3 and conductivity is to be reported. This permit also allows discharge of stormwater from outfalls SW1, SW2, SW3, SW4 and SW5 to Fuller Brook. A number of parameters should be reported on including Acute Whole Effluent Toxicity and LC50. This permit was switched to a multisector general permit (MAR05C657). This permit was terminated on May 12,2005. Effluent Whole effluent toxicity tests have been conducted on the Connecticut Valley Sanitary Waste Disposal, Inc. treated effluent. Between May 2000 and September 2004, 9 valid tests were conducted using *C. dubia* and *P. promelas*. The LC_{50} using *C. dubia* were all $\geq$100% effluent (n=9). The LC_{50} using *P. promelas* were all $\geq$100% effluent (n=9). Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between January 2001 and September 2004 ranged from <4.00 mg/L to 17.000 mg/L (n=6). Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and September 2004 is <0.02 mg/L (n=1). Ambient The Connecticut Valley Sanitary Waste Disposal, Inc. staff collected water from the Fuller Brook just upstream of New Lombard Road for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and September 2004, survival of *C. dubia* exposed (48 hours) to the Fuller Brook water was all 100% (n=9). Between May 2000 and September 2004 survival of *P. promelas* exposed (48 hours) to the Fuller Brook water ranged from 95 to 100% (n=9).		

PERMITTEE **Consolidated Edison Energy Massachusetts, Inc. (CEEMI)**	**NPDES #** **MA0035670, MA0035777, MA0035815, MA0035823, MA0035831**	**Segments** **MA36-25, MA36-24, MA36-23,**
The Consolidated Edison Energy Massachusetts, Inc. (CEEMI) is authorized (MA0035670, MA0035777, MA0035815, MA0035823, MA0035831 issued in September 1999) to discharge from the Dwight Station(MA0035777) thrust bearing leakage via outfall #001, non-contact cooling water via outfall #002, and wheelpit drainage via outfall #003 to the Chicopee River (MA36-25); to discharge from Indian Orchard Station (MA0035815) turbine bearing seal leakage via outfall #001 to the Chicopee River (MA36-24); to discharge from Red Bridge Station (MA0035823) thrust bearing leakage via outfall #001, and floor drainage via outfall #002 to the Chicopee River (MA36-23); and to discharge from Putts Bridge Station(MA0035831) thrust bearing leackage via outfall #001, and floor drainage via outfall #002 to the Chicopee River (MA36-24).		

PERMITTEE Doncasters Inc.	NPDES # MAG250947	SEGMENT MA36-39
Doncasters Inc. is authorized (MA250947**)** issued in December 2000 to discharge from the Storms Forge Division in Springfield a flow of 0.057 MGD average monthly and 0.060 MGD daily average of non-contact cooling water (NCCW) to Poor Brook in the Chicopee River watershed. They conducted one whole effluent toxicity tests with *C. dubia*. The EPA granted them a waiver to use soft reconstituted freshwater as their diluent water. The non-contact water source is municipal water.		

PERMITTEE Double-A-Plastics Co., Inc.	NPDES # MAG250027	SEGMENT MA36-21
Double-A-Plastics Co., Inc. is authorized (MAG250027) issued in June 2003 to discharge from their facility in Monson a flow of 173,000 gal average monthly of non-contact cooling water (NCCW) via outfall #001 to Chicopee Brook (MA36-21). The source of water for the facility is municipal.		

PERMITTEE Eastern Etching & Manufacturing Company	NPDES # MA0000647	SEGMENT MA36-25
The Eastern Etching & Manufacturing Company is authorized (MA0000647) issued in September 1995 to discharge from their facility in Chicopee a flow of 3500 GPD average monthly and 7000 GPD daily maximum of treated wastewater from wire rinsing via outfall #001 to the Chicopee River. The facility's whole effluent toxicity limit is $LC_{50} \geq 50\%$ effluent using *Ceriodaphnia dubia* and *Pimephales promelas* as test species on a biannual basis. There are also limits on total aluminum, chromium 6+, fluoride, total nickel, total zinc, total copper, total chromium, total suspended solids, cyanide, iron, oil and grease, and TT0. Effluent Whole effluent toxicity tests have been conducted on the Eastern Etching & Manufacturing Company treated effluent. Between May 2000 and May 2002, 5 valid tests were conducted using *C. dubia* and *P. promelas*. The LC_{50} using *C. dubia* ranged from 56.10% to >100% effluent (n=5). The LC_{50} using *P. promelas* were all >100% (n=5). All of the tests met the limit of $\geq$50%. Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2000 and May 2002 ranged from 0.170 mg/L to 3.400 mg/L (n=5). Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and May 2002 ranges from <0.020 to 0.150 mg/L (n=5). Between May 2000 and May 2002 only once on May 10, 2000 was the total aluminum limited exceeded when the effluent had a aluminum concentration of 5.3 mg/L. Ambient The Eastern Etching & Manufacturing Company staff collected water from the Chicopee River approximately 100 feet upstream of Eastern Etching east parking lot, off of Riverview Terrace, for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and May 2002, survival of *C. dubia* exposed (48 hours) to the Chicopee River water ranged from 90 to 100% (n=5). Between May 2000 and May 2002 survival of *P. promelas* exposed (48 hours) to the Chicopee River water was all 100% (n=5). Hardness ranged from 19.00 mg/L to 29.00 mg/L (n=5).		

PERMITTEE Massachusetts Division of Fisheries and Wildlife	NPDES # MA0110043	SEGMENT MA36-09
The Massachusetts Division of Fisheries and Wildlife is authorized (MA0110043 issued in December 2001) to discharge from the Charles L. McLaughlin Trout Hatchery a flow of 7.0 MGD average monthly and 8.1 MGD daily maximum of treated effluent via outfall #001 to the Swift River. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq$ 33% effluent using *Ceriodaphnia dubia* as a test species on a quarterly basis when formalin is being used. The total phosphorus limit is 1.0 mg/L daily maximum. The facility has not used formalin since 1998 and therefore not conducted any whole effluent toxicity tests.		

PERMITTEE	NPDES #	SEGMENT
Polymer Injection Molding	**MAG250376**	**MA36-21**
Montec Plastics is authorized (MAG250376 issued in December 2000) to discharge from their facility in Monson a flow of 0.375 MGD daily maximum of non-contact cooling water (NCCW) via two outfalls to the Chicopee Brook. On January 1, 2001 the company name changed to Polymer Injection Molding, A Division of Polymer Corporation. The source of water for the facility is municipal.		

PERMITTEE	NPDES #	SEGMENT
Quabbin Wire & Cable Co. Inc.	**MA0030571**	**MA36-06**
The Quabbin Wire & Cable Co. Inc. is authorized (MA0030571 issued in August 1997) to discharge from their facility in Ware contact cooling water via outfall #003 to the Ware River. There is no flow limit although it should be monitored daily and the maximum daily temperature limit is 83 degrees Fahrenheit. The permit also stipulates the quarterly monitoring of arsenic, copper, lead, zinc BIS (2-Ethyl-Hexayl) Phthalate. PH should also be between 6.8 and 8.3 and monitoring quarterly.		

PERMITTEE	NPDES #	SEGMENT
Solutia Inc.	**MA0001147**	**MA36-24**
Solutia Inc. is authorized (MA0001147 issued in December 1993) to discharge from their facility in Springfield a flow of 4.0 MGD average monthly and 6.0 daily maximum of non-contact cooling water (NCCW) via outfall #017 to the Chicopee River with a maximum daily temperature of 90 degrees Fahrenheit; a flow of 0.4 MGD average monthly and 0.5 MGD daily maximum of non-contact cooling water (NCCW) via outfall #009 to the Chicopee River with a maximum daily temperature of 90 degrees Fahrenheit.		

PERMITTEE	NPDES #	SEGMENT
William E. Wright Limited Partnership	**MAG250031**	**MA36-15**
The William E. Wright Limited Partnership is authorized (MAG250031 issued in January 2005) to discharge from their facility in West Warren a flow of 3,000 MGD average monthly and 2110 MGD daily maximum of surface water discharge and non-contact cooling water to the Quaboag River (MA36-15). Recently in December 2006 Wm. Wright announced that they were closing their operations in Warren. William Wright is currently closed and no longer discharging (McElroy 2007). Wm Wright formerly had an individual permit #MA0001074.		

Table D2: Chicopee River Basin Municipal and Sanitary Surface Wastewater Discharges

PERMITTEE	NPDES #	SEGMENT
Barre Wastewater Treatment Plant (WWTP)	**MA0103152**	**MA36-04**

The Barre Wastewater Treatment Plant (WWTP) is authorized (MA0103152) issued in November 2005) to discharge from this facility a flow of 0.3 MGD average monthly of treated effluent via outfall #001 to the Ware River. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Ceriodaphnia dubia* test species on a quarterly basis. The total phosphorus limit is 1.0 mg/L average monthly.

This permit includes limits on BOD5, total suspended solids (TSS), pH, fecal coliform bacteria, total phosphorus and total copper. The permit stipulates the reporting of flow, total kjeldahl nitrogen and nitrite and nitrate. The total phosphorus limit of 1.0 mg/L is to be met within 3 years of the effective date of the permit. This permit also does not allow the use of chlorine.

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD_5	30 mg/L (75 lbs/day)	30 mg/L (876 lbs/day)	
TSS	30 mg/L (75 lbs/day)	30 mg/L (876 lbs/day)	
pH	6.5-8.3		
Fecal coliform bacteria	200 cfu/100 mL		400 cfu/100 mL
TP	1.0 mg/L		

PERMITTEE	NPDES #	SEGMENT
City of Chicopee	**MA0101508**	**MA36-24, MA36-25, MA36-38**

The City of Chicopee is authorized (MA0101508 issued in September 1999) to discharge from the Chicopee Water Pollution Control a flow of 15.5 MGD average monthly of treatment plant effluent via outfall #010 to the Connecticut River, combined sewage overflow to the Chicopee River, and stormwater runoff that has passed through an oil/water separator to Cooley Brook. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Pimephales promelas* as a test species on a quarterly basis. The TRC limit between April 1 and October 31 is 0.89 mg/L average weekly and 1.0 mg/L daily maximum.

The Chicopee Water Pollution Control has fourteen CSOs in the Chicopee River (MA36-24). There are currently ten CSO's in the Chicopee River (MA36-25). Previously there were twelve CSOs in the Chicopee River (MA36-25) segment. CSO #023 was plugged in early 2002 while CSO #025 was plugged on June 29, 2005. Previously the twelve CSOs in this segment were estimated to be discharging 165 MG/year.

PERMITTEE Town of Hardwick	NPDES # MA01001021	SEGMENT MA36-05

The Town of Hardwick is authorized (MA0100102 issued in April 2006) to discharge from the Hardwick Water Pollution Control Facility in Gilbertville a flow of 0.23 MGD average monthly of treated effluent via outfall #001 to the Ware River. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Ceriodaphnia dubia* as a test species on a biannual basis. The permit stipulates the reporting of total phosphorus, TKN and nitrite + nitrate nitrogen.

Parameter	Average Monthly	Average Weekly	Maximum Daily
Flow	0.23 MGD		
BOD	30 mg/L (58lbs/day)	45 mg/L (86bs/day)	
TSS	30mg/L (58lbs/day)	45 mg/L (56 lbs/day)	
pH	6.5-8.3		
Fecal Coliform (April 1- October 31)	200 cfu/100mL		400 cfu/100mL
TRC (April 1- October 31	0.6 mg/L		1.0 mg/L
Total Phosphorus	1.0 mg/L		

Effluent

Whole effluent toxicity tests have been conducted on the Hardwick Water Pollution Control Facility treated effluent. Between May 2000 and November 2005, 12 valid tests were conducted using *C. dubia* and 7 using *P. promelas*. The LC_{50} using *C. dubia* was all >100% effluent (n=12), except for May 2001 which was 93.90%, and November 2001 and 2002 which were both 70.70%. The LC_{50} using *P. promelas* were all >100% (n=7).

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2000 and November 2005 ranged from < 0.100 mg/L to 38.3 mg/L (n=11).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and November 2005 ranges from 0.010 to < 0.050 mg/L (n=10).

Ambient

The Harwick Pollution Control Facility staff collected water from the Ware River approximately 50 yards above the outfall at the Gilbertville and Wheelwright facilities, for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and November 2005, survival of C. dubia exposed (48 hours) to the Ware River water was all 100% (n=12). Between May 2000 and May 2003, survival of P. promelas exposed (48 hours) to the Ware River water was all 100% (n=7). Hardness ranged from 12.0 mg/L to 61.00 mg/L (n=11).

PERMITTEE Town of Hardwick	NPDES # MA0102431	SEGMENT MA36-05

The Town of Hardwick is authorized (MA0102431 issued in April 2006) to discharge from the Hardwick Water Pollution Control Facility in Wheelwright a flow of 0.043 MGD average monthly of treated effluent via outfall #001 to the Ware River. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Ceriodaphnia dubia* as a test species on a biannual basis. The TRC limit between April 1 and October 31 is 1.0 mg/L daily maximum. The town has hired an engineer to implement a flow paced sodium hypochlorite disinfection system. The permit stipulates the reporting of total phosphorus, dissolved phosphorus, TKN and nitrite + nitrate nitrogen.

Parameter	Average Monthly	Average Weekly	Maximum Daily
Flow	0.043 MGD		
BOD5	30 mg/L (11lbs/day)	45 mg/L (16lbs/day)	
TSS	30mg/L (11lbs/day)	45 mg/L (16 lbs/day)	
pH	6.5-8.3		
Fecal Coliform (April 1-October 31)	200 cfu/100mL		400 cfu/100mL
TRC			1.0 mg/L

Effluent

Whole effluent toxicity tests have been conducted on the Hardwick Water Pollution Control Facility treated effluent. Between May 2000 and November 2005, 12 valid tests were conducted using *C. dubia* and 7 using *P. promelas*. The LC_{50} using *C. dubia* ranged from 35.4% to >100% effluent (n=12). Of the 12 tests, four did not meet the limit of $\geq$100%. The LC_{50} using *P. promelas* were all >100% (n=7) with the exception of May 2002 which was 57.40%. Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2000 and November 2005 ranged from <0.100 mg/L to 16.000 mg/L (n=12).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and November 2005 ranges from <0.020 to 0.180 mg/L (n=12). All the TRC tests met the required limit of 1.0 mg/L daily maximum.

Ambient

The Hardwick Water Pollution Control Facility staff collected water from the Ware River approximately 50 yards above the outfall at the Gilbertville and Wheelwright facilities, for use as dilution water in the facility's whole effluent toxicity tests. Between May 2000 and November 2005, survival of *C. dubia* exposed (48 hours) to the Ware River water was all 100% (n=12). Between May 2000 and May 2003, survival of *P. promelas* exposed (48 hours) to the Ware River water ranged from 95 to 100% (n=7). Hardness ranged from 12.0 mg/L to 27.00 mg/L (n=11).

PERMITTEE Town of Ludlow	NPDES # MA0101338	SEGMENT MA36-24

The Town of Ludlow is authorized (MA0101338issued in August 1985) to discharge from the Ludlow Sewage Collection System combined sewer overflow via outfall #003, #004, #007, #008, #009 to the Chicopee River. This permit expired in 1990 and was not renewed. As of June 2000 the stautus of the CSO's was as follows:

CS0#003, Motyka St	Blocked off December 1998
CSO#004a, Manhole	Blocked off December 1998
CSO#004b; Box	Blocked off December 1998
CSO #005- South, Primary Plant-	Side Spill Weir, Active
CSO#007- Albank driveup	Blocked off December 1998
CSO#008- State St @ East St.	Blocked off December 1983
CSO#009A- State St. @ Bristol	Blocked off December 1998
CSO#009B- State St @Duke St	Storm drain only, no longer CSO.
CSO#010 State St @ Essex St	Blocked off December 1998

Since the permit's expiration the Town of Ludlow has worked with Springfield to craft a Long Term CSO Plan. CSO#005 is the only CSO currently active and is scheduled to be eliminated in 2009.

PERMITTEE Town of North Brookfield	NPDES # MA0101061	SEGMENT MA36-28

The Town of North Brookfield is authorized (MA0101061 issued in March 2007) to discharge from the North Brookfield Wastewater Treatment Facility (WWTF) a flow of 0.76 MGD average monthly of treated effluent via outfall #001 to Dunn Brook. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Ceriodaphnia dubia* and *Pimephales promelas* as test species on a quarterly basis. The permit limit for CNOEC is 100% effluent tested on a quarterly basis. There are also limits on fecal coliform bacteria , pH, copper, zinc and aluminum and seasonal limits on ammonia-nitrogen, total phosphorus, BOD, total suspended solids and dissolved oxygen. The permit also stipulates the quarterly reporting of TKN and nitrite + nitrate.

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD and TSS each (May 1-October 31)	15 mg/L (95lbs/day)	22 mg/L (139 lbs/day	
BOD and TSS each (November 1 – April 30)	30 mg/L (190lbs/day)	45 mg/L (285lbs/day)	
Ammonia Nitrogen (May 1-October 31)	1.0 mg/L (6.3 lbs/day)	1.5 mg/L (9.5lbs/day)	
Ammonia Nitrogen (November 1 – April 30)	5.4 mg/L (34.3lbs/day)	Report	
Total Phosphorus (May 1-October 31)	0.2 mg/L (6.3lbs/day)	1.0 mg/L (9.5lbs/day)	
Total Phosphorus (November 1 – April 30	Report		
Fecal coliform bacteria	200 cfu/ml		400 cfu/ml
Copper	5.2 ug/L		7.3 ug/L
Zinc	66.6 ug/L		66.6 ug/L
Aluminum	87 ug/L		750 ug/L
Dissolved Oxygen (May 1-October 31)	>5.0 mg/L	>5.0 mg/L	

Effluent

Whole effluent toxicity tests have been conducted on the North Brookfield Wastewater Treatment Facility (WWTF) treated effluent. Between July 2000 and February 2006, 23 valid chronic tests were conducted using *C. dubia* and 25 using *P. promelas.* The chronic whole effluent toxicity tests using *C. dubia* were all >100% effluent (n=23) with the exception of five. January 2001 and February 2005 were both 50.00%, and July 2002 was 12.50%. April 2001 had poor reproduction in 6.25% effluent, so the CNOEC was reported as <6.25%. November 2004 had poor reproduction in 12.5% effluent. The chronic whole effluent toxicity tests using *P. promelas* were all >100% (n=18) with the exception of July 2001 which was 25.00%. Results of the LC_{50} were all 100% effluent.

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between July 2000 and February 2006 ranged from <0.100 mg/L to 3.100 mg/L (n=26).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between July 2000 and February 2006 ranges from <0.020 to 0.130 mg/L (n=26).

Ambient

The North Brookfield Wastewater Treatment Facility (WWTF) staff collected water from Forget-Me-Not Brook (MA36-18) approximately 10 feet north of East Brookfield Road, for use as dilution water in the facility's whole effluent toxicity tests. Between July 2000 and February 2006, survival of *C. dubia* exposed (approximately 7 days) to the Chicopee River water ranged from 80 to 100% (n=23). Between July 2000 and February 2001 survival of *P. promelas* exposed (approximately 7 days) to the Chicopee River water ranged from 63 to 100% (n=23). Three tests did not meet the regulations requirement, ≥75%.

Hardness ranged from 20.00 mg/L to 64.00 mg/L (n=26).

PERMITTEE Town of Palmer	NPDES # MA0026891	

The Town of Palmer is authorized (MA0026891 issued in March 1979) to discharge from the Dan Wesson firearms Company a flow of 5,000 GPD average monthly of processed wastewater via outfall #001 to the Chicopee River.

This company is out of business but the permit was listed as active as of March 15, 2007.

PERMITTEE Town of Palmer	NPDES # MA0101168	SEGMENT MA36-22, MA36-17, MA36-07, MA36-06, MA36-10

The Town of Palmer is authorized (MA0101168 issued in September 2000) to discharge from the Palmer Water Pollution Control Facilities a flow of 5.6 MGD average monthly of treated effluent via outfall #027 to the Chicopee River and via CSO's to the Quaboag River, the Ware River, and the Swift River. The facility's whole effluent toxicity limit is $LC_{50} \geq 100\%$ effluent using *Ceriodaphnia dubia* as a test species on a quarterly basis. The TRC limit between April 1 and October 31 is 0.11 mg/L average monthly and 0.20 mg/L daily maximum. The total phosphorus limit between May 1 and October 31 is 1.0 mg/L average monthly and 2.0 average weekly. There are also limits on BOD, total suspended solids, fecal coliform bacteria, pH, copper, and aluminum. Numerous CSO's are also included in this permit.

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD	30 mg/L (1400lbs/day)	45mg/L (2100lbs/day)	report
TSS	30 mg/L (1400lbs/day)	45mg/L (2100lbs/day)	report
Fecal coliform bacteria (April 1-October 15)	200 cfu/ml		400 cfu/ml
Copper Total Recoverable	25 ug/L		32 ug/L
Aluminum	905 ug/L		report

Effluent

Whole effluent toxicity tests have been conducted on the Palmer Water Pollution Control Facility treated effluent. Between July 2000 and March 2006, 22 valid chronic tests were conducted using *C. dubia.* Results of the chronic whole effluent toxicity tests using *C. dubia* ranged from 6.25% to $\geq$100% effluent (n=22). June 2001 showed a significant difference in reproduction for 25% effluent. The LC_{50}'s were all 100% effluent (n=24) with the exception of September 2004, which was 33.00%.

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between July 2000 and March 2006 ranged from <0.100 mg/L to 19.000 mg/L (n=23).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between July 2000 and March 2006 ranges from <0.020 to 0.100 mg/L (n=24).

Ambient

The Palmer Water Pollution Control Facilities staff collected water from the Ware River about 500 feet from the railroad tracks, about half a mile from where the Ware River and the Quaboag River converge, for use as dilution water in the facility's whole effluent toxicity Ware. Between July 2000 and March 2006, survival of *C. dubia* exposed (approximately 7 days) to the Ware River water ranged from 80 to 100% (n=23).

Hardness ranged from 12.00 mg/L to 26.00 mg/L (n=23).

PERMITTEE Town of Spencer	NPDES # MA0100919	SEGMENT MA36-20

The Town of Spencer is authorized (MA0100919 issued in February 2003) to discharge from the Spencer Wastewater Treatment Plant (WWTP) a flow of 1.08 MGD average monthly of treated effluent via outfall #001 to Cranberry Brook. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC $\geq$ 89% effluent using *Ceriodaphnia dubia* as a test species on a quarterly basis. The TRC limit 12 ug/L average monthly and 21 ug/L daily maximum. There are seasonal limits on BOD, TSS, ammonia-nitrogen, total phosphorus and dissolved oxygen. The permit includes limits on fecal coliform bacteria, pH and copper along with stipulating the reporting of TKN and nitrite + nitrate nitrogen.

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD and TSS each (May 1-October 31)	5.6 mg/L (50lbs/day)	7.5 mg/L(68lbs/day)	
BOD and TSS each (November 1 – April 30)	30 mg/L (270lbs/day)	45 mg/L (405 lbs/day)	
Ammonia Nitrogen (May 1-October 31)	0.56 mg/L (5.0 lbs/day)	0.84 mg/L (7.5lbs/day)	
Ammonia Nitrogen (November 1 – April 30)	8.5 mg/L (76 lbs/day)	Report	
Total Phosphorus (May 1-October 31)	0.3 mg/L (2.7 lbs/day)	Report	
Total Phosphorus (November 1 – April 30	0.75 mg/L (6.8 lbs/day)		
Dissolved Oxygen (May 1-October 31)	>6.0 mg/L	>6.0 mg/L	
Cooper	4 ug/L		5 ug/L
Fecal coliform bacteria (May 1-October 31)	200 cfu/ml		400 cfu/ml

The total phosphorus limit of 0.3 mg/L between May 1 and October 31 is an interim limit, ultimately a 0.2 mg/L limit of total phosphorus average monthly (1.8 lb/day) is to be imposed. A recent optimization study at the treatment plant generally failed to meet the stricter 0.2 mg/L limit and the permit calls for a phosphorus reduction feasibility study to be submitted. The EPA has also issued an Administrative Order due to copper concentrations in the plant's effluent that exceed the permitted value. A report outlining options to reduce cooper in the plants effluent required by the administrative order was recently written (Wright-Pierce, 2007). The draft NPDES permit issued August 17, 2006 has an average effluent copper discharge limit of 10.3 ug/L and a daily maximum of 15.3 ug/L. The current interim copper limits for the plant are 73 ug/L monthly average and 79 ug/L daily maximum concentration.

Effluent

Whole effluent toxicity tests have been conducted on the Spencer Wastewater Treatment Plant (WWTP) treated effluent. Between May 2000 and February 2006, 22 valid chronic tests were conducted using *C. dubia.* The chronic whole effluent toxicity tests using *C. dubia* were all >100% effluent (n=22). Results of the LC_{50} were all > 100% effluent (n=24).

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between May 2000 and February 2006 ranged from <0.075 mg/L to 0.493 mg/L (n=24). Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between May 2000 and February 2006 ranges from <0.020 to 0.050 mg/L (n=24).

Ambient

The Spencer Wastewater Treatment Plant (WWTP) staff collected water from the Cranberry River at the South Spencer Road Crossing for use as dilution water in the facility's whole effluent toxicity tests. Between May 2003 and February 2006, survival of *C. dubia* exposed (approximately 7 days) to the Cranberry River water ranged from 70 to 100% (n=12). Only one test did not meet the $\geq$75% requirement. Hardness measured between May 2003 and February 2006 ranged from 15.00 mg/L to 44.00 mg/L (n=12).

PERMITTEE Springfield Water and Sewer Commission	NPDES # MAG640022	SEGMENT Connects to MA36-42

The Springfield Water and Sewer Commission is authorized (MAG640022 issued in February 2001) to discharge water treatment plant effluent from the Ludlow Reservoir to Higher Brook.

PERMITTEE Springfield Water and Sewer Commission	NPDES # MA01033312	SEGMENT MA36-24
The Springfield Water and Sewer Commission is authorized (MA010331 issued 17 June 2003) to discharge from 24 Combined Sewer Overflows discharges serial numbers: 007,008,010 – 019, 034-037, 043- 046, 048 and 049 to the Connecticut River, Chicopee River and Miller River. CSOs #034-037 , 043 and 044 discharge to the Chicopee River (MA36-24). The estimated discharge from these CSOs is 23 MG/year.		

PERMITTEE Town of Ware	NPDES # MA0100889	SEGMENT MA36-06

The Town of Ware is authorized (MA0100889 issued in September 2000) to discharge from the Ware Wastewater Treatment Plant (WWTP) a flow of 1.0 MGD average monthly of treated effluent via outfall #001 to the Ware River. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC > 7% effluent using *Ceriodaphnia dubia* as a test species on a quarterly basis. There are seasonal limits on fecal coliform bacteria, total residual chlorine, total ammonia (as N), total posphorus. There are limits on BOS, TSS pH and total copper. The permit stipulates the reporting of TKN and nitrite + nitrate.

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD and TSS each	25 mg/L (208 lbs/day)	25 mg/L (208 lbs/day)	
Fecal coliform bacteria (April 1-October 31)	200 cfu/ml		400 cfu/ml
Ammonia Nitrogen (June-1 October 31)	1.0 mg/L	1.0 mg/L	1.5 mg/L
Total Residual Chlorine (April-1 October 31)	160 ug/L		277 ug/L
Total Phosphorus (April 1-October 31)	1.0 mg/L	1.0 mg/L	1.5 mg/L
Total Phosphorus (November 1 – April 30	Report		
Dissolved Oxygen (May 1-October 31)	>6.0 mg/L	>6.0 mg/L	
Cooper	41 ug/L		55 ug/L

Effluent

Whole effluent toxicity tests have been conducted on the Ware Wastewater Treatment Plant (WWTP) treated effluent. Between July 2000 and May 2006, 24 valid chronic tests were conducted using *C. dubia.* The chronic whole effluent toxicity tests using *C. dubia* ranged between <6.25% and >100% effluent (n=24). Of the 24 tests, 16 did not meet the required limit of >7%. TheJanuary 2001 test and the tests from November 2002 to May 2006 were all $\leq$6.25%. Results of the LC_{50} ranged from 71.00% to 100% effluent. Five of the 24 tests did not meet the required limit.

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between July 2000 and May 2006 ranged from <0.075 mg/L to 12.500 mg/L (n=23).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between July 2000 and February 2006 ranges from <0.010 to 0.060 mg/L (n=23).

Ambient

The Ware Treatment Plant (WWTP) staff collected water from the Ware River (MA36-05) off of Upper Church Street, by the northern end of the landing strip, for use as dilution water in the facility's whole effluent toxicity tests. Between November 2005 and May 2006, survival of *C. dubia* exposed (approximately 7 days) to the Ware River water was 100% (n=3). Hardness ranged from 8.00 mg/L to 20.00 mg/L (n=3).

PERMITTEE Town of Warren	NPDES # MA0101567	SEGMENT MA36-16

The Town of Warren is authorized (MA0101567 issued in September 2000) to discharge from the Warren Treatment Plant a flow of 1.5 MGD average monthly of treated effluent via outfall #001 to the Quaboag River. The facility's whole effluent toxicity limits are $LC_{50} \geq 100\%$ and C-NOEC > 13% effluent using *Ceriodaphnia dubia* as a test species on a quarterly basis. There are seasonal limits on fecal coliform bacteria and total residual chlorine. There are limits on BOS, TSS, pH and copper. The permit also stipulates the reporting of average monthly TKN, nitrite + nitrate and total phosphorus (April 1 to October 31).

Parameter	Average Monthly	Average Weekly	Maximum Daily
BOD and TSS each	30mg/L (375 lbs/day)	45 mg/L (563 lbs/day)	
Fecal coliform bacteria (April 1-October 31)	200 cfu/ml		400 cfu/ml
Total Residual Chlorine (May-1 September 30)	85 ug/L		146 ug/L
Cooper	22 ug/L		29 ug/L

Effluent

Whole effluent toxicity tests have been conducted on the Warren Treatment Plant treated effluent. Between September 2000 and November 2005, 19 valid chronic tests were conducted using *C. dubia*. The chronic whole effluent toxicity tests using *C. dubia* ranged from between 13.00 to >100% effluent (n=19), all of which meet the permit limit of >13.00, except for May 2001 which is exactly 13.00%. The chronic whole effluent toxicity test using *P. promelas* was 25.00% effluent, which meets the permit requirements. Results of the LC_{50} were all 100% effluent, with the exception of May 2003 which was 38.00%, and May 2004 which was 66.00%.

Ammonia-nitrogen concentrations reported in the whole effluent toxicity reports between September 2000 and November 2005 ranged from <0.100 mg/L to 4.50 mg/L (n=21).

Total Residual Chlorine (TRC) concentrations reported in the whole effluent toxicity reports between September 2000 and November 2005 ranges from <0.020 to <0.050 mg/L (n=21).

Ambient

The Warren Treatment Plant staff collected water from the Quaboag River (MA36-15), at Gilbert Street, approximately 500 feet upstream from the discharge site, for use as dilution water in the facility's whole effluent toxicity tests. Between September 2000 and November 2005, survival of *C. dubia* exposed (approximately 7 days) to the Quaboag River water ranged from 90 to 100% (n=21). Between September 2000 and November 2001 survival of *P. promelas* exposed (approximately 7 days) to the Quaboag River water was 100% (n=1).

Hardness ranged from 12.00 mg/L to 30.00 mg/L (n=21).

Table D3. Chicopee River Basin-Inactive/Terminated Permits. [Note: All general NPDES permits (MAG######) have a flow limit of 1.0 MGD. Volumes in the permitted flow (MGD) column for these facilities were taken from their NPDES general permit applications.]

Permittee	NPDES #	Last Date of permit issuance	Permitted Flow (MGD)	Type of Discharge	Special Notes/Conditions for next permit
Brookfield Wire Co. Inc., West Brookfield	MA0004715	6/27/1986 Inactive: 4/3/01	Outfall 001 - 0.003 Outfall 002 approx. 180 gal/day	NCCW, treated wastewater from wire rinsing, cleaning and coating operations	Discharge to unnamed tributary to Willow Brook
Cascades Diamond, Inc., Thorndike	MAG250963	2/23/2001 Inactive: 1/7/04	Outfall 002: average monthly flow of 0.13 Outfall 003: average monthly flow of 0.116	NCCW	Discharge to Ware River
Connecticut Valley Sanitary Waste Disposal, Inc	MA0033847	Issued 9/94 Terminated 5/12/05	144,000 GPD average monthly and 290,000 GPD maximum daily flow	Uncontaminated groundwater via outfalls	This permit was switched to a multi-sector general permit (MAR0C657).
The Hanson Group (formerly Glendale Plastics)	MA0032913	1989 application Inactive: 1/12/00	Not applicable	Storm water	Issue either general or individual NPDES permit
Westover AFB, Chicopee	MA0005444	12/09/76 Inactive 3/25/02	No limits	Runway runoff and wash water	Discharges to Cooley Brook,

STORMWATER

The NPDES Phase II General Permit program 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 (populations over 100,000) 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 a 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. The NPDES Stormwater Phase II General Permit requires operators of regulated small municipal separate storm sewer systems (MS4s) to develop a stormwater management program that prevents harmful pollutants from being washed or dumped directly into the storm sewer system, and then 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.

As a result of the census mapping, all 17 communities in the Chicopee River Watershed were located either totally or partially in the regulated Urbanized Area (see below Table D4). 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. All Chicopee River drainage area communities applied to EPA and MassDEP for coverage under the Phase II stormwater general permit, issued on 1 May 2003. EPA issued stormwater general permits to all 17 ChicopeeRiver Watershed municipalities after administrative review and, in coordination with MassDEP, will complete a thorough review of the communities' stormwater management program during the five-year permit term. Phase II stormwater general permits will expire on 1 May 2008 (Domizio 2004). For detailed community maps see http://www.epa.gov/region01/npdes/stormwater/ma.html.

Table D4: NPDES Phase II stormwater permit information for Chicopee River Watershed communities.

Community	Permit #	Permit Issued	Mapped Regulatory area in community
Belchertown	MAR041002	9/12/2003	Partial
Charlton	MAR041100	9/2/2003	Partial
Chicopee	MAR041003	9/4/2003	Total
Granby	MAR041007	10/2/2003	Partial
Hampden	MAR041009	9/12/2003	Partial
Leicester	MAR041202	10/1/2003	Partial
Ludlow	MAR041014	10/16/2003	Partial
Monson	MAR041015	10/2/2003	Partial
Palmer	MAR041017	12/8/2003	Partial
Paxton	MAR041148	9/29/2003	Partial
Rutland	MAR041154	9/30/2003	Partial
Spencer	MAR041162	2/11/2004	Partial
Springfield	MAR041023	9/12/2003	Total
Sturbridge	MAR041240	9/9/2003	Partial
Templeton	MAR041225	10/2/2003	Partial
Westminster	MAR041233	3/31/2004	Partial
Wilbraham	MAR041025	10/7/2003	Partial

Information for other general NPDES permittees are available online at: http://cfpub.epa.gov/npdes/stormwater/noi/noisearch.cfm.

Table D5: NPDES General Permits in Chicopee River Watershed

Permitee	Permit #	Date Issued	Waterbody (Segment)
Westover Airforce Base	MAR05B973	2/21/02	Cooley Brook (MA36-38)
Quabbin Wire & Cable Co.	MAR00A028		Ware River (MA36-06)

Works Cited

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