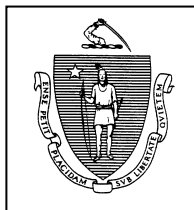


CHICOPEE RIVER WATERSHED 2003 WATER QUALITY ASSESSMENT REPORT



Ware River, Ware, Massachusetts

COMMONWEALTH OF MASSACHUSETTS
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CHICOPEE RIVER WATERSHED
2003 WATER QUALITY ASSESSMENT REPORT

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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List of Acronyms and Abbreviations

| | |
|---|--|
| 7Q10'.....Lowest mean flow for seven consecutive days to be expected once in ten years | MDL..... Method Detection Limit |
| ACOE Army Corps of Engineers | MWRA..... Massachusetts Water Resources Authority |
| ADBAssessment Database | NOAA.....National Oceanic and Atmospheric Administration |
| BRPBureau of Resource Protection | NPDES..... National Pollutant Discharge Elimination System |
| BMPBest Management Practices | PALIS..... Pond and Lake Information System |
| BODBiological Oxygen Demand | PCB..... Polychlorinated Biphenyl |
| BWSC.....Bureau of Waste Site Cleanup | QAPP Quality Assurance Project Plan |
| CERO Central Environmental Regional Office | RBP..... Rapid Bioassessment Protocol |
| C-NOECChronic No Observe Effect Concentration | SARIS Stream and River Inventory System |
| CSO Combined Sewer Overflow | SMART Strategic Monitoring and Assessment for River Basin Teams |
| DODissolved Oxygen | SRF State Revolving Fund |
| EOEAExecutive Office of Environmental Affairs | SWQS Surface Water Quality Standards |
| EPA.....United States Environmental Protection Agency | TMDL Total Maximum Daily Load |
| FERC.....Federal Energy Regulatory Commission | TOXTD..... MassDEP DWM Toxicity Testing Database |
| LC ₅₀Lethal concentration to 50% of the test organisms | TRC Total Residual Chlorine |
| MA DCRMassachusetts Department of Conservation and Recreation. | TSS Total Suspended Solids |
| MassDEP.....Massachusetts Department of Environmental Protection | USFWS.....United States Fish and Wildlife Service |
| MA DFG.....Department of Fish and Game (formerly the Department of Fisheries, Wildlife and Environmental Law Enforcement) | USGS..... United States Geological Survey |
| MA DPH.....Massachusetts Department of Public Health | WBID..... Waterbody Identification Code |
| MDCMetropolitan District Commission | 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 hectare per year |

Table of Fish Scientific Names

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

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 Chicopee River 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--29798²) | | | |
| 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%) |
| <p>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</p> <p>2 – Quabbin Reservoir (20412 acres) constitutes 81 percent of the lake acreage in the Chicopee River basin.</p> | | | |

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*.

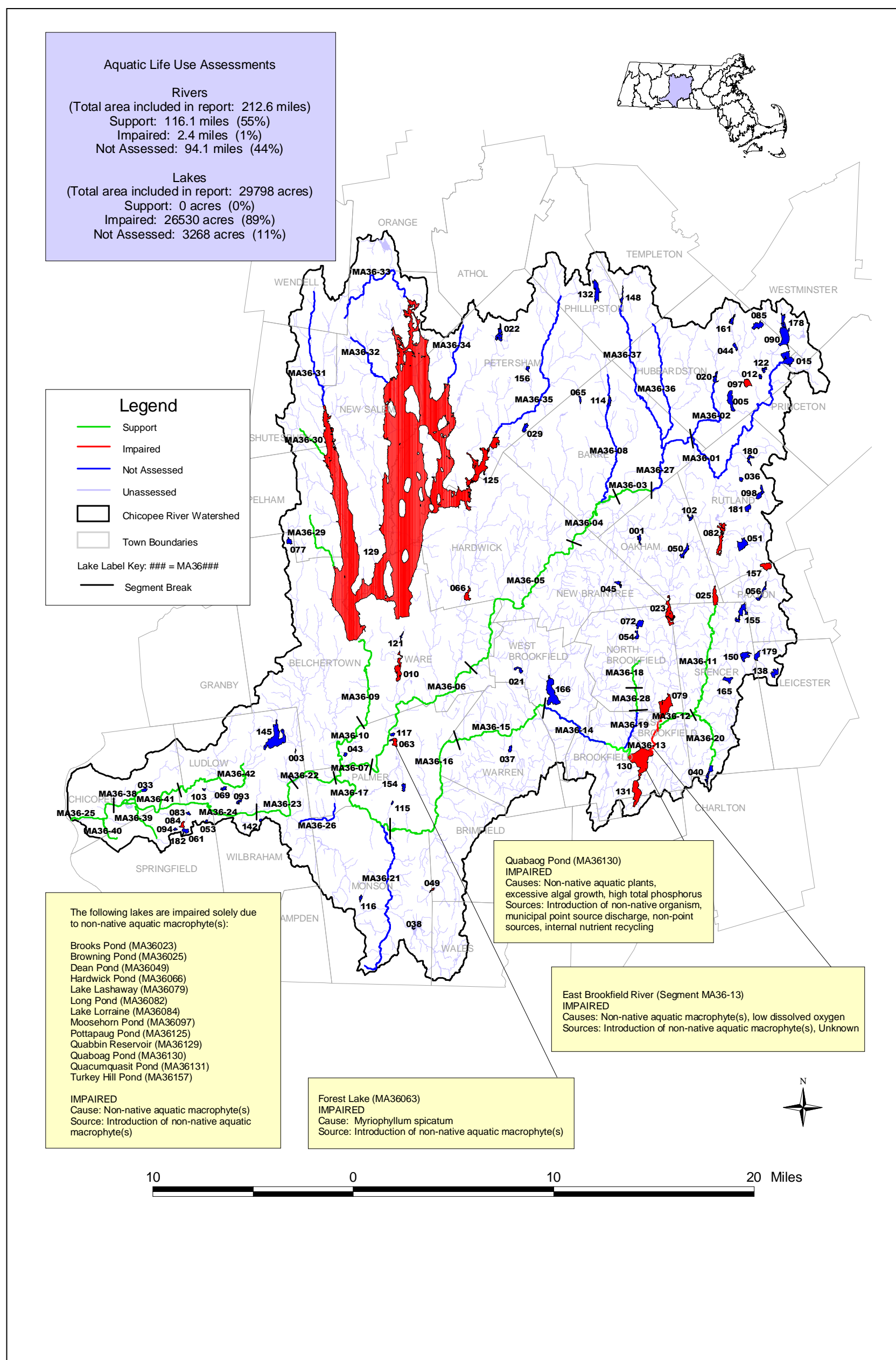
Continue to conduct biological and water quality monitoring to evaluate the effect(s), if any of National Pollution Discharge Elimination (NPDES) discharges, water withdrawals, and non-point sources of pollution and to document any changes in water quality as a result of infrastructure improvements/pollution 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.

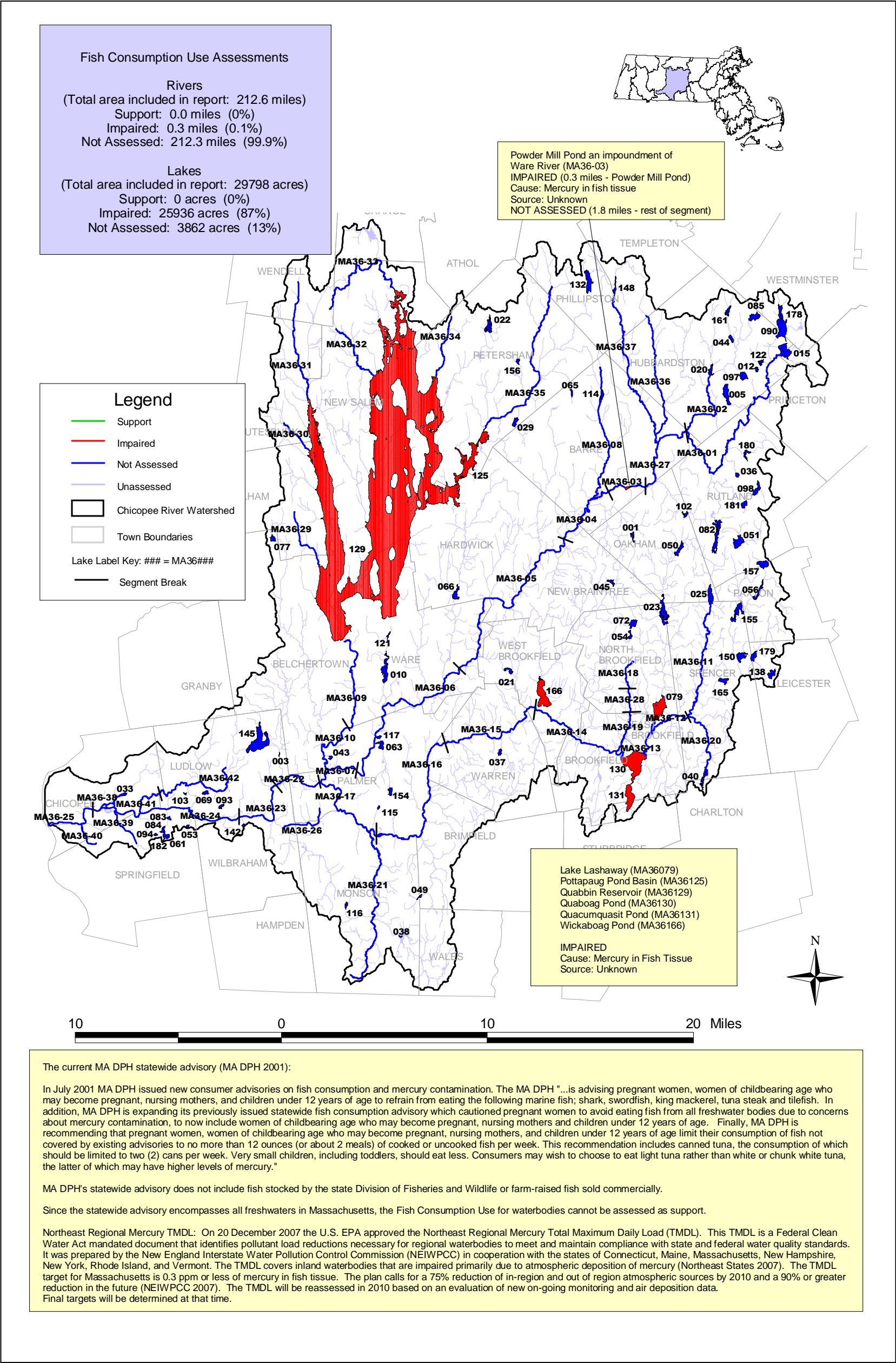
Fish passage should be encouraged at both hydropower plants and other dams in the watershed. In addition, dam removal should be encouraged to promote ecological continuity as feasible.

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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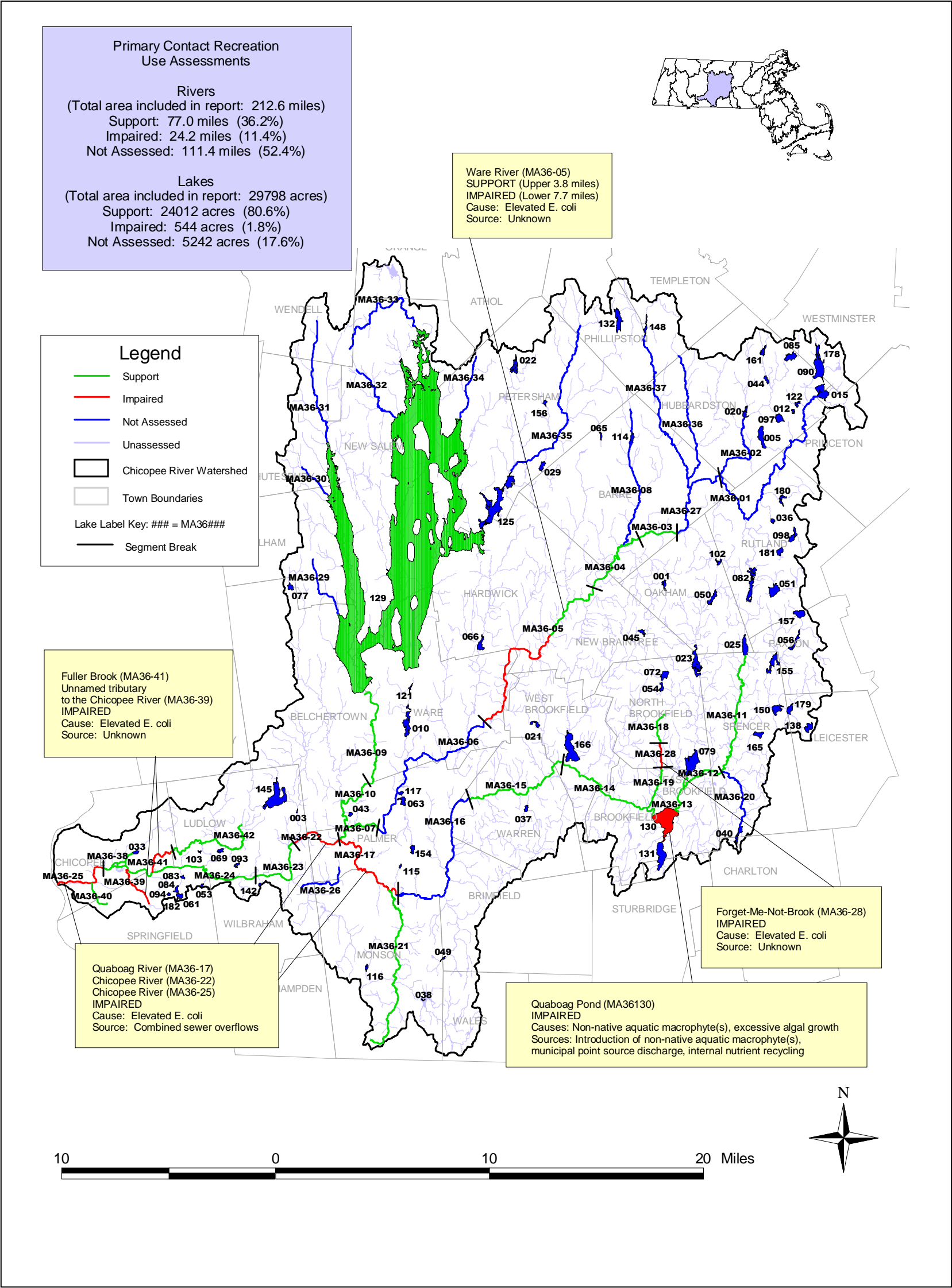
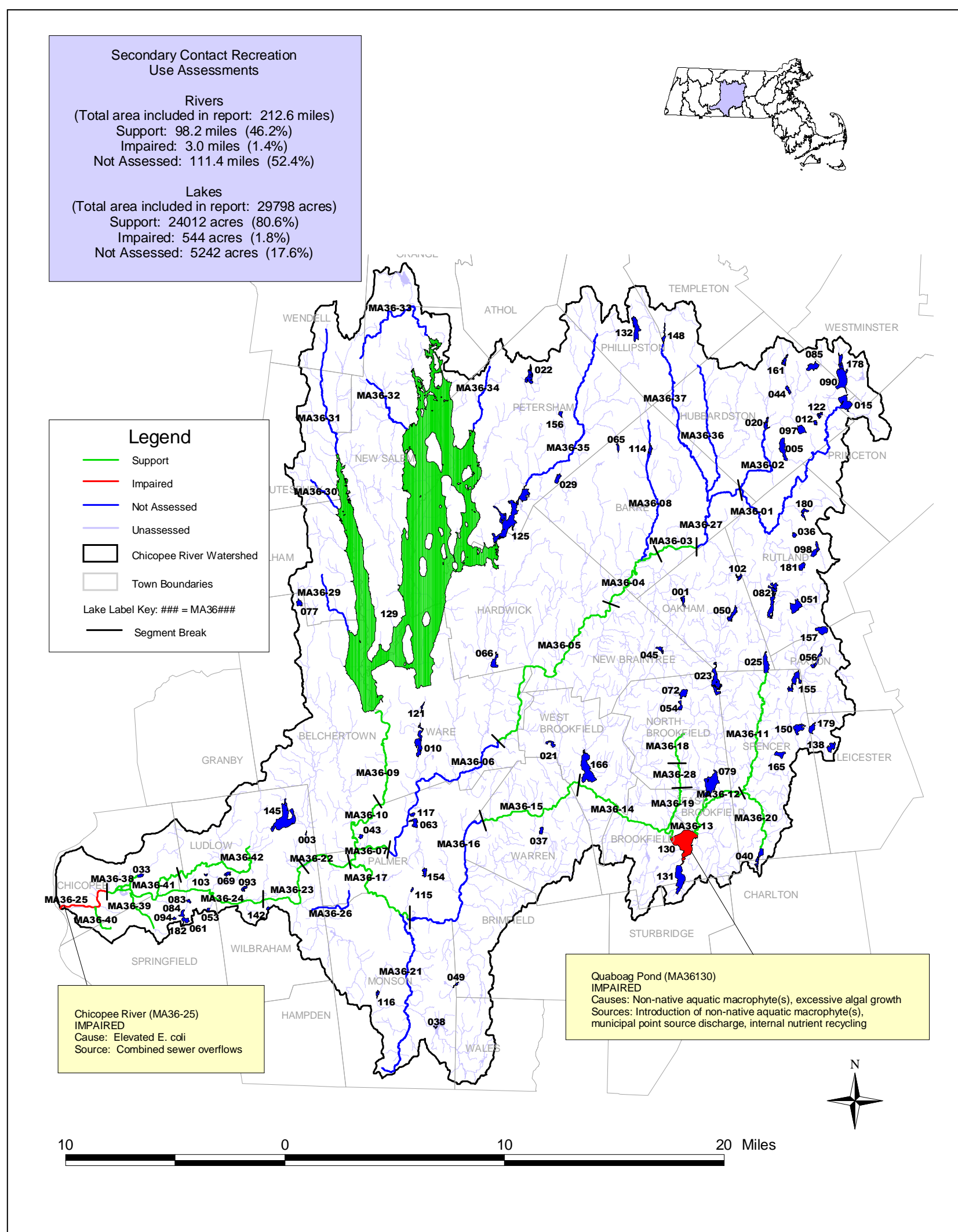


Figure 3: Chicopee River Basin *Primary Contact Recreational Use* Assessment Summary

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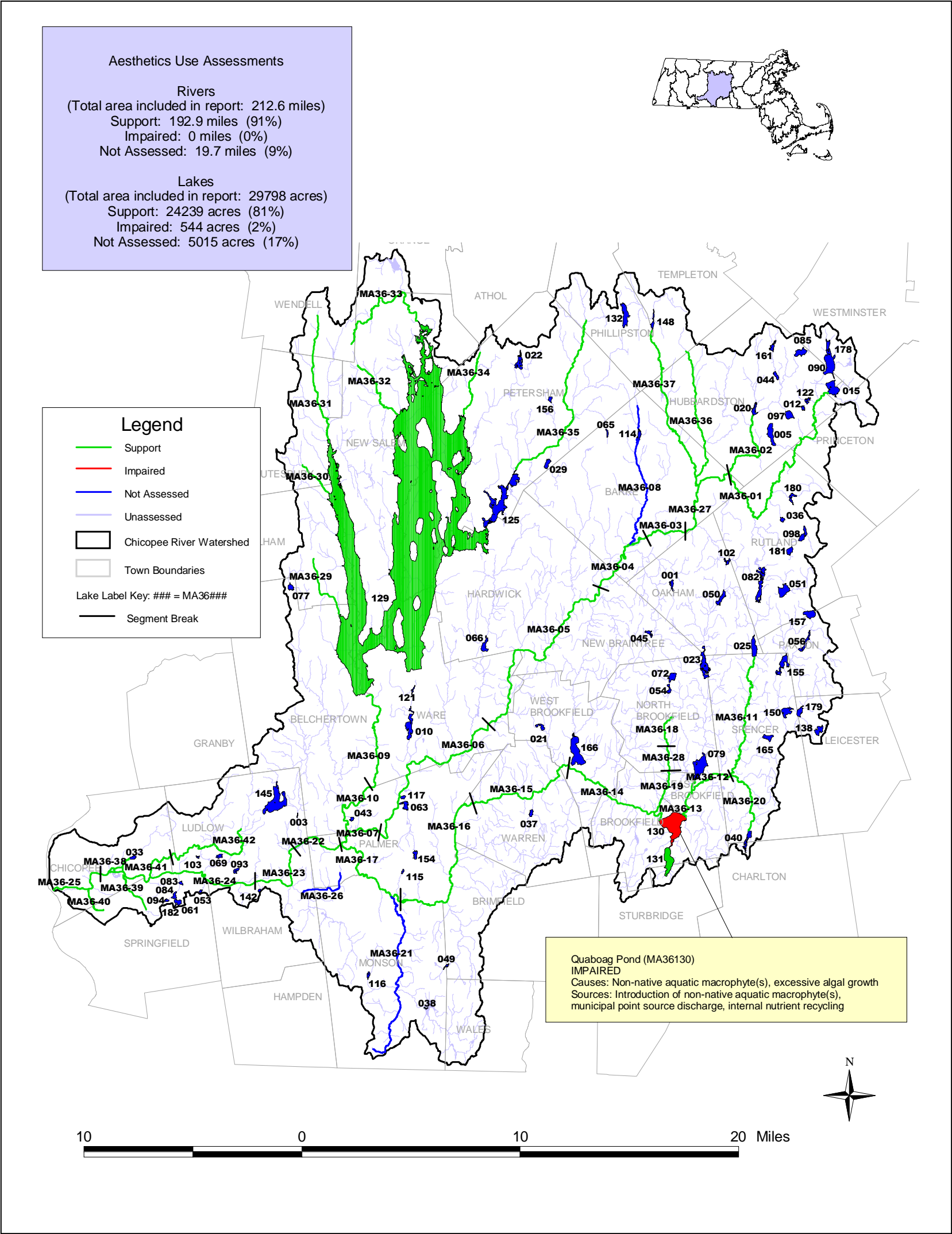


Figure 5: Chicopee River Basin *Aesthetics Use* Assessment Summary

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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)

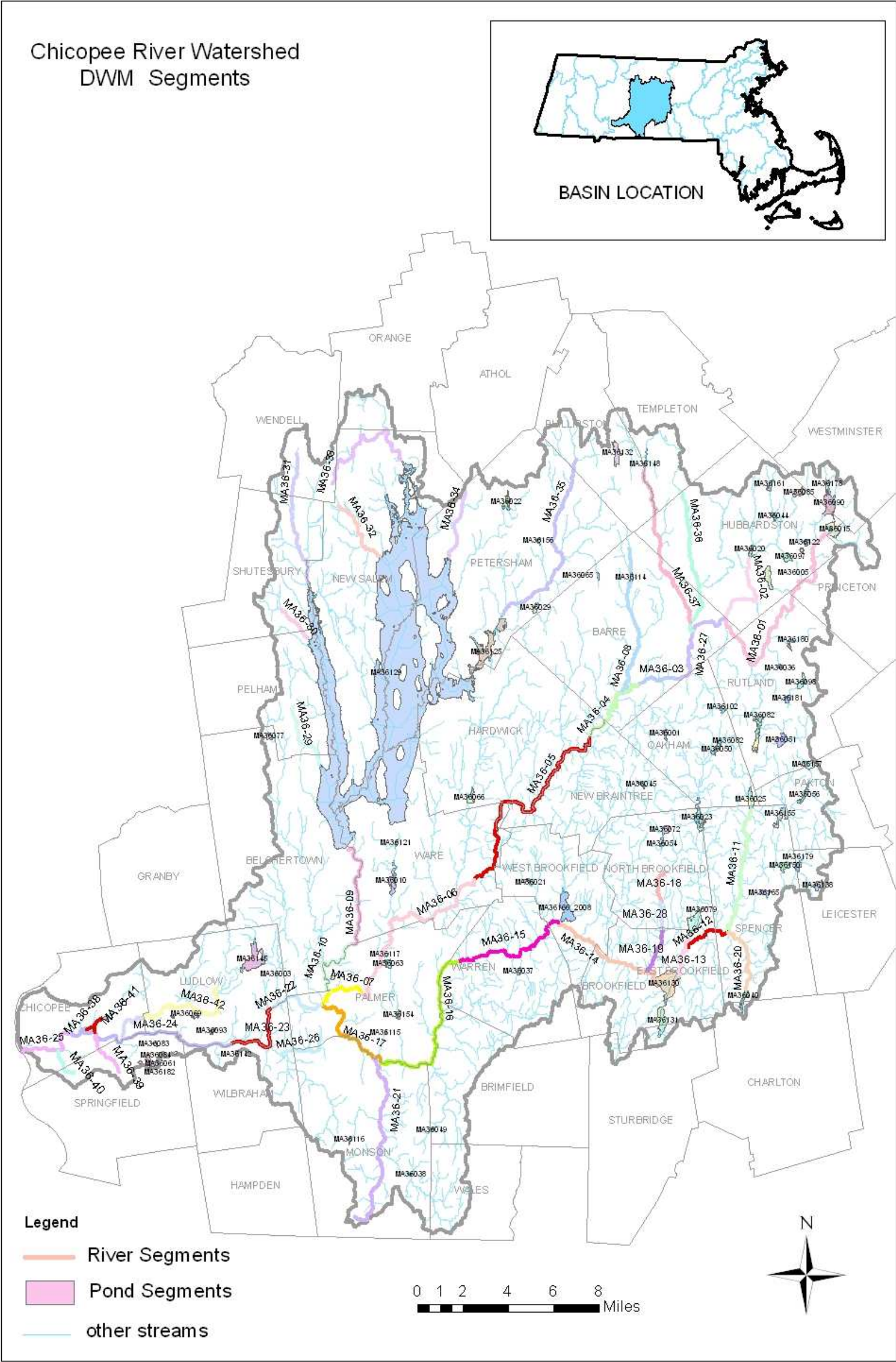


Figure 6: Chicopee River Basin - River Segments and Lake Segments

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The Swift River Subbasin

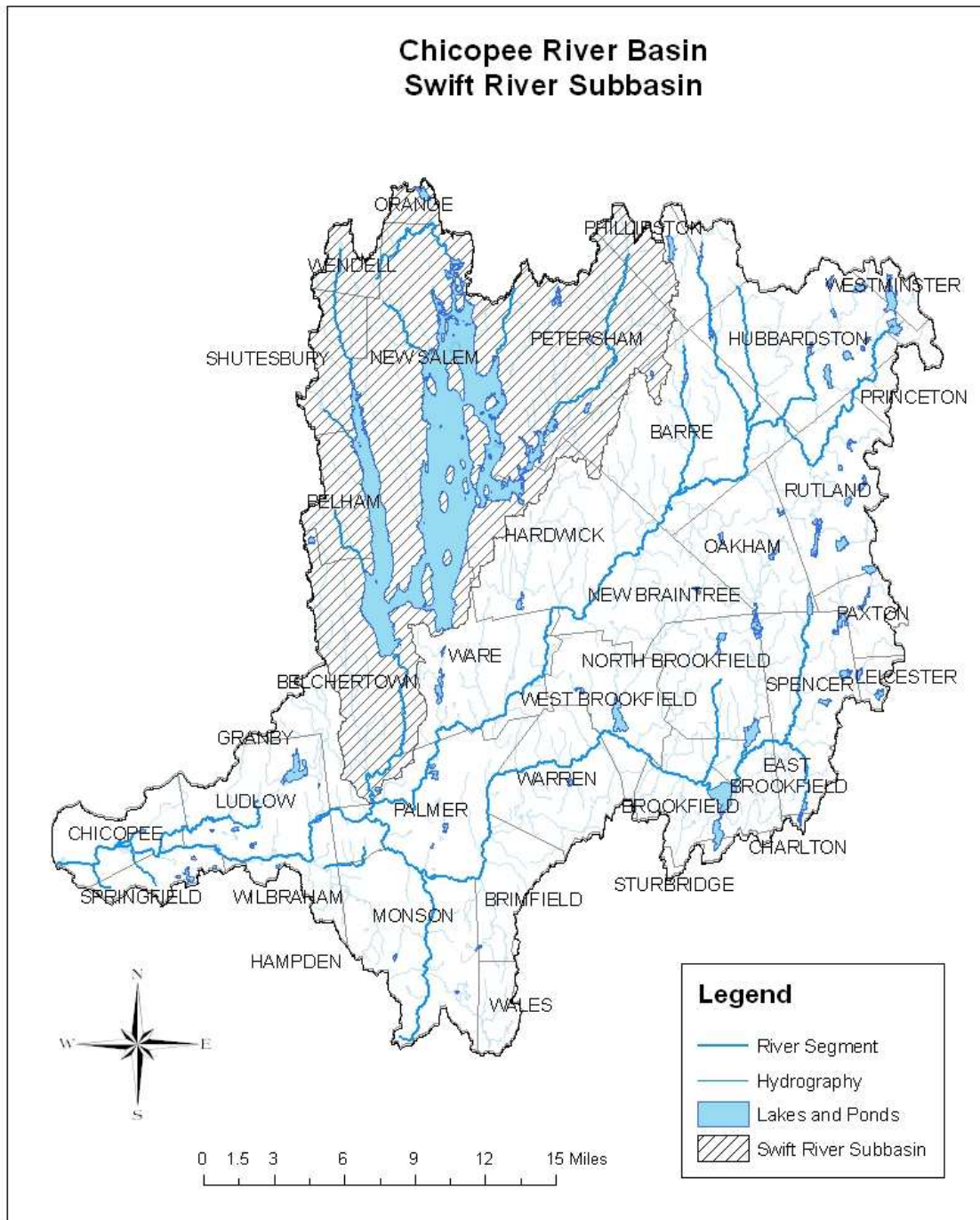


Figure 7: Swift River Subbasin

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).



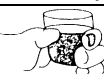



Given the presence of multiple age classes of brook trout *the Aquatic Life Use* is assessed as support. Due to its acid sensitivity Cadwell Creek is given "Alert Status".

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).



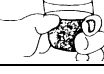



Given the presence of multiple age classes of brook trout the *Aquatic Life Use* is assessed as support. Due to its acid sensitivity Atherton Creek is given "Alert Status".

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 mi². 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



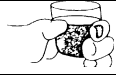



Based on the available information there are no WMA regulated water withdrawals from or permitted surface water discharges to this subwatershed.

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).

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 ASSESSMENTBiology

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. Although 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 its 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 mi² including 1.6 mi² 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 (°C) | 8.9 – 14.6 (n=13) |
| Conductivity (µS/cm at 25°C) | 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 Belchertown Road, 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 |
| <i>E. coli</i> (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 WTP (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 (°C) | 11.9 – 19.5 (n=9) |
| Conductivity (µS/cm at 25°C) | 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 |
| <i>E. coli</i> (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

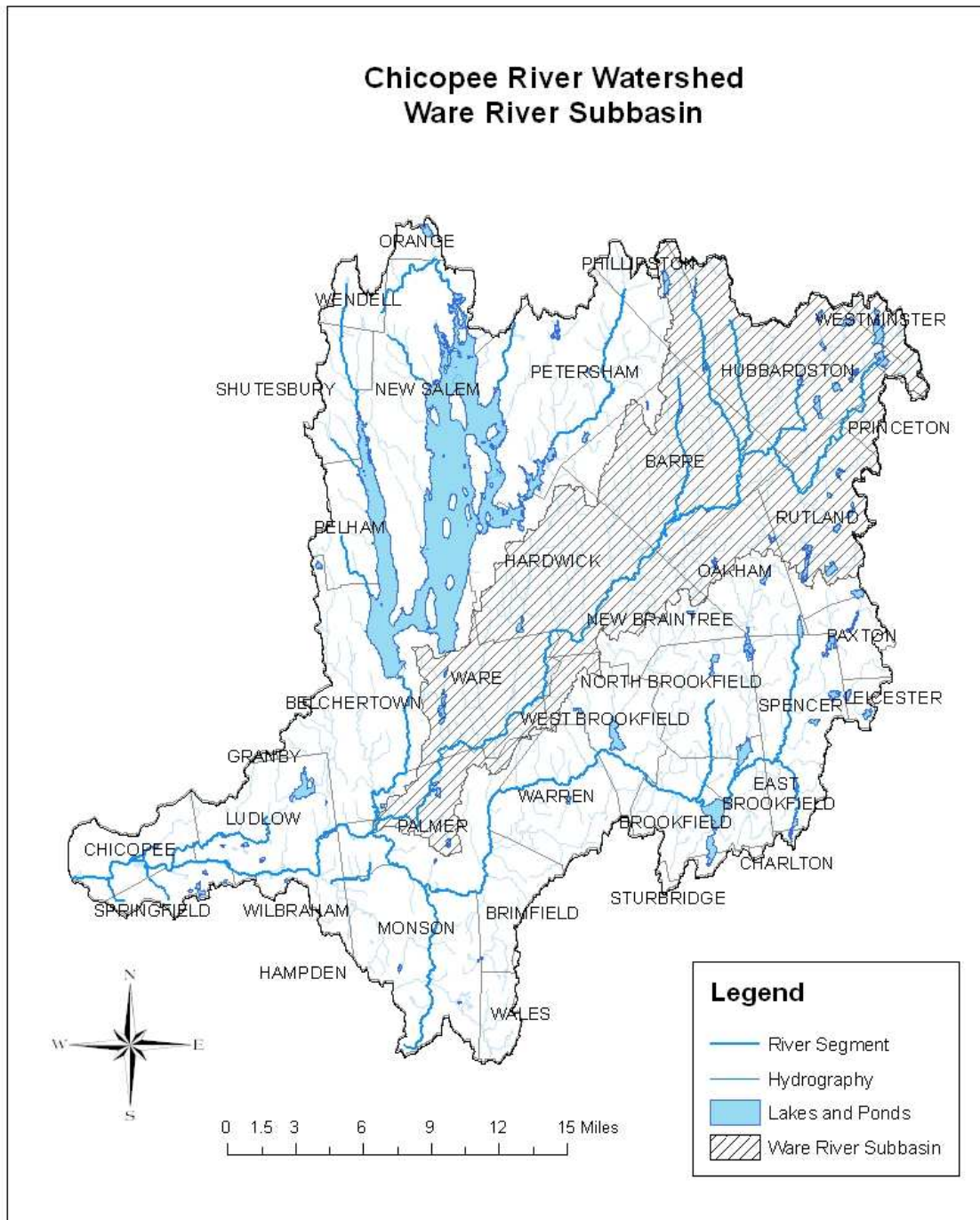


Figure 8: Ware River Subbasin

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.



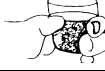



Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics

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.



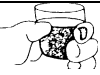



Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics

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.



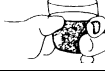



Although the fish community was largely composed of fluvial specialist/dependant species, too limited data are available, so the *Aquatic Life Use* is not assessed.

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 mi² 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 mi² 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.



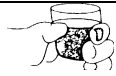



Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics

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 mi² (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 mi² 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 |
| <i>E. coli</i> (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 LC₅₀ using *C. dubia* ranged from 18.30% to >100% effluent (n=28). Of the 28 valid tests, ten did not meet the LC₅₀ limit, which is $\geq 100\%$. Seven of the nine acutely toxic samples were during the January/February or April/May testing period. The LC₅₀ 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 |
| <i>E. coli</i> (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 LC₅₀'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 LC₅₀'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 LC₅₀ 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 LC₅₀ 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 believed to be natural (Appendix B).




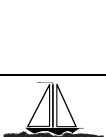

At Station WAX *E. coli* counts ranging from 2 – 880 cfu/100 and the geometric mean of 87.6 met criteria. Only one bacteria count exceeded 235 cfu/100ml at this station and this sample represented wet weather conditions.

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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 mi² 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 mi² to supply water to Boston Metropolitan district (now MA DCR) and since 1955 from 6.5 mi² 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 LC₅₀ 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 |
| <i>E. coli</i> (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 embeddedness at 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 available |
| | 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 $\geq 100\%$ effluent (n=26). June 2001 showed a significant difference in reproduction for 25% effluent. The LC₅₀ 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 |
| <i>E. coli</i> (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

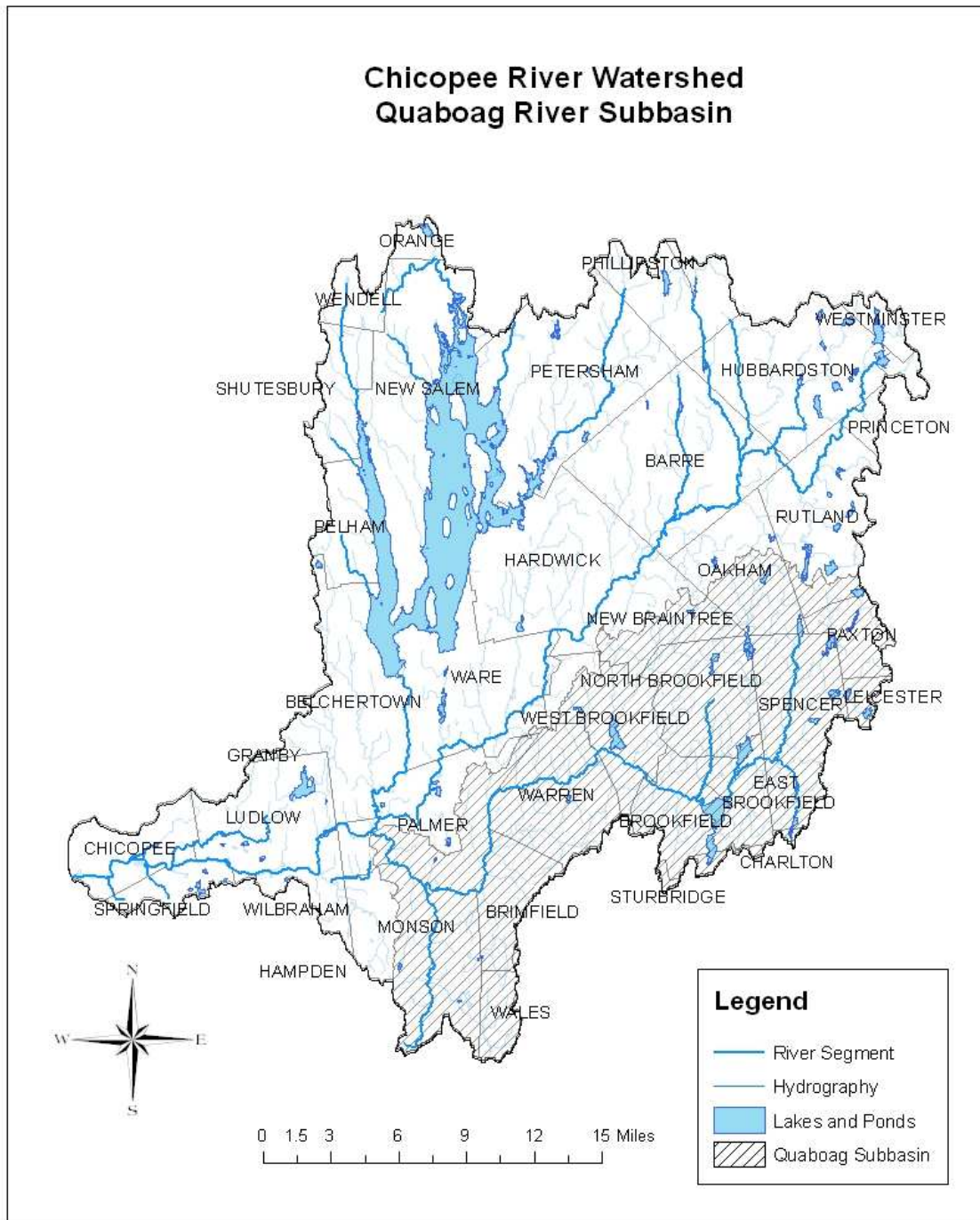


Figure 9: Quaboag River Subbasin

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 USGS gage was relocated to the downstream side of the Cooney Road bridge. The drainage area for this gage is 8.81 mi² 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 redbfin/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 CFR 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 (°C) | 12.7 – 22.3 (n=4) | -0.11 – 24.3 (n=17) |
| Conductivity (µS/cm at 25°C) | 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 |
| <i>E. coli</i> (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 LC₅₀ 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 |
| <i>E. coli</i> (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 |
| <i>E. coli</i> (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 ASSESSED |
| 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 |
| <i>E. coli</i> (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: 6.1 miles.

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 |
| <i>E. coli</i> (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 |
| <i>E. coli</i> (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 LC₅₀ were all ≥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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 |
| <i>E. coli</i> (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 ASSESSED* |
| Fish Consumption |  | NOT ASSESSED |
| 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: 6.3 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 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 |
| <i>E. coli</i> (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 macroinvertebrate 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: 8.7 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, 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 mi² 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 bass, 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 blacknose 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 LC₅₀ for *C. dubia* were all \geq 100% effluent, with the exception of the LC₅₀ of 38.0% in May 2003 and the LC₅₀ 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 (°C) | 15.3 – 23.5 (n =4) | -0.08 – 24.6 (n =16) |
| Conductivity (µS/cm at 25°C) | 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 |
| <i>E. coli</i> (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 macroinvertebrate 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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 Watershed
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 LC₅₀ 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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 |
| <i>E. coli</i> (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 (CSO#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 | <i>Eliminated</i> |
| 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 mi² 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 Socolow *et al.* 2005).

The USGS remarks that flow diversion has occurred since 1941 from 186 mi² in Swift River basin and at times since 1931 from 97 mi² 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 mi² 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 |
| <i>E. coli</i> (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 |
| <i>E. coli</i> (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 LC₅₀ results 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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 LC₅₀ 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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 confluent 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 |
| <i>E. coli</i> (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 EOE, 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 LC₅₀ using *C. dubia* ranged from 56.10% to >100% effluent (n=5). The LC₅₀ tests using *P. promelas* were all >100% (n=5). All of the tests met the limit of ≥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 |
| <i>E. coli</i> (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 <i>E. coli</i> 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 |
| <i>E. coli</i> (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 Whitemore | 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.

POTTAPAUD 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*), Yellow 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 Pottapug 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).

Pottapuag 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 Pottapuag 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 (*Myriophyllum 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 metalimnion and epilimnion. 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 hypolimnion. 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 CaCO₃ (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 hypolimnion. 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 CaCO₃. 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 hypolimnion (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 CaCO₃. 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 hypolimnion (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 CaCO₃ (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



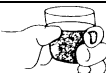



stations on five sampling days during the primary contact season. The majority of the samples did not show the presence of fecal coliform bacteria. Of the 129 samples taken, *E. coli* was only detected in two samples. These samples, taken on October 19 and November 15, had *E. coli* counts at the minimum 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 |  | IMPAIRED 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 <i>Myriophyllum spicatum</i> 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)



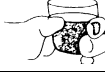



NPDES SURFACE WATER DISCHARGES (APPENDIX D)

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



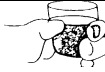



Based on the available information there are no WMA regulated groundwater or surface withdrawals from this segment or permitted surface water discharges to this segment.

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: <i>Myriophyllum spicatum</i> 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 UseBiology

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* |  | |
| Fish Consumption |  | |
| Primary Contact |  | |
| Secondary Contact |  | |
| Aesthetics |  | NOT ASSESSED |

* 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)



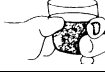



NPDES SURFACE WATER DISCHARGES (APPENDIX D)

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.



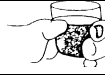



DESIGNATED USE ASSESSMENT

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 NOT ASSESSED |
| Fish Consumption |  | |
| 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.

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)



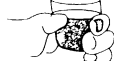



NPDES SURFACE WATER DISCHARGES (APPENDIX D)

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)



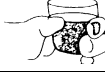



NPDES SURFACE WATER DISCHARGES (APPENDIX D)

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 (*Myriophyllum spicatum*) and fanwort (*Cabomba caroliniana*) 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 ug/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 |  | IMPAIRED 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 specific 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 NOT ASSESSED |
| Fish Consumption |  | |
| 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 NOT ASSESSED |
| Fish Consumption |  | |
| 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



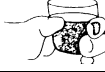



Aquatic Life Use

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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