# WESTFIELD RIVER WATERSHED

# 2001 WATER QUALITY ASSESSMENT REPORT


**COMMONWEALTH OF MASSACHUSETTS**
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# WESTFIELD RIVER WATERSHED

# 2001 WATER QUALITY ASSESSMENT REPORT

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Division of Watershed Management

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Division of Watershed Management
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- Department of Environmental Protection (MA DEP)
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  - Bureau of Waste Prevention (BWP)
  - Bureau of Waste Site Cleanup (BWSC)
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- Department of Public Health (MA DPH)
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  - Division of Fisheries and Wildlife (MDFW)
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- United States Environmental Protection Agency (EPA)
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  - Water Resources Division
- United States Army Corps of Engineers (ACOE)
- Federal Energy Regulatory Commission (FERC)
- United States Fish & Wildlife Service (USFWS)
- National Park Service (NPS)

Regional

- Lower Pioneer Valley Regional Planning Commission
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Cover photo: Westfield River in Russell, Massachusetts
Photo credit: Alan Wynn, EOEA

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7Q10.....seven day, ten year low flow
ACEC.....Area of Critical Environmental Concern
ACO.....Adminstrative Consent Order
ACOE.....Army Corps of Engineers (United States)
ADB.....assessment database
BMP .....best management practice
BOH .....Board of Health
BPJ .....best professional judgment
BRP.....Bureau of Resource Protection
BWP.....Bureau of Waste Prevention
BWSC.....Bureau of Waste Site Cleanup
CMR.....Code of Massachusetts Regulations
CNOEC.....chronic no observed effect concentration
CSO.....combined sewer overflow
CVP.....certified vernal pool
CWA .....Clean Water Act
DDT .....dichlorodiphenyltrichloroethane
DMF .....Division of Marine Fisheries
DMR.....discharge monitoring report
DSI .....Decorative Specialties International
DO.....dissolved oxygen
DWM.....Division of Watershed Management
EOEA.....Executive Office of Environmental Affairs
EPA.....United States Environmental Protection Agency
EPT.....Ephemeroptera, Plecoptera, and Trichoptera
ESS.....Environmental Science Services
FERC.....Federal Energy Regulatory Commission
$LC_{50}$.....lethal concentration to 50% of the test organisms
L-EL.....low effect level
MA DCR.....Massachusetts Department of Conservation and Recreation
MA DEM.....Massachusetts Department of Environmental Management (now the Department of Conservation and Recreation)
MA DEP.....Massachusetts Department of Environmental Protection
MA DFG .....Massachusetts Department of Fish and Game
MDFW .....Massachusetts Division of Fisheries and Wildlife
MA DPH .....Massachusetts Department of Public Health
MassGIS.....Massachusetts Geographic Information System
MPN.....most probable number
NAS/NAE ....National Academy of Sciences/National Academy of Engineers
NAWQA.....National Water-Quality Assessment
NPDES.....National Pollutant Discharge Elimination System
ORS.....Office of Research and Standards
ORW.....Outstanding Resource Water
PAH.....Polycyclic aromatic hydrocarbons
PALIS.....Pond and Lake Information System
PCB.....polychlorinated biphenyls
POTW.....Publicly Owned Treatment Works
QA/QC .....quality assurance/ quality control
RBP.....rapid bioassessment protocol
S-EL.....severe effect level
SWPPP .....Stormwater pollution prevention plan
SWQS.....Surface Water Quality Standards
TMDL.....total maximum daily load
TNTC .....too numerous to count
TOXTD .....MA DEP DWM Toxicity Testing Database
TOC .....total organic carbon
TRC.....total residual chlorine
USFWS .....United States Fish & Wildlife Service
USGS.....United States Geological Survey
WBID .....waterbody identification code
WBS.....waterbody system database
WMA.....Water Management Act
WWTP .....wastewater treatment plant

## LIST OF UNITS

cfs .....cubic feet per second
cfu .....colony forming unit
kW.....kilowatt
kWh .....kilowatt hour
MGD .....million gallons per day
mg/L.....milligram per liter
ng.....nanograms
NTU .....nephelometric turbidity units
ppb.....parts per billion
ppm.....parts per million
SU.....standard units
TEQ/kg.....toxic equivalents per kilogram
µg/kg.....microgram per kilogram
µS/cm.....microsiemens per centimeter

# EXECUTIVE SUMMARY
## WESTFIELD RIVER WATERSHED
## 2001 WATER QUALITY ASSESSMENT REPORT

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which surface waters in the Commonwealth shall be protected. The assessment of current water quality conditions is a key step in the successful implementation of the Watershed Approach. This critical phase provides an assessment of whether or not the designated uses are supported or impaired, or not assessed, as well as basic information needed to focus resource protection and remediation activities later in the watershed management planning process.

This assessment report presents a summary of current water quality data/information in the Westfield River Watershed used to assess the status of the designated uses as defined in the SWQS. The designated uses, where applicable, include: *Aquatic Life, Fish Consumption, Drinking Water, Primary* and *Secondary Contact Recreation* and *Aesthetics*. Each use, within a given segment, is individually assessed as ***support*** or ***impaired***. When too little current data/information exists or no reliable data are available the use is ***not assessed***. However, if there is some indication of water quality impairment, which is not "naturally occurring", the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed rivers and lakes are currently ***unassessed***; the status of their designated uses 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 in the Waterbody System (WBS) or the new Assessment Database (ADB).

There are a total of 28 freshwater rivers, streams, or brooks (the term "rivers" will hereafter be used to include all) comprising 35 river segments in the Westfield River Watershed presented in this report. These include: Little River, Middle Branch Westfield River, Swift River, West (Falls) Branch, West Branch Westfield River, and Westfield River; Bedlam, Bradley, Depot, Dickenson, Glendale, Great, Kinne, Meadow, Miller, Moose Meadow, Paucatuck, Pond, Potash, Powdermill, Roaring, Sanderson, Shaker Mill, Walker, White, and Yokum brooks; and Watts and Wards streams. They account for approximately 51% (232.6 miles) of an estimated 452.6 named river miles. The remaining rivers are small and are currently *unassessed*. This report also includes information on 33 of the 82 lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) that have been assigned a pond and lake identification system (PALIS) number in the Westfield River Watershed. The 33 lakes included in this report represent 87% of the total lake acreage (3,654 of 4,197 acres) in the Westfield River Watershed.

### *AQUATIC LIFE USE*

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

### *Aquatic Life Use Summary – Rivers (Figure 1)*

Eighty-five percent (85%) of the river segments in the Westfield River Watershed included in this report are assessed as either support or impaired for the *Aquatic Life Use*. All of 23 segments and portions of three additional segments are assessed as supporting the *Aquatic Life Use*.

The *Aquatic Life Use* is assessed as support for a large portion (the upper 50 miles) of the Westfield River (all of MA32-04 and the upper 16.8 miles of MA32-05), impaired for the 1-mile reach of the river downstream from the Westfield Wastewater Treatment Plant (WWTP) discharge to the Route 20 bridge in Westfield and not assessed for the lower 10.4 miles (MA32-06 and MA32-07). Sources of impairment in the impaired one-mile reach include the municipal point source discharge and municipal separate storm sewer systems (suspected source).

**_Aquatic Life Use_ Assessment**
**Rivers**
**(total length included in report – 232.6 miles)**
**Support – 190.1 miles (82%)**
**Impaired – 6.6 miles (3%)**
**Not Assessed – 35.9 miles (15%)**

**Lakes**
**(total area included in report – 3,654 acres)**
**Impaired – 901 acres (25%)**
**Not Assessed – 2,753 acres (75%)**

The *Aquatic Life Use* is assessed as support for the majority of the Little River (all of MA32-08, MA32-16, and MA32-35 and a portion of MA32-36) but impaired for the lower 2.4-mile reach of MA32-36 downstream from its confluence with Cook Brook. Habitat quality degradation resulting from instream deposition appears to be impacting the biota in the Little River downstream from its confluence with Cook Brook. The municipal water treatment plant filter backwash discharge is the suspected source of impairment.

The *Aquatic Life Use* is assessed as support for the upper 6.1 miles of Powdermill Brook (MA32-09), but impaired for the 3.3 mile reach downstream from a small impoundment to the confluence with the Westfield River because of severe habitat quality degradation, reduced overall fish abundance, and the shift in fish community structure (dominated by pollution tolerant species). Causes of impairment in Powdermill Brook are sedimentation and siltation. Where known, sources of impairment include land development, streambank modification/destabilization, and post-development erosion. Additional suspected sources are construction road runoff, road runoff, and sand and gravel operations.

The *Aquatic Life Use* is assessed as support for 19 additional river segments and not assessed for the remaining seven segments included in this report (15% of the river miles).

***Aquatic Life Use Summary – Lakes (Figure 1)***

Few lakes in the Westfield River Watershed have recently been surveyed for variables used to assess the status of the *Aquatic Life Use* (i.e., DO, pH, nutrients, macrophytes and plankton/chlorophyll *a*). Because of the lack of these types of data 75% of the lake acreage (2,753 acres) are not assessed for the *Aquatic Life Use*. Nine lakes (Blair Pond, Buck Pond, Center Pond, Horse Pond, Pequot Pond, Windsor Pond and the three basins of Congamond Lake) totaling 901 acres are impaired due to non-native aquatic plant infestations. Additionally, the Middle and North Basins of Congamond Lake were also assessed as impaired because of oxygen depletion.

***FISH CONSUMPTION USE***

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

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

***Fish Consumption Use* Summary – Rivers and Lakes**

No site-specific fish consumption advisories exist for river or lake segments in the Westfield River Watershed. Therefore, all segments default to Not Assessed for the *Fish Consumption Use* because of the statewide advisory.

| ***Fish Consumption Use* Assessment** |
|---|
| **Rivers** |
| **(total length included in report – 232.6 miles)** |
| **Not Assessed – 232.6 miles (100%)** |
| **Lakes** |
| **(total area included in report – 3,654 acres)** |
| **Not Assessed – 3,654 acres (100%)** |

***DRINKING WATER USE***

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

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

***PRIMARY AND SECONDARY CONTACT RECREATIONAL USES***

The *Primary Contact Recreational Use* is supported when conditions are suitable (fecal coliform bacteria densities, turbidity and aesthetics meet the SWQS) for any recreational or other water related activity during which there is prolonged and intimate contact with the water and there exists a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing. The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact related to shoreline activities. For lakes, macrophyte cover and/or transparency data (Secchi disk depth) are evaluated to assess the status of the recreational uses.

***Primary and Secondary Contact Recreational Uses Summary – Rivers (Figures 2 and 3)***

Twenty-nine percent (29%) of the river segments in the Westfield River Watershed included in this report are assessed as either support or impaired for the *Primary Contact Recreational Use* while only 18% of the river segments are assessed as either support or impaired for the *Secondary Contact Recreational Use*.

***Primary Contact Recreational Use Assessments***
**Rivers**
**(total length included in report – 232.6 miles)**
**Support – 23.7 miles (10%)**
**Impaired – 43.3 miles (19%)**
**Not Assessed – 165.6 miles (71%)**

**Lakes**
**(total area included in report – 1,956 acres)**
**Support – 495 acres (14%)**
**Not Assessed – 3,159 acres (86%)**

***Secondary Contact Recreational Use Assessments***
**Rivers**
**(total length included in report – 232.6 miles)**
**Support – 37.6 miles (16%)**
**Impaired – 4.7 miles (2%)**
**Not Assessed – 190.3 miles (82%)**

**Lakes**
**(total area included in report – 1,956 acres)**
**Support – 495 acres (14%)**
**Not Assessed – 3,159 acres (86%)**

The mainstem Westfield River is divided into four segments. The uppermost segment, MA32-04 (33.2 miles), from the confluence of Drowned Land Brook and Center Brook in Savoy to the confluence with Middle Branch Westfield River in Huntington is assessed as impaired for the *Primary Contact Recreational Use* due to beach closures, but not assessed for the *Secondary Contact Recreational Use*. The next two segments, MA32-05 (17.8 miles) and MA32-06 (1.9 miles) are not assessed for the recreational uses. The last segment, MA32-07 (8.5 miles), from the Westfield/ West Springfield/Agawam city lines to the confluence with Connecticut River in Agawam is not assessed for the *Primary Contact Recreational Use*, but assessed as supporting the *Secondary Contact Recreational Use*.

The segment of the Little River (MA32-08) from Horton's Bridge to the confluence with the Westfield River in Westfield is assessed as support for the *Secondary Contact Recreational Use*, but impaired for the *Primary Contact Recreational Use* due to elevated fecal coliform bacteria counts. Suspected sources of the bacteria are storm drains and runoff.

All of Great Brook (MA32-25), the upper 6.9-mile portion of Moose Meadow Brook (MA32-23), and the upper 6.2-mile portion of Powdermill Brook (MA32-09) are assessed as support for both the *Primary and Secondary Contact Recreational uses*. However, the lower 1.3 miles of Moose Meadow Brook and lower 3.3 miles of Powdermill Brook are impaired. Causes of impairment in Moose Meadow Brook are fecal coliform bacteria and turbidity. Grazing of livestock in the riparian zone appears to be the source of the impairment. Causes of impairment in Powdermill Brook are sedimentation/siltation, turbidity, and excess algal growth due to land development, streambank modification/destabilization, post-development erosion and suspected sources include construction road runoff, road runoff, and sand and gravel operations.

***Primary and Secondary Contact Recreational Uses Summary – Lakes (Figures 2 and 3)***
Four lakes totaling 495 acres, Center Pond, Congamond Lake (South Basin), Pequot Pond and Russell Pond, are assessed as support for both the *Primary* and *Secondary Contact Recreational uses*. The remaining 3,159 acres of lake segments in the Westfield River Watershed are not assessed.

***AESTHETICS USE***
The *Aesthetics Use* is supported when surface waters are free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.

***Aesthetics Use Summary – Rivers (Figure 4)***
All or portions of 16 segments, totaling 115.7 miles and representing 50% of the river segment mileage in the Westfield River Watershed are assessed as supporting the *Aesthetics Use*. Only 2% of the river segment mileage is assessed as impaired for the *Aesthetics Use* and the remaining 48% is not assessed. The *Aesthetics Use* is supported for a large portion (50 miles) of the Westfield River, not assessed for an additional 10.4 miles, and impaired for the 1-mile reach of the river downstream from the Westfield WWTP discharge to the Route 20 bridge in Westfield. Causes of impairment are excess algal growth, turbidity, and odor. Known and suspected sources of impairment are the point source discharge and discharge from municipal separate storm sewer systems.

**_Aesthetics Use A_ssessment**
**Rivers**
**(total length included in report – 232.6 miles)**
**Support – 115.7 miles (50%)**
**Impaired – 5.7 miles (2%)**
**Not Assessed – 111.2 miles (48%)**

**Lakes**
**(total area included in report – 1,956 acres)**
**Support – 495 acres (14%)**
**Not Assessed – 3,159 acres (86%)**

The upper 6.9-mile portion of Moose Meadow Brook and the upper 6.2-mile portion of Powdermill Brook are assessed as support for the *Aesthetics Use*. However, the lower 1.3 miles of Moose Meadow Brook and lower 3.3 miles of Powdermill Brook are impaired for this use. The cause of impairment in Moose Meadow Brook is turbidity with grazing of livestock in the riparian zone as the source of the impairment. Causes of impairment in Powdermill Brook are sedimentation/siltation, turbidity, and excess algal growth. Where known, sources of impairment in Powdermill Brook include land development, streambank modification/destabilization, and post-development erosion. Additional suspected sources are construction road runoff, road runoff, and sand and gravel operations.

***Aesthetics Use Summary – Lakes (Figure 4)***
The three basins of Congamond Lake (North, Middle and South) comprise the only lake acreage assessed as supporting the Aesthetics Use in the Westfield River Watershed. The remaining lake segments are not assessed.

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## Figure 1. *Aquatic Life Use* Assessment Summary – Rivers and Lakes

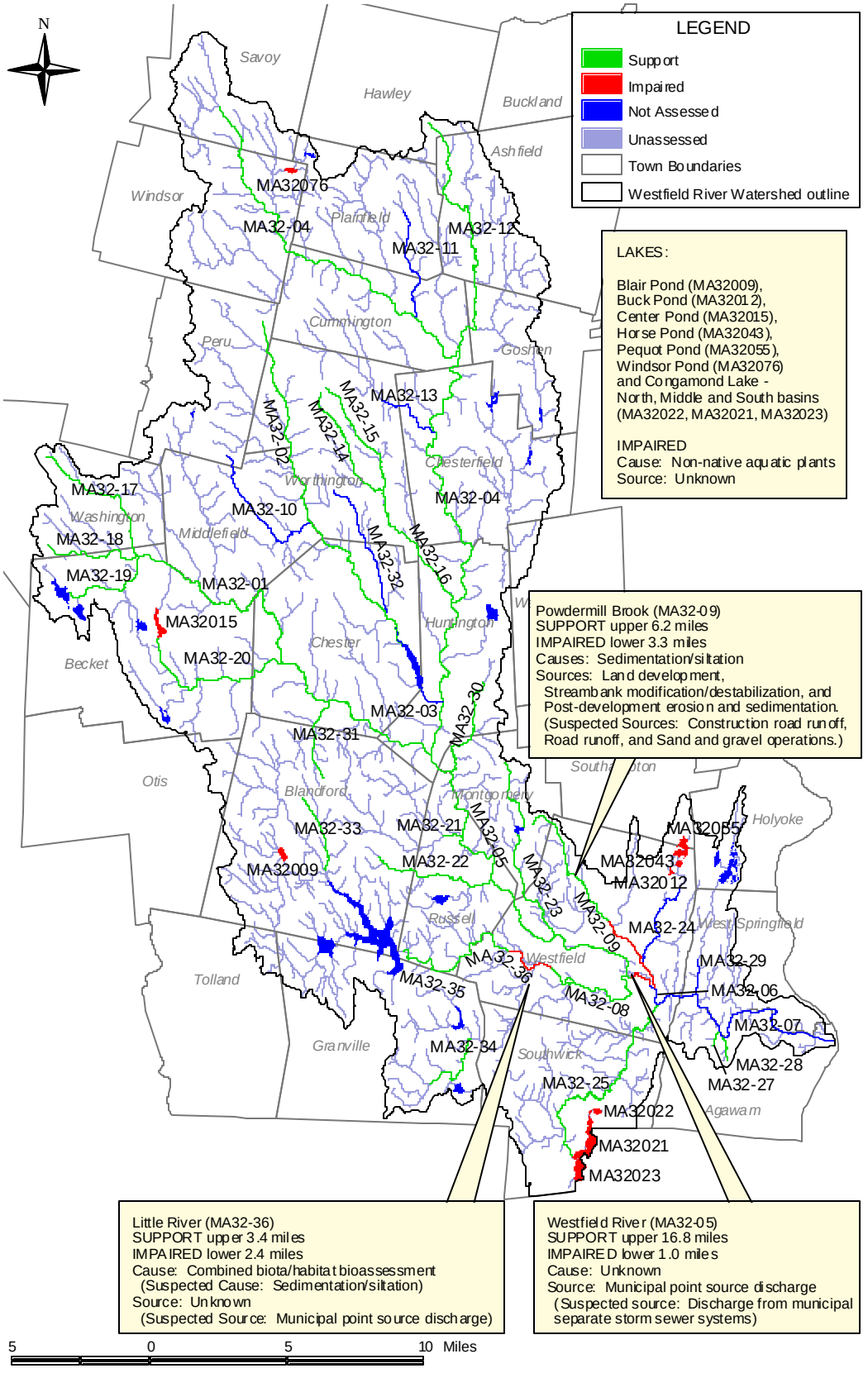

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Figure 2. *Primary Contact Recreational Use* Assessment Summary – Rivers and Lakes

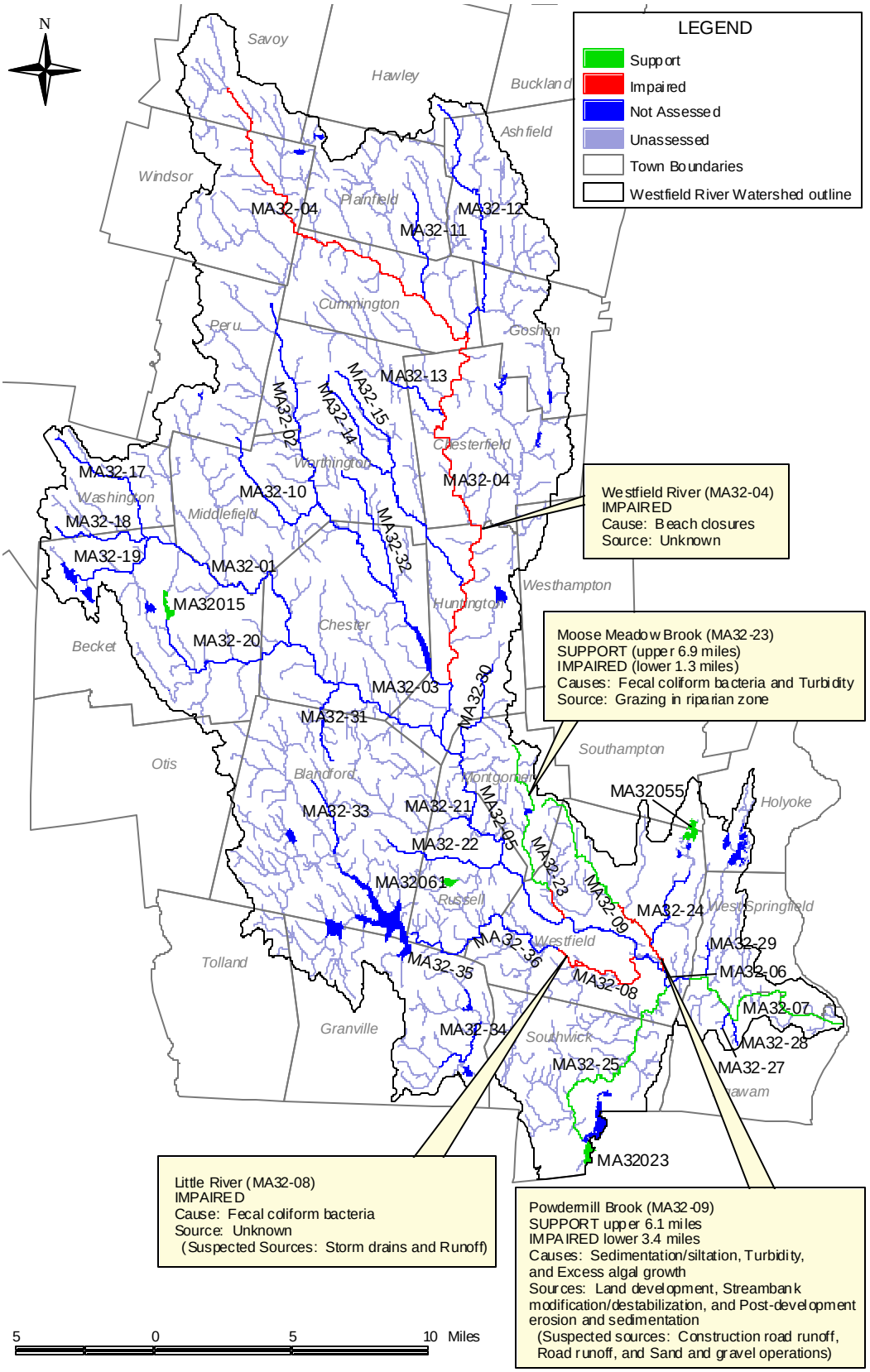

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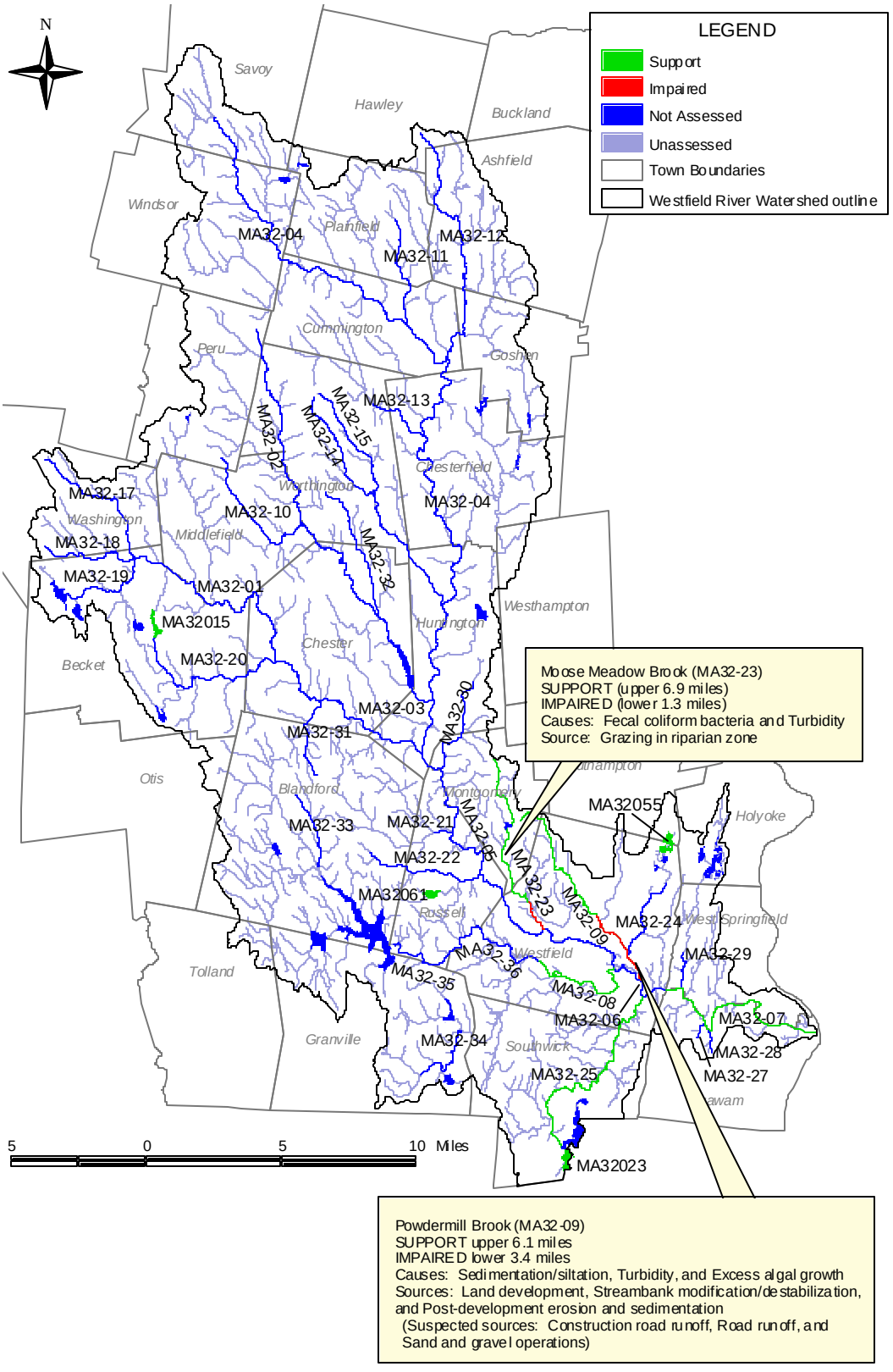
Figure 3. *Secondary Contact Recreational Use* Assessment Summary – Rivers and Lakes



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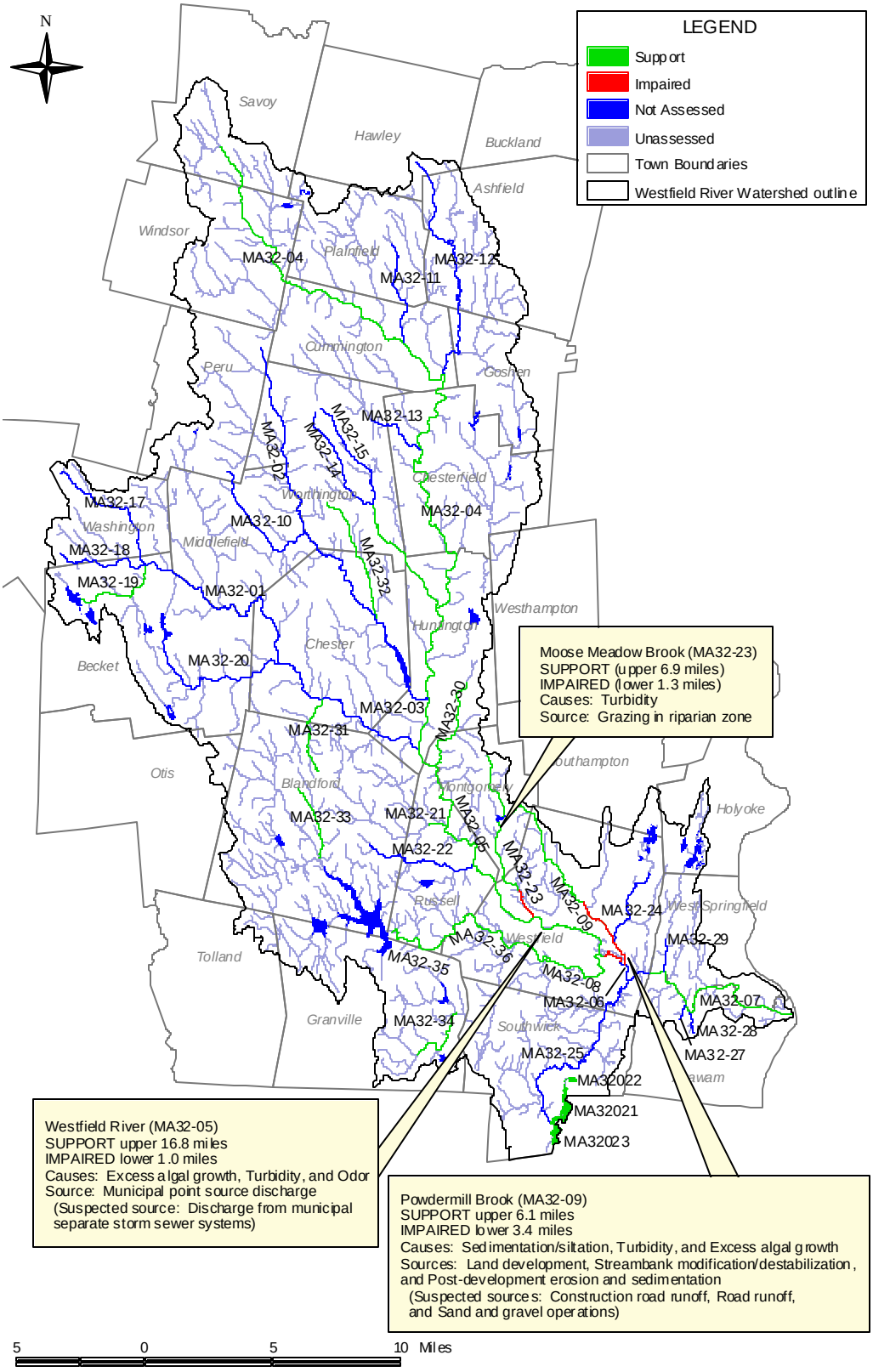
## Figure 4. *Aesthetics Use* Assessment Summary – Rivers and Lakes



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# INTRODUCTION

The Massachusetts Watershed Approach is a collaborative effort between state and federal environmental agencies, municipal agencies, citizens, non-profit groups, businesses and industries in the watershed. The mission is to improve water quality conditions and to provide a framework under which the restoration and/or protection of the watershed's natural resources can be achieved. Figure 5 illustrates the management structure to carry out the mission. This report presents the current assessment of water quality conditions in the Westfield River Watershed. The assessment is based on information that has been researched and developed by the Massachusetts Department of Environmental Protection (MA DEP) through the first three years (information gathering, monitoring, and assessment) of the five-year cycle in partial fulfillment of MA DEP's federal mandate to report on the status of the Commonwealth's waters under the Federal Water Pollution Control Act (commonly known as the Clean Water Act [CWA]).

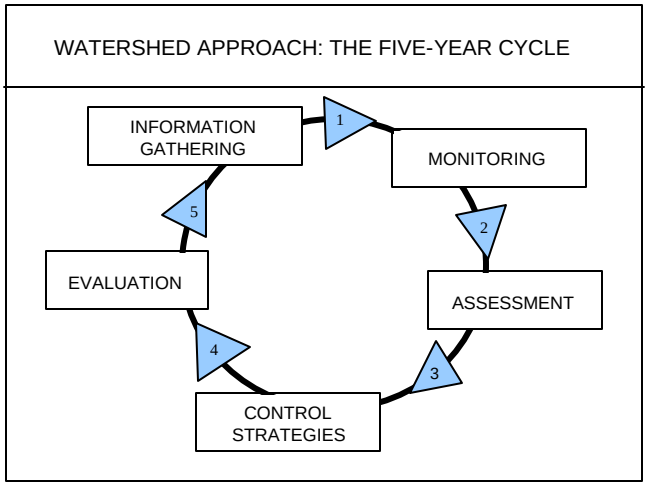



Figure 5. Five-year cycle of the Watershed Approach

The goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this objective, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act MA DEP must submit a statewide report every two years to the EPA, which describes the status of water quality in the Commonwealth. Up until 2000 this was accomplished as a statewide summary of water quality (the 305(b) Report). States are also required to submit, under Section 303(d) of the CWA, a list of waters requiring a total maximum daily load (TMDL) calculation. In 2002, however, EPA recommended that the states combine elements of the statewide 305(b) Report and the Section 303(d) List of Waters into one "Integrated List of Waters" (EPA 2001). This statewide list is based on the compilation of information for the Commonwealth's 27 watersheds. Massachusetts has opted to write individual watershed water quality assessment reports and use them as the supporting documentation for the Integrated List of Waters. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. In stream biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions. This analysis follows a standardized process described in the Assessment Methodology section of this report. Once the use assessments have been completed the segments are categorized for the Integrated List of Waters.

# ASSESSMENT METHODOLOGY

## WATER QUALITY CLASSIFICATION

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MA DEP 1996). These regulations should undergo public review every three years. The surface waters are segmented and each segment is assigned to one of the six classes described below. Each class is identified by the most sensitive and, therefore, governing water uses to be achieved and protected. Surface waters may be suitable for other beneficial uses, but shall be regulated by the Department of Environmental Protection to protect and enhance the designated uses.

***Inland Water Classes***

1. ***Class A*** *– These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life* and *wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORWs) under 314 Code of Massachusetts Regulations (CMR) 4.04(3).*
2. ***Class B*** *– These waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.*
3. ***Class C*** *– These waters are designated as a habitat for fish, other aquatic life and wildlife, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.*

***Coastal and Marine Classes***

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

The CWA Section 305(b) water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. In so doing, the states report on waterbodies within the context of meeting their designated uses (described above in each class). These uses include: *Aquatic Life, Fish Consumption, Drinking Water, Primary Contact Recreation, Secondary Contact Recreation, Shellfish Harvesting* and *Aesthetics*. Two subclasses of Aquatic Life are also designated in the standards: Cold Water Fishery (capable of sustaining a year-round population of cold water aquatic life, such as trout) and Warm Water Fishery (waters that are not capable of sustaining a year-round population of cold water aquatic life).

The SWQS, summarized in Table 1, prescribes minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MA DEP 1996). In rivers the lowest flow conditions at and above which aquatic life criteria must be applied are the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In artificially regulated waters the lowest flow conditions at which aquatic life criteria must

be applied are the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow that has been agreed upon. In coastal and marine waters and for lakes the most severe hydrological condition for which the aquatic life criteria must be applied shall be determined by MA DEP on a case-by-case basis.

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

EPA provides guidelines to the States for making their use support determinations (EPA 1997, EPA 2002, Grubbs and Wayland III 2000 and Wayland III 2001). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Although data/information older than five years are usually considered "historical" and used for descriptive purposes they can be utilized in the use support determination provided they are known to reflect the current conditions. While the water quality standards (Table 1) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance in the literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, 1993, Persaud, *et al*.). Excursions from criteria due solely to "naturally occurring" conditions (e.g., low pH in some areas) do not constitute violations of the standards.

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

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

| | |
|---|---|
| Dissolved Oxygen | Class A, Class B Cold Water Fishery (BCWF), and Class SA: ≥6.0 mg/L and ≥75% saturation unless background conditions are lower<br>Class B Warm Water Fishery (BWWF) and Class SB: ≥5.0 mg/L and ≥60% saturation unless background conditions are lower<br>Class C: Not <5.0 mg/L for more than 16 of any 24-hour period and not <3.0 mg/L anytime unless background conditions are lower; levels cannot be lowered below 50% saturation due to a discharge<br>Class SC: Not <5.0 mg/L for more than 16 of any 24-hour period and not <4.0 mg/L anytime unless background conditions are lower; and 50% saturation; levels cannot be lowered below 50% saturation due to a discharge |
| Temperature<br>Change (Δ) allowed due to a discharge | Class A: ≤68°F (20°C) and Δ1.5°F (0.8°C) for Cold Water and ≤83°F (28.3°C) and Δ1.5°F (0.8°C) for Warm Water.<br>Class BCWF: ≤68°F (20°C) and Δ3°F (1.7°C)<br>Class BWWF: ≤83°F (28.3°C) and Δ3°F (1.7°C) in lakes, Δ5°F (2.8°C) in rivers<br>Class C and Class SC: ≤85°F (29.4°C) nor Δ5°F (2.8°C)<br>Class SA: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C)<br>Class SB: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) between July through September and Δ4.0°F (2.2°C) between October through June |
| pH | Class A, Class BCWF and Class BWWF: 6.5 - 8.3 SU and Δ0.5 outside the background range.<br>Class C: 6.5 - 9.0 SU and Δ1.0 outside the naturally occurring range.<br>Class SA and Class SB: 6.5 - 8.5 SU and Δ0.2 outside the normally occurring range.<br>Class SC: 6.5 - 9.0 SU and Δ0.5 outside the naturally occurring range. |
| Solids | All Classes: *These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.* |
| Color and Turbidity | All Classes: *These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.* |
| Oil and Grease | Class A and Class SA: *Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.*<br>Class SA: *Waters shall be free from oil and grease and petrochemicals.*<br>Class B, Class C, Class SB and Class SC: *Waters shall be free from oil* and *grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.* |
| Taste and Odor | Class A and Class SA: *None other than of natural origin.*<br>Class B, Class C, Class SB and Class SC: *None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.* |
| Aesthetics | All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.* |
| Toxic Pollutants | All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife… The Division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established*. |
| Nutrients | *Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.* |

*Note*: *Italics are direct quotations.*
Δ criterion (referring to a change from natural background conditions) is applied to the effects of a permitted discharge.

Table 1 continued. Summary of Massachusetts Surface Water Quality Standards.

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

# DESIGNATED USES

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

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

The guidance used to assess the *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary* and *Secondary Contact Recreation* and *Aesthetics* uses follows. In lieu of any information to the contrary, both the *Agricultural* and *Industrial* uses, where applicable, are considered by the Department to be supported.

## *AQUATIC LIFE USE*

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

| ***Variable*** | ***Support***<br>Data available clearly indicates support or minor modification of the biological community. Excursions from chemical criteria (Table 1) not frequent or prolonged and may be tolerated if the biosurvey results demonstrate support. | ***Impaired***<br>There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community. |
|---|---|---|
| BIOLOGY | | |
| Rapid Bioassessment Protocol (RBP) III* | Non/Slightly impacted | Moderately or Severely Impacted |
| Fish Community | Best Professional Judgment (BPJ) | BPJ |
| Habitat and Flow | BPJ | Dewatered streambed due to artificial regulation or channel alteration, BPJ |
| Eelgrass Bed Habitat (Costello 2003) | Stable (No/Minimal loss), BPJ | Loss/Decline, BPJ |
| Macrophytes | BPJ | Exotic species present, BPJ |
| Plankton/Periphyton | No/infrequent algal blooms | Frequent and/or prolonged algal blooms |
| TOXICITY TESTS** | | |
| Water Column/Ambient | ≥75% survival either 48 hr or 7-day exposure | <75% survival either 48 hr or 7-day exposure |
| Sediment | ≥75% survival | <75% survival |
| CHEMISTRY-WATER** | | |
| Dissolved oxygen (DO)/percent saturation (MA DEP 1996, EPA 1997) | Infrequent excursion from criteria (Table 1), BPJ (minimum of three samples representing critical period) | Frequent and/or prolonged excursion from criteria [river and shallow lakes: exceedances >10% of measurements; deep lakes (with hypolimnion): exceedances in the hypolimnetic area >10% of the surface area]. |
| pH (MA DEP 1996, EPA 1999a) | Infrequent excursion from criteria (Table 1) | Criteria exceeded >10% of measurements. |
| Temperature **(**MA DEP 1996,EPA 1997) | Infrequent excursion from criteria (Table 1)[1] | Criteria exceeded >10% of measurements. |
| Toxic Pollutants (MA DEP 1996, EPA 1999a)<br>Ammonia-N (MA DEP 1996, EPA 1999b)<br>Chlorine (MA DEP 1996, EPA 1999a) | Infrequent excursion from criteria (Table 1)<br>1.32 mg/L $NH_3$-N[2]<br>0.011 mg/L total residual chlorine (TRC)[3] | Frequent and/or prolonged excursion from criteria (exceeded >10% of measurements). |
| CHEMISTRY-SEDIMENT** | | |
| Toxic Pollutants (Persaud *et al*. 1993) | Concentrations ≤ Low Effect Level (L-EL), BPJ | Concentrations ≥ Severe Effect Level (S-EL)[4], BPJ |
| CHEMISTRY-TISSUE | | |
| PCB – whole fish (Coles 1998) | ≤500 µg/kg wet weight | BPJ |
| DDT (Environment Canada 1999) | ≤14.0 µg/kg wet weight | BPJ |
| PCB in aquatic tissue (Environment Canada 1999) | ≤0.79 ng TEQ/kg wet weight | BPJ |

*RBP II analysis may be considered for assessment decision on a case-by-case basis, **For identification of impairment, one or more of the following variables may be used to identify possible causes/sources of impairment: NPDES facility compliance with whole effluent toxicity test and other limits, turbidity and suspended solids data, nutrient (nitrogen and phosphorus) data for water column/sediments. [1]maximum daily mean T in a month (minimum six measurements evenly distributed over 24-hours) less than criterion. [2] [$NH_3$-N] at pH = 8.0 SU and 24°C. [3] The minimum quantification level for TRC is 0.05 mg/L. [4]For the purpose of this report, the S-EL for total polychlorinated biphenyl compounds (PCB) in sediment (which varies with Total Organic Carbon (TOC) content) with 1% TOC is 5.3 ppm while a sediment sample with 10% TOC is 53 ppm.

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

### *FISH CONSUMPTION USE*

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

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

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

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

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

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

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

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

### *DRINKING WATER USE*

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

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

Note: While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/brp/dws/dwshome.htm and from the Westfield River Watershed's public water suppliers.

### *SHELLFISH HARVESTING USE*

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

| ***Variable*** | ***Support***<br>SA Waters: Approved[1]<br>SB Waters: Approved[1], Conditionally Approved[2] or Restricted[3] | ***Impaired***<br>SA Waters: Conditionally Approved[2], Restricted[3], Conditionally Restricted[4], or Prohibited[5]<br>SB Waters: Conditionally Restricted[4] or Prohibited[5] |
|---|---|---|
| DMF Shellfish Project Classification Area Information | Reported by DMF | Reported by DMF |

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

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

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

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

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

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

### *PRIMARY CONTACT RECREATION USE*

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

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

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

### *SECONDARY CONTACT RECREATION USE*

This use is suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. Following is an overview of the guidance used to assess the status (support or impaired) of the *Secondary Contact Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

| ***Variable*** | ***Support*** Criteria are met, no aesthetic conditions that preclude the use | ***Impaired*** Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use |
|---|---|---|
| Fecal Coliform Bacteria (MA DEP 1996) | Other waters: Samples* collected must meet the Class C or SC criteria (see Table 1). | Other waters: Samples* collected do not meet the Class C or SC criteria (see Table 1). |
| Aesthetics (MA DEP 1996) - *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance* [growth or amount] *species of aquatic life* | | |
| Odor, oil and grease, color and turbidity, floating matter<br><br>Transparency (MA DPH 1969)<br><br>Nuisance organisms | Narrative "free from" criteria met or excursions neither frequent nor prolonged*, BPJ.<br><br>Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).<br><br>No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ. | Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged*, BPJ.<br><br>Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).<br><br>Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ. |

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

### *AESTHETICS USE*

All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support or impaired) of the *Aesthetics Use*.

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

# WESTFIELD RIVER WATERSHED DESCRIPTION AND CLASSIFICATION

## WESTFIELD RIVER WATERSHED DESCRIPTION

The Westfield River Watershed drains 517 square miles from the eastern Berkshires to the Connecticut River (Figure 6). The mainstem (the upper portion sometimes referred to as the East Branch) originates in the high country of Savoy and Windsor and flows 27 miles in a southeasterly direction, where it joins the Connecticut River. The Middle Branch Westfield River begins in Peru and forms the border between Worthington and Middlefield before flowing through Chester to join the mainstem in the town of Huntington. The West Branch Westfield River, formed by the confluence of Depot and Yokum Brooks in Becket flows easterly, also meeting the mainstem in Huntington. There are a total of 850 miles of rivers, streams, and brooks and 4,200 acres of lakes and ponds in the watershed.

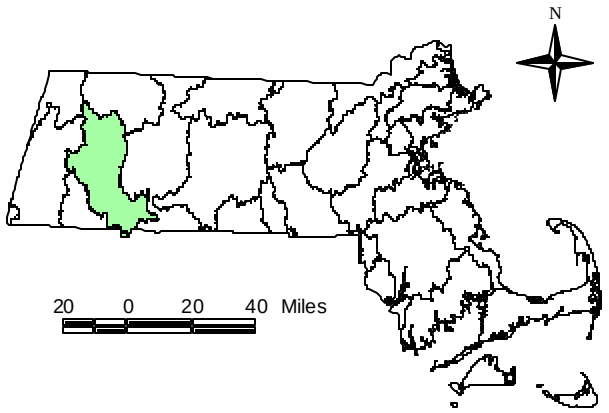


Figure 6. Location of the Westfield River Watershed

The National Park Service has designated approximately forty-three miles of the Westfield River as "Wild and Scenic". Included in this first-ever Wild and Scenic designation for a Massachusetts river are parts of the Main, Middle and West Branches.

The Westfield River Watershed is bordered by the Deerfield, Hoosic, Housatonic, Farmington and Connecticut River watersheds and is contained almost entirely within Massachusetts. The watershed covers all or a part of twenty-eight municipalities: Agawam, Ashfield, Becket, Blandford, Chester, Chesterfield, Cummington, Goshen, Granville, Hawley, Holyoke, Huntington, Middlefield, Montgomery, Otis, Peru, Plainfield, Russell, Savoy, Southampton, Southwick, Tolland, Washington, Westhampton, Westfield, West Springfield, Windsor, and Worthington.

Because the headwaters originate in mountains with little soil to retain water the Westfield River rises quickly in response to large storms and snowmelt. After those flows subside little water is left for base flows. Consequently, the river naturally fluctuates between high and low flows. Both the mainstem Westfield River and the Middle Branch Westfield River have U.S. Army Corps of Engineer dams to alleviate some of the danger of flooding. Several water supply reservoirs capture spring runoff, storing it for use throughout the year. Cobble Mountain in Blandford, Littleville in Huntington, and Bearhole in Westfield are the largest reservoirs. The lower reaches of the Westfield River flow through a broad valley filled with stratified drift, forming the Barnes Aquifer, a major groundwater resource that stretches from Holyoke to Southwick.

The upper portion of the watershed is rural. Timber harvesting and agricultural activities dominate the landuse. The lower portion of the watershed is more developed and includes the heavily urbanized areas of Agawam, West Springfield, and Westfield.

The Westfield River Watershed supplies surface water to seven public water supply systems (12 withdrawal sites) and three industrial users (four withdrawal sites) and groundwater to four of the seven municipal supply systems.

During the settlement of the watershed hydropower, available from the Westfield River, and an abundance of raw materials fueled industrial development. The major historic mill sites are still industrial sites even though hydropower has diminished in importance. In the past, sewage and industrial discharges greatly impacted the water and habitat quality of the lower mainstem Westfield River.

The Westfield River Watershed is divided into 35 segments, with sub-basins ranging in size from 0.3 to 516 square miles (with an average of 66 square miles). The impervious cover for these sub-basins was calculated into one of three impact categories as defined below. Only one sub-basin segment was classified as a moderate threat (impacted stream) to water quality: White Brook, MA32-28. All 34 other sub-basin segments were classified as low potential impact (sensitive stream) to water quality.

Research has indicated a strong correlation exists between percent impervious cover and water quality (Center for Watershed Protection 1998). Impervious cover influences streams by increasing surface runoff during storm events. In natural settings, very little annual rainfall is converted to runoff and about half is infiltrated into the ground and water table. This water is filtered by the soils and serves to supply aquifers and adjacent surface waters with clean water during dry periods. In urbanized areas less annual rainfall infiltrates and more volume is converted to runoff. The volume of runoff becomes greater and occurs more frequently and at higher magnitudes. As a result less water is available to streams during dry periods and more flow occurs during storms. Impervious cover can be a very useful indicator with which to measure the impacts of land development on aquatic systems. It can also serve as an indicator of potential problems in a watershed. The Rapid Watershed Planning Handbook (Center for Watershed Protection 1998) has defined the following three impact categories based on the percentage of impervious cover.

| Water Quality | Impervious Cover | Description |
|---|---|---|
| Sensitive Stream | 0-10% | ❖ High habitat/water quality rating characterized by stable channels and good habitat structure with diverse communities of fish and aquatic insects.<br>❖ Hydrologic regime is consistent with natural conditions.<br>❖ Species sensitive to pollution are within normal abundance ranges. |
| Impacted Stream | 11-25% | ❖ Some decline in habitat and water quality is evident.<br>❖ Erosion and stream channel widening become evident.<br>❖ Sensitive fish and aquatic insects begin to drop in overall numbers.<br>❖ Water quality is classified as fair or good. |
| Nonsupporting Stream | Exceeds 25% | ❖ Stream channels become highly unstable, severe widening occurs. Down-cutting and streambank erosion are chronic problems.<br>❖ Biological quality is relatively poor with only pollutant tolerant species existing within its reaches.<br>❖ Water quality is considered fair to poor.<br>❖ Not a candidate for stream restoration |

**WESTFIELD RIVER WATERSHED CLASSIFICATION**

Consistent with the National Goal Uses of "fishable and swimmable waters", the classification of waters in the Wesfield River Watershed according to the Massachusetts Surface Water Quality Standards (SWQS) include the following (MA DEP 1996a).

***Class A Waters***

These waters are designated as a source of public water supply. To the extent compatible with its use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. All Class A waters are designated for protection as ORWs under 314 CMR 4.04(3) (Rojko *et al.* 1995).

In the Westfield River Watershed, the following waterbodies are classified as A.

- *Middle Branch Westfield River,* source in Peru to the Littleville Dam in Huntington
- *Long Pond (Tucker Healy Pond, Lincoln Pond),* source to outlet in Blandford and those tributaries thereto
- *Unnamed Reservoir (Austin Brook Reservoir),* source to outlet in Chester and those tributaries thereto
- *Horn Pond,* Source to outlet in Becket and those tributaries thereto
- *Huntington Reservoir (Cold Brook Reservoir),* source to outlet in Huntington and those tributaries thereto
- *Russell Reservoir,* source to outlet in Russell and those tributaries thereto
- *Bearhole Reservoir (Prudy's Pond),* source to outlet in West Springfield and those tributaries thereto
- *Granville Reservoir,* source to outlet in Granville and those tributaries thereto
- *Cobble Mountain Reservoir,* source to outlet in Blandford and those tributaries thereto

- *Ashley Pond (Wrights Pond, Cedar Reservoir),* source to outlet and those tributaries thereto in Holyoke
- *McLean Reservoir,* source to outlet in Holyoke and those tributaries thereto
- *Wright Pond,* source to outlet in Holyoke and those tributaries thereto
- *Unnamed Reservoir (Black Brook Reservoir),* Reservoir to outlet in Blandford and those tributaries thereto

It should also be noted that MA DEP's Division of Water Supply has recommended that the Little River, and its tributaries, from the source at outlet of Cobble Mountain Reservoir Dam in Russell to a dam northwest of Gorge Road, Russell be reclassified from Class B to a Class A public water supply waterbody in the next revision of the SWQS.

The designation of ORW is applied to those waters with exceptional socio-economic, recreational, ecological and/or aesthetic values. ORWs have more stringent requirements than other waters because the existing use is so exceptional or the perceived risk of harm is such that no lowering of water quality is permissible. ORWs include certified vernal pools (CVP), all designated Class A Public Water Supplies, and may include surface waters found in National Parks, State Forests and Parks, Areas of Critical Environmental Concern (ACEC) and those protected by special legislation (MA DEM 1993). Wetlands that border ORWs are designated as ORWs to the boundary of the defined area. In the Westfield River Watershed one ACEC has been designated in the western edge of the watershed – The Hindsdale Flats Watershed in Dalton, Hinsdale, Peru, and Washington (MA DCR 2003a). Officially designated as an ACEC on 31 January 1992, it encompasses approximately 14,500 acres and is bordered by the Appalachian National Scenic Trail on its western edge. The following is excerpted from the MA DCR website (MA DCR 2003a).

> The Hinsdale Flats Watershed ACEC covers approximately 14,500 acres and is located at the headwaters of the East Branch of the Housatonic River in four communities in central Berkshire County. The ACEC is generally defined by several watershed subbasins that contribute to the northward-flowing headwaters of the East Branch of the Housatonic above the Old Grist Mill Dam in the town of Hinsdale. Beginning in the town of Washington, the East Branch flows through extensive wetlands and floodplains known as the Hinsdale Flats. Tributary streams flow into the Flats and East Branch from higher elevations and ridges to the east, west, and south. The Appalachian National Scenic Trail forms the western boundary of the ACEC. The unique topography and contrasting land forms provide scenic vistas of the lowlands of the Flats and the predominantly wooded uplands that surround it. Open fields and farmlands, extensive forestlands, and historic and archaeological resources are integral parts of the ACEC. The excellent water quality of the East Branch and its tributaries, the wetlands and floodplains of the Hinsdale Flats, and the surrounding uplands support an outstanding variety of natural communities and wildlife, including six state-listed rare species.

Vernal pools are small, shallow ponds characterized by lack of fish and by periods of dryness. Vernal pool habitat is extremely important to a variety of wildlife species including some amphibians that breed exclusively in vernal pools, and other organisms such as fairy shrimp, which spend their entire life cycles confined to vernal pool habitat. Many additional wildlife species utilize vernal pools for breeding, feeding and other important functions. Certified vernal pools are protected if they fall under the jurisdiction of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00). Certified vernal pools are also afforded protection under the state Surface Water Quality Standards, the state Water Quality Certification regulations (401 Program), the state Title 5 regulations, and the Forest Cutting Practices Act regulations. However, the certification of a pool only establishes that it functions biologically as a vernal pool. Certification does not determine that the pool is within a resource area protected by the Wetlands Protection Act (NHESP 1999). Currently 53 vernal pools have received full certification in the Westfield River Watershed (Harding 2003). These are located in the towns of Agawam, Becket, Cummington, Holyoke, Huntington, Southwick, Westfield, and West Springfield. Additional information is available from the Natural Heritage and Endangered Species Program Website: http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm

***Class B Waters***

These waters are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

In the Westfield River Watershed, the following waterbodies are classified as B Cold Water Fisheries.

- *Westfield River*, source to confluence with Middle Branch Westfield River (this reach is sometimes referred to as the East Branch Westfield River)
- *West Branch Westfield River*, source to confluence with Westfield River

In the Westfield River Watershed, the following waterbodies are classified as B Warm Water Fisheries.

- *Middle Branch Westfield River*, Littleville Dam to confluence with the Westfield River
- *Westfield River*, from confluence with Middle Branch Westfield River to confluence with Connecticut River
- *Little River*, Cobble Mountain Reservoir Dam to confluence with Westfield River
  (Note: The MA DEP/Division of Water Supply has recommended that the Little River and its tributaries from the Cobble Mountain Reservoir Dam, Russell to a dam northwest of Gorge Road, Russell be reclassified from Class B to a Class A public water supply waterbody in the next revision of the SWQS.)

Unlisted waters in the Westfield River Watershed not otherwise designated in the SWQS are designated *Class B, High Quality Waters* for inland waters. According to the SWQS where fisheries designations are necessary they shall be made on a case-by-case basis. The Massachusetts Department of Fish and Game has recommended that an additional 55 rivers in the Westfield River Watershed be reclassified as Cold Water Fisheries in the next revision of the SWQS.

## SUMMARY OF HISTORICAL CONDITIONS AND PERCEIVED PROBLEMS

Many improvements in water quality conditions in the Westfield River Watershed have occurred over the past 30 years with the abatement of point sources of pollution (MA DEQE 1986 and MA DEP 1990). The 1970's saw construction upgrades to secondary treatment levels of domestic sewage in the towns of Huntington, Russell, and Westfield. Additionally, wastewater treatment facilities were constructed and began operation at four major paper companies and one metal finishing industry. The 1990's revealed even more change including: the closing of most of the paper industries and the metal finishing industry, as well as the continued upgrades and expansion of the three municipal sewage treatment facilities, and the construction upgrade and removal of all the Combined Sewer Overflow discharges in Westfield, Agawam and West Springfield. According to the Commonwealth of Massachusetts Summary of Water Quality 1992, Appendix I: Basin/Segment Information, water quality impairment in the Westfield River Watershed was due primarily to the presence of bacteria as measured by elevated fecal coliform levels (MA DEP 1993). Sources of these contaminants when known included urban runoff, onsite wastewater systems, municipal point sources, and combined sewer overflows. The present decade is witnessing a further upgrade and expansion of capacity at the Westfield WWTP. All of these 1990 to present events should lead to a substantial improvement in overall water quality on the mainstem Westfield River from its confluence with the Middle Branch Westfield River in Huntington to its confluence with the Connecticut River in West Springfield/Agawam.

There are an estimated 112 dams in the Westfield River Watershed (Pietrzak 2004). Included in this list are the two Army Corps of Engineers (ACOE) facilities (Knightville Dam and Littleville Lake Dam), two Federal Energy Regulatory Commission (FERC) facilities (Woronoco and Decorative Specialties International (DSI) West Springfield) and one FERC exempt hydro-generating facility (Texon, USA).

The USGS, as part of their National Water Quality Assessment (NAWQA) Program in the Connecticut, Housatonic, and Thames River Basins Study Unit, conducted water quality sampling in the Connecticut River Basin between 1992 and 1995. In the Westfield River Watershed, sampling was conducted on 27 June 1994 as part of the NAWQA program to detect concentrations of pesticides in the water column at one site on the Westfield River near Westfield MA (USGS Station # 01183500) (Zimmerman 1999).

Within the last decade, the northeastern United States has been identified as receiving elevated rates of mercury deposition from the atmosphere and high levels of mercury contamination in non-commercial freshwater fish (Tatsutani 1998). Mercury is a trace metal that exists in the earth's crust. It is a toxicant that, once mobilized in the environment, can be transformed into methylmercury, a particularly toxic form that can bioaccumulate. Most of the mercury contamination in the northeastern United States has been

linked to air emissions (incinerators, fossil fuel combustion facilities) from both local and mid-western sources. Fish and sediment from a total of five lakes in the Westfield River Watershed were sampled in 1994 as part of a research and development study on mercury contamination developed by the Department's Office of Research and Standards (ORS) (Rose *et al*. 1999). The five lakes sampled in the Westfield River Watershed as part of the mercury contamination study included Ashley Pond (Holyoke), Crooked Pond (Plainfield), and Buckley-Dunton Lake, Center Pond and Yokum Pond, (Becket). Currently there are no site-specific MA DPH fish consumption advisories for any waterbodies in the Westfield River Watershed. It should be noted, however, that the statewide fish consumption advisory is in effect (see Fish Consumption Use assessment guidance, page 8).

## SOURCES OF INFORMATION

Multiple local, private, state and federal agencies provided information used in the water quality assessment of the Westfield River Watershed. Within MA DEP information was obtained from three programmatic bureaus: Bureau of Resource Protection (BRP), Bureau of Waste Prevention (industrial wastewater discharge information) and the Bureau of Waste Site Cleanup (hazardous waste site cleanup information). Specifically, water quality, biological (including benthic macroinvertebrate and periphyton), fish toxics, and lake data were provided by BRP's Division of Watershed Management (DWM) Watershed Planning Program (Appendices A, B, C, D, E, F and G). Water withdrawal and wastewater discharge permit information were provided by MA DEP staff in the Boston and Western Regional Offices, as well as the DWM Watershed Permitting Program (Appendix H). [Note: the BRP DWM Drinking Water Program evaluates the status of the *Drinking Water Use* and this information is, therefore, not provided in this assessment report.]

**NPDES PERMITTED DISCHARGES**

The Westfield River and several of its tributaries receive discharges of treated and municipal and industrial wastewater, contact and non-contact cooling water, etc. (Appendix H, Tables H1-H3). A large number of industrial and paper production facilities are either no longer in operation or have tied their wastewater into the Westfield WWTP. In 1980 the list of these dischargers totaled nearly 20 facilities and at least six were major dischargers (MA DEQE 1975). The following types of National Pollutant Discharge Elimination System (NPDES) discharges occur in the Westfield River Watershed.
*Municipal wastewater treatment plants and sanitary wastewater discharges* (Table H1):

- Huntington WWTP, Huntington (MA0101265) discharges to Westfield River (Segment MA32-05).
- Russell Village POTW, Russell (MA0100960) discharges to Westfield River (Segment MA32-05).
- Woronoco Village POTW, Russell (MA0103233) discharges to Westfield River (Segment MA32-05).
- Westfield WWTP, Westfield (MA0101800) discharges to Westfield River (Segment MA32-05).
- The Maples, Worthington (MA0027871) discharges to Wards Stream (Segment MA32-15).
- Renaissance Manor (formerly known as Valley View Nursing Home), Southwick (permit pending), discharges to Westfield River (MA32-06).

*Industrial wastewater treatment plants and non-process discharges* (Table H2):

- Texon USA, Russell (MA0005282) discharges process wastewater, floor drainage, and non-contact cooling water to the Westfield River (Segment MA32-05).
- Northeast Utilities, Westfield (MA0035556) discharges turbine bearing cooling water, and non-contact cooling water to the Little River (MA32-36).

*NPDES General Permits* (Table H2):

- Austin Brook Reservoir Slow Sand Water Filtration Plant (MAG640035) discharges sand media filtered water to Austin Brook Reservoir and Walker Brook (Segment MA32-20)
- City of Springfield, Water Treatment Plant (MAG640023) discharges filter backwash to Cooks Brook (not a segment).
- City of Westfield, Water Treatment Plant (MAG640001) discharges effluent to Jack's Brook (not a segment).
- Jen-Coat Inc. (MAG250856) discharges non-contact cooling water to the Westfield River (Segment MA32-05).

The NPDES Phase II General Permit Program requires NPDES permit coverage for stormwater discharges from small municipal separate storm sewer systems (MS4s) and construction activity disturbing one acre or more of land in a mapped "urbanized area" defined and delineated by the US Bureau of Census in 2000 http://www.epa.gov/npdes/pubs/fact2-2.pdf. Large and medium MS4s were permitted during Phase I of the NPDES stormwater program. Under EPA's Phase II program the definition of "municipal" includes Massachusetts communities, U.S. military installations, state or federal owned facilities such as hospitals, prison complexes, state colleges or universities and state highways. An MS4 is a system that: discharges at one or more point sources, is a separate storm sewer system (not designed to carry combined stormwater and sanitary waste water), is operated by a public body; discharges to the Waters of the United States or to another MS4, and is located in an "*Urbanized Area*". The NPDES Phase II General Permit requires operators of regulated MS4s to develop and implement a stormwater management program that prevents harmful pollutants from being washed or dumped directly into the storm sewer system, which is subsequently discharged into local waterbodies. Certain Massachusetts communities were automatically designated (either in full or part) by the Phase II Rule based on the urbanized area delineations from the 2000 U.S. Census (Table H3).

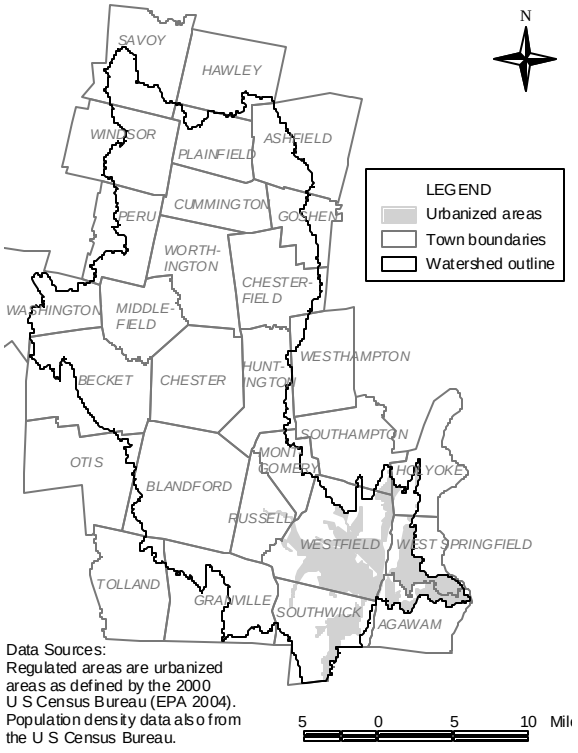



Figure 7. Phase II Regulated Area Map of the Westfield River Watershed.

With respect to the MS4 communities in the Westfield River Watershed, six communities are required to have coverage: Westfield, Southampton, Southwick, Holyoke, Agawam, and West Springfield. One other community, Russell, received a waiver from EPA from being required to have coverage (Domizio 2004) (Figure 7 and Appendix H, Table H3). All of these communities applied to EPA and MA DEP for coverage under the Phase II stormwater general permit, issued on 1 May 2003. Municipalities that are totally regulated must implement the requirements of the Phase II permit in the entire town, while communities that are partially regulated need to comply with the Phase II permit only in the mapped Urbanized Areas (see http://www.epa.gov/region01/npdes/stormwater/ma.html for detailed maps for each community). Stormwater general permits will be issued jointly by EPA and MA DEP after administrative review by EPA. A thorough review of the communities' stormwater management program will be completed by EPA, in coordination with MA DEP, during the five year permit term. Annual reports will be submitted to EPA and MA DEP by the permittees. Phase II stormwater g neral permits will expire on 1 May 2008 (Domizio 2004). This report does not have information on the other municipal (i.e., non-community) MS4s that may be in the Westfield River Watershed and are regulated under the NPDES Stormwater Phase II permit program.

**NPDES TOXICITY TESTING DISCHARGE MONITORING REPORTS (DMRS)**

All four of the municipal wastewater treatment plants in the Westfield River watershed, as well as several of the industrial and institutional dischargers, submit toxicity reports to EPA and MA DEP as required by their NPDES permits. Data from these toxicity reports are maintained by DWM in a database entitled "Toxicity Testing Data - TOXTD". Information from the reports includes: survival of test organisms exposed to ambient river water (used as dilution water), physiochemical analysis (e.g., hardness, alkalinity, pH, total suspended solids) of the dilution water, and the whole effluent toxicity test results. Data from reports submitted by these facilities were reviewed and summarized (ranges) for use in the assessment of current water quality conditions in the Westfield River Watershed. These include:

- Huntington Wastewater Treatment Facility (MA0101265) – November 1998 to May 2004
- Russell Wastewater Treatment Facility (MA0100960) – November 1998 to May 2004
- Russell Woronoco Village Treatment Facility (MA0103233) – September 1999 to September 2003
- Texon USM Corporation (MA0005282) – January 2000 to March 2004
- The Maples (formerly Worthington Senior Housing), (MA0027871) – October 1998
- Westfield Wastewater Treatment Facility (MA0101800) – May 2000 to March 2004

**HYDROPOWER**

There are two Federal Energy Regulatory Commission (FERC) licensed hydroelectric plants in the Westfield River Watershed (Kubit 2004).

- Woronoco Hydro LLC is licensed (April 2002) to operate the Woronoco Hydroelectric Project (2631) on the Westfield River (Segment MA32-05) as a run-of-river project. The project can generate 2,700 kWh.
- A&D Hydro is licensed (October 1994) to operate the West Springfield Hydroelectric (2608) on the Westfield River (Segment MA32-07) as a run-of-river project. The project can generate 1.4 megawatt hours.

There is one FERC-exempt licensed hydroelectric plant in the Westfield River Watershed. Exemptions are granted for small hydroelectric projects that meet certain characteristics and have a generating capacity of less than 5 megawatts. While the exemptions are granted in perpetuity, under Article #2 of the exemption, the projects must comply with any terms and conditions that any federal or state fish and wildlife agency has determined are appropriate to prevent the loss of or damage to fish or wildlife resources or otherwise to carry out the purposes of the Fish and Wildlife Conservation Act.

- The Littleville Power Company Inc. is licensed to operate the Crescent Hydroelectric Project (Texon Project) (2986) on the Westfield River (Segment MA32-05) as a run-of-river project. The project can generate 1,500 kW.

There is one application for a FERC-exempt licensed hydroelectric plant for the Westfield River.

- The Indian River Power Supply LLC has submitted an application (12462-000-MA) to FERC to operate a run-of-river project on the Westfield River at the Westfield River Paper Company Dam in Russell. The facility would be cable of generating 700 kWh and if projects improvements were made up to 1,500 kWh.

Hydropower projects at the two ACOE flood control dams (Littleville Lake Dam and Knightville Dam) are not permitted to generate. Additionally, there is one FERC non-jurisdictional hydropower project, Cobble Mountain Station, on the Little River owned by the Springfield Water and Sewer Commission in Granville, MA (downstream from Cobble Mountain Reservoir). There are three water wheel generators with a total rating of 30.6 megawatts.

**WATER WITHDRAWALS**

A list of registered and permitted Water Management Act (WMA) withdrawals (both public water suppliers and other industrial users) is provided in Appendix H, Table H7 (LeVangie 2002).

**WATER QUALITY**

In addition to instream water quality data generated by DWM staff (provided in the technical appendices to this report) projects funded through various MA DEP grant and loan programs also provide valuable information that may be used in the water quality assessment report. A summary of these projects for the Westfield River Watershed is provided in Appendix I.

Other state agencies contributing information to this report include: the Massachusetts Department of Public Health (MA DPH), the Department of Fish and Game (MA DFG, formerly the Department of Fisheries, Wildlife, and Environmental Law Enforcement), and the Department of Conservation and Recreation (MA DCR, formerly the Department of Environmental Management, MA DEM). Federal agencies contributing include the Environmental Protection Agency (EPA), United States Geological Survey (USGS), and the United States Army Corps of Engineers (ACOE).

MA DFG's Division of Fisheries and Wildlife (MDFW) conducted electrofishing (backpack, barge, boat) surveys in the Westfield River Watershed in the summer/fall of 2001. A summary of the fish collected (using common names) is summarized in the segments where they were sampled. A list of common and scientific names for the species collected in the Westfield River Watershed are given below.

| Common Name | Scientific Name |
|---|---|
| American eel | *Anguilla rostrata* |
| Atlantic salmon | *Salmo salar* |
| Banded sunfish | *Enneacanthus obesus* |
| Black crappie | *Pomoxis nigromaculatus* |
| blacknose dace | *Rhinichthys atratulus* |
| Bluegill | *Lepomis macrochirus* |
| Bridle shiner | *Notropis bifrenatus* |
| Brook trout | *Salvelinus fontinalis* |
| Brown bullhead | *Ameiurus nebulosus* |
| Brown trout | *Salmo trutta* |
| Chain pickerel | *Esox niger* |
| Common carp | *Cyprinus carpio* |
| Common shiner | *Notropis cornutus* |
| Creek chub | *Semotilus atromaculatus* |
| Fallfish | *Semotilus corporalis* |
| Golden shiner | *Notemigonus crysoleucas* |
| Green sunfish | *Lepomis cyanellus* |
| Lake chub | *Couesius plumbeus* |
| Largemouth bass | *Micropterus salmoides* |
| Longnosed dace | *Rhinicthys cataractae* |
| Pumpkinseed | *Lepomis gibbosus* |
| Rainbow trout | *Oncorhynchus mykiss* |
| Redbreast sunfish | *Lepomis auritus* |
| Redfin pickerel | *Esox americanus americanus* |
| Rock bass | *Ambloplites rupestris* |
| Sea Lamprey | *Petromyzon marinus* |
| Slimy sculpin | *Cottus cognatus* |
| Smallmouth bass | *Micropterus dolomieu* |
| Spottail shiner | *Notropis hudsonius* |
| Tesselated darter | *Etheostoma olmstedi* |
| White sucker | *Catostomus commersoni* |
| Yellow bullhead | *Ameiurus natalis* |
| Yellow perch | *Perca flavescens* |

The ACOE New England District owns and operates fourteen flood control projects throughout the Connecticut River Basin, including two projects in the Westfield River Basin: Knightville Dam on the mainstem Westfield River (see details in Segment MA32-04), and Littleville Lake Dam on the Middle Branch Westfield River (see Segment MA32-02) (ACOE 2003). The Knightville Dam Project includes a dry bed lake, which when filled has a lake surface area of 960 acres. The Littleville Dam Project includes Littleville Lake, which when filled to capacity has a lake surface area of 510 acres.

The goals of the ACOE reservoir water quality management program, established in 1982, are: to protect public health and safety, to meet State water quality standards, to maintain the water quality necessary to meet individual project goals, and to identify the impacts of the projects on water quality (Barker 1998). Activities conducted under the Reservoir Water Quality and Maintenance Program between 2000 and 2002 included: routine bacteria and other water quality parameter monitoring of wells and/or public water supply wells at both projects; and priority pollutant scans in sediment samples (analyses included metals, PCB's, pesticides, semi- volatile organic compounds, dioxins and furans, grain size, and TOC) (Barker 2003 and Barker 2004). Overall, levels of EPA priority pollutants at these two Westfield River Watershed projects were low, and indicative of natural background conditions. No substances were in high enough concentrations to pose a risk to humans or interfere with uses of the projects or their waters. Routine bacteria testing of all wells found no significant levels of contaminants. The Knightville and Littleville Lake Dam Projects are considered by the ACOE to be Class I projects (i.e., they do not have significant water quality problems) based on previous ACOE New England District water quality reports, state water quality reports, changes between inflow and discharge water quality, frequency of violation of water quality criteria, and the presence/absence of a conservation pool (Barker 2000).

In August 2001, the Massachusetts "Beach Bill" was enacted (MGL. C111. S5S). This act created minimum standards for public bathing waters adjacent to any public or semi-public bathing beach in the Commonwealth. A "public bathing beach" is defined as a beach open to the general public whether or not any entry fee is charged that permits access to bathing waters. A "semi-public bathing beach" is defined as a bathing beach used in connection with a hotel, motel, trailer park, campground, apartment house, condominium, country club, youth club, school, camp, or similar establishment where the primary purpose of the establishment is not the operation of the bathing beach, and where admission to the use of the bathing beach is included in the fee paid for use of the premises. A semi-public bathing beach shall also include a bathing beach operated and maintained solely for the use of members and guests of an organization that maintains such bathing beach. Under the Beach Bill, the Massachusetts Department of

Public Health (MA DPH) was directed to establish minimum uniform water quality standards for coastal and inland beach waters as well as determining the frequency and location of testing, reporting requirements, and requirements for notifying the public of threats to human health or safety. *105 CMR 445.000: Minimum Standards for Bathing Beaches (State Sanitary Code, Chapter VII)* outlines MA DPH's guidelines for the Beach Bill and is available online at http://www.mass.gov/dph/dcs/bb4_01.pdf. Additionally, under the Beach Bill and MA DPH guidelines, local boards of health and state agencies are responsible for collecting samples from public beaches using testing procedures consistent with the American Public Health Association's *Standard Methods for Examination of Water and Waste Water* or methods approved by EPA. Operators of semi-public beaches are responsible for the costs of testing their beaches. Results of testing, monitoring, and analysis of public and semi-public beaches must be submitted in an annual report to MA DPH by 31 October of each year (MA DPH 2002b).

In addition to state and federal agencies, regional and local groups provide information for the watershed management process, which may be used to indicate areas of both high and degraded water quality, as well as causes and sources of contamination. The principal regional planning association in much of the watershed is the Pioneer Valley Regional Planning Commission, located in West Springfield. In the past two decades this organization has facilitated many water quality related projects that have enhanced conditions in the watershed. The Westfield River Watershed Association, located in Westfield, has been involved in citizen monitoring efforts and river enhancement efforts associated with the State's Wild and Scenic Rivers Designation Program in the 1990s (Banks 2004). Westfield State College in Westfield has had an active volunteer monitoring program, focusing on spring-summer stream temperature monitoring efforts on the mainstem Westfield River and tributaries. The Trout Unlimited, Pioneer Valley Chapter in Westfield, has held many activities related to fisheries enhancement throughout the watershed. Other organizations concerned with water quality include: Big Pond Association in Chester and Citizens Restoring Congamond Lakes, Inc. in Southwick.

## MASSACHUSETTS YEAR 2002 INTEGRATED LIST OF WATERS

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

The Massachusetts Year 2002 Integrated List of Waters was published by the MA DEP in September 2003 (MA DEP 2003a). In that report each waterbody segment was placed in one of five major categories. Category 1 included those waters that were meeting all designated uses. No Massachusetts waters were listed in Category 1 because a state-wide health advisory pertaining to the consumption of fish precludes any waters from being in full support of the fish consumption use. Waters listed in Category 2 were found to support some of the uses for which they were assessed but other uses were unassessed. Finally, Category 3 contained those waters for which insufficient or no information was available to assess any uses.

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

calculations because the impairment is not related to one or more pollutants were included in Category 4C. Table 2 identifies those waterbodies in the Westfield River Watershed that were included on this list in Category 4C.

Table 2. Massachusetts Category 4c Waters, impairment not caused by a pollutant, Westfield River Watershed (MA DEP 2003a).

| Name (Segment) | Location | Cause of Impairment |
|---|---|---|
| Little River (MA32-26) | Source at outlet of Cobble Mountain Reservoir Dam, Blandford to Horton's Bridge, Westfield | Flow alteration |
| Blair Pond (MA32009) | Blandford | Exotic Species |
| Buck Pond (MA32012) | Westfield | Exotic Species |
| Congamond Lakes, North Pond (MA32022) | Southwick | Exotic Species |
| Congamond Lakes, Middle Pond (MA32021) | Southwick | Exotic Species |
| Congamond Lakes, South Pond (MA32023) | Southwick | Exotic Species |
| Horse Pond (MA32043) | Westfield | Exotic Species |

## TOTAL MAXIMUM DAILY LOADS (TMDLs)

While the EPA's guidance for the preparation of the Integrated List provided an overall framework for a five-part list of waters, the development, submittal, and review of Category 5 was subject to the prevailing regulation governing the implementation of Section 303(d) of the CWA and, so, this category was approved as the Massachusetts 2002 303(d) List by the EPA on October 1, 2003. States must develop TMDLs for each of the waterbodies in Category 5 and establish pollution control strategies to restore these waters to meet water quality standards. A TMDL is the greatest amount of a pollutant that a waterbody can accept and still meet water quality standards. Further information on the 303(d) List and the TMDL Program is available on the MA DEP website at: http://www.mass.gov/dep/brp/wm/tmdls.htm. Table 3 identifies those waterbodies in the Westfield River Watershed that were included on this list.

Table 3. Massachusetts Category 5 Waters, waters requiring a TMDL in the Westfield River Watershed (MA DEP 2003a).

| Name | Location | Cause of Impairment |
|---|---|---|
| North Railroad Pond (MA32053) | Holyoke | Noxious Aquatic Plants<br>Turbidity |
| Pequot Pond (MA32055) | Westfield/Southampton | Nutrients<br>Organic Enrichment/Low DO<br>Noxious Aquatic Plants<br>Exotic species (non-pollutant) |
| Powdermill Brook (MA32-09) | Montgomery/Westfield | Siltation<br>Pathogens<br>Suspended solids<br>Turbidity |
| Windsor Pond (MA32076) | Windsor | Organic enrichment/Low DO<br>Exotic species (non-pollutant) |

**RIVERS**

MA DEP is required to produce TMDLs for various causes of impairment including siltation, suspended solids, and turbidity for Powdermill Brook (Table 3). This work has not been specifically scheduled yet. Pathogens were also listed as a cause of impairment but a statewide TMDL being developed for pathogens may be applied to this waterbody.

**LAKES**

MA DEP is also required to produce TMDLs for three lakes in the Westfield River Watershed (Table 3), but this work has not been specifically scheduled yet.

# OBJECTIVES

This report summarizes information generated by MA DEP DWM in the Westfield River Watershed through *Year 1* (information gathering in 2000) and *Year 2* (environmental monitoring in 2001) activities established in the "Five-Year Cycle" of the Watershed Initiative. In addition, where appropriate, information collected by MA DEP DWM during the 1996 water quality and biological monitoring surveys are also summarized. Together with other sources of information (identified in each segment assessment) these data were used to assess the status of water quality conditions of rivers and lakes in the Westfield River Watershed in accordance with EPA's and MA DEP's use assessment methods. Data collected by DWM in 1996, 1997 and 2001 are provided in Appendices A through G of this report. Not all waters in the Westfield River Watershed are included in the MA DEP/EPA WBS or ADB databases or this report.

The objectives of this water quality assessment report are to:

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

# REPORT FORMAT

***RIVERS***

The rivers assessed in the Westfield River Watershed are presented in the River Segment Assessment section of this report. The order of river segments follows the Massachusetts Stream Classification Program (Halliwell *et al*. 1982) hierarchy. River segments are organized hydrologically (from most upstream to downstream) and tributary segments follow after the river segment into which they discharge. Each river segment assessment is formatted as follows.

**SEGMENT IDENTIFICATION**

Name, water body identification number (WBID), location, length, classification.

Sources of information: coding system (waterbody identification number e.g., MA32-01) used by MA DEP to reference the stream segment in databases such as 305(b) and 303(d), the Integrated List of Waters, the Massachusetts SWQS (MA DEP 1996), and other descriptive information.

**SEGMENT DESCRIPTION**

Major land-use estimates (the top three uses for the segment's subwatershed, excluding "open water", and other descriptive information.

Sources of information: descriptive information from USGS topographical maps, base geographic data from MassGIS, land use statistics from a GIS analysis using the MassGIS land use coverage developed in 1999 at a scale of 1:25,000 (Umass Amherst 1999).

**SEGMENT LOCATOR MAP**

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

Sources of information: MassGIS data layers (stream segments and quadrangle maps from MassGIS 2001).

**2002 INTEGRATED LIST OF WATERS CATEGORY**

Category (2 – 5) in which the segment is listed on the 2002 Integrated List of Waters.

Source of information: Massachusetts Year 2002 Integrated List of Waters (MA DEP 2003a).

**WATER WITHDRAWALS AND WASTEWATER DISCHARGE PERMIT INFORMATION**

Water withdrawal, NPDES wastewater discharge

Sources of information: WMA Database Printout (LeVangie 2002); open NPDES permit files located in the Worcester and Western Regional MA DEP Offices (MA DEP 2001a, Hogan 2004, Keohane 2004, McElroy 2004, and Nietupski 2004a).

**USE ASSESSMENT**

*Aquatic Life*, *Fish Consumption*, *Drinking Water* (where applicable – see note below), *Primary Contact*, *Secondary Contact*, and *Aesthetics*.

Sources of information include: MA DEP DWM 1996/1997 and 2001 survey data (Appendix A through G); MA DEP DWM Toxicity Testing Database "TOXTD". The MA DPH Freshwater Fish Consumption Advisory Lists (MA DPH 2001 and MA DPH 2004a) were used to assess the *Fish Consumption Use*. Where other sources of information were used to assess designated uses, citations were included. [Note: Although the *Drinking Water Use* itself was not assessed in this water quality assessment report the Class A waters were identified.]

**SUMMARY**

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

**RECOMMENDATIONS**

Additional protection, monitoring and implementation needs.

***LAKES***

The assessed lakes, identified with their Waterbody Identification Code (WBID) numbers, are listed alphabetically in the Lake Assessment section of this report (Table 5). The status of the individual uses is summarized for these lakes. The location, acreage, trophic status, use assessments, and causes of impairment, are then summarized for each individual lake.

## WESTFIELD RIVER WATERSHED - RIVER SEGMENT ASSESSMENTS

There are a total of 28 rivers, comprising 35 segments, from the Westfield River Watershed assessed in this report (Figure 8). These include: the Little River (MA32-16, MA32-35, MA32-36, MA32-08); Middle Branch Westfield River (MA32-02, MA32-03); Swift River (MA32-12); West (Falls) Branch (MA32-13); West Branch Westfield River (MA32-01); Westfield River (MA32-04, MA32-05, MA32-06, MA32-07); Bedlam (MA32-33), Bradley (MA32-21), Depot (MA32-17), Dickenson (MA32-34), Glendale (MA32-10), Great (MA32-25), Kinne (MA32-32), Meadow (MA32-11), Miller (MA32-27), Moose Meadow (MA32-23), Paucatuck (MA32-29), Pond (MA32-24), Potash (MA32-22), Powdermill (MA32-09), Roaring (MA32-30), Sanderson (MA32-31), Shaker Mill (MA32-18), Walker (MA32-20), White (MA32-28), and Yokum (MA32-19) brooks; and Watts (MA32-14) and Wards (MA32-15) streams. While these rivers represent only a small number (30%) of the 89 named rivers they account for approximately 50% of the named river miles in the watershed. The remaining rivers are small and/or unnamed and are currently unassessed.

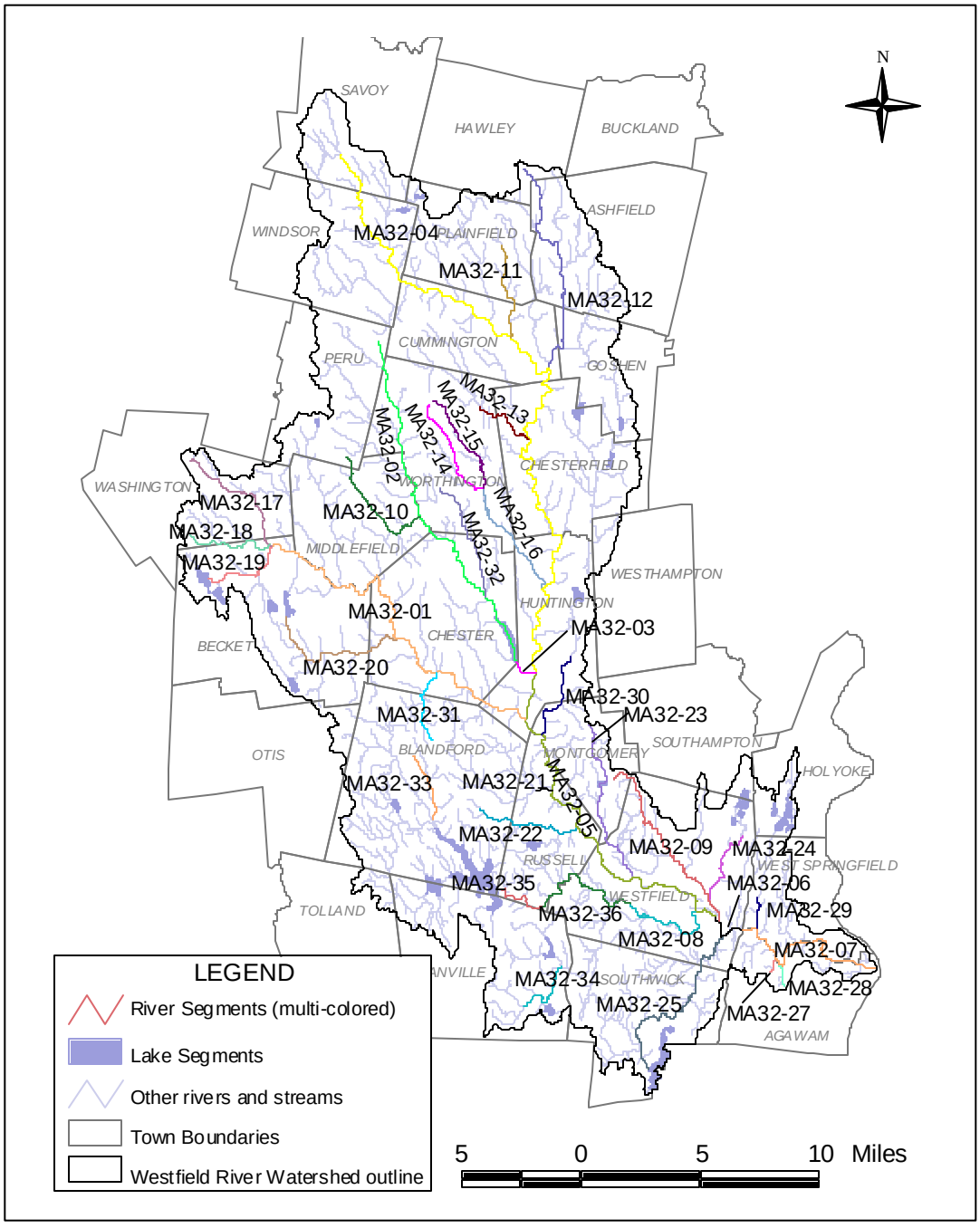
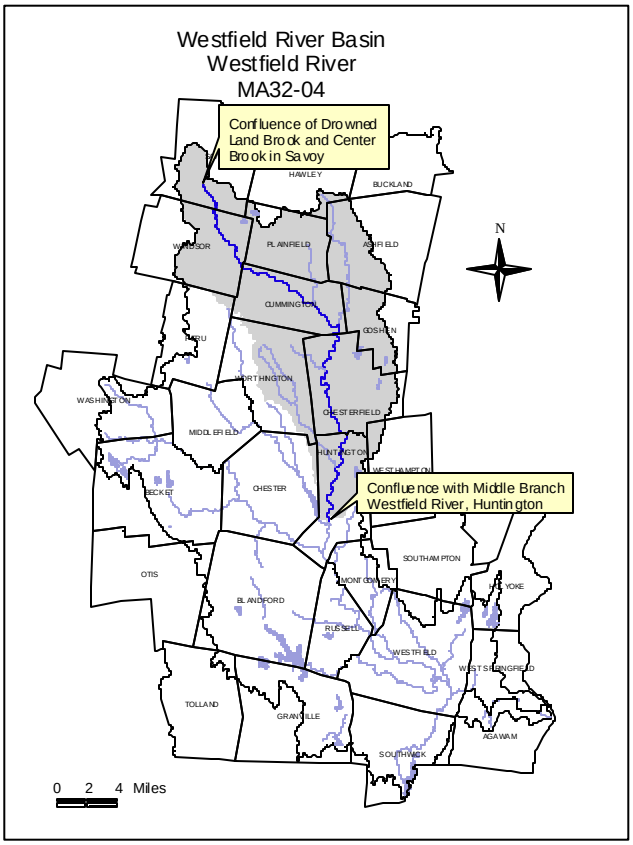



Figure 8. Westfield River Watershed - river segment locations identified by segment number.

## WESTFIELD RIVER (SEGMENT MA32-04)

Location: Confluence of Drowned Land Brook and Center Brook, in Savoy, to confluence with Middle Branch Westfield River, Huntington.
Segment Length: 33.2 miles
Classification: Class B, Cold Water Fishery




The drainage area of this segment is approximately 168 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 84%
- Agriculture..... 7%
- Residential ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 1.5 %, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The Westfield River begins at the confluence of Drowned Land Brook and Center Brook in Savoy. The river flows in a southeast direction through mostly undeveloped steep terrain with little floodplain development through the towns of Windsor and Cummington. At Cummington Center the floodplain widens but then narrows as the river continues southeast through Cummington in a narrow steep valley. Just before entering Chesterfield the river turns east and then sharply to the north where the Swift River joins it. The Westfield River then turns abruptly to the south and flows into Chesterfield in a reach called “The Gorge” with extremely steep slopes and a narrow river channel. The floodplain then widens as the river enters Huntington. In Huntington the river picks up flow from the Little River before entering the Army Corps of Engineers (ACOE) Knightville Dam area. Approximately 2.5 miles below the dam the Middle Branch Westfield River joins the Westfield River and this segment ends.

The ACOE New England District maintains a flood control project, Knightville Dam (Reservoir) in the town of Huntington, within this segment of the Westfield River (ACOE 2003). Knightville Dam is a Class I project (with no significant water quality problems) that is part of a system of 14 ACOE flood control dams in the Connecticut River Watershed (covering parts of Vermont, New Hampshire, Massachusetts, and Connecticut). During the past five years there has been no indication of significant water quality problems, including bacteria problems.

The Knightville Dam is 1,200’ long, 150’ high (above streambed), and consists of compacted earth with an impervious core, protected with rock slopes on both sides (ACOE 2003). Peak storage capacity is 16 billion gallons when filled to spillway crest, equivalent to 5.7” of runoff from the contributing drainage area of 162 square miles. The Class I project began operation in 1940, after the disastrous floods of September 1938, to provide flood control and regulation of flows to reduce flood stages in Westfield and West Springfield. The 2430-acre Army Corps Property, in addition to another 258 acres of private land easements, encompasses approximately 4.75 miles of the mainstem Westfield River in Huntington and Chesterfield. When filled to spillway crest the reservoir extends about 6 miles and has a surface area of about 960 acres. The reservoir area and associated land offer recreational opportunities that include: camping, fishing, hiking, and cross-country skiing (but no swimming). The maximum flood stage occurred during April 1987, when the water level attained an elevation of 612.4’ above sea level, which was 2.4’ above the spillway crest of 610’ (ACOE 2003).

Based on the last evaluation of water quality conditions this segment of the Westfield River is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Aquatic Life, Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics) and was not assessed for others (Fish Consumption).

MDFW has proposed that several tributaries to this segment of the Westfield River be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003). They are: Pond Brook, Dead Branch, Tower Brook, Mill Brook, Bartlett Brook, Westfield Brook, and Windsor Jambs Brook.

**WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY**

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

The Knightville Dam can impound up to a 6-mile reach of the Westfield River in Huntington and Chesterfield when filled to spillway crest (ACOE 2002). At Knightville Dam no permanent storage pool is maintained. However, a winter pool is maintained to prevent the flood-control gates from freezing. Historically the winter pool was held until the last weekend in April and dumped to provide flows for the "Westfield River Days" canoe and water rapids running celebration. In order to improve passage for outmigrating smolts (salmon fry are stocked by MDFW in the Westfield River and select tributaries) the pool is now released on or about 1 April (Slater 2004). The ACOE, North Atlantic Engineering Branch, started releasing the winter pool during the last weekend in March and did not store up for the Westfield River Days event until 48 hours before the scheduled release (for the event). This was done experimentally in 2001, but is now incorporated as part of normal operations. In 2002 the spring was wet enough so that sufficient storage was available, but even in a dry year the recreational release will only be the excess water that can be stored in 48 hours. This works well for the smolts running the Westfield River, because most of them will have already migrated downstream before the last weekend in April. The pool is not refilled until freezing conditions occur (late December/January). While downstream passage is no longer an issue, migrating adults are unable to move upstream past the dam at this time.

The USGS gage 01179500 is located on the Westfield River approximately 0.2 miles downstream from the Knightville Dam (upstream from this segment of the Westfield River). The USGS remarks for this gage indicate that flow has been regulated by Knightville Reservoir since 1941 (Socolow 2003). The average discharge at this gage reported by USGS for the period of record (1909 to 2002) is 332 cfs. There is no evidence of aberrant streamflow fluctuations at this gage when viewing real-time USGS gaging data (USGS 2004).

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey, a habitat survey was performed in this segment of the Westfield River downstream from the Knightville Dam (upstream from the confluence with the Middle Branch Westfield River) off Rocky Brook Drive and Route 112 in Huntington (Station WR01, Appendix B). The available habitat was excellent and the score at Station WR01 was 184 out of a possible 200 (Appendix B).

Biology

The MDFW regularly stocks salmon fry and trout in this segment of the Westfield River.

In August and September 2001 MDFW personnel conducted backpack electrofishing in three reaches of this segment of the Westfield River. The sampling locations and the fish population information are described below.

- The most upstream reach surveyed by MDFW was located near the powerline crossing off River Road in Windsor (Station 336, Richards 2003). Seven fish species collected, in order of abundance, were blacknosed dace, longnosed dace, slimy sculpin, Atlantic salmon (multiple age classes), creek chubsucker, common shiner, and white sucker.
- The next reach sampled was located upstream from the Route 143 bridge and the confluence

with the West (Falls) Branch in Chesterfield (Station 547, Richards 2003). Seven fish species collected, in order of abundance, were blacknosed dace, longnosed dace, common shiner, Atlantic salmon (multiple age classes), white sucker, lake chub, and slimy sculpin. It should be noted that lake chub are a state "endangered" species.

- The most downstream reach sampled was located near the top gate of the Army Corp flood control project in the Gorge (Station 548, Richards 2003). Eight fish species collected, in order of abundance, were common shiner, longnosed dace, blacknosed dace, Atlantic salmon (multiple age classes), white sucker, lake chub, rainbow trout, and one tessellated darter.

It is interesting to note that according to a *Stream Survey of the Westfield River System 1977-1978*, "game fish, primarily trout" comprised 27% of the biomass in "Unit B" (their fishery management unit which included the area including the main stem sections of the upper branches (East, Middle, and West) of the Westfield River) (Halliwell 1978) only three trout were collected in the three stations sampled in 2001 (Richards 2003).

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey in this segment of the Westfield River downstream from the Knightville Dam (upstream from the confluence with the Middle Branch Westfield River) off Rocky Brook Drive and Route 112 in Huntington (Station WR01) (Appendix B). The benthic community at this station (WR01) was diverse and was considered to represent the "least-impacted" conditions in the watershed. It was, therefore, used as a reference station. Backpack electrofishing by DWM in September 2001 in this reach of the river resulted in the collection of eight species of fish (Appendix B). However, electrofishing efficiency was limited by the width of the river. The species collected, in order of abundance, were smallmouth bass, white sucker, common shiner, longnosed dace, and an individual each of brown trout, brown bullhead, American eel, and pumpkinseed. A small amount of green filamentous algae was observed, but coverage in this open canopied reach was <1% (Appendix D, MA DEP 2001c).

Chemistry – sediment

A priority pollutant scan was conducted by ACOE on sediment samples collected from the Westfield River at Knightville Dam (ACOE 2002 and Barker 2004). Sediment samples were collected in September 2000 and analyzed for metals, PCB, pesticides, semi-volatile organic compounds, dioxins and furans, grain size, and TOC. According to the annual report the levels of EPA priority pollutants in the sediment collected from the Westfield River at Knightville Dam were low and indicative of natural background conditions (ACOE 2002).

The *Aquatic Life Use* is assessed as support based on the benthic macroinvertebrate and fish community data. The presence of two intolerant species and the dominance of fluvial specialists/dependant species is indicative of excellent water quality and stable flow regimes. It should be noted, however, that the lower 8.2-mile reach of this segment of the Westfield River could be affected by the operations of the ACOE Knightville Dam. It is unclear whether salmon stocking is having an effect on trout populations in this segment of the Westfield River.

***FISH CONSUMPTION***

Fish were collected from this segment of the Westfield River by MA DEP and MDFW personnel in October 1990 in the reach downstream from the Knightville Army Corps Area in Huntington (Maietta 1993). Tissue from eastern brook trout and white suckers were analyzed for selected metals (including mercury), PCB, and pesticides. MA DPH did not issue any fish consumption advisories based on this survey.

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

Bacteria samples were collected at two state managed beaches, the Westfield River Beach at the Windsor State Forest, Windsor and the Westfield River Beach at the Gardner State Park, Huntington, along this segment of the Westfield River during 2001-2003 swimming seasons (MA DCR 2003b).

At the Windsor State Forest, Westfield River Beach, beach closures occurred on the following dates.

- In 2001: 2-5, 9, and 12 July, 6-7 August;
- In 2002: 22, and 24-25 July, 5-6 August;
- In 2003: 2-3, 23, 25 and 30 June, 2, 7, 9, 18, 21, 23, 25 and 28-29 July, 4 and 6-26 August.

At the Gardner State Park, Westfield River Beach beach closures occurred on the following dates.

- In 2001: 2, 5, and 9-11 July, 6-7, 13, 15, 17, 19-21, and 27 August, 1 September;
- In 2002: 5, 7-11, 19 and 26 August;
- In 2003: 27 May-1 June and 23 June, 14, 16, 21, 23, 25, and 28 July 4 and 6-26 August.

DWM collected fecal coliform bacteria samples from six sites along this segment of the Westfield River between May and August 1996 (Stations WSFR56.8, SWFR 50.6, WSFR48.1, WSFR42.7, WSFR38.0 and WSFR26.8) as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Based on the frequent and occasionally prolonged beach closures at both MA DCR Westfield River beaches the *Primary Contact Recreation Use* is assessed as impaired. The *Secondary Contact Recreational Use*, however, is not assessed at this time due to a lack of recent fecal coliform bacteria data.

***AESTHETICS***

No objectionable deposits, odors, oils, or other conditions were noted by DWM biologists at their survey site on the Westfield River downstream from the Knightville Dam (upstream from the confluence with the Middle Branch Westfield River) off Rocky Brook Drive and Route 112 in Huntington (Station WR01) in either 1996 or 2001 (Appendices B and C).

The *Aesthetics Use* is assessed as support for this segment of the Westfield River based primarily on field observations by DWM biologists in 2001.

Westfield River (MA32-04) Use Summary Table

| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | IMPAIRED<br>Cause: Beach closures (based on *Enterococcus* sp. data)<br>Source: Unknown |
| Secondary Contact |  | NOT ASSESSED |
| Aesthetics |  | SUPPORT |

**RECOMMENDATIONS WESTFIELD RIVER (MA32-04)**

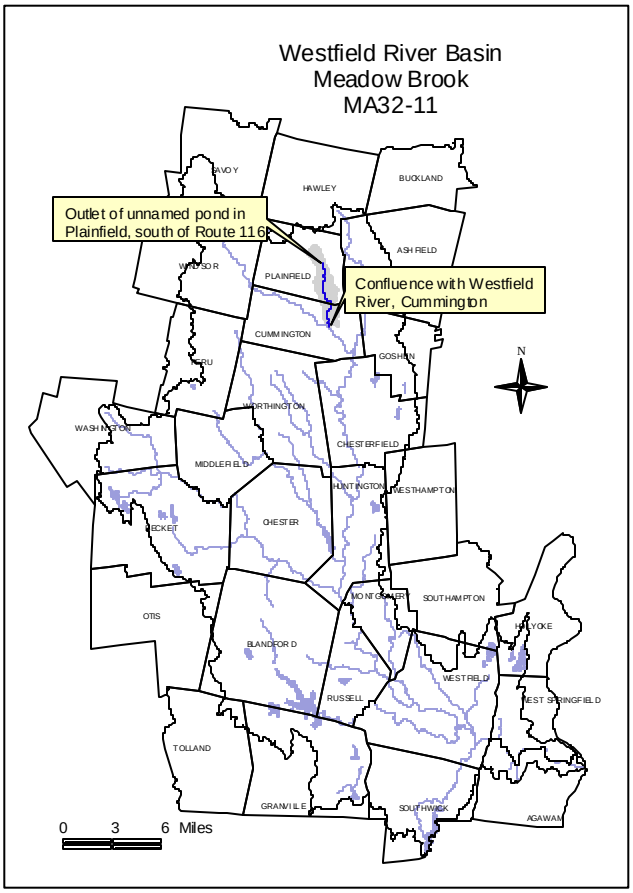
- Conduct bacteria monitoring to better assess the status of the *Primary* and *Secondary Contact Recreational* uses throughout the entire length of this river segment. Conduct additional sampling to pinpoint sources of bacteria specifically in the vicinity of the two MA DCR state beaches.

- Continue to conduct biological monitoring (habitat, benthic and fish population) to evaluate the status of the *Aquatic Life Use*.

- Long-term monitoring of fish populations in this segment of the Westfield River would be valuable to investigate possible impact of salmon stocking on reproducing wild trout populations.

## MEADOW BROOK (SEGMENT MA32-11)

Location: Outlet of unnamed pond in Plainfield, south of Route 116, to confluence with Westfield River, Cummington.
Segment Length: 4.6 miles
Classification: Class B




The drainage area of this segment is approximately 4 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 72%
- Agriculture..... 19%
- Residential ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 1.8%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The headwaters of Meadow Brook begin as the outflow from a small, unnamed pond (east of Plainfield Center) just south of Route 116 in Plainfield. The brook flows south, first over gently sloping forested terrain, then through a reach of moderately sloping terrain and finally into a relatively flat meadow and marsh. Meadow Brook then flows for approximately one mile over moderately steep terrain before its confluence with the Westfield River in the town of Cummington.

Based on the last evaluation of water quality conditions Meadow Brook is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics) and was not assessed for others (Aquatic Life, Fish Consumption).

MDFW has proposed that Meadow Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

DWM collected fecal coliform bacteria samples from Meadow Brook at the Nash Road Bridge (Station MEDB00.2) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No recent water quality data are available so all uses for Meadow Brook are currently not assessed.

Meadow Brook (MA32-11) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| NOT ASSESSED | | | | |

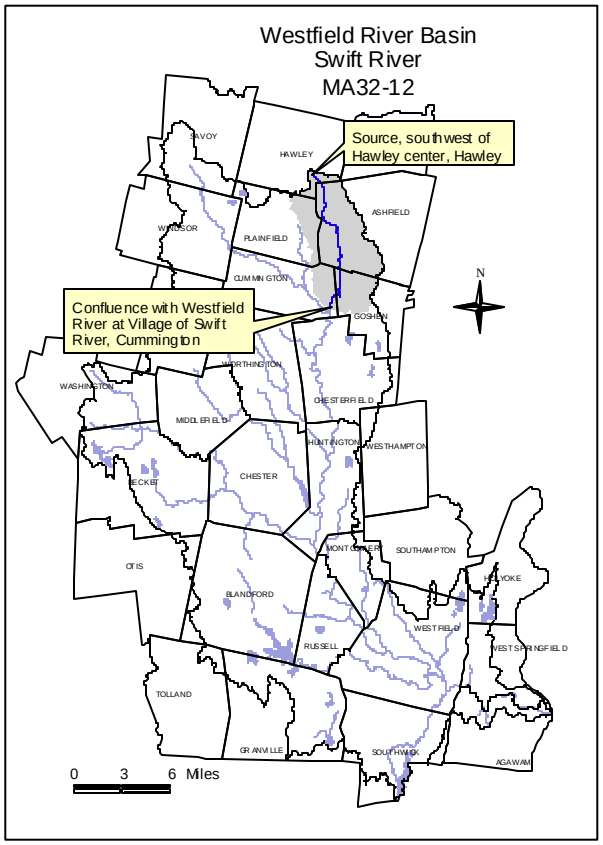
**RECOMMENDATIONS MEADOW BROOK (MA32-11)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses. Conduct additional sampling to pinpoint sources if deemed necessary.

- Monitor the fish population, dissolved oxygen and temperature in Meadow Brook to evaluate MDFW's proposal to list this segment as a cold water fishery in the next revision of the Surface Water Quality Standards.

## SWIFT RIVER (SEGMENT MA32-12)

Location: Source, southwest of Hawley center to confluence with Westfield River at the village of Swift River, Cummington.
Segment Length: 11.5 miles
Classification: Class B




The drainage area of this segment is approximately 30 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 82%
Agriculture..... 8%
Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.4%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The Swift River originates out of a small unnamed pond just south of Hawley Center in Hawley and flows southeasterly into Ashfield over moderately sloping terrain with some wetland areas. The river then flows in a more southerly direction by the village of Spruce Corner after which it enters the extensive Bassett Meadow wetland. The river then continues south into Goshen through steeper forested terrain until it reaches Route 9 where it abruptly turns west and then southwest into Cummington. The river flows through very steep terrain into the village of Swift River where the North Branch Swift River joins it and then flows a short distance before its confluence with the Westfield River.

Based on the last evaluation of water quality conditions Swift River is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that the Swift River and its tributaries, the North Branch Swift River and Stones Brook, be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

MDFW regularly stocks salmon fry and trout in the Swift River.

MDFW conducted fish population sampling in the Swift River near Spruce Corner Road in Goshen using a backpack shocking unit in September 2001 (Station 487, Richards 2003). A total of six fish species collected, in order of abundance, were blacknosed dace, Atlantic salmon (multiple age classes), longnosed dace, brook trout (multiple age classes), common shiner and white sucker. These species are all fluvial specialists/dependants. In addition, the presence of two intolerant species is indicative of excellent water and habitat quality.

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of multiple year age classes of reproducing brook trout is indicative of high quality cold water.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

DWM collected fecal coliform bacteria samples from the Swift River from the Route 9/112 bridge, Cummington (Station SWFT00.2) in May and August as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited and no recent water quality data are available so the *Recreational uses* for Swift River are currently not assessed.

Swift River (MA32-12) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS SWIFT RIVER (MA32-12)**

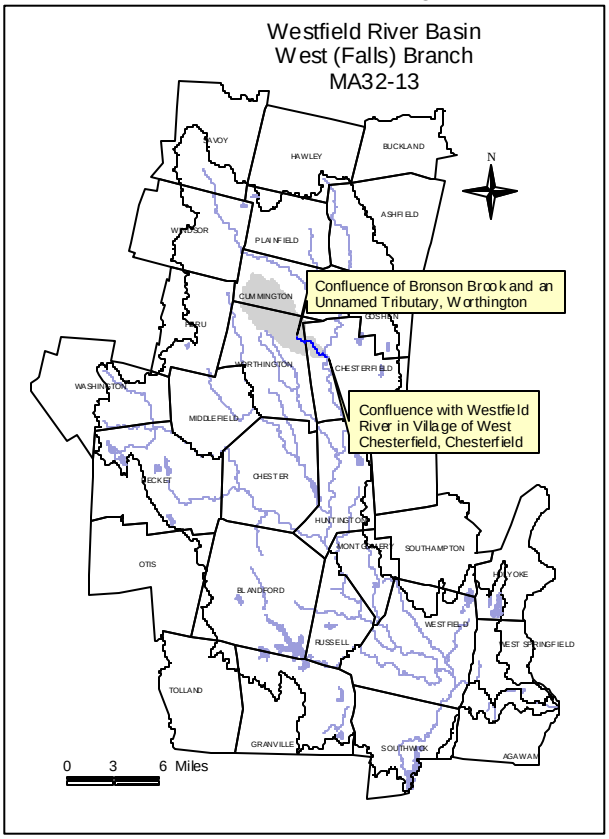
- Long-term monitoring of fish populations in the Swift River would be valuable to investigate possible impact of salmon stocking on reproducing wild trout populations.

- The Swift River should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## WEST FALLS BRANCH (SEGMENT MA32-13)

(Formerly identified by the Massachusetts Stream Classification Program as West Branch)
Location: Headwaters at confluence of Bronson Brook and an unnamed tributary near intersection of Dingle Road and Route 143, Worthington to confluence with Westfield River near the village of West Chesterfield, Chesterfield.
Segment Length: 2.8 miles
Classification: Class B




The drainage area of this segment is approximately 12 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 83%
Agriculture..... 11%
Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.4%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The West Falls Branch is formed by the confluence of Bronson Brook and an unnamed tributary north of the village of Worthington Corners in Worthington. The West Falls Branch flows southeast through a narrow steep valley with little development before joining the Westfield River in the Village of West Chesterfield in the town of Chesterfield.

Based on the last evaluation of water quality conditions the West Falls Branch (identified as West Branch) is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that West Falls Branch and the following tributaries: Bronson Brook, Steven Brook, Childs Brook, Kearney Brook, be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003). MDFW regularly stocks trout in West Falls Branch.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

DWM collected a fecal coliform bacteria sample from the West Falls Branch near Ireland Street, south of West Chesterfield on the way to Chesterfield Gorge (Station WBWC00.1) in August as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No recent water quality data are available so all uses for West Falls Branch are currently not assessed.

West Falls Branch (MA32-13) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
| | | | | |
| NOT ASSESSED | | | | |

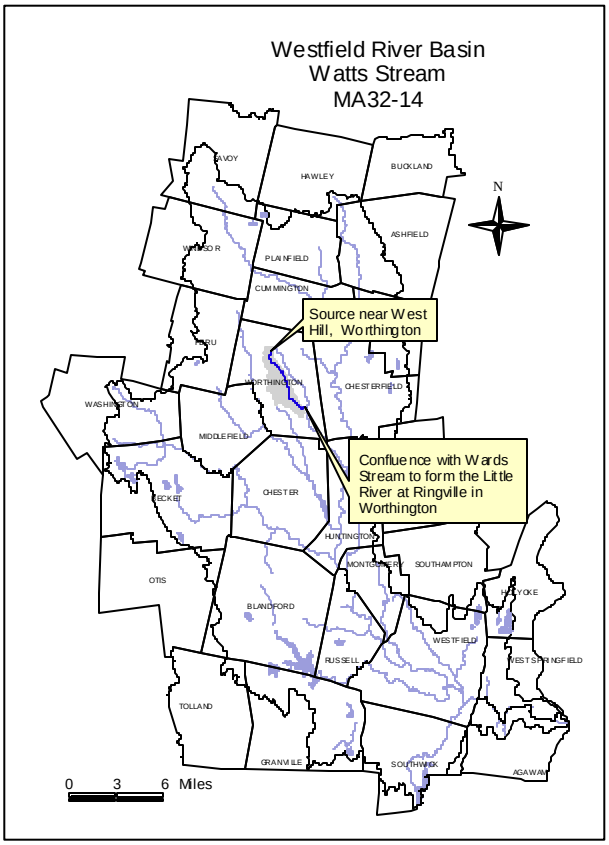
**RECOMMENDATIONS WEST FALLS BRANCH (MA32-13)**

- Monitor the fish population and/or DO and temperature in West Falls Branch to evaluate MDFW's proposal to classify this segment as a cold water fishery in the next revision of the surface water quality standards.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## WATTS STREAM (SEGMENT MA32-14)

Location: Source near West Hill, Worthington to confluence with Wards Stream at Ringville, Worthington.
Segment Length: 5.2 miles
Classification: Class B




The drainage area of this segment is approximately 4 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 81%
- Agriculture ..... 9%
- Residential ..... 5%

The impervious cover area for the individual sub-basins located in this segment is 1.7%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Watts Stream begins on the slopes of West Hill in Worthington State Forest and flows southerly over moderately steep terrain through the center of Worthington to its confluence with Wards Stream in the village of Ringville in Worthington. This confluence marks the beginning of the Little River.

Based on the last evaluation of water quality conditions Watts Stream is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Primary Contact Recreation, Secondary Contact Recreation, Aesthetics) and was not assessed for others (Aquatic Life, Fish Consumption).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

In August 2001, MDFW surveyed the fish population in Watts Stream near the Guard Road Bridge in Worthington (Station 572, Richards 2003). Four fish species collected, in order of abundance, were brook trout (multiple age classes), blacknosed dace, slimy sculpin and one creek chubsucker. These species are all fluvial specialists/dependants. In addition, the presence of two intolerant species is indicative of excellent water and habitat quality.

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of multiple year age classes of reproducing brook trout is indicative of high quality cold water.

#### *PRIMARY CONTACT AND SECONDARY CONTACT RECREATION*

DWM collected fecal coliform bacteria samples from Watts Stream at Prentice Road Bridge in Ringville (Worthington) at Station WATS00.1 in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited recent water quality data are available so the *Recreational* uses for Watts Stream are currently not assessed.

Watts Stream (MA32-14) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

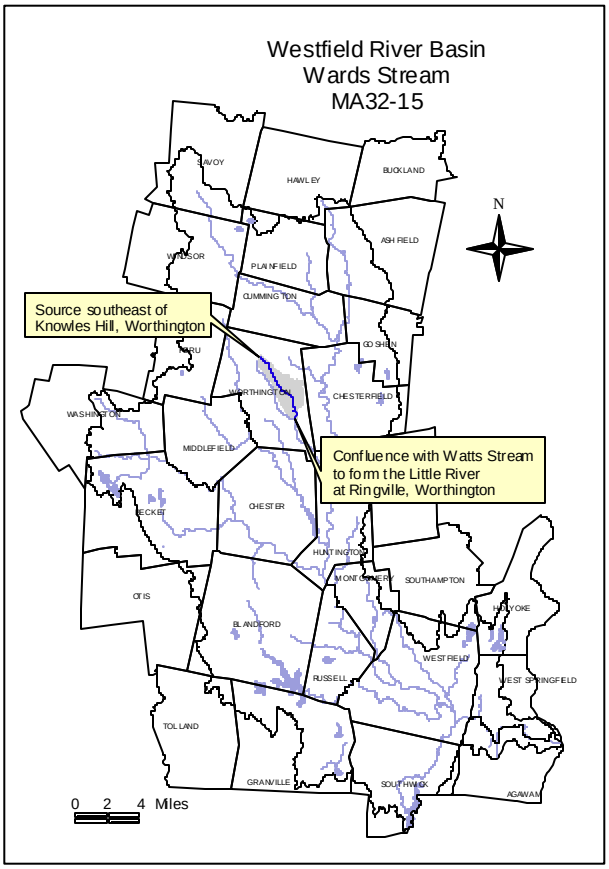
**RECOMMENDATIONS WATTS STREAM (MA-32-14)**

- Although not proposed as a cold water fisheries resource by MDFW, Watts Stream should be considered for listing as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## WARDS STREAM (SEGMENT MA32-15)

Location: Source southeast of Knowles Hill, Worthington, to confluence with Watts Stream at Ringville, Worthington.
Segment Length: 5.2 miles
Classification: Class B




The drainage area of this segment is approximately 4 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 62%
Agriculture .. 19%
Residential ... 8%

The impervious cover area for the individual sub-basins located in this segment is 2.5%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Wards Stream originates southeast of Knowles Hill in Worthington and flows south to southeast over moderately sloping terrain through the village of Worthington Corners in Worthington to its confluence with Watts Stream in the village of Ringville in Worthington. The confluence of these two streams marks the beginning of the Little River.

Based on the last evaluation of water quality conditions Wards Stream is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported one designated use (Aquatic Life), and was not assessed for others (Primary Contact Recreation, Secondary Contact Recreation, Aesthetics, Fish Consumption).

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H1)

The Maples, formerly called the Worthington Senior Housing Inc., is authorized to discharge (NPDES MA0027871) up to 0.0023 MGD of treated sanitary wastewater to Wards Stream (permit issued in September 1999). The wastewater is treated through subsurface sand filters and, on occasion, during high groundwater conditions or excessive precipitation the wastewater reaches a chlorine contact tank after sand filtration and is discharged into Wards Stream. Therefore, the discharge is on an intermittent basis only. The facility has a maximum daily total residual chlorine (TRC) limit of 0.1 mg/L, a monthly average total phosphorus and ammonia-nitrogen limit of 2.0 and 1.0 mg/L, respectively, and a fecal coliform limit of 200 cfu/100 mls. According to the MA DEP Western Regional Office staff the facility has been in compliance with the permit limits (McElroy 2004). The previous permit required the facility to conduct whole effluent toxicity testing of the discharge. A whole effluent toxicity test (100% effluent) was conducted on the discharge in October 1998. Survival of *Ceriodaphnia dubia* and *Pimephales promelas* exposed (48-hour) to the effluent sample was excellent (≥ 100%) in the test. The present permit no longer requires whole effluent toxicity testing.

### USE ASSESSMENT

***AQUATIC LIFE***

Biology

MDFW conducted backpack electrofishing at two locations in Wards Stream in August 2001. The most upstream location was near Buffington Hill Road in Worthington (Station 350, downstream from the Maples discharge) and the downstream location was near Indian Oven Road in Worthington

(Station 347, Richards 2003). Four fish species collected at the upstream station, in order of abundance, were creek chubsucker, brook trout (multiple age classes), white sucker, and blacknosed dace. Five species collected at the downstream location, in order of abundance, were blacknosed dace, creek chubsucker, common shiner, white sucker, and one brook trout. These species are all fluvial specialists/dependants. In addition, the presence of one intolerant species is indicative of excellent water and habitat quality.

Toxicity

*Ambient*

Water was collected from Wards Stream for use as dilution water in the Maples facility's whole effluent toxicity test conducted in October 1998. Water was collected approximately 0.2 miles upstream from where Ward's Stream crosses Buffington Hill Road. Survival of *C. dubia* and *P. promelas* exposed (48-hour) to the river water was good (≥ 95%) in the test.

*Effluent*

Water from The Maples treatment plant was collected in October 1998 and tested for whole effluent toxicity. Although the toxicity test was invalid because of a sample holding-time violation it should be noted that survival of *C. dubia* and *P. promelas* exposed (48-hour) to the effluent sample was excellent (≥ 100%) in the test.

Chemistry – water

Water from Wards Stream was collected for use as dilution water in The Maples whole effluent toxicity test conducted in October 1998 (approximately 0.2 miles upstream from where Ward's Stream crosses Buffington Hill Road). Data from this report (maintained in the TOXTD database) are summarized below.

*pH*

Instream pH was 6.3 mg/L.

*Total Residual Chlorine*

The TRC measurement was ≤ 0.05 mg/L.

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of multiple year age classes of reproducing brook trout is indicative of high quality cold water.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATIONAL AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Wards Stream near the Route 112 bridge in Ringville (Station WRDS00.0) in May and August as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited recent water quality data are available so the *Recreational* and *Aesthetic* uses for Wards Stream are currently not assessed.

Wards Stream (MA32-15) Use Summary Table

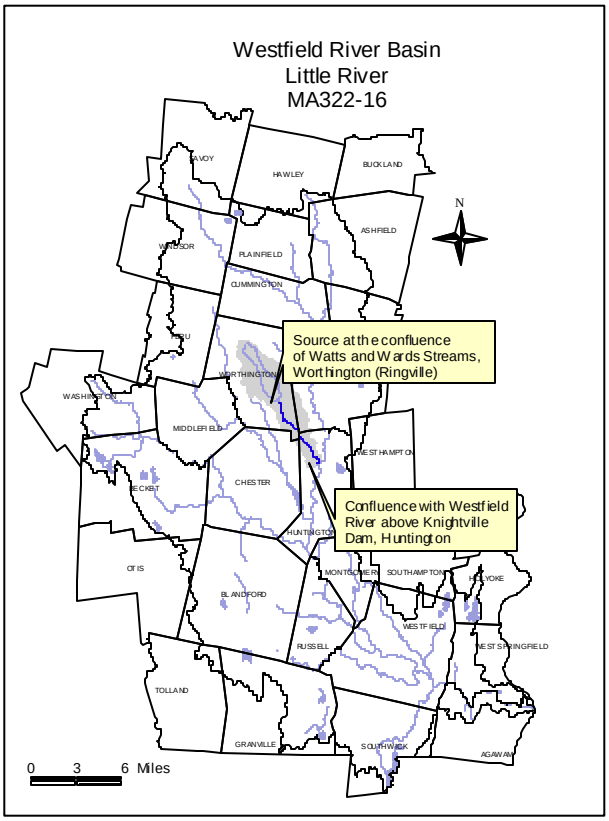
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS WARDS STREAM (MA32-15)**

- Although not proposed as a cold water fisheries resource by MDFW, Wards Stream should be considered for listing as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## LITTLE RIVER (SEGMENT MA32-16)

Location: Confluence of Watts and Wards streams at Ringville, Worthington, to confluence with Westfield River, Huntington.
Segment Length: 5.7 miles
Classification: Class B




The drainage area of this segment is approximately 15 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 78%
Agriculture..... 10%
Residential ..... 5%

The impervious cover area for the individual sub-basins located in this segment is 1.7 %, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The Little River is formed at the confluence of Watts and Wards Streams in the village of Ringville in Worthington paralleling Route 112 its entire length. From Ringville the river flows south to southeast and first enters a relatively flat area with low gradient before entering a narrow steep valley with a high gradient. The river then passes by the village of South Worthington before entering Huntington and its confluence with the Westfield River above the Knightville Dam.

Based on the last evaluation of water quality conditions Little River is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that the Little River be listed in the next revision of the SWQS as a cold water fishery (MDFW 2001).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project a habitat survey was performed by DWM at Station BT08LIT on the Little River off the north side of Route 112 approximately 1900 meters downstream from Ireland Street crossing Huntington in September 1997. At the time of the survey the river was roughly 7 m wide with depths ranging from 0.25 m to 1.0 m. The substrates were comprised primarily of boulder and cobble. The overall habitat score was 152 out of a possible 200 (MA DEP 1997). Habitat quality was limited most by the channel flow status with additional limitations related to velocity/depth combinations, embeddedness and an inadequate riparian zone on the right bank.

Biology

MDFW regularly stocks salmon fry and trout in the Little River.

In August 2001 MDFW conducted electrofishing in the Little River near Goss Hill Road Bridge in Worthington (Station 381, Richards 2003). Seven fish species collected, in order of abundance, were Atlantic salmon (multiple age classes), blacknosed dace, longnosed dace, common shiner, white sucker, and one individual each of creek chubsucker and brook trout.

As part of the MA DEP Biocriteria Development Project MA DEP DWM biologists collected benthic macroinvertebrate samples from Little River off the north side of Route 112 approximately 1900 meters southeast (downstream) from Ireland Street crossing Huntington (Station BT08LIT) in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 24 September 1997 (ENSR 1997). Fish collected in order of abundance included: blacknosed dace, longnosed dace, slimy sculpin, white sucker, eastern brook trout, common shiner, Atlantic salmon (multiple age classes), creek chubsucker, and an individual tessellated darter. These species are all fluvial specialists/dependants. In addition the presence of three intolerant species is indicative of excellent water and habitat quality.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of the Little River off the north side of Route 112 approximately 1900 meters southeast (downstream) from Ireland Street crossing Huntington (Station BT08LIT) were made on 24 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of Atlantic salmon, reproducing brook trout and slimy sculpin are indicative of high quality cold water.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from the Little River just upstream from the flood pool of Knightville Dam in Huntington (Station LRWT00.1) between May and August as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in the Little River in 1997 (MA DEP 1997).

Too limited recent water quality data are available so the *Recreational* uses for the Little River are currently not assessed. The *Primary Contact Recreational* Use is identified with an Alert Status, however, because of one fairly high bacteria count. The *Aesthetics Use* is assessed as support based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Little River (MA32-16) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED* | NOT ASSESSED | SUPPORT |

* Alert Status issues identified see use assessment summary for additional information.

**RECOMMENDATIONS LITTLE RIVER (MA32-16)**

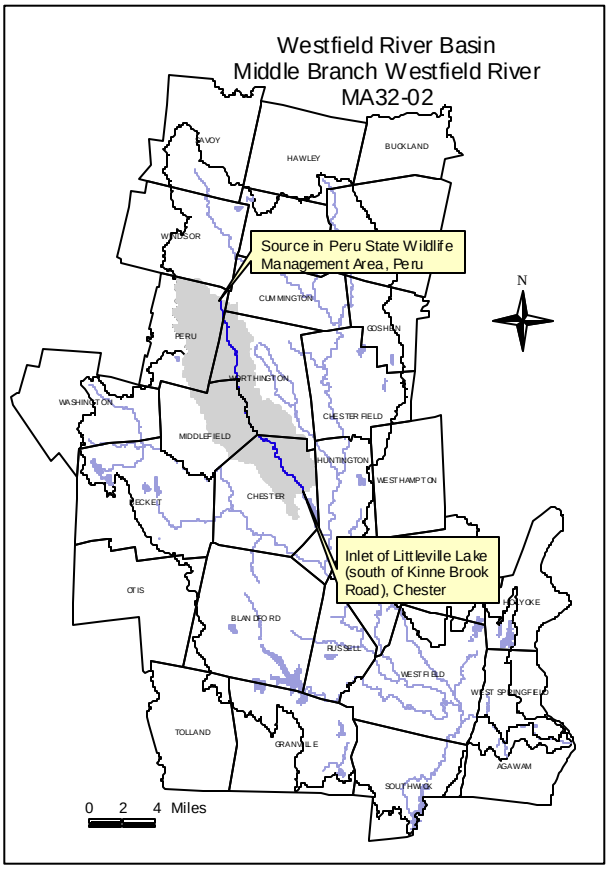
- Long-term monitoring of the Atlantic salmon and brook trout populations at this site would be valuable to investigate possible impact of salmon stocking on the brook trout population.

- The Little River should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## MIDDLE BRANCH WESTFIELD RIVER (SEGMENT MA32-02)

Location: Source in Peru State Wildlife Management Area, Peru, to inlet of Littleville Lake just upstream from boat ramp (south of Kinne Brook Road), Chester.
Segment Length: 14.7 miles
Classification: Class A




The drainage area of this segment is approximately 49 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 91%
Agriculture..... 4%
Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.3 %, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The headwaters of the Middle Branch Westfield River form in the Peru Wildlife Management Area in Peru. The river passes from Worthington to become the town boundary between Middlefield and Worthington and winds its way in a more easterly direction as it passes into Chester. The gradient decreases here and the river meanders its way to the southeast down to the village of North Chester. From North Chester the river runs in a fairly straight reach by Bemis Hill and then begins a reach of small meanders as it continues to flow southeast. The river then enters Littleville Lake, a reservoir formed by the Army Corps of Engineers Littleville Dam, at the Huntington/Chester town line.

Based on the last evaluation of water quality conditions the Middle Branch Westfield River is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Aquatic Life, Primary Contact Recreation, Secondary Contact Recreation, Aesthetics) and was not assessed for others (Fish Consumption).

MDFW has proposed that this segment of the Middle Branch Westfield River and the following tributaries- Day Brook, Tuttle Brook, Fuller Brook, Trout Brook- be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

***AQUATIC LIFE***

Habitat and Flow

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 in one reach of this segment of the Middle Branch Westfield River upstream from Littleville Lake (Station MB01). Habitat quality conditions at this location are described in detail in Appendix C.

Upstream fish passage to this segment of the Middle Branch Westfield River is blocked by the Littleville Lake Dam. In 2002 the ACOE installed three feet of aluminum stoplogs in the overflow channel to create a plunge pool for smolts going over the dam.

Biology

MDFW regularly stocks salmon fry and trout in the Middle Branch Westfield River upstream from Littleville Lake.

In September 2001 MDFW conducted backpack electrofishing along one reach in this segment of the Middle Branch Westfield River (Station 319, Richards 2003). The station was located upstream from the confluence with Tuttle Brook, off East River Road, Middlefield/Worthington. Seven fish species collected, in order of abundance, were blacknosed dace, longnosed dace, slimy sculpin, Atlantic salmon, brook trout, white sucker, and one common shiner. Multiple age classes of Atlantic salmon and brook trout were found. All species collected are fluvial specialists/dependants.

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 in one reach of this segment of the Middle Branch Westfield River upstream from Littleville Lake (Station MB01). Results of the RBP II analysis are provided in detail in Appendix C.

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of three intolerant species (Altantic salmon, brook trout and slimy sculpin) is indicative of excellent water and habitat quality.

***FISH CONSUMPTION***

Fish were collected from this segment of the Middle Branch Westfield River by MA DEP and MDFW personnel in October 1990 upstream from Dayville Bridge in Chester (Maietta 1993). Tissue from rainbow trout, eastern brook trout and brown were analyzed for selected metals (including mercury), PCB and pesticides. MA DPH did not issue any fish consumption advisories based on this data.

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from six stations along this segment of the Middle Branch Westfield River once in July 1996. Stations MBWF16.4, MBWF14.4, MBWF09.3, MBWF07.5, MBWF05.2, and MBWF04.0 are all described in Appendix G as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No objectionable conditions were noted by DWM biologists in the reach sampled in this segment of the Middle Branch Westfield River upstream from Littleville Lake in the summer of 1996 (Station MB01).

Too limited recent water quality data are available so the *Recreational* and *Aesthetics* uses for this segment of the Middle Branch Westfield River are currently not assessed.

Middle Branch Westfield River (MA32-02) Use Summary Table

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

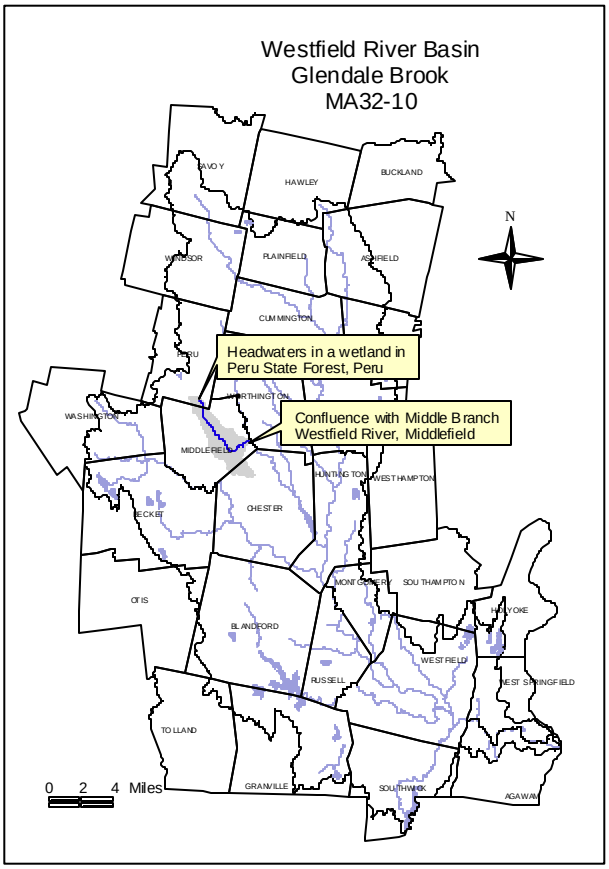
**RECOMMENDATIONS MIDDLE BRANCH WESTFIELD RIVER (MA32-02)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

- Long-term monitoring of the Atlantic salmon and brook trout populations in the Middle Branch Westfield River would be valuable to investigate possible impact of salmon stocking on the brook trout population.

## GLENDALE BROOK (SEGMENT MA32-10)

Location: From headwaters in a wetland in Peru State Forest, Peru, to confluence with Middle Branch Westfield River, Middlefield.
Segment Length: 6.0 miles
Classification: Class A




The drainage area of this segment is approximately 7 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 88%
- Agriculture..... 6%
- Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.3%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Glendale Brook begins in the Peru State Forest in Peru originating in a wetland southeast of Garnet Hill. The stream flows southeasterly over moderately steep terrain until it crosses under Wright Road where it then flows northeasterly through a relatively flat area before flowing over Glendale Falls to its confluence with the Middle Branch of the Westfield River in Middlefield.

Based on the last evaluation of water quality conditions Glendale Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Glendale Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

DWM collected one fecal coliform bacteria sample from the Trustees of the Reservation access to Glendale Falls (Station GDBR00.4) in July 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No recent water quality data are available so all uses for Glendale Brook are currently not assessed.

Glendale Brook (MA32-10) Use Summary Table

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

**RECOMMENDATIONS GLENDALE BROOK (MA32-10)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses. Conduct additional sampling to pinpoint sources if deemed necessary.

- Monitor the fish population and/or DO and temperature in Glendale Brook to evaluate MDFW's proposal to list this segment as a cold water fishery in the next revision of the surface water quality standards.

## KINNE BROOK (SEGMENT MA32-32)

Location: Source, west of West Street, Worthington, to confluence with Middle Branch Westfield River, Chester.
Segment Length: 5.6 miles
Classification: Class A

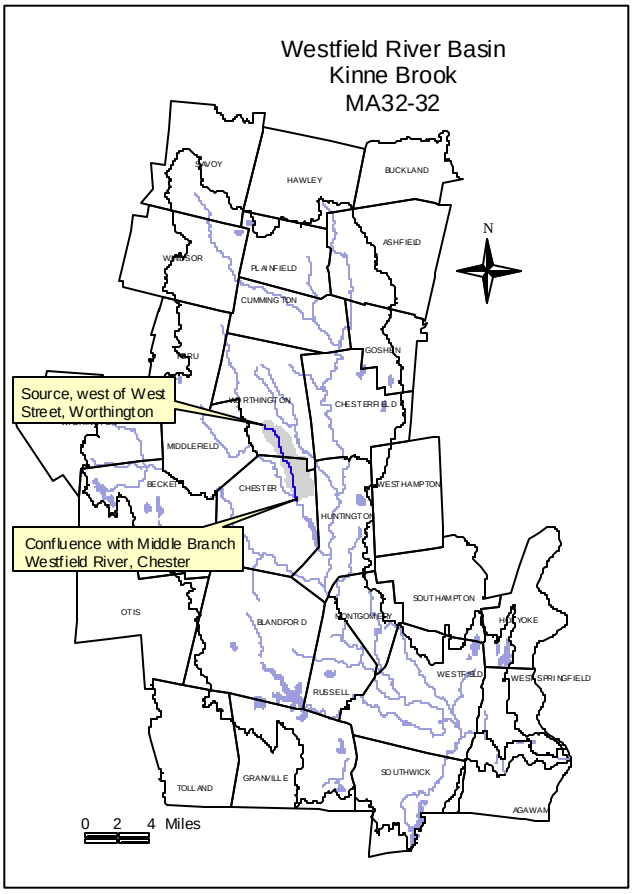
The drainage area of this segment is approximately 6 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 87%
Agriculture..... 7%
Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.3 %, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Kinne Brook originates near Parker Four Corners in Worthington on the slopes of a moderately steep hill. The brook flows south to southeast through mostly forested terrain soon entering Chester, where it has its confluence with the Middle Branch Westfield River in the village of Dayville.

Based on the last evaluation of water quality conditions Kinne Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.




MDFW has proposed that Kinne Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project a habitat survey was performed by DWM on Kinne Brook at Station BT05KIN, approximately 250 meters downstream from the confluence of Skunk Brook in Chester, in September 1997. At the time of the survey the river was roughly 2 m wide with a depth of approximately 0.25 m. The substrates were comprised primarily of boulder, cobble, and gravel. The overall habitat score was 154 out of a possible 200 (MA DEP 1997). Habitat quality was limited by the channel flow status with additional limitations related to velocity/depth combinations, embeddedness, and the inadequate riparian zone on the left bank.

Biology

MDFW regularly stocks salmon fry in Kinne Brook.

In August 2001 MDFW conducted backpack electrofishing in Kinne Brook downstream from the confluence with Skunk Brook in Chester (Station 395, Richards 2003). Only blacknosed dace was collected.

As part of the MA DEP Biocriteria Development Project MA DEP DWM biologists collected benthic macroinvertebrate samples from Kinne Brook approximately 250 meters downstream from the confluence of Skunk Brook in Chester (Station BT05KIN) in September 1997 (Lotic 1999). Electrofishing was also conducted at this location on 24 September 1997 (ENSR 1997). Fish collected in order of abundance included: blacknose dace, Atlantic salmon, creek chubsucker, eastern brook trout, and an individual each of pumpkinseed, golden shiner, and slimy sculpin. Multiple age classes of Atlantic salmon and eastern brook trout were found. With the exception of the pumpkinseed and golden shiner all fish species collected were fluvial specialists/dependants. While blacknose dace dominated both MDFW and DWM samples, which were taken in close proximity to one another, the absence of other species in the more recent MDFW sample is of concern.

Chemistry – water

*In-situ* measurements (DO, % saturation, pH, temperature, conductivity, and turbidity) of Kinne Brook were made approximately 250 meters downstream from the confluence of Skunk Brook in Chester (Station BT05KIN) on 24 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

Although the fish assemblage documented by DWM in 1997 appears to be indicative of excellent water quality, the *Aquatic Life Use* is not assessed because of inconsistencies when compared with the more recent MDFW fish population data. However, the *Aquatic Life Use* is identified with an Alert Status because only one species was collected during the most recent sampling event.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Kinne Brook in 1997 (MA DEP 1997).

The *Aesthetics Use* is assessed as support based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Kinne Brook (MA32-32) Use Summary Table

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

* Alert Status issues identified see details in use assessment

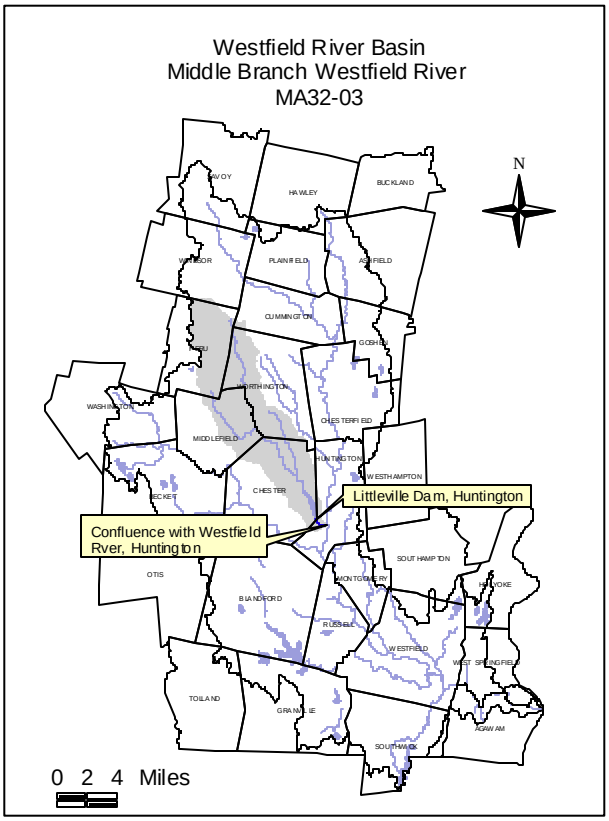
**RECOMMENDATIONS KINNE BROOK (MA32-32)**

- Conduct additional fish population and water quality (e.g., DO, temperature, pH) monitoring in Kinne Brook to assess the *Aquatic Life Use* and potential for Cold Water Fishery designation.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## MIDDLE BRANCH WESTFIELD RIVER (SEGMENT MA32-03)

Location: Littleville Dam to confluence with Westfield River, Huntington.
Segment Length: 1.1 miles
Classification: Class B, Warm Water Fishery




The drainage area of this segment is approximately 53 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 91%
Agriculture..... 4%
Residential ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.3%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

This segment starts at the Littleville Dam, Chester, and flows southeasterly for one mile to the confluence with the Westfield River, Huntington.

Based on the last evaluation of water quality conditions the Middle Branch Westfield River is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Aquatic Life, Primary Contact Recreation, Secondary Contact Recreation, and Aesthetics) and was not assessed for others (Fish Consumption).

MDFW has proposed that this segment of the Middle Branch Westfield River be reclassified to a cold water fishery from a warm water fishery in the next revision of the SWQS (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Source | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Springfield Water and Sewer Commission | 10428101 | Littleville Lake 281-03S | 37.2* |

*indicates system wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES regulated surface wastewater discharges to this segment.

### USE ASSESSMENT

***AQUATIC LIFE***

Habitat and Flow

The Littleville Lake Dam is 1360' long, 160' high above streambed consists of compacted earth fill with an impervious core, and is protected by rock slopes on both sides (ACOE 2003). Peak storage capacity is 10.6 billion gallons when filled to the spillway crest (including 7.5 billion gallons for flood control), which is equivalent to 8.3" rain from the contributing 52 square miles of drainage area. The Class I project began operations in 1940, after the disastrous floods of September 1938, to provide flood control and regulation of flows to reduce flood stages in Westfield and West Springfield. Additionally, Littleville Lake was authorized for water supply storage for the city of Springfield. The 1567-acre Army Corps property, plus private land easements of another 10 acres, bound

approximately 3.7 miles of the Middle Branch Westfield River within the town of Chester. When filled to spillway crest the reservoir has a surface area of 510 acres. The reservoir area and associated land offer recreational opportunities that include: picnics, boating, fishing, and hiking, but no swimming. The recreational emphasis is on fishing, since MDFW considers the lake an excellent cold-water fishery that has an intensive on-going trout-stocking program. The maximum flood stage occurred during the April 1987 floods, when the water level got up to an elevation of 571.7' above sea level, which was 4.3' below the spillway crest.

The Littleville Lake Dam has a year round pool with a surface water release. In 2002 the ACOE installed three feet of aluminum stoplogs in the overflow channel to create a plunge pool for smolts going over the dam. The Littleville Lake Dam also is the site of a prior FERC hydro-generating facility (Project # 8350). The permit was issued 24 March 1986 was surrendered 15 June 1988 (Cover 2004). This facility had a potential generating capacity of 1060 kWh (ACOE 2003).

A habitat survey was performed by DWM biologists in the summer of 1996 in one reach of this segment downstream from Littleville Lake (Station MB02). Habitat quality conditions at this location are described in detail in Appendix C.

Biology

MDFW regularly stocks trout in this segment of the Middle Branch Westfield River.

A benthic macroinvertebrate survey was performed by DWM biologists in the summer of 1996 in one reach of this segment downstream from Littleville Lake (Station MB02). Results of the RBP II analyses are provided in detail in Appendix C.

In August 2001 MDFW conducted backpack electrofishing of half of the stream width in one reach of this segment of the Middle Branch Westfield River (Station 355, Richards 2003). The station was located just downstream from the Littleville Dam in Huntington. Nine species were collected including, in order of abundance, longnosed dace, Micropterus dolomieu (smallmouth bass), blacknose dace, two individuals each of Anguilla rostrata (American eel), white sucker, and yellow perch, and an individual each of Atlantic salmon, brown trout, and fallfish.

The *Aquatic Life Use* is not assessed because of too limited data and the fish sampling inefficiencies.

***FISH CONSUMPTION***

Fish were collected from this segment of the Middle Branch Westfield River by MA DEP and DFW personnel in October 1990 below Littleville Dam in Huntington (Maietta 1993). Tissue from brown trout, eastern brook trout and white sucker were analyzed for selected metals (including mercury), PCB and pesticides. The results of this survey did not indicate a problem, nor did MA DPH issue any advisories with respect to fish consumption (Maietta 1993).

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from the Middle Branch Westfield River just upstream from its confluence with the mainstem, off the Goss Hill Road bridge, Huntington (Station MBWF00.4) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No objectionable deposits or other conditions were noted by DWM biologists in the reach sampled in this segment during the summer of 1996 (Station MB02, Appendix C).

Too limited water quality data are available so the *Recreational* and *Aesthetic* uses for this segment of the Middle Branch Westfield River are currently not assessed.

Middle Branch Westfield River (MA32-03) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| NOT ASSESSED | | | | |

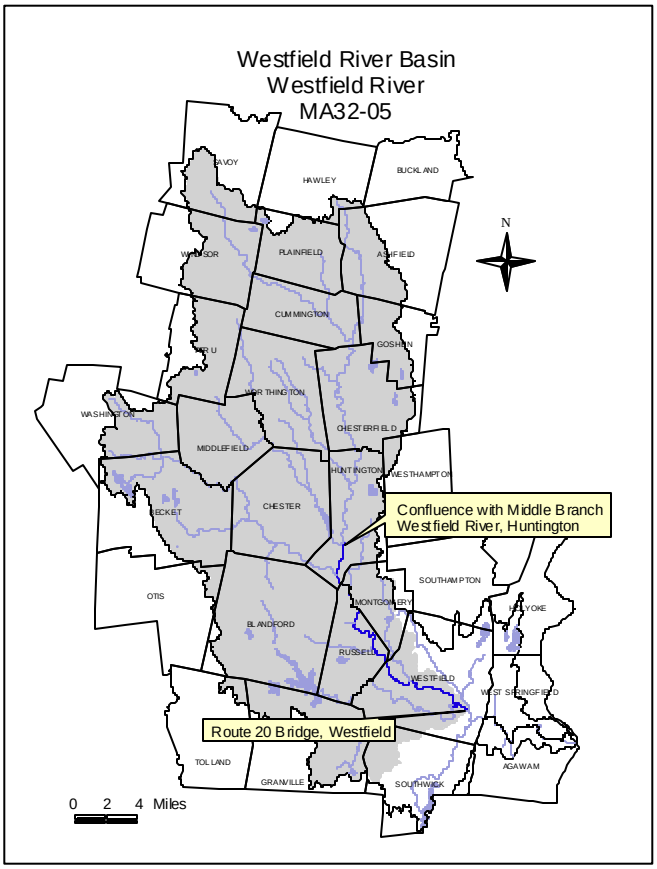
**RECOMMENDATIONS:**

- Monitor the fish population and/or DO and temperature in this segment of the Middle Branch Westfield River to evaluate MDFW's proposal to list this segment as a cold water fishery in the next revision of the surface water quality standards.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## WESTFIELD RIVER (SEGMENT MA32-05)

Location: Confluence with Middle Branch Westfield River, Huntington, to Route 20 Bridge, Westfield.
Segment Length: 17.8 miles
Classification: Class B, Warm Water Fishery




The drainage area of this segment is approximately 497 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 84%
- Agriculture..... 5%
- Residential ..... 5%

The impervious cover area for the individual sub-basins located in this segment is 2.2 %, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

From the confluence with the Middle Branch Westfield River the Westfield River continues flowing south past the town center of Huntington to the confluence with the West Branch Westfield River (where the river receives the Huntington WWTP discharge). The Westfield River then begins to flow in a southeasterly direction. Just before passing by the village of Crescent Mills the river is dammed at the Littleville Power Company's Cresent Mill Dam, where the Crescent Hydroelectric Project is operated (also known as the Texon Project, FERC Exempt license number 2986). Downstream from the dam the river receives the process wastewater and noncontact cooling water from the Texon USA facility. The river meanders to the southeast through steep terrain to the town of Russell where it is impounded by the Westfield River Paper Company Dam. There is a hydroelectric powerhouse at this dam that is currently inactive. Just downstream from the dam the river receives the discharge of treated effluent from the Russell WWTP. A few miles further downstream in the village of Woronoco the river is again dammed at the Woronoco Dam. The Strathmore Paper Co. (MA0004995) discharges to the river in this reach. The river continues to the southeast passing under the Massachusetts Turnpike and then enters the city of Westfield. Here the topography changes to a broad floodplain and the river gradient decreases. The river then enters the urbanized part of Westfield where the Westfield WWTP (MA0101800) discharges. The Westfield River then flows southeast and continues to the Route 20 bridge in Westfield where this segment ends.

Based on the last evaluation of water quality conditions Westfield River Segment MA32-05 is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that several tributaries to this segment of the Westfield River be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003). They are: Bradley Brook, Bearden Brook, Roaring Brook (East Branch), Stage Brook (Tributary to Bradley Brook), and Freeland Brook (Tributary to Stage and Bradley Brooks).

**WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)**

| Facility | WMA Registration Number | WMA Permit Number | Source (G = ground S = surface) | Authorized Withdrawal (MGD) |
|---|---|---|---|---|
| John S. Lane & Son, Inc. | N/A | 9P210432901 | Westfield River-S | 0.65 |
| Texon, USA | N/A | 9P210425603 | Westfield River-S | 0.72 |
| Russell Water Department* | N/A | 9P210425602 | Well#2, 1256000-02G | 0.29 |
| Westfield Water Department* | 10432901 | N/A | Well#2, 329-02G | 6.11 |

* indicates system-wide withdrawal; all sources are not within this segment

**NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H1, H2, AND H3)**

The Town of Huntington is authorized to discharge treated sanitary wastewater from the Huntington POTW to the Westfield River (NPDES permit #MA0101265 issued 29 September 1998). The facility began operating in 1992 and is authorized to discharge an average monthly flow of 0.2 MGD via outfall #001(the discharge location is at the mouth of the West Branch Westfield River just upstream from the confluence with the Westfield River). The facility's whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent with a monitoring frequency of 4X/year using both *C. dubia* and *P. promelas*. The facility utilizes chlorine for disinfection and the limits for total residual chlorine (TRC) are 0.6 and 1.0 mg/L (average monthly and maximum daily, respectively) between 1 April and 31 October. The maximum TRC concentration recorded in the toxicity testing reports for this facility was 0.1 mg/L. Effluent ammonia-nitrogen concentrations recorded in the toxicity testing reports ranged from <0.05 to 11 mg/L (TOXTD database).

Texon USA (formerly U.S.M. Corporation Texon Division – Russell), located at 1190 Huntington Rd., Russell, is a facility engaged in the manufacturing of specialty impregnated papers for use in inner soles, suitcases, and safety equipment, and other products used in the filtration and blotter markets. The company is authorized to discharge a daily maximum flow of 1.3 MGD (average monthly flow of 0.8 MGD) of treated process wastewater, floor drainage, boiler condensate and untreated non–contact cooling water via outfall #001 to the Westfield River (NPDES permit #MA0005282 issued November 1999). The facility's whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent and a chronic no observed effect concentration (CNOEC) monitor only requirement with a monitoring frequency of 4X/year using both *C. dubia* and *P. promelas*. The facility has a maximum daily ammonia-nitrogen limit of 10.8 mg/L. Effluent ammonia-nitrogen concentrations recorded in the 18 toxicity testing reports ranged from 0.15 to 1.6 mg/L (TOXTD database). Total Residual Chlorine (TRC) was not detected in the effluent (<0.05 in all tests).

The Town of Russell is authorized to discharge treated sanitary wastewater from the POTW to the Westfield River (NPDES permit # MA0100960, issued 29 September 1998). The Town is authorized to discharge an average monthly flow of 0.24MGD via outfall #001 (the discharge location is just downstream from the Russell Falls Dam). Ultraviolet light is utilized as a disinfection process. The facility's whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent with a monitoring frequency of 4X/year using both *C. dubia* and *P. promelas*. Effluent ammonia-nitrogen concentrations recorded in the toxicity testing reports ranged from <0.1 and 16 mg/L (TOXTD database).

The former Westfield River Paper Company, Inc. was authorized to discharge (NPDES permit #MA0004316, issued September 1989) treated process wastewater, beater room, bearing cooling water and sand filter backwash via outfall #001 and non-contact cooling water for machine bearings and calendar rolls via outfall #003 along the east bank of the Westfield River adjacent to the Russell Falls Dam. The facility closed in April 1994 and the permit was terminated by EPA in October 1994 (Nietupski 2004b and MA DEP 1994).

The Town of Russell is also authorized to discharge treated sanitary wastewater from the Woronoco Village POTW to the Westfield River (NPDES permit # MA0103233 issued 30 September 1998). The Town is authorized to discharge an average monthly flow of 0.02 MGD via outfall #001 (the discharge location is just downstream from the footpath and the Bridge Street bridge in Woronoco Village in Russell). Ultraviolet light is utilized as a disinfection process. The facility's whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent with a monitoring frequency of 1X/year using both *C. dubia* and *P. promelas*. Effluent ammonia-

nitrogen concentrations recorded in the toxicity testing reports ranged from 1.4 and 6.8 mg/L (TOXTD database). According to the MA DEP Western Regional Office no permit violations have occurred during the past 5 years (Nietupski 2004a).

The Strathmore Paper Company located at Woronoco Mills), Valley View Avenue in Russell, was a facility engaged in the manufacturing of cotton content specialty fine papers. The Strathmore Paper Company was authorized (NPDES permit MA0004995 issued September 1983) to discharge non-contact cooling water via outfall #006 and treated process wastewater and filter backwash water via outfall #008 to the Westfield River. Although the facility completed a reapplication for their NPDES permit as of December 1993 a new permit was never reissued and the facility shut down their operations between December 1997 and mid summer 1998. The permit was terminated by EPA in October 2000 (St. Thomas 1997).

Jen-Coat Inc., located at 132 North Elm Street in Westfield, produces paper coated and laminated packaging. Jen-Coat Inc. is authorized (NPDES permit #MAG250856 issued 13 June 2001) to discharge an average monthly flow of 0.028MGD of non-contact cooling water to the Westfield River. Jen-Coat Inc. installed, in October 1993, a cooling tower that has essentially close-looped their cooling process (Gilli 1993). The permittee indicates that it will still keep the permit active in the event that they need to discharge their cooling water. Jen-Coat Inc. is also permitted (MAR05B629) to discharge stormwater to this segment of the Westfield River. As part of this permit the facility is required to develop a SWPPP and conduct quarterly visual monitoring of their stormwater discharge.

The City of Westfield is authorized to discharge treated effluent from the Westfield WWTP to the Westfield River (NPDES permit # MA0101800, issued 27 April 2000 and subsequently modified on 14 November 2001). The City is authorized to discharge an average monthly flow of 4 MGD via outfall #001 (the discharge location is near the treatment plant downstream from the confluence with the Little River in Westfield) and will be permitted to discharge 6.1 MGD once facility upgrade is completed (expected by December 2004). The facility's whole effluent toxicity limits are $LC_{50} \geq$ 100% effluent and a CNOEC = 9.4% (April 2000 permit) or CNOEC = 20% (November 2001 permit) with a monitoring frequency of 4X/year using *C. dubia*. Chlorination/dechlorination is utilized for disinfection. A TRC maximum daily limit of 0.20 mg/L was imposed in the April 2000 permit and 0.095 mg/L was imposed in the November 2001 permit.

Current upgrades to the Westfield WWTP and upgrades to other municipal treatment plants upstream, combined with less discharges from the various industrial permittees upstream that are no longer discharging should result in demonstrable future improvements in water quality throughout this segment.

Westfield is a Phase II Stormwater community. This community was issued a stormwater general permit from EPA and MA DEP in 2003 and is authorized to discharge stormwater from the municipal drainage system (MAR041236). Over the five-year permit term the City will develop, implement and enforce their stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

**FERC (APPENDIX H, TABLE H4 AND H5)**

The Littleville Power Company Inc. owns and operates the FERC-exempt Crescent Hydroelectric Project (also known as the Texon Project) # 2986A in Russell. The license was issued on 11 May 1982. The total installed generating capacity is 1500 kW. The facility operates in a run-of-river mode. The Crescent Mills Dam is an "S" shaped, stone masonry structure, approximately 250 feet long by 12' high, constructed on top of a bedrock outcrop. The spillway is topped by three foot high wooden flashboards designed to collapse under high flow conditions. The dam forms a small, three-acre impoundment. The intake and powerhouse are located at the western end of the dam and are part of a former paper mill complex. The powerhouse contains a single Kaplan turbine with a maximum hydraulic capacity of 700 cfs. The turbine discharges back to the Westfield River at the base of the dam so there is no bypassed reach of the river. A downstream fish passage flow of 20 cfs is released through a sluiceway between 1 April and 1 July of each year and trashrack overlays with one inch of clear space are installed during this period to provide additional protection to out-migrating anadromous fish (Grenier 2004).

Indian River Power Supply LLC owns the hydroelectric project formerly owned by the Westfield River Paper Company that is located at the Westfield River Paper Company Dam in Russell (Clark 2004a). The hydropower plant has not operated during the last 10 years since the paper company went out of business in 1994. An application for exemption from FERC licensing and revisions to the application has recently been filed by the owners. The hydropower project is listed as FERC Project No. 12462-000-MA. The two turbines installed in 1908 at the powerhouse have a capacity of 700 kW. The project's principal features consist of: (1) two contiguous dam sections with a crest length of 425 feet; (2) an intake area with trashracks and two 60 foot long, seven foot diameter penstocks leading to a powerhouse that contains two turbine/generator units; (3) a downstream fish passage facility will be installed adjacent to the gatehouse to conduct downstream migrants directly to the tailrace; (4) a 14.1-acre impoundment at the normal pool elevation; (5) a bypassed reach with the primary channel on the west side of the dam whose crest is 1 foot lower than the east side of the dam; and (6) appurtenant facilities. The two contiguous dam sections (east and west) provide a maximum elevation of about 30 feet above the riverbed with a crest elevation of 269.64 feet (National Geodetic Vertical Datum or NGVD) when the flashboards are installed. The powerhouse currently contains two turbines with hydraulic capacities between a minimum of 60 and a combined maximum of 543 cfs (Clark 2004b). [Following rehabilitation of the existing equipment, the owners intend to optimize the hydraulic resources by increasing capacity closer to 1,500 kW. If/when the turbines are replaced the maximum capacity would be between 1,100 and 1,200 cfs (Clark 2004b).] Based on the conditions of the proposed exemption from licensing, the Indian River Project will be operated in a run-of-river mode with a target elevation of 269.5 feet NGVD. The project's automation will minimize fluctuation of the impoundment surface water elevation by maintaining a discharge from the project so that, at any point in time, flows measured independently downstream from the project tailrace, approximate the rate of inflow into the project impoundment from Bradley Brook and from upstream. The project's bypass reach extends from the crest of the east dam down over continuous ledge outcropping to the tailrace and from the spillway and deep gate on the west side of the dam over a 80 foot diameter pool and about 70 feet of riffles for a distance of approximately 100 to 170 feet to the tailrace pool depending on the route. The minimum flow release will be made up of 25 cfs going through the downstream fish passage facility and an interim discharge of another 25 cfs through the riffle area, or inflow, whichever is less, as measured in the separate channels of the bypassed reach. Habitat evaluation and permanent minimum flow requirements will be set by FERC and the resource agencies after the hydro plant returns to service. Downstream passage flows during winter conditions result in significant ice accumulation and will be discontinued annually between December and so called "ice out" conditions or when the river temperatures reach 5 degrees Celsius. The downstream fish passage system is a free-surfaced open channel flow structure with no flow control gate (Clark 2004a).

Woronoco Hydro, LLC owns and operates the Woronoco Hydroelectric Project licensed as FERC Project No. 2631. The license was issued on 30 April 2002. The total installed capacity is 2,700 kW. The project's principal features consist of: (1) two non-contiguous dam sections and an earthen dike; (2) an intake area leading to a powerhouse that contains three turbine/generator units; (3) a downstream fish passage facility; (4) a 43-acre impoundment at the normal pool elevation; (5) a bypassed reach with three channels; and (6) appurtenant facilities. The two non-contiguous dam sections (north and south) provide an elevation of about 25 feet above the riverbed with a crest elevation of 229.0 feet (National Geodetic Vertical Datum or NGVD). The powerhouse contains three turbine-generating units with minimum and maximum hydraulic capacities of 45 cfs and 710 cfs, respectively. Based on the conditions of the FERC license, the Woronoco Hydroelectric Project will be operated in a run-of-river mode with a target elevation of 229.0 feet NGVD and will minimize fluctuation of the impoundment surface water elevation by maintaining a discharge from the project so that, at any point in time, flows measured independently downstream from the project tailrace approximate the sum of inflows to the project impoundment. The project's bypass reach extends from the toe of the north and south dams to the confluence with the project tailrace (approximately 0.2 river miles). There are three bypass reaches at the project for each of which a combined minimum flow release of 57 cfs, or inflow, whichever is less, as measured in the separate channels of the bypassed reach, is required. Downstream passage flows during winter conditions result in significant ice accumulation and will be discontinued annually between December and so called "ice out" conditions or when the river temperatures reach 5 degrees Celsius. The downstream fish passage system is a free-surfaced open channel flow structure with no flow control gate. The bypass channels and minimum flow requirements are described below.

- North Dam channel - The secondary erosion channel begins at the base of the north dam's spillway and extends about 1,000 feet to its confluence with the original channel. The minimum flow required in this channel of 22 cfs is discharged from the deep gate located on the north end of the north dam.
- South Dam channel - The original river channel extends about 700 feet from the ledge base of the south dam's spillway to the project tailrace. The minimum flow required in this channel of 15 cfs cfs is discharged from the deep gate located in the middle of the south dam.
- Fish Passage channel - This channel is located adjacent to the project intake at the base of the south dam and cascades some 200 feet over bedrock ledges to its confluence with the original river channel. The minimum flow required through this downstream fish passage of 20 cfs drops approximately eight feet into a 10-foot deep plunge pool that discharges into a rocky channel dropping into the bypass reach.

Below the confluence of all of these channels the bypass flows drop over 14.6 feet of very steep ledge that form a natural block to upstream migrant fish. In the future there will be eel passage facilities installed allowing upstream and downstream eel passage over the dam at each of the discharge points (Clark 2004a).

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

The USGS gage 01179500 is located on the Westfield River approximately 0.2 miles downstream from the Knightville Dam (upstream from this segment of the Westfield River). The USGS remarks for this gage indicate that flow has been regulated by Knightville Reservoir since 1941 (Socolow *et al*. 2003). The average discharge at this gage reported by USGS for the period of record (1909 to 2002) is 332 cfs. There is no evidence of aberrant streamflow fluctuations at this gage when viewing real-time USGS gaging data (USGS 2004).

The Littleville Power Company Inc. is supposed to operate the FERC exempt Texon Project # 2986A located at the Crescent Mills Dam in Russell in a run-of-river mode. The turbine discharges back to the Westfield River at the base of the dam so there is no bypassed reach of the river. A downstream fish passage flow of 20 cfs is released through a sluiceway between 1 April and 1 July of each year and trashrack overlays with one inch of clear space are installed during this period to provide additional protection to out-migrating anadromous fish (Grenier 2004). According to MDFW, between 15 October and iceup, flow through the sluiceway is also required for spawned out adult salmon (kelt) passage (Slater 2004).

Indian River Power Supply LLC owns the hydroelectric project at the former Westfield River Paper Company Dam in Russell (Clark 2004a). Although the hydropower plant is now inactive the owners have filed for a FERC exemption to operate the project. Based on the conditions of the proposed exemption from licensing the Indian River Project will be operated in a run-of-river mode and the flows measured independently downstream from the project tailrace will approximate the rate of inflow into the project impoundment from Bradley Brook and from upstream. The project's bypass reach extends from the crest of the east dam down over continuous ledge outcropping to the tailrace and from the spillway and deep gate on the west side of the dam over a 80 foot diameter pool and about 70 feet of riffles for a distance of approximately 100 to 170 feet to the tailrace pool depending on the route. The minimum flow release will be made up of 25 cfs going through the downstream fish passage facility and an interim discharge of another 25 cfs through the riffle area, or inflow, whichever is less, as measured in the separate channels of the bypassed reach. Habitat evaluation and permanent minimum flow requirements will be set by FERC and the resource agencies after the hydropower plant returns to service. Downstream passage flows during winter conditions result in significant ice accumulation and will be discontinued annually between December and so called "ice out" conditions or when the river temperatures reach 5-degrees Celsius. The downstream fish passage system is a free-surfaced open channel flow structure with no flow control gate (Clark 2004a). According to MDFW the project will also be required to have upstream passage for American eels (Slater 2004).

A minimum flow release of 57 cfs or inflow, whichever is less, as measured in the separate channels of the bypass reach of the Westfield River is required at the Woronoco Hydro, LLC (FERC Project

2631). To ensure these conditions are met hourly impoundment level data are being continuously recorded. The free discharge from the gates and passage system are also being documented through the use of visual observations downstream of the gates at the confluence of the bypass reach sections. Articles 403 and 404 of the FERC license required Woronoco Hydro to develop a plan to monitor impoundment levels and minimum flow releases and to develop a comprehensive fish passage plan (Nash 2004). The plans were submitted to FERC in May 2004 (Kleinschmidt 2004a and Kleinschmidt 2004b). The project's bypass reach extends from the toe of the north and south dams to the confluence with the project tailrace (approximately 0.2 river miles). Downstream passage flows during winter conditions result in significant ice accumulation and will be discontinued annually between December and so called "ice out" conditions or when the river temperatures reach 5-degrees Celsius. According to MDFW the project will also be required to have upstream passage for American eels in 2005 (Slater 2004).

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey a habitat survey was performed in three reaches of this segment of the Westfield River (Appendix B). From upstream to downstream the locations were as follows: 250m downstream from the discontinued Strathmore Paper Company treated effluent discharge in Russell (Station WR05), outside of the Westfield WWTP discharge mixing zone in Westfield (Station WR06B) and 340m downstream from the Westfield WWTP discharge in Westfield (Station WR06A). The habitat score at Station WR05 was 185 out of a possible 200 and was only slightly compromised by the drought-induced low baseflow conditions observed (Appendix B). The habitat score at Station WR06B was 165 out of 200 (Appendix B). Habitat quality in the Westfield River downstream from the Westfield WWTP outfall (Station WR06A) was limited primarily to riffle habitat, green algae covering virtually all the stream bottom, and sewage fungus beinh noted along the margins of the sampling reach. The habitat assessment score was 168 out of 200 (Appendix B).

A zone of passage for migrating fish was documented in the Westfield River during the dye study conducted by Metcalf & Eddy in September 2000 at the Westfield WWTP (Metcalf and Eddy 2000).

The USGS gage 01183500 is located downstream from this segment of the Westfield River. The USGS remarks for this gage indicate that flow is regulated (Borden Brook Reservoir, Cobble Mountain Reservoir, Knightville Reservoir and Littleville Lake, and diversion from Little River for municipal supply of Springfield) (Socolow *et al*. 2003). Evidence of substantial streamflow fluctuations are apparent when viewing real-time USGS gaging data (USGS 2004).

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 at a total of six reaches in this segment of the Westfield River. From upstream to downstream the locations were as follows: upstream from the Texon USA facility near the roadside park near Huntington Health Center in Huntington (Station WR02), 450m downstream from the Texon USA discharge in Russell (Station WR03), upstream from Strathmore Paper across from the Whippernon Golf Club in Russell (Station WR04), 250m downstream from the Strathmore Paper Company treated effluent discharge in Russell (Station WR05), just upstream from the confluence with the Little River in Westfield (Station WR06), and 340m downstream from the Westfield WWTP discharge in Westfield (Station WR07). Habitat quality conditions at these locations are described in detail in Appendix C.

Biology

This segment of the Westfield River is regularly stocked by MDFW with trout.

In August 2001 MDFW conducted barge electrofishing within two reaches of this segment of the Westfield River upstream from the Texon Mill in Russell (slightly downstream from the Huntington/Russell town line and upstream from the confluence with Roaring Brook) and across from Wippernon Golf Course (downstream from the confluence with Bradley Brook, Richards 2003). Seven species of fish were collected upstream from the Texon Mill including, in order of abundance, common shiner, Micropterus dolomieu (smallmouth bass), longnosed dace, tessellated darter, Atlantic salmon, and an individual each of Lepomis gibbosus (pumpkinseed) and white sucker. The presence of a number of fluvial specialists/dependants is indicative of stable flow regimes. The presence of Atlantic salmon, an intolerant stream species (also endangered), is most likely the result of upstream fry stocking. Although other intolerant species are absent (except for two salmon), most

species collected are considered moderately tolerant and are consistent with those found in larger streams and rivers in western Massachusetts. Further downstream near Wippernon Golf Course in the town of Russell, ten fish species collected, in order of abundance, were smallmouth bass, American eel, fallfish, rock bass, creek chubsucker, tessellated darter, common shiner, white sucker, pumpkinseed, and Atlantic salmon. Smallmouth bass, a macrohabitat generalist, dominated the fish sample. This is not unusual in that smallmouth bass prefer cool, rocky, riverine habitats. Six of the remaining nine fish species collected in this reach of the Westfield River are fluvial specialists/dependants. The presence of Altantic salmon is most likely a result of upstream fry stockings. The fish community present appears to be indicative of good habitat and water quality conditions as well as stable flow regimes.

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey at three reaches of this segment of the Westfield River (Appendix B). From upstream to downstream the locations were as follows: 250m downstream from the discontinued Strathmore Paper Company treated effluent discharge in Russell (Station WR05), outside the Westfield WWTP discharge mixing zone in Westfield (Station WR06B) and 340m downstream from the Westfield WWTP discharge in Westfield (Station WR06A). The RPB III analysis of the benthic macroinvertebrate community collected downstream from the discontinued Strathmore Paper Company discharge in Russell (Station WR05) indicated slightly impacted conditions compared to reference station on the Westfield River near Route 112 in Huntington (Station WR01). A dramatic improvement was found over conditions documented during the 1996 survey when Strathmore Paper Company still maintained two discharges: a discharge of non-contact cooling water and a treated process wastewater and filter backwash discharge (Appendices B and C). No periphyton samples were collected by DWM biologists from this sampling location (Appendix D).

The RPB III analysis of the benthic macroinvertebrate community collected in the Westfield River downstream from the confluence with the Little River outside the Westfield WWTP discharge mixing zone in Westfield (Station WR06B) indicated slightly impacted conditions compared to the reference station on the Westfield River near Route 112 in Huntington (Station WR01). Similarly, the RBP III analysis of the benthic macroinvertebrate community collected in the Westfield River downstream from the Westfield WWTP discharge (Station WR06A) indicated slightly impacted conditions compared to both the reference station on the Westfield River near Route 112 in Huntington (Station WR01) and the reference station downstream from the confluence with the Little River outside the Westfield WWTP discharge mixing zone in Westfield (Station WR06B). Slight improvements in community structure were evident since the last DWM survey here--results of the 1996 RPB II evaluation upstream and downstream from the Westfield WWTP discharge indicated moderately impacted benthic community downstream from the discharge (Appendix C). Metcalf & Eddy also conducted a benthic macroinvertebrate study (EPA RBP II protocols) in August 1999 at the sites used by MA DEP DWM biologists in 1996. The samples were analyzed at the Great Lakes Environmental Center. The results from the study also indicated slight improvements in water quality since the 1996 MA DEP evaluation (Metcalf & Eddy 2000). The benthic community sampled by Metcalf & Eddy was strikingly similar to that observed by DWM in 2001 (Fiorentino 2004a). The apparent improvements in the biological condition in the river downstream from the Westfield WWTP discharge appear to coincide with the ongoing upgrade of the WWTP. The green filamentous algae *Ulothrix zonata* was very abundant in the Westfield River at both sampling stations, covering an estimated 100% of the reach (Appendix D).

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 at a total of six reaches in this segment of the Westfield River. From upstream to downstream the locations were as follows: upstream from the Texon USA facility near the roadside park near Huntington Health Center in Huntington (Station WR02), 450m downstream from the Texon USA discharge in Russell (Station WR03), upstream from Strathmore Paper across from the Whippernon Golf Club in Russell (Station WR04), 250m downstream from the Strathmore Paper Company treated effluent discharge in Russell (Station WR05), just upstream from the confluence with the Little River in Westfield (Station WR06), and 340m downstream from the Westfield WWTP discharge in Westfield (Station WR07). Results of the RBP II analyses are provided in detail in Appendix C.

Toxicity

*Ambient*

Water from the Westfield River was collected 50 yards upstream from the dam at Texon USA and in inclement weather from screens in the mill for use as dilution water for the Texon USA facility's whole effluent toxicity tests. Between January 2000 and March 2004 survival of *C. dubia and P. promelas* exposed (7 days) to the river was good (≥ 80%) in all 18 tests conducted.

Water from the Westfield River was collected just below Main Street Bridge for use as dilution water for the Russell WWTP whole effluent toxicity tests. Between November 1998 and May 2004 survival of *C. dubia and P. promelas* exposed (48 hr) to the river was good (≥ 83%) in 21 of the 22 tests conducted. Survival was low (50 and 43% for *C. dubia* and *P. promelas*, respectively) during the May 2003 test event.

Water from the Westfield River was collected just below Bridge Street Bridge for use as dilution water for the Russell, Woronoco Village POTW whole effluent toxicity tests. Between September 1999 and September 2003 survival of *C. dubia and P. promelas* exposed (48 hr) to the river was excellent (≥98%) in the five tests conducted.

Water from the Westfield River was collected approximately 200 feet upstream from the Westfield WWTP outfall on the south side of the river in back of the former Garvelle Appliances (now a cell phone store) for use as dilution water for the Westfield WWTP whole effluent toxicity tests. Between May 2000 and March 2004 survival of *C. dubia* exposed (7 day) to the river was good (≥ 80%) in the 15 tests conducted.

*Effluent*

A total of 22 definitive acute whole effluent toxicity tests were conducted on the Huntington POTW treated sanitary wastewater effluent (outfall #001) using both *C. dubia* and *P. promelas* between November 1998 and May 2004. The effluent was acutely toxic to *C. dubia* on two occasions (May 2001 and July 2003 with $LC_{50}$'s of 61.8 and 40.6 % effluent, respectively). Effluent water quality data during the two toxic episodes indicated the following: pH of 4.9 and 4.4 SU, aluminum concentrations of 0.32 and 0.33 mg/L, copper concentrations of 0.14 and 0.098 mg/L and zinc concentrations of 0.23 mg/L. The effluent was not acutely toxic to *P. promelas* during any of the 22 test events.

A total of 18 modified acute and chronic whole effluent toxicity tests were conducted on the Texon USA treated effluent (outfall #001) using both *C. dubia* and *P. promelas* between January 2000 and March 2004. The effluent was acutely toxic to *C. dubia* in five of the eighteen tests with $LC_{50}$s ranging between 20 and 89% effluent. The effluent was acutely toxic to *P. promelas* in three of the eighteen tests with $LC_{50}$s ranging between 39 and 87% effluent. In all but one of the modified acute tests the *C. dubia* were the more sensitive test organism. The CNOECs ranged between <6.25 and 50% effluent for *C. dubia* and between <6.25 and 100% effluent for *P. promelas*. The CNOECs were ≤ 6.25% effluent in six and two of the 18 tests for *C. dubia* and *P. promelas,* respectively.

A total of 20 of 22 definitive acute whole effluent toxicity tests conducted on the Russell POTW treated sanitary wastewater effluent (outfall #001) using both *C. dubia* and *P. promelas* between November 1998 and May 2004 were valid. The effluent was acutely toxic to *C. dubia* on two occasions (July 2000 and September 2002 with $LC_{50}$s of 19 and 59% effluent, respectively). The effluent was not acutely toxic to *P. promelas* during any of the 20 valid test events.

A total of 5 definitive acute whole effluent toxicity tests were conducted on the Russell Woronoco Village POTW treated sanitary wastewater effluent (outfall #001) using both *C. dubia* and *P. promelas* between September 1999 and September 2003. No acute toxicity was detected ($LC_{50}$s all ≥100% effluent).

A total of 15 modified acute and chronic whole effluent toxicity tests were conducted on the Westfield WWTP treated effluent (outfall #001) using *C. dubia* between May 2000 and March 2004. The effluent was acutely toxic to *C. dubia* in six of the 15 tests with $LC_{50}$s ranging between 44 and 82% effluent. The CNOECs ranged between 9 and 50% effluent.

Chemistry – water

a. Water from the Westfield River was collected 50 yards upstream from the dam at Texon USA (during inclement weather from screens in the mill) for use as dilution water for the Texon USA facility's whole effluent toxicity tests. Data from these reports (maintained in the TOXTD database) between January 2000 and March 2004 are summarized below.

b. Water from the Westfield River was collected just below Main Street Bridge for use as dilution water for the Russell WWTP whole effluent toxicity tests. Data from these reports (maintained in the TOXTD database) between November 1998 and May 2004 are summarized below.

c. DWM collected *in-situ* measurements from a station on the Westfield River (Station WSFR21.3, Unique ID W0810 - on the Western bank at Main Street, Russell) between 1 August and 3 October 2001 (n=4). Parameters measured were dissolved oxygen, pH, temperature, conductivity, and total dissolved solids. Between 1 August and 3 October grab samples were also collected and analyzed for alkalinity, hardness, chloride, suspended solids, ammonia-nitrogen, nitrate nitrogen, total phosphorus (n=8) (Appendices B and C of Appendix A).

d. Water from the Westfield River was collected just below Bridge Street Bridge for use as dilution water for the Russell, Woronoco Village POTW whole effluent toxicity tests. Data from these reports (maintained in the TOXTD database) between September 1999 and September 2003 are summarized below.

e. DWM collected *in-situ* measurements from a station on the Westfield River (Station WSFR12.7, Unique ID W0807, ~350 feet upstream from Route 202/10 bridge, Westfield) on four occasions between 1 August and 3 October 2001. Parameters regularly measured were dissolved oxygen, pH, temperature, conductivity, and total dissolved solids. Grab samples were also collected on those occasions and analyzed for alkalinity, hardness, chloride, suspended solids, ammonia-nitrogen, nitrate nitrogen, total phosphorus (Appendices 2 and 3 of Appendix A).

f. Water from the Westfield River was collected approximately 200 feet upstream from the Westfield WWTP outfall on the south side of the river in back of the former Garvelle Appliances (now a cell phone store) for use as dilution water for the Westfield WWTP whole effluent toxicity tests. Data from these reports (maintained in the TOXTD database) between May 2000 and March 2004 are summarized below.

*DO*

The instream DO measured by DWM in the Westfield River at Main Street, Russell (Station WSFR21.3) ranged from 8.2 to 10.0 mg/L (92% to 99% saturation) (Appendix 2 of Appendix A).

The instream DO measured by DWM on the Westfield River, ~350 feet upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) ranged from 7.9 to 11.1 mg/L (91% to 107% saturation) (Appendix 2 of Appendix A). Three of the four measurements were representative of pre-dawn conditions.

*Temperature*

Temperatures recorded by DWM at ranged from 14.2 to 24.0°C and 14.1 to 23.3°C at Stations WSFR21.3 and WSFR12.7, respectively.

*pH*

a. Instream pH ranged between 6.0 and 7.5 SU and only one of the 18 measurements was < 6.5 SU.
b. Instream pH ranged between 6.5 and 7.7 SU.
c. DWM pH measurements ranged from 7.0 to 7.3 SU at Station WSFR21.3.
d. Instream pH ranged between 6.8 and 7.7 SU.
e. DWM pH measurements ranged from 7.2 to 7.3 SU at Station WSFR12.7.
f. Instream pH ranged between 6.5 and 8.0 SU.

*Suspended Solids*

a. The maximum suspended solids concentration was 8.0 mg/L.
b. The maximum suspended solids concentration was 6.0 mg/L.

c. The maximum suspended solids concentration in the Westfield River at Main Street Bridge in Russell (Station WSFR21.3) was 2.9 mg/L in all eight samples analyzed.
d. The suspended solids concentrations were all <5.0 mg/L.
e. The maximum suspended solids concentration in the Westfield River upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) was 1.9 mg/L in all four samples analyzed.
f. The maximum suspended solids concentration was 9.5 mg/L.

*Ammonia-Nitrogen*
a. Of the 18 measurements, the maximum ammonia-nitrogen concentration was 0.2 mg/L.
b. Of the 22 measurements, the maximum ammonia-nitrogen concentration was 0.3 mg/L.
c. The concentration of ammonia-nitrogen in the Westfield River at Main Street Bridge in Russell (Station WSFR21.3) was <0.02 mg/L in all eight samples analyzed.
d. Of the 5 measurements, the maximum ammonia-nitrogen concentration was 0.2 mg/L.
e. The concentration of ammonia-nitrogen in the Westfield River upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) was <0.02 mg/L in all four samples analyzed.
f. Of the 14 measurements, the maximum ammonia-nitrogen concentration was 0.3 mg/L.

None of these measurements exceeded the instream chronic criterion of 1.32 mg N/L at the highest pH (8.0SU) and temperature (24.0°C) recorded in this segment.

*Total Residual Chlorine*
a. All of the TRC measurements were $\leq$ 0.05 mg/L.
b. All of the TRC measurements were $\leq$ 0.05 mg/L.
c. N/A at Station WSFR21.3.
d. All of the TRC measurements were $\leq$ 0.05 mg/L.
e. N/A at Station WSFR12.7.
f. With the exception of one measurement (0.06) the remaining 14 TRC measurements were $\leq$ 0.05 mg/L.

*Alkalinity*
a. Alkalinity measurements ranged between 8 and 22 mg/L.
b. Alkalinity measurements ranged between 7 and 24 mg/L.
c. Alkalinity measurements ranged from 13 to 20 in the Westfield River at Main Street Bridge in Russell (Station WSFR21.3) in all eight samples analyzed.
d. Alkalinity measurements ranged between 17 and 25 mg/L.
e. Alkalinity measurements ranged from 15 to 25 in the Westfield River upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) in all four samples analyzed.
f. Alkalinity measurements ranged between 8 and 30 mg/L.

*Hardness*
a. Hardness measurements ranged between 12 and 40 mg/L, with 15 out of 18 samples $\leq$25 mg/L.
b. Hardness measurements ranged between 16 and 35 mg/L, with 14 out of 22 samples $\leq$25 mg/L.
c. Alkalinity measurements ranged from 18 to 22 in the Westfield River at Main Street Bridge in Russell (Station WSFR21.3) in all eight samples analyzed.
d. Hardness measurements ranged between 22 and 32 mg/L, with 2 out of 5 samples $\leq$25 mg/L.
e. Alkalinity measurements ranged from 18 to 26 in the Westfield River upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) in all four samples analyzed.
f. Hardness measurements ranged between 18 and 96 mg/L, with 9 out of 15 samples $\leq$25 mg/L.

*Total Phosphorus (as P)*
a. N/A at this station.
b. N/A at this station.
c. The maximum total phosphorus concentration measured in the Westfield River at Main Street Bridge in Russell (Station WSFR21.3) in the eight samples analyzed was 0.030 mg/L.
d. N/A at this station.
e. N/A at this station.
f. The maximum total phosphorus concentration measured in the Westfield River upstream from Route 202/10 bridge, Westfield (Station WSFR12.7) in the four samples analyzed was 0.012 mg/L.

The *Aquatic Life Use* is assessed as support in the upper 16.8 mile reach of this segment of the Westfield River based primarily on the benthic macroinvertebrate community analysis, the good survival of test organisms exposed to river water, and the presence of a balanced riverine fish community. The absence of American eel upstream from the Texon USA dam may be the result of the dam(s) located downstream from the sampling station. Aberrant streamflow fluctuations in this segment of the Westfield River, however, and the continued presence of numerous barriers to fish migration are of concern and, therefore, the *Aquatic Life Use* is identified with an Alert Status. Downstream from the Westfield WWTP discharge however, the *Aquatic Life Use* is assessed as impaired based on the best professional judgment of DWM biologists. Although the RBP III analysis indicated slight impairment at the WR06A station the percent comparability to the reference station (60%) is at the low end of that impairment category. That, coupled with a clear and dramatic shift (pollution tolerant chironomids displace virtually all sensitive EPT taxa) in community composition downstream from the discharge point, warrants the decision to list the downstream portion of this segment as impaired. Acute and chronic whole effluent toxicity detected in the Westfield WWTP effluent and the amount of green filamentous algae *Ulothrix zonata* downstream from the discharge is also of concern.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

Within the last five years fecal coliform bacteria samples were collected from a total of four locations along this segment of the Westfield River (Appendix 3 of Appendix A and ESS 2000).

- Environmental Sciences Services, Inc. (ESS) collected fecal coliform bacteria samples above confluence with the West Branch Westfield River, Huntington (Station SS-2) in 1999.
- DWM collected fecal coliform bacteria samples near the western bank of the Westfield River at Main Street, Russell (Station WSFR21.3, Unique ID W0810) between 1 August and 3 October 2001.
- DWM collected fecal coliform bacteria samples ~350 feet upstream from Route 202/10 bridge, Westfield (Station WSFR12.7, Unique ID W0807) between 1 August and 3 October 2001.
- (ESS) collected fecal coliform bacteria samples at the Route 202 and 10 bridge, Westfield (Station PS-1).

Of the validated ESS data the fecal coliform bacteria count was elevated at SS-2 on 30 September 1999 (1200 cfu/100 mls) (ESS 2000). The highest count (n=3) documented by DWM in the river at the Main Street Bridge in Russell (Station WSFR21.3) was 90 cfu/100 ml (Appendix 3 of Appendix A). Fecal coliform counts (n=4) were higher in the river upstream from the Route 202/10 Bridge (ranged between 62 and 690 cfu/100 mls) (Appendix 3 of Appendix A). Of the validated ESS data the count was 190 cfu/100 ml at PS-1 on 28 December (ESS 2000).

It should also be noted that several fecal coliform bacteria samples were also collected by DWM from this segment of the Westfield River in May and August 1996. The three sampling stations were located as follows: at the pull-off just south of Route 20, Huntington (Station WSFR23.5), the pull-off near Whippernon Golf Course, Russell (Station WSFR20.3), and 200 feet downstream from the Route 90 bridge access from route 20, Russell (Station WSFR17.3). Fecal coliform bacteria counts at these stations did not exceed 180 cfu/100 ml (Appendix D, Table D4).

Too limited recent bacteria data are available and, therefore, both the *Primary* and *Secondary Contact Recreational* uses are not assessed for this segment of the Westfield River.

***AESTHETICS***

There were no objectionable odors, deposits or turbidity noted by MA DEP DWM sampling crews at the station on the Westfield River (Station WSFR21.3) on the Western bank at Main Street, Russell, between 1 August and 3 October 2001 (MA DEP 2001b).

There were no objectionable deposits or oils observed by MA DEP DWM biologists in the Westfield River 250m downstream from the Strathmore Paper Company treated effluent discharge in Russell (Station WR05) in September 2001 (MA DEP 2001c). The river did have a slight effluent odor.

MA DEP DWM field sampling crews noted occasional odors of petroleum and sulfide in the Westfield River upstream from the confluence with the Little River (Station WSFR12.7, Unique ID W0807, ~350 feet upstream from Route 202/10 bridge, Westfield) between 1 August and 3 October 2001(MA DEP 2001b). No visual turbidity or other objectionable deposits were observed except for isolated amounts of trash/debris.

Downstream from the confluence with the Little River, but out of the mixing zone for the Westfield WWTP discharge, and downstream from the Westfield WWTP discharge MA DEP DWM biologists observed that the Westfield River was slightly turbid and a sewage odor was present. Some sewage fungus was observed along the river outside of the effluent mixing zone. No other objectionable conditions were noted (MA DEP 2001c). Algal growth of primarily the green filamentous algae *Ulothrix zonata* covered an estimated 100% of both reaches sampled (Appendix D).

MA DEP DWM biologists surveyed a total of six reaches in this segment of the Westfield River in the summer of 1996 (Appendix C). From upstream to downstream the locations were as follows: upstream from the Texon USA facility near the roadside park near Huntington Health Center in Huntington (Station WR02), 450m downstream from the Texon USA discharge in Russell (Station WR03), upstream from Strathmore Paper across from the Whippernon Golf Club in Russell (Station WR04), 250m downstream from the Strathmore Paper Company treated effluent discharge in Russell (Station WR05), just upstream from the confluence with the Little River in Westfield (Station WR06), and 340m downstream from the Westfield WWTP discharge in Westfield (Station WR07).

The *Aesthetics Use* is assessed as support for the upper 16.8-mile reach of this segment of the Westfield River. The lower 1.0 mile reach of the river (downstream from the Westfield WWTP discharge) is assessed as impaired for the *Aesthetics Use* because of the slight instream turbidity, presence of sewage fungus, excess algal growth, and the sewage odor as documented during the 2001 MA DEP surveys.

Westfield River (MA32-05) Use Summary Table

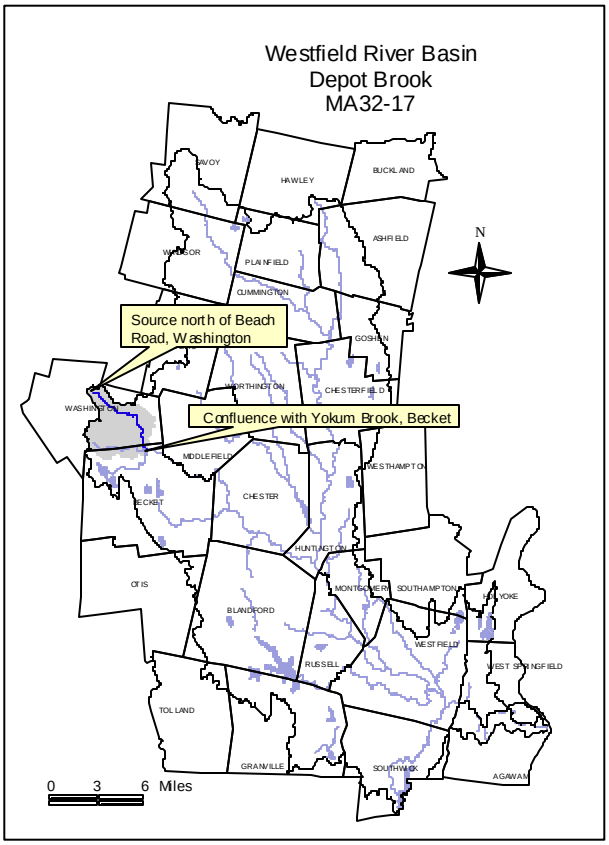
| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT upper 16.8 miles<br>IMPAIRED lower 1.0 miles<br>Cause: Unknown<br>Source: Municipal point source discharge<br>(Suspected source: Discharge from municipal separate storm sewer systems) |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | NOT ASSESSED |
| Secondary Contact |  | NOT ASSESSED |
| Aesthetics |  | SUPPORT upper 16.8 miles<br>IMPAIRED lower 1.0 miles<br>Cause: Excess algal growth, Turbidity, and Odor<br>Source: Municipal point source discharge<br>(Suspected source: Discharge from municipal separate storm sewer systems) |

**RECOMMENDATIONS WESTFIELD RIVER (MA32-05)**

- Evaluate flow data for FERC Project 2631 to ensure that run-of-river conditions, minimum flow releases and impoundment fluctuation conditions of the license are being met.
- Further investigate source(s) of aberrant streamflow fluctuations observed using on-line real-time data for the USGS gage 01183500. Ideally, a natural flow regime should be restored in the Westfield River.
- To ensure run-of-river operations all dam operators should install, calibrate and maintain a continuous streamflow monitoring gage or determine some other method to ensure compliance with run-of-river operations.
- Conduct fish population sampling to determine the effectiveness of fish passage facilities at FERC licensed and exempt projects.
- An upstream/downstream evaluation of the benthic macroinvertebrate community in the Westfield River should be conducted during the next Westfield River Watershed Survey to document any improvements associated with the upgrades at the Westfield WWTP.
- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Review the community of Westfield (MAR041236) Phase II Stormwater SWPPP, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River mainstem and subwatershed tributaries.

## DEPOT BROOK (SEGMENT MA32-17)

Location: Source in Washington (north of Beach Road) to confluence with Yokum Brook in Becket.
Segment Length: 6.0 miles
Classification: Class B




The drainage area of this segment is approximately 13 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 90%
Residential ..... 5%
Agriculture..... 2%

The impervious cover area for the individual sub-basins located in this segment is 1.6%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The headwaters of Depot Brook form in the northwest area of the town of Washington, just north of Beach Road. The brook flows southeast over moderately steep terrain through Washington Center and then flows more southerly towards Becket Center until it joins with Yokum Brook, forming the West Branch Westfield River.

Based on the last evaluation of water quality conditions Depot Brook is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption).

MDFW has proposed that Depot Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

Depot Brook is regularly stocked by MDFW with salmon fry and trout.

In August 2001 MDFW surveyed the fish population in one reach in Depot Brook near Valley Road in Washington (Station 361, Richards 2003). Nine species were collected, including, in order of abundance, blacknose dace, slimy sculpin, creek chubsucker, Atlantic salmon, brown trout, brook trout, white sucker, common shiner, and a longnosed dace. Multiple age classes of Atlantic salmon, brown trout, and brook trout were found. The presence of multiple age classes of three salmonids (and four intolerant species) along with all fluvial dependant/specialist species is indicative of excellent water and habitat quality conditions as well as a stable flow regime.

The *Aquatic Life Use* is assessed as support based on the fish population information and best professional judgment. The presence of four intolerant species (Altantic salmon, brook trout, brown trout and slimy sculpin) is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Depot Brook near the Cross Place Road bridge, Washington (Station DPOB02.3), in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are available so the *Recreational* and *Aesthetics* uses for Depot Brook are currently not assessed.

Depot Brook (MA32-17) Use Summary Table

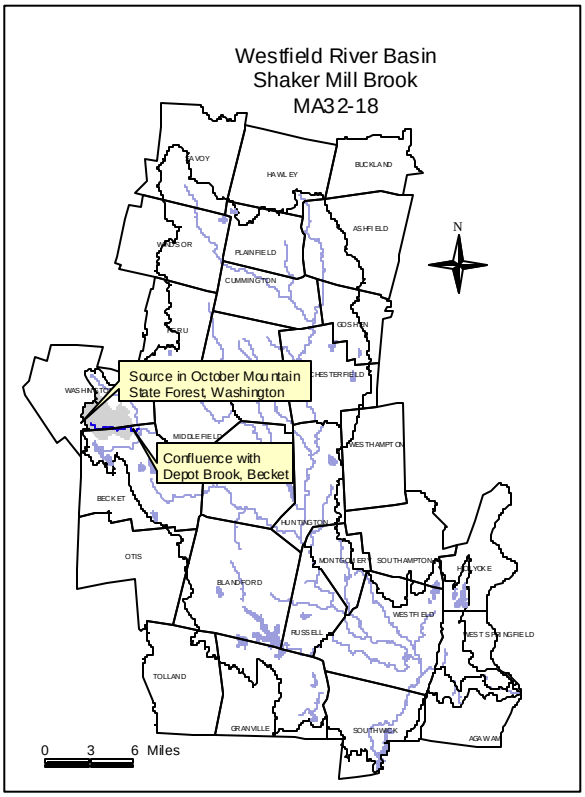
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS DEPOT BROOK (MA32-17)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Depot Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## SHAKER MILL BROOK (SEGMENT MA32-18)

Location: Source in October Mountain State Forest in Washington to confluence with Depot Brook in Becket.
Segment Length: 4.2 miles
Classification: Class B




The drainage area of this segment is approximately 6 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 91%
Residential ..... 5%
Agriculture ..... 1%

The impervious cover area for the individual sub-basins located in this segment is 1.1%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Shaker Mill Brook begins in the October Mountain State Forest in Washington, just east of Bald Top Mountain, and flows southeasterly down moderately steep terrain. The brook then enters Becket where its course changes to a more easterly direction flowing over generally steep terrain to its confluence with Depot Brook in the village of Becket.

Based on the last evaluation of water quality conditions Shaker Mill Brook is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Primary Contact Recreation, Secondary Contact Recreation, Aesthetics) and was not assessed for others (Aquatic Life, Fish Consumption).

MDFW has proposed that Shaker Mill Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

MDFW regularly stocks salmon fry in Shaker Mill Brook.

In August 2001 MDFW conducted backpack electrofishing in one reach of Shaker Mill Brook off of Lovers Lane in Becket (Station 383, Richards 2003). Five species were collected, including, in order of abundance, Atlantic salmon, brook trout, blacknose dace, creek chubsucker, and a brown trout. Multiple age classes of Atlantic salmon and brook trout were found. These species are all fluvial specialists/dependants.

The *Aquatic Life Use* is assessed as support based on the fish population information and best professional judgment. The presence of three intolerant species (Altantic salmon, brook trout and brown trout) is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples at the Lovers Lane bridge in Becket (Station SKMB00.4) between May and August 1996 (n=2) as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are available so the *Recreational* and *Aesthetics* uses for Shaker Mill Brook are currently not assessed.

Shaker Mill Brook (MA32-18) Use Summary Table

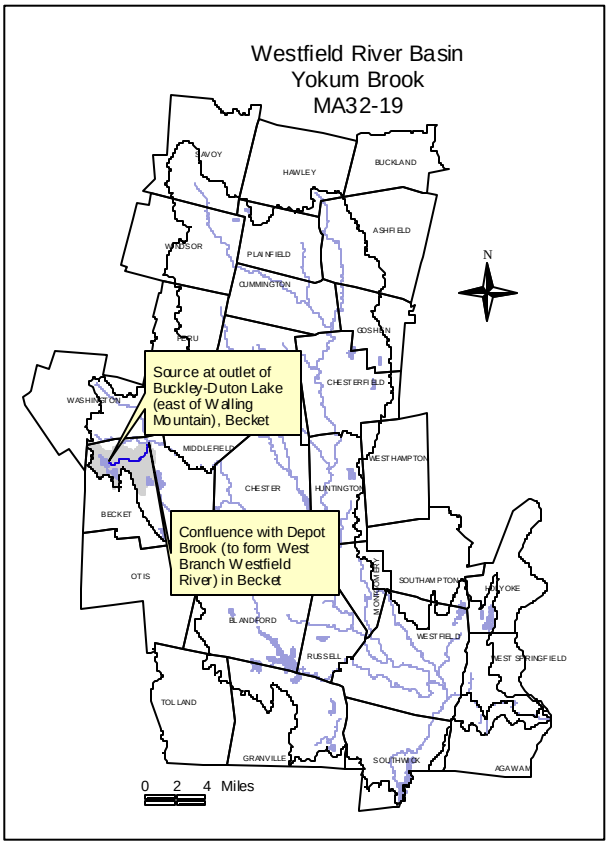
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS SHAKER MILL BROOK (MA32-18)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Shaker Mill Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## YOKUM BROOK (SEGMENT MA32-19)

Location: Source at outlet of Buckley-Dunton Lake (east of Walling Mountain) in Becket, to confluence with Depot Brook in Becket.
Segment Length: 4.0 miles
Classification: Class B




The drainage area of this segment is approximately 9 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 83%
Residential ..... 5%
Open Land ..... 1%

The impervious cover area for the individual sub-basins located in this segment is 1.6%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Yokum Brook originates at the outlet of Buckley Dunton Lake in Becket and flows generally in a northeasterly direction over moderately sloping terrain. The brook parallels Yokum Road and County Road into Becket Center to its confluence with Depot Brook, forming the West Branch Westfield River.

Through a project sponsored by the MA DFG, Riverways, River Restore Program, the Silk Mill Dam on Yokum Brook was removed in February 2003 (Riverways 2004). The Taconic Chapter of Trout Unlimited is also leading an effort to provide ongoing community stewardship of the fishery by implementing the Atlantic Salmon Egg Rearing Program in the Becket-Washington Elementary School with support from a Massachusetts Outdoor Classroom and EPA Environmental Education grant. The River Restore Program is also slated to raise funds for the breaching of Ballou Dam on Yokum Brook, although an alternative source of water for fire protection for Becket must be secured prior to the breaching of Ballou Dam. Additionally, the Program is developing an environmental risk predictive model to apply to these two dam breaches, as well as other similar breach situations throughout Massachusetts. The plan is to study pre- breach and post- breach effects of possible toxic sediments behind the dams (pre) and the effects of the released sediments and their effects downstream after the particular breach has occurred.

Based on the latest evaluation of water quality conditions Yokum Brook is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Primary Contact Recreation, Secondary Contact Recreation, Aesthetics) and was not assessed for others (Aquatic Life, Fish Consumption).

MDFW has proposed that Yokum Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

**WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY**

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey a habitat survey was performed in three reaches of Yokum Brook in Becket: downstream from Route 8 near intersection with Carter Road (approximately 50m upstream from the Silk Mill Dam) (Station YB01A), 100m upstream from Prentice Place (between the Silk Mill and Ballou dams (Station YB01B) and downstream from Ballou Dam near the Becket Elementary School at the mouth of the brook (Station YB01C, Appendix B). The habitat score at Station YB01A was 151 out of a possible 200 and was only slightly compromised by the drought-induced low baseflow conditions observed. Station YB01B received a total habitat assessment score of 168 out of 200. Station YB01C received a total habitat assessment score of 140 out of 200 (Appendix B). The disturbed riparian zone along the banks, in addition to low baseflow conditions and sediment deposition (sand), was responsible for the lower habitat assessment score at this most downstream reach sampled (MA DEP 2001c). At the time of the 2001 biomonitoring survey (Appendix B) both dams were scheduled for removal, so the biological examinations were conducted to assess aquatic faunal health and pre-removal conditions. Restoring habitat for coldwater fisheries in Yokum Brook began with the removal of Silk Mill Dam in Becket in February 2003.

Biology

MDFW regularly stocks salmon fry and trout in Yokum Brook.

In August 2001 MDFW conducted backpack electrofishing in Yokum Brook along Route 8 just below the Bear Creek Store Bridge in Becket (Richards 2003). Six species were collected from within this segment, including, in order of abundance, Atlantic salmon, blacknose dace, brook trout, longnosed dace, creek chubsucker, and a brown trout. Multiple age classes of Atlantic salmon and brook trout were found.

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey in three reaches of Yokum Brook in Becket: downstream from Route 8 near intersection with Carter Road (approximately 50m upstream from the Silk Mill Dam) (Station YB01A), 100m upstream from Prentice Place (between the Silk Mill and Ballou dams (Station YB01B) and downstream from Ballou Dam near the Becket Elementary School at the mouth of the brook (Station YB01C, Appendix B). The benthic community at the most upstream station (YB01A) was extremely diverse and was considered to represent the "best attainable" conditions in the watershed. It was, therefore, used as a reference station (Appendix B). Backpack electrofishing by DWM in September 2001 in this reach of the brook resulted in the collection of seven species of fish. These included, in order of abundance, Atlantic salmon, blacknose dace, yellow perch, longnosed dace, eastern brook trout, brown trout, and a creek chubsucker. Multiple age classes of Atlantic salmon, eastern brook trout, and brown trout were found. A small amount of green filamentous algae was observed. However, coverage in this partially canopied reach was very low (<1%) (Appendix D, MA DEP 2001c). The RPB III analysis of the benthic macroinvertebrate community between the Silk Mill and Ballou dams (Station YB01B) indicated non-impacted conditions compared to the upstream reference station on Yokum Brook (Station YB01A). The fish community in this reach was comprised of five species, including, in order of abundance, Atlantic salmon, eastern brook trout, blacknose dace, yellow perch, and a creek chubsucker. Multiple age classes of Atlantic salmon and eastern brook trout were found (Appendix B). The algal coverage was very low (<1%) (Appendix D, MA DEP 2001c). The RPB III analysis indicated that the benthic community at the most downstream station sampled in Yokum Brook (Station YB01C) was non-impacted when compared to upstream reference station on the Yokum Brook (Appendix B). Six species of fish were collected from this location including, in order of abundance, blacknose dace, slimy sculpin, longnosed dace, Atlantic salmon, eastern brook trout, and brown trout. Multiple age classes of Atlantic salmon and eastern brook trout were found (Appendix B). No algae were visible at this sampling location (Appendix D).

Chemistry – Sediment

On 26 July 2001 the USGS conducted a screening examination of sediments behind two dams on Yokum Brook - above the Silk Mill Dam (the upstream dam that has now been removed) and above

the Ballou Dam (the lower dam that is still slated for removal) (Zimmerman and Brealt 2003). Three sediment cores were taken from behind the Silk Mill Dam and one sediment core was taken from behind the Ballou Dam. Sediment samples from these cores were analyzed for a suite of organic and inorganic constituents. Polycyclic aromatic hydrocarbons (PAHs) were detected in all samples analyzed, ranging in concentrations from 2.2 to > 5 ppm (the deepest core samples having the highest concentrations). The Lowest Effect Level (L-EL) guideline for total PAH is 4 ppm. However, the Severe Effect Level (S-EL) cannot be calculated (no total organic carbon data are available for the calculation). Two of fourteen samples, both from the Silk Mill Dam, slightly exceeded the L-EL. Three deep core sample results (two behind Silk Mill and one behind Ballou Dam) were reported as >5 ppm and cannot be compared to the guideline for total PAH. Neither petroleum hydrocarbons nor polychlorinated biphenyls (PCB) were detected in the Yokum Brook sediment. Chlordane was detected in only one sample collected behind Ballou Dam. The concentration of chlordane did exceed the L-EL, however, the S-EL could not be calculated. Of the six metals analyzed arsenic and zinc concentrations were below the L-ELs in all samples analyzed. The cadmium samples were all reported as <1 ppm and the L-EL (0.6 ppm) is lower than the detection limit so no comparisons could be made. The concentration of three metals (copper, nickel and lead) in samples collected behind Silk Mill Dam slightly exceeded the L-ELs for those metals (one copper sample, two nickel samples and two lead samples). The concentrations in all of the other samples analyzed behind Silk Mill and Ballou dams were less than the L-ELs.

The *Aquatic Life Use* for Yokum Brook is assessed as support based primarily on the benthic macroinvertebrate community analyses and the fish population information. The presence of reproducing salmonids and other intolerant, fluvial specialists/dependants is indicative of excellent water quality and stable streamflow conditions.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Yokum Brook at Route 8 bridge near Carter Road, Becket (Station YKMB00.2) in May and August 1996 (n=2) as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4). Additionally, DWM collected a fecal coliform bacteria sample in May 1996 from a discharge pipe upstream from the Route 8 bridge, which was discharging to an unnamed tributary of Yokum Brook (Station TTYB00.0).

No objectionable odors, oils, deposits, turbidity or other conditions were noted by DWM biologists at any of the three stream reaches sampled in September 2001 in the lower portion of Yokum Brook (Stations YB01A, YB01B, or YB01C).

Too limited data are available so the *Recreational* uses for Yokum Brook are currently not assessed. The *Aesthetics Use* is assessed as support based primarily on field observations by DWM biologists in 2001 and best professional judgment.

Yokum Brook (MA32-19) Use Summary Table

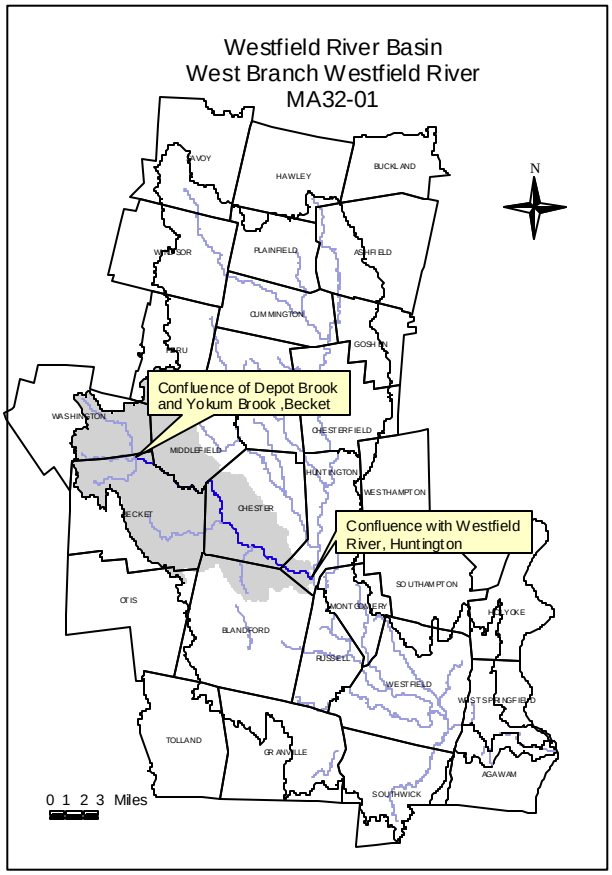
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

**RECOMMENDATIONS YOKUM BROOK (MA32-19)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Yokum Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Biological monitoring is recommended to document changes in the biota of Yokum Brook following the removal of both dams and to assess the status of the *Aquatic Life Use*.
- Investigate the source of sediment (sand) loads to Yokum Brook downstream from Ballou Dam near the Becket Elementary School and remediate as deemed necessary to protect instream habitat quality.

## WEST BRANCH WESTFIELD RIVER (SEGMENT MA32-01)

Location: Source formed by confluence of Depot Brook and Yokum Brook in Becket to confluence with Westfield River, Huntington.
Segment Length: 18.1 miles
Classification: Class B, Cold Water Fishery




The drainage area of this segment is approximately 96 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 88%
- Residential ..... 5%
- Agriculture ..... 2%

The impervious cover area for the individual sub-basins located in this segment is 1.7%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The West Branch Westfield River is formed by the confluence of Depot Brook and Yokum Brook in Becket Center. The river flows southeasterly through steep terrain forming the municipal boundary between Middlefield and Becket. Just before crossing the town boundary of Chester the river winds to the northeast around Gobble Mountain and then resumes its southeasterly course at a fairly steep gradient through some floodplain development. The river flows through the town center of Chester, where it is joined by Walker Brook, and continues southeast into the town of Huntington, where the river gradient decreases and the terrain is not as steep. The river passes through Huntington town center and flows into the Westfield River.

Based on the last evaluation of water quality conditions the West Branch Westfield River is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Aquatic Life, Primary Contact Recreation, Secondary Contact Recreation, Aesthetics) and was not assessed for others (Fish Consumption).

MDFW has proposed that several tributaries to the West Branch Westfield River be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003). They are Roaring Brook (West Branch), Goldmine Brook, Otis Wait Brook, Factory Brook, and Coles Brook.

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Huntington Water Department | 10414301 | Cold Brook Reservoir, 143-01S<br>Well#1, 1143000-01G<br>Well#2, 1143000-02G | 0.12 |

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H1)

The Huntington WWTP (NPDES #MA0101265) discharges midstream, approximately 10 feet upstream from the confluence with the mainstem Westfield River. Information on this facility can be found in the Westfield River segment MA32-05.

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

The USGS, in cooperation with the MA DCR and MA DFG, investigated monthly flow-durations and low-flow statistics over a 25 year period (1976-2000) for 23 index streamflow-gaging stations in Massachusetts, Connecticut, Rhode Island, and New Hampshire (Armstrong *et al*. 2004). The index stations were located in watershed areas with minimal effects from surface-water regulation or reduction of base flow from ground-water withdrawals. Flow-duration and low-flow statistics at the index stations were compared to flow management targets and streamflow requirements for habitat protection determined using a variety of instream flow methods. One of the 23 index stations was located on the West Branch Westfield River in Huntington, approximately 1.5 miles upstream from the confluence of the West Branch Westfield River with the mainstem Westfield River. Median and interquartile ranges for 50-percent monthly flow durations and n-day low-flow statistics, normalized by drainage area, were calculated. Monthly median flows for June through August for the West Branch Westfield River were slightly less than the median values for the other 22 stations. Existing habitat quality depends on this base-flow. Consequently, water-withdrawals and alterations to land-use that further reduce summer streamflows may have consequences for instream habitat quality.

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in August 1996 in two reaches of this segment of the West Branch Westfield River: upstream from the town of Huntington center just downstream from a footbridge (Station WB01) and downstream from the town's center upstream from the confluence with the mainstem Westfield River, Huntington (Station WB02). Habitat quality conditions at these locations are described in detail in Appendix C.

Biology

MDFW regularly stocks salmon fry and trout in West Branch Westfield River.

In August 2001 MDFW conducted barge and backpack electrofishing in the West Branch Westfield River off of Route 20 near the roadside park in Chester (MDFW sample Stations 353 and 378) (Richards 2003 and Richards 2004). Sampling efficiency was described as fair. A total of 12 species were collected including, longnosed dace, Atlantic salmon, blacknosed dace, common shiner, tessellated darter, as well as a few or an individual of smallmouth bass, spottail shiner, American eel, brown bullhead, creek chubsucker, slimy sculpin and white sucker. The presence of multiple age classes of Atlantic salmon and slimy sculpin (both intolerant species) is indicative of excellent water quality.

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in August 1996 in two reaches of this segment of the West Branch Westfield River: upstream from the town of Huntington center just downstream from a footbridge (Station WB01) and downstream from the town's center upstream from the confluence with the mainstem Westfield River, Huntington (Station WB02). Results of the RBP II analyses are provided in detail in Appendix C.

Toxicity

*Ambient*

Water from the West Branch Westfield River was collected just downstream from the Route 112 bridge (across from Department of Public Works shed) in Huntington for use as dilution water for the Huntington POTW whole effluent toxicity tests. Between November 1998 and May 2004 survival of both *C. dubia and P. promelas* exposed (48 hours) to the river water was excellent ($\geq$ 93%) in all 22 tests conducted.

Chemistry – water

Water from the West Branch Westfield River was collected just downstream from the Route 112 bridge (across from Department of Public Works shed) in Huntington for use as dilution water for the Huntington POTW whole effluent toxicity tests. Data from these reports (maintained in the TOXTD database) between November 1998 and May 2004 are summarized below.

*pH*
Instream pH ranged between 6.4 and 7.6 SU and only one of the 22 measurements was < 6.5 SU.
*Suspended Solids*
The maximum suspended solids concentration was 7.0 mg/L.

*Ammonia-Nitrogen*
The maximum ammonia-nitrogen concentration was 1.1 mg/L although it should be noted that of the 22 measurements recorded 86% were <0.05 mg/L.

*Total Residual Chlorine*
With the exception of one measurement (0.07 mg/L), all other TRC measurements were $\leq$ 0.05 mg/L.

*Alkalinity*
Alkalinity measurements ranged between 10 and 60 mg/L.

*Hardness*
Hardness measurements ranged between 16 and 52 mg/L, with 10 out of 22 samples $\leq$ 25 mg/L.

The *Aquatic Life Use* for the West Branch Westfield River is assessed as support based on the good survival of test organisms exposed to the river water, the fish population information, and best professional judgment. The absence of trout and the relatively low abundance of intolerant fishes other than stocked salmon are of concern, so the *Aquatic Life Use* is identified with an Alert Status.

***FISH CONSUMPTION***

Fish were collected from the West Branch Westfield River by MA DEP and MDFW personnel in October 1990 in the reach at Keystone Bridges/Conrail Area, Becket/Washington (Maietta 1993). Tissue from brown trout, eastern brook trout and white suckers were analyzed for selected metals (including mercury), PCB's, and other pesticides. The results of this survey did not indicate a problem nor did MA DPH issue any advisories with respect to fish consumption (Maietta 1993).

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

Environmental Sciences Services, Inc (ESS 2000) collected a fecal coliform sample from ESS Station SS-1 on 30 September 1999 (located on the West Branch Westfield River at the Route 112 bridge, Huntington). The fecal coliform count was 1600 cfu/100 mls.

DWM collected fecal coliform bacteria samples from five stations along the West Branch Westfield River: below Becket center downstream from the confluence with Yokum Brook in Becket (Station WBWF16.1), near the Bancroft Road/Town Hill Road bridge, Becket/Middlefield (Station WBWF13.2), Middlefield Road bridge in Chester (Station WBWF08.9), approximately 0.9 miles upstream from Sanderson Brook in Chester (Station WBWF05.4), and USGS gaging station on Fiske Avenue in Huntington (Station WBWF01.4) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

No objectionable conditions were noted by DWM biologists at either of the two river reaches sampled for benthic macroinvertebrate assemblages in this segment in 1996 (Appendix C).

Too limited recent data are available, so the *Recreational* and *Aesthetics* uses for the West Branch Westfield River are not assessed.

West Branch Westfield River (MA32-01) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT* | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

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

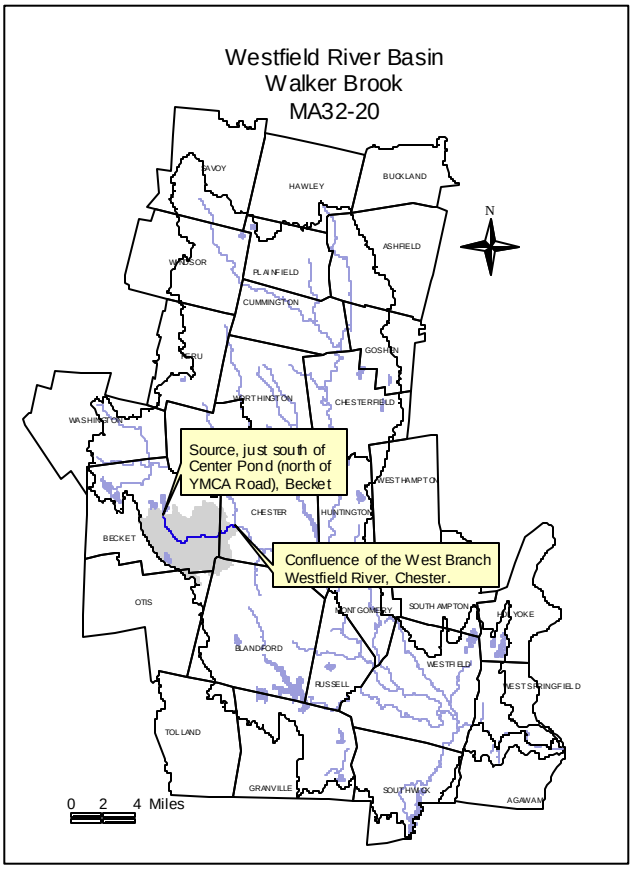
**RECOMMENDATIONS WEST BRANCH WESTFIELD RIVER (MA32-01)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

- Additional biological monitoring (macroinvertebrates and fish) is recommended to assess the status of the *Aquatic Life Use*. Long-term monitoring of fish populations in this segment of the Westfield River would be valuable to investigate possible impact of salmon stocking on reproducing wild trout populations.

## WALKER BROOK (SEGMENT MA32-20)

Location: Headwaters, at outlet of Center Pond (north of YMCA Road) in Becket to confluence of the West Branch Westfield River, Chester.
Segment Length: 7.1 miles
Classification: Class B




The drainage area of this segment is approximately 18 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 84%
Residential ..... 9%
Open Land ..... 2%

The impervious cover area for the individual sub-basins located in this segment is 2.3%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Walker Brook forms at the outlet of Center Pond in Becket. The brook flows southeasterly over moderately sloping terrain to Bonny Rigg Corners where it turns to the east paralleling Route 20 for much of its length. After passing through Becket State Forest the brook crosses into Chester and flows towards the northeast through a very narrow steep valley to its confluence with the West Branch Westfield River in Chester town center.

Based on the last evaluation of water quality conditions Walker Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Walker Brook and its tributary Cushman Brook be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H2)

The Town of Chester is authorized (NPDES permit MAG640035 issued December 1995) to discharge sand media filtered water from the Austin Brook Reservoir Slow Sand Water Filtration Plant in Chester to Austin Brook Reservoir. (It should be noted that MA DEP and EPA are deliberating the need for an NPDES discharge for slow sand water filtration plants, since no chemicals are used in the treatment process.)

**USE ASSESSMENT**

***AQUATIC LIFE***

Biology

MDFW regularly stocks salmon fry and trout in Walker Brook.

In August 2001 MDFW conducted backpack electrofishing in Walker Brook adjacent to Route 20 (upstream from the confluence with Austin Brook near the Pine Hill Cemetery) in Chester (Richards 2003). Eight species were collected, including, in order of abundance, blacknose dace, longnosed dace, Atlantic salmon, slimy sculpin, brown trout, brook trout, white sucker, and a creek chubsucker. Multiple age classes of Atlantic salmon, brown trout, and brook trout were found. These species are all fluvial specialists/dependants.

The *Aquatic Life Use* for Walker Brook is assessed as support based on the fish population information and best professional judgment. The presence of four intolerant species of fish is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Walker Brook near the Hampden Street Bridge (near Route 20) in Chester (Station WLKB00.4) in May and August 1996 (n=2) as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are available so the *Recreational* and *Aesthetics* uses are currently not assessed.

Walker Brook (MA32-20) Use Summary Table

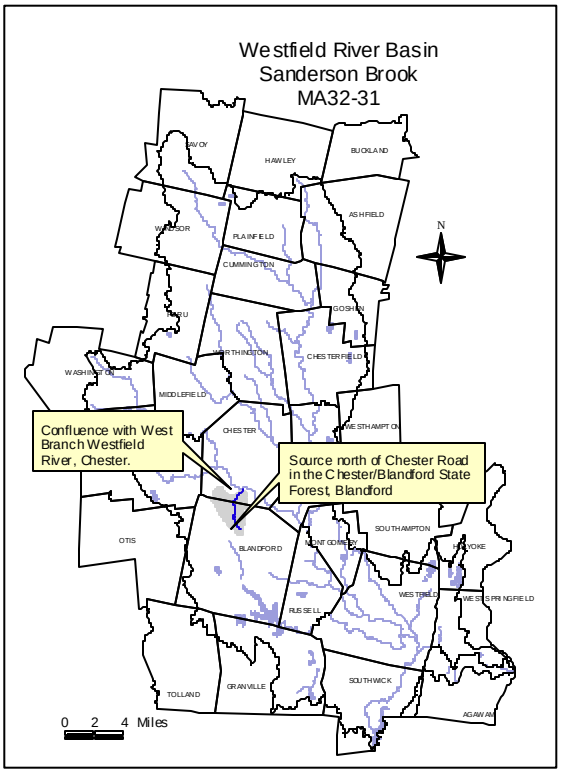
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS WALKER BROOK (MA32-20)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Biological monitoring (benthic macroinvertebrate and fish) is recommended to assess the status of the *Aquatic Life Use*.
- Walker Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## SANDERSON BROOK (SEGMENT MA32-31)

Location: Source north of Chester Road in the Chester/Blandford State Forest, Blandford, to confluence with West Branch Westfield River, Chester.
Segment Length: 3.5 miles
Classification: Class B




The drainage area of this segment is approximately 4 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 94%
Agriculture ..... 3%
Residential ..... 2%

The impervious cover area for the individual sub-basins located in this segment is 1.6%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The headwaters of Sanderson Brook begin just north of the Massachusetts Turnpike in Blandford and flow north into the Chester-Blandford State Forest. The brook then flows northeast into Chester soon joined by Griffin Brook. Sanderson Brook flows down very steep terrain to its confluence with the West Branch Westfield River in Chester.

Based on the last evaluation of water quality conditions Sanderson Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Sanderson Brook and its tributary Griffin Brook be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM in Sanderson Brook off the west side of Sanderson Brook Road approximately 1000 meters south (upstream) of Route 20 in Chester (Station BT04SAN) in September 1997. At the time of the survey the brook was roughly 3 m wide with a depth of approximately 0.25 m. The substrates were comprised primarily of boulder, cobble, and gravel. The overall habitat score was 168 out of a possible 200 (MA DEP 1997). Habitat quality was limited most by the channel flow status.

Biology

As part of the MA DEP Biocriteria Development Project, DWM biologists collected benthic macroinvertebrate samples from Sanderson Brook off the west side of Sanderson Brook Road approximately 1000 meters south (upstream) of Route 20 in Chester (Station BT04SAN) in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 23 September 1997 (ENSR 1997). Fish collected in order of abundance included: brown trout, eastern brook trout, slimy sculpin, and a longnosed dace. In a replicate reach Atlantic salmon were also found. Multiple age classes of brown trout and eastern brook trout were found. All species collected are fluvial specialists/dependants.

Chemistry – water

*In-situ* measurements (dissolved oxygen, % saturation, pH, temperature, conductivity, and turbidity) of Sanderson Brook off the west side of Sanderson Brook Road approximately 1000 meters south (upstream) of Route 20 in Chester (Station BT04SAN) were made on 23 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of Atlantic salmon, reproducing brown and brook trout and slimy sculpin are indicative of high quality cold water.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Sanderson Brook in 1997 (MA DEP 1997).

The *Aesthetics Use* is assessed as support for Sanderson Brook based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Sanderson Brook (MA32-31) Use Summary Table

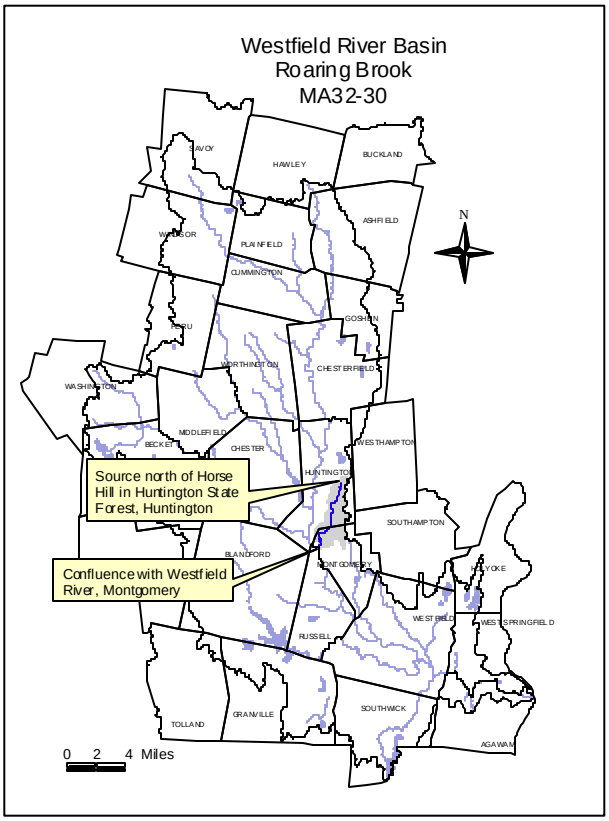
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

**RECOMMENDATIONS SANDERSON BROOK (MA32-31)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Biological monitoring is recommended to assess the status of the *Aquatic Life Use*.
- Sanderson Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## ROARING BROOK (SEGMENT MA32-30)

Location: Source north of Horse Hill in Huntington State Forest, Huntington to confluence with Westfield River, Montgomery.
Segment Length: 4.3 miles
Classification: Class B




The drainage area of this segment is approximately 6 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 85%
Residential ..... 8%
Agriculture..... 5%

The impervious cover area for the individual sub-basins located in this segment is 1.7%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Roaring Brook forms south of the village of Norwich in Huntington. The brook flows southwesterly through undeveloped terrain entering a very steep reach in the Huntington State Forest. Horse Hill Brook joins Roaring Brook just before the town boundary with Montgomery. As the brook enters Montgomery it turns to the southwest where it is joined by Crow Brook. Roaring Brook continues flowing over steep terrain until it reaches a relatively flat area. It then turns south and flows onto a broad floodplain before its confluence with the Westfield River in Montgomery (opposite of the village of Crescent Mills in Russell).

Based on the last evaluation of water quality conditions Roaring Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Roaring Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM in Roaring Brook upstream from the second Carrington Road crossing of the brook in Montgomery (Station BT07ROA) in September 1997. At the time of the survey the brook was roughly 2 m wide with a depth of approximately 0.25 m. The substrates were comprised primarily of boulder, cobble, and gravel. The overall habitat score was 166 (MA DEP 1997). Habitat quality was limited most by the channel flow status and sediment deposition.

Biology

MDFW regularly stocks salmon fry in Roaring Brook.

As part of the MA DEP Biocriteria Development Project, MA DEP DWM biologists collected benthic macroinvertebrate samples from Roaring Brook upstream from the second Carrington Road crossing

of the brook in Montgomery (Station BT07ROA) in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 24 September 1997 (ENSR 1997). Fish collected in order of abundance included: blacknose dace and slimy sculpin, Atlantic salmon, eastern brook trout, and brown trout. Multiple age classes of Atlantic salmon, eastern brook trout, and brown trout were found. The presence of Atlantic salmon, reproducing brown and brook trout and slimy sculpin are indicative of high quality cold water.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of Roaring Brook upstream from the second Carrington Road crossing of the brook in Montgomery (Station BT07ROA) were made on 24 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The fish species present are all fluvial specialists/dependants. In addition, the presence of four intolerant species is indicative of excellent water and habitat quality.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Roaring Brook in 1997 (MA DEP 1997).

The *Aesthetics Use* is assessed as support for Roaring Brook based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Roaring Brook (MA32-30) Use Summary Table

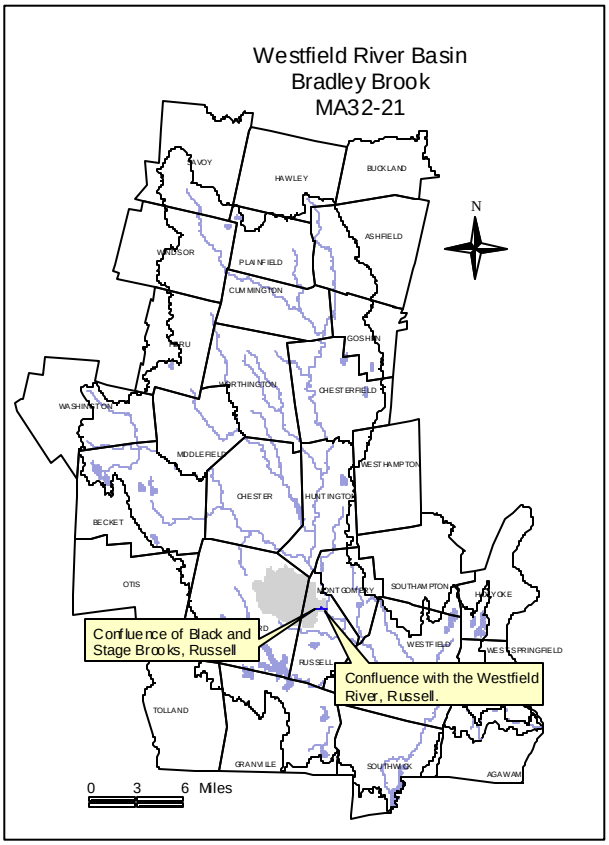
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

**RECOMMENDATIONS ROARING BROOK (MA32-30)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Biological monitoring is recommended to assess the status of the *Aquatic Life Use*.
- Roaring Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## BRADLEY BROOK (SEGMENT MA32-21)

Location: From the confluence of Black and Stage Brooks, Russell, to the confluence with the Westfield River, Russell.
Segment Length: 0.7 miles
Classification: Class B




The drainage area of this segment is approximately 11 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 86%
Open Land ..... 5%
Residential ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 2.2%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Bradley Brook is formed at the confluence of Black and Stage Brooks in the town of Russell and flows east through Russell town center to its confluence with the Westfield River just upstream from the Westfield River Paper Company Dam in Russell.

Based on the last evaluation of water quality conditions Bradley Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Bradley Brook and its tributaries Stage and Freeland brooks be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Permit Number | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|---|
| Russell Water Department | 9P210425602 | 12560000 | Black Brook Reservoir 256-01S<br>Well#1, 1256000-01G | 0.29* |

* indicates system-wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H)

The Mass Turnpike Authority used to operate a sewage disposal pond (MA0023515), which discharged into Freeland Brook, a tributary to Stage Brook. According to MA DEP's Western Regional Office their discharge was routed to the Russell WWTP in 1996 (Nietupski 2004a).

### USE ASSESSMENT

***AQUATIC LIFE***

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM on Bradley Brook behind #54 Moss Hill Road, approximately 400 meters west (upstream) of Route 20 in Montgomery (Station BT03BRA), in September 1997. At the time of the survey the brook was roughly 3m wide with depths between 0.25 and 0.75m in the runs and pools. The substrates were

comprised primarily of boulder, cobble, and gravel. The overall habitat score was 184 out of a possible 200 (MA DEP 1997).

Complaints of sediment inputs from Bradley Brook to the Westfield River just upstream from the Westfield River Paper Company Dam in Russell have recently been reported (Lynch 2004).

Biology

As part of the MA DEP Biocriteria Development Project, MA DEP DWM biologists collected benthic macroinvertebrate samples from Bradley Brook behind #54 Moss Hill Road, approximately 400 meters west (upstream) of Route 20 in Montgomery (Station BT03BRA) in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 23 September 1997 (ENSR 1997). Fish collected in order of abundance included: Atlantic salmon, blacknose dace, eastern brook trout, and an individual each of brown trout and pumpkinseed. Multiple age classes of Atlantic salmon and eastern brook trout were found. With the exception of the individual pumpkinseed all species collected are fluvial specialists/dependants.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of Bradley Brook behind #54 Moss Hill Road, approximately 400 meters west (upstream) of Route 20 in Montgomery (Station BT03BRA), were made on 23 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of three intolerant species (Atlantic salmon, brook trout and brown trout) is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

DWM collected fecal coliform bacteria samples from Bradley Brook behind the fire house in Russell center (Station BDLB00.1) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited recent data area available, so the *Primary* and *Secondary Contact Recreational* Uses are not assessed for Bradley Brook.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Bradley Brook in 1997 (MA DEP 1997).

Discussions with Richard and Nancy Lynch (part owners of the proposed Russell Falls Hydroelectric Plant on the Westfield River) report a serious siltation problem over many years emanating from Bradley Brook. This silt deposits behind the dam after it joins the Westfield River. They note that various construction and land disturbances upstream in Bradley Brook have contributed to this continued problem. Bradley Brook, particularly near the lower end in Russell, is visibly clouded much of the time. Mr. Lynch relates that when, as dam operator before the hydroelectric plant shut down in 1994, he was responsible for dredging material from the upstream side of the dam every few years due to siltation coming from Bradley Brook (Lynch 2004).

The *Aesthetics Use* is assessed as support in Bradley Brook based primarily on the observations of DWM biologists during their survey. However, this use is identified with an Alert Status based on the observations/complaints of turbidity.

Bradley Brook (MA32-21) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT* |

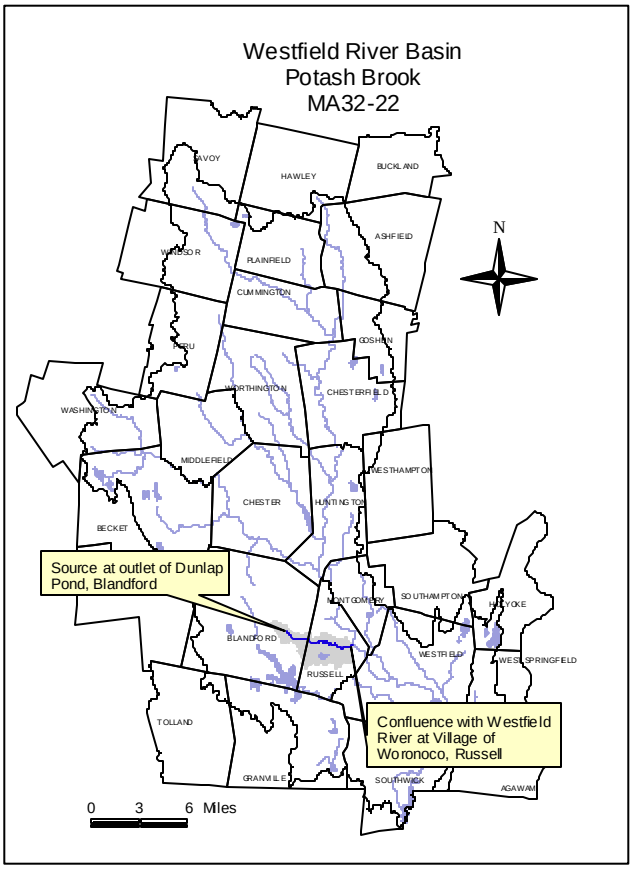
* Alert Status issues identified, see details in use assessment section

**RECOMMENDATIONS BRADLEY BROOK (MA32-21)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Biological monitoring is recommended to assess the status of the *Aquatic Life Use*.
- Bradley Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Investigate inputs of sediment from Bradley Brook to the Westfield River and recommend actions as deemed necessary to remediate problem.

## POTASH BROOK (SEGMENT MA32-22)

Location: Source at outlet of Dunlap Pond in Blandford to confluence with Westfield River at the village of Woronoco, Russell.
Segment Length: 5.2 miles
Classification: Class B




The drainage area of this segment is approximately 7 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 80%
Residential ..... 9%
Transport ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 4.7%. Thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Potash Brook originates from Dunlap Pond in Blandford and flows in an easterly direction paralleling the Massachusetts Turnpike and Route 23 to its confluence with the Westfield River in the village of Woronoco in Russell.

Based on the last evaluation of water quality conditions Potash Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). The segment was not assessed for any uses.

MDFW has proposed that Potash Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

MDFW regularly stocks salmon fry and trout in Potash Brook.

In August 2001 MDFW surveyed the fish population within Potash Brook (Richards 2003). The station was located at the Route 23 Bridge in Russell. Six species collected, in order of abundance, were Atlantic salmon, brook trout, blacknose dace, creek chubsucker, common shiner, and one brook trout/brown trout hybrid. Multiple age classes of Atlantic salmon, brook trout were found. All species collected are fluvial specialists/dependants.

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of two intolerant species (Altantic salmon and brook trout) is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected a fecal coliform bacteria sample Potash Brook from the upstream side of the bridge on the road to Strathmore Paper in Russell (village of Woronoco) (Station PTAB00.1) in August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited recent data are available, so the Recreational and Aesthetic Uses for Potash Brook are not assessed.

Potash Brook (MA32-22) Use Summary Table

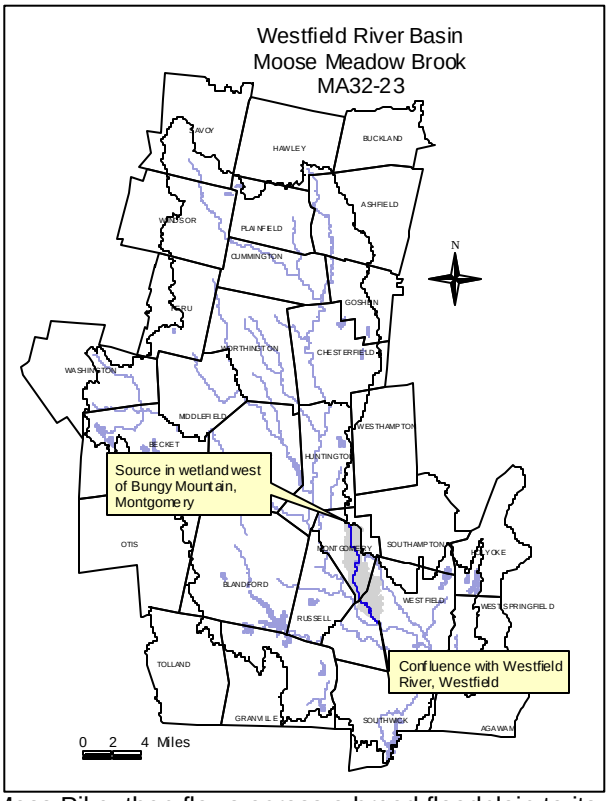
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS POTASH BROOK (MA32-22)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Biological monitoring is recommended to assess the status of the *Aquatic Life Use*.
- Potash Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## MOOSE MEADOW BROOK (SEGMENT MA32-23)

Location: Source in wetland west of Bungy Mountain, Montgomery, to confluence with Westfield River, Westfield.
Segment Length: 8.2 miles
Classification: Class B




The drainage area of this segment is approximately 8 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 80%
- Agriculture..... 9%
- Residential ..... 5%

The impervious cover area for the individual sub-basins located in this segment is 2.4%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Moose Meadow Brook originates in the town of Montgomery west of Bungy Mountain and flows south through Westfield Reservoir. The brook then continues over steep terrain past the east side of Tekoa Mountain into Tekoa Reservoir. Moose Meadow Brook continues flowing from the outlet of the reservoir initially in a southwesterly direction. It then turns towards the southeast crossing the corporate boundary into Westfield, passing under the Mass Pike, then flows across a broad floodplain to its confluence with the Westfield River.

Based on the last evaluation of water quality conditions Moose Meadow Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Moose Meadow Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Source | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Westfield Water Department | 10432901 | Montgomery Reservoir**, 329-01S | 6.11* |

* indicates system-wide withdrawal; all sources are not within this segment
** also known as Tekoa Reservoir. This source is an emergency surface water supply and therefore this segment is not currently classified as a Class A waterbody.

### NPDES WASTEWATER DISCHARGE SUMMARY

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

### USE ASSESSMENT

***AQUATIC LIFE***

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM in Moose Meadow Brook approximately 400 meters north (upstream) of Tekoa Reservoir in Westfield (Station BT06MOO) in September 1997. At the time of the survey the river was roughly 4m wide, with a depth of approximately 0.25 m in the riffle/runs and 0.5m in the pool. The substrates were

comprised primarily of boulder, cobble, and gravel. The overall habitat score was 145 out 200 (MA DEP 1997). Habitat quality was limited most by the channel flow status, embeddedness, sediment deposition and the limited riparian vegetative cover on the right bank facing downstream.

Biology

As part of the MA DEP Biocriteria Development Project, MA DEP DWM biologists collected benthic macroinvertebrate samples from Moose Meadow Brook approximately 400 meters north (upstream) of Tekoa Reservoir in Westfield (Station BT06MOO) in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 24 September 1997 (ENSR 1997). Fish collected in order of abundance included: blacknose dace, eastern brook trout, golden shiner, and a creek chubsucker. Multiple age classes of eastern brook trout were found. The sample was dominated by fluvial specialists/dependants, one of which is intolerant (brook trout).

In August 2001 MDFW surveyed the fish population within Moose Meadow Brook (Richards 2003). The station was located near the Pochassic Road Bridge in Westfield. Nine fish species collected, in order of abundance, were blacknose dace, brown trout, longnosed dace, American eel, white sucker, tessellated darter, slimy sculpin, brook trout and creek chubsucker. Multiple age classes of brown trout and brook trout were included in the sample. The sample was dominated by fluvial specialists/dependants.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of Moose Meadow Brook approximately 400 meters north (upstream) of Tekoa Reservoir in Westfield (Station BT06MOO) were made on 24 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

Between 1 August and 3 October 2001 DWM collected *in-situ* measurements (n=4) from two stations on Moose Meadow Brook: Station MMBR02.4 approximately 250 feet downstream from Tekoa Reservoir, Montgomery, and Station MMBR00.5 at Farm Road (private road south off Pochassic Road) bridge, Westfield. Parameters measured included dissolved oxygen, pH, temperature, conductivity, and total dissolved solids (Appendix 2 of Appendix A). Grab samples were collected and analyzed for alkalinity, hardness, chloride, suspended solids and nutrients (Appendix 3 of Appendix A).

*DO*

The instream DO measured by DWM on Moose Meadow Brook at Station MMBR02.4 ranged from 8.9 to 10.8 mg/L (96% to 99% saturation), and at Station MMBR00.5 ranged from 4.7 to 10.1 mg/L (49% to 93% saturation).

*Temperature*

Temperatures recorded by DWM at Station MMBR02.4 ranged from 12.1 to 20.1°C and at Station MMBR00.5 ranged from 12.1 to 20.3°C.

*pH*

pH measurements recorded by DWM at Station MMBR02.4 ranged from 6.6 to 6.9 SU and at Station MMBR00.5 ranged from 6.7 to 7.0 SU.

*Conductivity*

Conductivity reported by DWM at Station MMBR02.4 ranged from 41.5 to 46.1 µS/cm and at Station MMBR00.5 ranged from 165 to 410 µS/cm.

*Solids*

The maximum total suspended solid concentrations reported by DWM at Station MMBR02.4 ranged from <1.0 to 1.5 mg/L and at Station MMBR00.5 ranged from <1.0 to 5.3 mg/L.

*Alkalinity*
The alkalinity reported by DWM at Station MMBR02.4 ranged from 7 to 8 mg/L and at Station MMBR00.5 ranged from 31 to 78 mg/L.

*Hardness*
Hardness was extremely low at Station MMBR02.4 ranging from 4 to 6 mg/L and was slightly higher at Station MMBR00.5 ranging from 14 to 53 mg/L.

*Ammonia-Nitrogen (as N)*
Ammonia-nitrogen concentrations reported by DWM at Station MMBR02.4 were below minimum detection limits and at Station MMBR00.5 ranged from <0.02 to 1.3 mg/L.

*Total Phosphorus (as P)*
Total phosphorus concentrations reported by DWM at Station MMBR02.4 ranged between 0.013 and 0.020 mg/L and at Station MMBR00.5 ranged between 0.049 and 0.29 mg/L.

The *Aquatic Life Use* is assessed as support based primarily on the fish population information, the limited water quality data, and best professional judgment. The presence of fluvial specialists/dependants, some of which are cold-water intolerant species, in both stream reaches sampled is indicative of high quality cold water. However, slightly low DO and elevated nutrients as well as the presence of the agricultural activities (grazing allowed in the riparian zone) result in the *Aquatic Life Use* being identified with an Alert Status for the lower 1.3-mile reach of the brook.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Moose Meadow Brook approximately 250 feet downstream of Tekoa Reservoir, Montgomery (Station MMBR02.4), between 1 August and 3 October 2001 (N=4). Sample results for fecal coliform ranged from <2 to 19 cfu/100 ml (Appendix 3 of Appendix A). Field survey crews did not note any objectionable odors, turbidity or deposits at this sampling location (MA DEP 2001b).

ESS collected fecal coliform bacteria samples from two tributaries to Moose Meadow Brook in 1999. The stations and results can be summarized as follows (ESS 2000).
Cooley Brook, north of Masspike, Westfield (Station SS-42) on 28 December - <10 cfu/100ml
Unnamed tributary, north of Masspike, Westfield (Station SS-41) on 28 December -150 cfu/100ml.

DWM collected fecal coliform bacteria samples from Moose Meadow Brook at a farm road (private access road to Conrail Line off Pochassic Road) bridge, Westfield (Station MMBR00.5) between 1 August and 3 October 2001 (N=4). Sample results for fecal coliform ranged from 3,300 to 24,000 cfu/100 ml (Appendix 3 of Appendix A). With the exception of one sampling event no objectionable odors, deposits or other conditions were noted by the field survey crews (MA DEP 2001b). However, water clarity in the brook was described as murky on one sampling occasion and there was evidence of cows having had access to the brook. ESS also collected fecal coliform bacteria samples from Moose Meadow Brook at the Conrail Bridge, Westfield (Station SS-5), on 3 November 1999. The fecal coliform bacteria result was 9,000 cfu/100ml (ESS 2000).

It should also be noted that DWM collected fecal coliform bacteria samples from Moose Meadow Brook near Pochassic Road, Westfield (Station MMBR01.1), in May and August 1996 (n=2) as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

The upper 6.9-mile reach of Moose Meadow Brook is assessed as support for the *Recreational* and *Aesthetic* uses. However the lower 1.3-mile reach of the brook is assessed as impaired for the *Recreational* and *Aesthetic* Uses because of the elevated fecal coliform bacteria counts and turbidity. The source of impairment is agricultural activities associated with grazing in the riparian zone.

Moose Meadow Brook (MA32-23) Use Summary Table

| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT* |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | SUPPORT upper 6.9 miles<br>IMPAIRED lower 1.3 miles<br>Causes: Fecal coliform, Turbidity<br>Source: Grazing in riparian zone |
| Secondary Contact |  | |
| Aesthetics |  | SUPPORT upper 6.9 miles<br>IMPAIRED lower 1.3 miles<br>Cause: Turbidity<br>Source: Grazing in riparian zone |

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

**RECOMMENDATIONS MOOSE MEADOW BROOK (MA32-23)**

- Landowners should be encouraged to implement agricultural Best Management Practices (BMPs) in this subwatershed to protect riparian areas and prevent agricultural runoff and streambank erosion. The Natural Resources Conservation Service and Department of Agricultural Resources may be able to provide assistance.

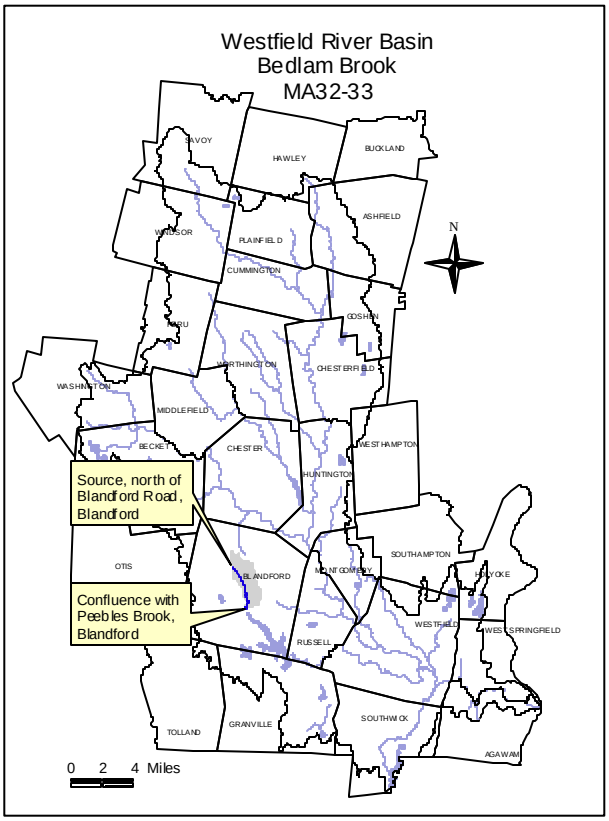
- Continue to conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and to evaluate the implementation of any agricultural BMPs that are put into practice.

- Continue to conduct biological monitoring (habitat, benthic and fish community) to assess the status of the *Aquatic Life Use*.

- Moose Meadow Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## BEDLAM BROOK (SEGMENT MA32-33)

Location: Source, north of Blandford Road, to confluence with Peebles Brook, Blandford.
Segment Length: 3.2 miles
Classification: Class A




The drainage area of this segment is approximately 4 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 77%
Agriculture..... 7%
Residential ..... 7%

The impervious cover area for the individual sub-basins located in this segment is 4.4%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Bedlam Brook is formed by the confluence of Tiffany Brook and an unnamed brook about 1.7 miles northwest of Blandford town center. The brook flows in a southward direction over undeveloped, moderately sloping terrain to its confluence with Peebles Brook in Blandford.

Based on the last evaluation of water quality conditions Bedlam Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Bedlam Brook be listed in the next revision of the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM in Bedlam Brook approximately 800 meters upstream from Route 23 in Blandford (Station BT02BED) in September 1997. At the time of the survey the brook was roughly 5m wide with a depth of approximately <0.25 m in the riffles and up to 0.5m in the run and pool habitats. The substrates were comprised primarily of boulder, cobble, and gravel. The overall habitat score was 169 (MA DEP 1997). Habitat quality was limited most by bank instability on the left side and the limitations related to velocity/depth combinations.

Biology

As part of the MA DEP Biocriteria Development Project, MA DEP DWM biologists collected benthic macroinvertebrate samples from Bedlam Brook at Station BT02BED in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 23 September 1997 (ENSR 1997). Fish collected in order of abundance included: brown trout, eastern brook trout, creek chubsucker, and blacknose dace. Multiple age classes of both brown trout and eastern brook trout were found. All species collected are fluvial specialists/dependants.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of Bedlam Brook approximately 800 meters upstream from Route 23 in Blandford (Station BT02BED) were made on 23 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish population information and best professional judgment. The presence of two intolerant species (brook trout and brown trout) is indicative of excellent water and habitat quality.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Bedlam Brook in 1997 (MA DEP 1997).

The *Aesthetics Use* is assessed as support based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Bedlam Brook (MA32-33) Use Summary Table

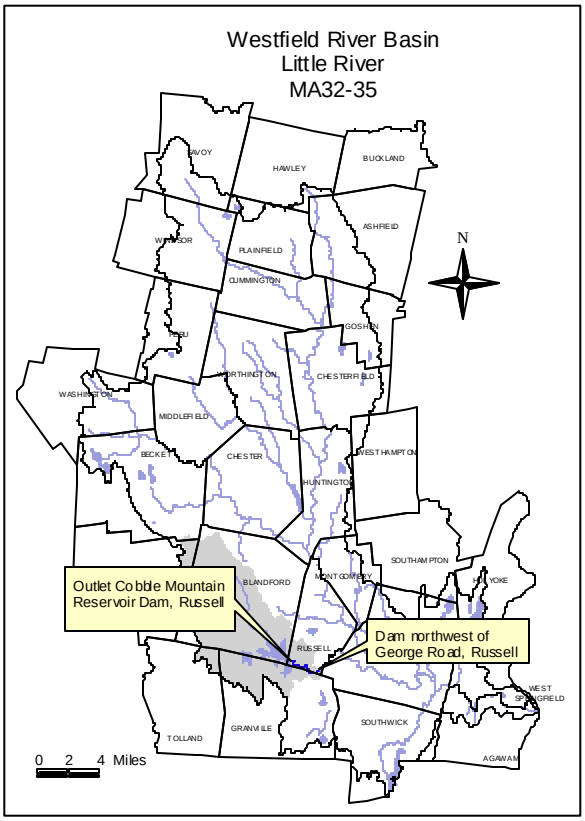
| Aquatic Life | Fish Consumption | Drinking Water | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

**RECOMMENDATIONS BEDLAM BROOK (MA32-33)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Continued biological monitoring is recommended in order to assess the *Aquatic Life Use*.
- Bedlam Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

## LITTLE RIVER (SEGMENT MA32-35, FORMERLY PART OF MA32-26)

Location: Source at the outlet of Cobble Mountain Reservoir dam, Russell, to dam northwest of Gorge Road, Russell (formerly part of Segment MA32-26).
Segment Length: 2.6 miles
Classification: Class B
*Note: MA DEP's Division of Water Supply has recommended that the Little River and its tributaries from the source at outlet of Cobble Mountain Reservoir Dam in Russel, to a dam northwest of Gorge Road, Russell, be reclassified from Class B to a Class A public water supply waterbody in the next revision of the SWQS.*




The drainage area of this segment is approximately 49 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 86%
Wetlands ..... 3%
Agriculture ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.6%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The Little River begins at the outlet of Cobble Mountain Reservoir in Russell, a drinking water supply for the city of Springfield, and flows eastward through a very steep valley called The Gorge. The river is impounded behind a dam northwest of Gorge Road in Russell. The Borden Brook and Cobble Mountain Reservoirs, in this subwatershed, comprise the second largest water-supply storage system in Massachusetts.

Based on the last evaluation of water quality conditions this segment of the Little River is listed in Category 4C of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired because of flow alteration, but this impairment is considered a pollutant not subject to TMDL calculations

MDFW has proposed that Peebles Brook and Pond Brook (tributary to Peebles Brook) in this subwatershed, be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Springfield Water and Sewer Commission* | 10428101 | Cobble Mountain Reservoir, 281-02S<br>Borden Brook Reservoir | 37.2 |

* indicates system-wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no NPDES regulated surface wastewater discharges to this segment.

### OTHER

FERC non-jurisdictional hydropower project Cobble Mountain Station, a hydroelectric generating station built in 1930 by the City of Springfield, is located downstream from Cobble Mountain Reservoir and just upstream from The Gorge on the Little River in Granville. The Station is owned by the Springfield Water and Sewer Commission and operated by Northeast Generation Services Company (NGS), a subsidiary of Northeast Utilities System (NUS). The Station contains three water wheel generators with a total rating of 30.6 megawatts. The Station's purpose is to generate electricity while meeting the city's demand for

water to the water treatment plant. The output of the hydrogenerators supplies the city's feed water to the Springfield West Parish Filter water treatment system.

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

There are currently no flow release requirements at the Cobble Mountain Dam to the Little River. The hydropower operation is not licensed by FERC; it is a non-jurisdictional facility. There is a power tunnel leading from the reservoir to the Cobble Mountain Station that generates power when supplying the Springfield Water & Sewer Commission feed water (the output of the hydro generators flows into the impoundment of the Little River just downstream from The Gorge). Water is then taken from the impoundment via an intake tunnel and flows to the Springfield Water & Sewer Commissions West Parish Filter water treatment plant. The power tunnel bypasses approximately 2.2 miles of this segment of the Little River.

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey, a habitat survey was performed in this segment of the Little River approximately 2 km downstream from the Cobble Mountain Reservoir outlet (Appendix B). The habitat score at Station LR02A was 182 out of a possible 200 and was only slightly compromised by the drought-induced low baseflow conditions observed.

Biology

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey in this segment of the Little River approximately 2 km downstream from the Cobble Mountain Reservoir outlet (Station LR02A, Appendix B). The RPB III analysis of the benthic macroinvertebrate community indicated slightly impacted conditions compared to the reference station on the Westfield River near Route 112 in Huntington (Station WR01). Some green algae were present in the sample collected from the riffle area, but not in an excessive amount (Appendix D).

The *Aquatic Life Use* is assessed as support based primarily on the benthic macroinvertebrate community analysis. This use is, however, identified with an "Alert Status" because of flow alteration associated with the hydropower operation at Cobble Mountain Station (i.e., the power tunnel diversion bypasses approximately 2.2 miles of the Little River) and there are currently no flow release requirements from Cobble Mountain Reservoir to the Little River.

***AESTHETICS***

No objectionable deposits, odors or oils were observed by MA DEP DWM biologists in the Little River approximately 2 km downstream from the Cobble Mountain Reservoir outlet (Station LR02A) in September 2001 (MA DEP 2001c).

The *Aesthetics Use* is assessed as support based on the observations of DWM biologists.

LITTLE RIVER (MA32-35, formerly MA32-26) Use Summary Table

| Aquatic Life* | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

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

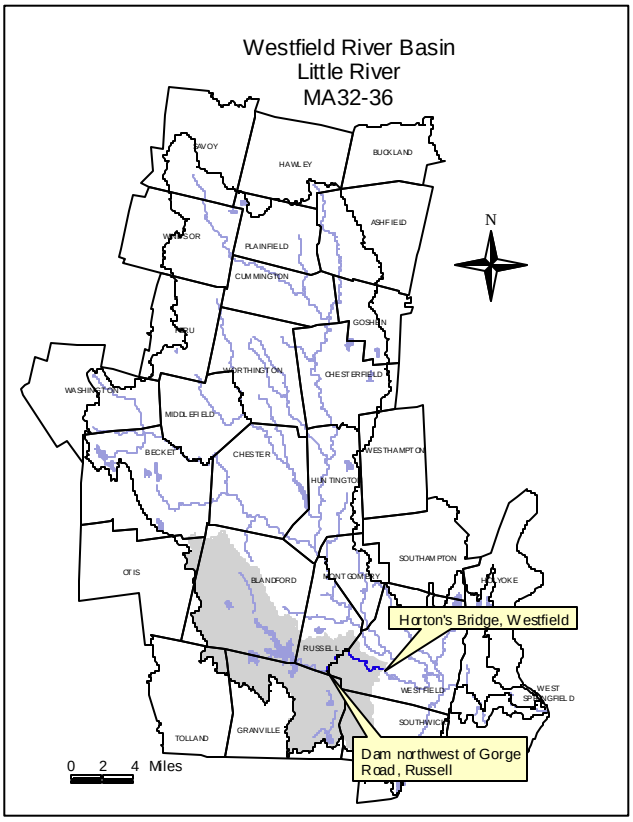
**RECOMMENDATIONS LITTLE RIVER (MA32-35)**

- Additional benthic macroinvertebrate sampling and instream flow measurements should be conducted during non-drought periods to determine the extent of effects due to flow alteration.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.

## LITTLE RIVER (SEGMENT MA32-36, FORMERLY PART OF MA32-26)

Location: From the dam northwest of Gorge Road, Russell, to Horton's Bridge, Westfield (formerly part of Segment MA32-26)
Segment Length: 5.8 miles
Classification: Class B, Warm Water Fishery




The drainage area of this segment is approximately 78 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 83%
- Residential ..... 4%
- Open Land ..... 3%

The impervious cover area for the individual sub-basins located in this segment is 1.8%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

After the dam at the end of the impoundment in The Gorge the Little River continues to flow east and becomes the municipal boundary between the town of Russell and the city of Westfield. As the Little River flows into Westfield the topography changes from steep hilly to gently sloping and the river meanders to the southeast through a widened floodplain. The river then enters an impounded reach and this segment ends at Horton's Bridge in Westfield.

Based on the last evaluation of water quality conditions the segment of the Little River is listed in Category 4C of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired by factors such as flow alteration, but these impairments are considered pollutants not subject to TMDL calculations.

MDFW has proposed that Munn Brook, a tributary to this segment of the Little River, be listed in the next revision of the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Westfield Water Department | 10432901 | Well#6, 329-06G<br>Well#5, 329-05G<br>Granville Reservoir, 329-02S | 6.11* |

* indicates system-wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

Northeast Utilities Service Co., Cobble Mountain Station, Old Granville Road, Westfield, MA0035556, discharges contact and non-contact cooling water to the Little River just downstream from the water supply intake dam. The most recent permit was issued 29 September 1998. The owners filed a permit reapplication in April 2003. The facility has station service sump water treated by an oil-water separator system. The sump water includes: turbine bearing cooling water, thrust bearing cooling water, trench and floor drain water, equipment de-watering, stormwater from transformer dikes, and non-contact cooling water from the transformer coolers. No water treatment chemicals are to be used, no discharge of PCB, or sanitary wastes are permitted.

The City of Springfield is permitted (NPDES permit MAG640023 issued January 2001) to discharge filter backwash from the West Parish Filters Water Treatment Plant and discharge up to 0.991 MGD (daily maximum flow) to Cook Brook, a tributary to this segment of the Little River. The effluent was not acutely toxic to *C. dubia* during the single test conducted in August 2001 ($LC_{50} \geq$ 100% effluent).

Westfield and Southwick are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003/2004, and are authorized to discharge stormwater from the municipal drainage systems (MAR041236 and MAR041022, respectively). Over the five-year permit term the communities will develop, implement and enforce stormwater management programs to reduce the discharge of pollutants from their storm sewer systems to protect water quality (Domizio 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey, a habitat survey was performed in two reaches of this segment of the Little River - approximately 50m upstream from Cook Brook (Station LR02B) and approximately 100m downstream from Cook Brook (Station LR02C, Appendix B). The habitat score at Station LR02B was 154 out of a possible 200 and was only slightly compromised by the drought-induced low baseflow conditions observed. Just downstream from the confluence with Cook Brook sediment deposition was clearly visible emanating from Cook Brook. Silt comprised approximately 10% of the inorganic substrate components, which were not present in the upstream sampling reach (MA DEP 2001c). The sampling reach in the Little River downstream from Cook Brook (Station LR02C) received a total habitat assessment score of 156 out of 200 (Appendix B).

Biology

In July 2001 MDFW conducted backpack electrofishing in this segment of the Little River upstream from the Northwest Road crossing in Westfield (Station 332, Richards 2003). Eight fish species collected, in order of abundance, were blacknose dace, longnosed dace, common shiner, brook trout, American eel, brown trout, white sucker, and a creek chubsucker. Multiple age classes of brook trout and brown trout were included in the sample, but the sample was dominated by tolerant and moderately tolerant species.

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey in two reaches of this segment of the Little River - upstream and downstream from the confluence with Cook Brook. The RPB III analysis of the benthic macroinvertebrate community upstream from Cook Brook (Station LR02B) indicated non-impacted conditions compared to reference station on the Westfield River near Route 112 in Huntington (Station WR01). The fish community was comprised of six species, including, in order of abundance, blacknose dace, longnosed dace, common shiner, eastern brook trout, and an individual each of brown trout and American eel (Appendix B). The fish community was similar to that found by MDFW (further upstream). The green, filamentous alga *Oedogonium* sp. covered approximately 100% of the substrates in the open-canopied riffle zone of the Little River upstream from Cook Brook, Russell (Station LR02B, Appendix D).

The RPB III analysis indicated that the benthic community in the Little River downstream from the confluence with Cook Brook (Station LR02C) was moderately impacted when compared to the reference station on the Westfield River (Appendix B). Slight impacts were detected when comparisons were made using the sampling station on the Little River upstream from Cook Brook as the reference station to assess the potential impacts originating from Cook Brook. Nine species of fish collected from this location (Station LR02C), in order of abundance, were blacknose dace, common shiner, longnosed dace, eastern brook trout, white sucker, brown trout, slimy sculpin, Atlantic salmon, and a fallfish. Multiple age classes of brown trout and Atlantic salmon were included in the sample (Appendix B). This fish community was also dominated by tolerant and moderately tolerant species. The green, filamentous alga *Oedogonium* sp. was not part of the algal assemblage found in the riffle zone of the Little River downstream from Cook Brook confluence (Station LR02C), but, it was abundant in the pool sample collected at the same station (Appendix D).

The *Aquatic* Life *Use* is assessed as support for this segment of the Little River upstream from its confluence with Cook Brook (3.6 miles) but assessed as impaired downstream from the confluence with Cook Brook (lower 2.2 mile reach). In the opinion of DWM biologists habitat quality degradation resulting from instream deposition is impacting the instream biota in the Little River downstream from its confluence with Cook Brook. Although there is a diverse assemblage of stream fishes the samples were dominated by species tolerant to both enrichment and habitat degradation (blacknose dace.

***FISH CONSUMPTION***

Fish were collected from the Little River by MA DEP and DFW personnel in October 1990 in the reach near the Northwest Street Bridge, Westfield (Maietta 1993). Tissue from brown trout, eastern brook trout and white suckers were analyzed for selected metals (including mercury), PCB, and other pesticides. The results of this survey did not indicate a problem nor did MA DPH issue any advisories with respect to fish consumption (Maietta 1993).

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION***

ESS collected a bacteria sample from Munn Brook, a tributary to this segment of the Little River, off Grainville Road Bridge in Westfield (ESS Station SS-27) on 30 September 1999. The count was 5,800 cfu/100 ml (ESS 2000).

DWM collected fecal coliform bacteria samples from the Little River near Horton's Bridge (Station LITR04.7) in May and August 1996 and from Munn Brook in August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are available, so the *Primary* and *Secondary Contact Recreational* uses are not assessed for this segment of the Little River.

***AESTHETICS***

No objectionable odors, oils, or other deposits were observed by MA DEP DWM biologists in either of the two reaches surveyed in September 2001 - approximately 20 m upstream from Cook Brook (Station LR02B) and approximately 100m downstream from Cook Brook (Station LR02C, MA DEP 2001c). Green algal growth was conspicuous in the Little River upstream from its confluence with Cook Brook but was less abundant in the riffle sample collected downstream from the confluence with Cook Brook (Appendix D).

The *Aesthetics Use* is assessed as support for this segment of the Little River.

Little River (MA32-36, formerly MA32-26) Use Summary Table

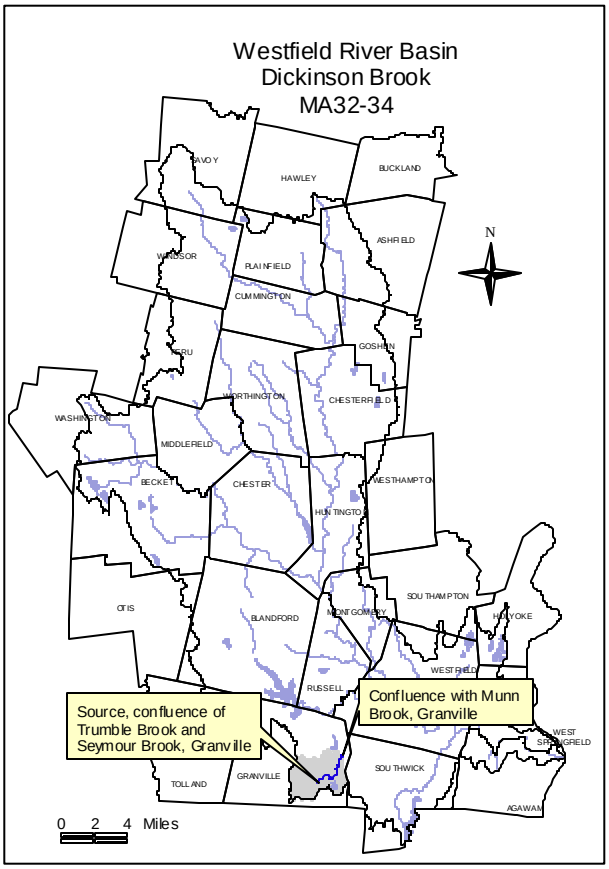
| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT upper 3.6 miles<br>IMPAIRED lower 2.2 miles<br>Cause: Combined biota/habitat bioassessment<br>(Suspected Cause: Sedimentation/siltation)<br>Source: Unknown<br>(Suspected Source: Municipal point source discharge) |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | NOT ASSESSED |
| Secondary Contact |  | NOT ASSESSED |
| Aesthetics |  | SUPPORT |

**RECOMMENDATIONS LITTLE RIVER (MA32-36)**

- Further evaluate streamflow conditions and other habitat quality conditions including sedimentation in this segment of the Little River.
- Conduct a site visit at the West Parish Filter water treatment plant and evaluate the effectiveness of the current NPDES permit limits in protecting water quality in Cook Brook and the Little River.
- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Continued biological monitoring is recommended in order to assess the *Aquatic Life Use*.
- Although not proposed as a cold water fisheries resource by MDFW, the Little River should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Review communities of Westfield (MAR041236), and Southwick (MAR041022) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## DICKINSON BROOK (SEGMENT MA32-34)

Location: Source, at the confluence of Trumble Brook and Seymour Brook, to confluence with Munn Brook, Granville.
Segment Length: 3.4 miles
Classification: Class B




The drainage area of this segment is approximately 8 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 75%
Open Land ..... 9%
Residential ..... 8%

The impervious cover area for the individual sub-basins located in this segment is 2.2%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Dickinson Brook is formed by the confluence of Trumble and Seymour Brooks in Granville, just northwest of South Mountain. The brook flows northeast for a short distance through a narrow valley and then flows through the village of Granville. Dickinson Brook then enters level terrain and flows to the south into a small pond and exits continuing to flow to the south. The brook then turns back to the northeast meandering along the west side of Sodom Mountain to its confluence with Munn Brook in Granville.

Based on the last evaluation of water quality conditions Dickinson Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

### WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

Based on the available information there are no WMA regulated water withdrawals or NPDES regulated surface wastewater discharges in this subwatershed.

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the MA DEP Biocriteria Development Project, a habitat survey was performed by DWM in Dickinson Brook approximately 100 meters upstream from Water Street crossing in Granville (Station BT01DIC) in September 1997. At the time of the survey the brook was roughly 2 m wide with a depth of approximately 0.25 m. The substrates were comprised primarily of boulder, cobble, and gravel. The overall habitat score was 160 (MA DEP 1997). Habitat quality was limited most by the channel flow status and some limitations related to velocity/depth combinations and the limited riparian zone on the right bank.

Biology

MDFW regularly stocks salmon fry in Dickinson Brook.

As part of the MA DEP Biocriteria Development Project, MA DEP DWM biologists collected benthic macroinvertebrate samples from Dickinson Brook at Station BT01DIC in September 1997 (Lotic 1999). Electrofishing was also conducted by DWM at this location on 23 September 1997 (ENSR 1997). Fish collected in order of abundance included: eastern brook trout, brown trout, and

blacknose dace. Multiple age classes of eastern brook trout and brown trout were found. All species collected are fluvial specialists/dependants.

In August 2001 MDFW conducted backpack electrofishing in Dickinson Brook Rt. 57, from a pulloff just below bridge in Granville (Station 338, Richards 2003). Seven fish species collected, in order of abundance, were Atlantic salmon, blacknose dace, brook trout, brown trout, longnosed dace, American eel and one white sucker. Multiple age classes of Atlantic salmon, brook trout and brown trout were found. With the exception of the eel all species collected are fluvial specialists/dependants.

Chemistry – water

*In-situ* measurements (DO, %saturation, pH, temperature, conductivity, and turbidity) of Dickinson Brook approximately 100 meters upstream from Water Street crossing in Granville (Station BT01DIC) were made on 23 September 1997 as part of the Biocriteria Development Project (Appendix G, Table G3).

The *Aquatic Life Use* is assessed as support based on the fish community data and best professional judgment. The presence of three intolerant species (Altantic salmon, brook trout and brown trout) is indicative of excellent water and habitat quality.

***AESTHETICS***

No aesthetic quality degradation (odors, turbidity, oil, grease) or any other objectionable conditions were noted by DWM biologists during their survey in Dickinson Brook in 1997 (MA DEP 1997).

The *Aesthetics Use* is assessed as support based primarily on field observations by DWM biologists in 1997 and best professional judgment.

Dickinson Brook (MA32-34) Use Summary Table

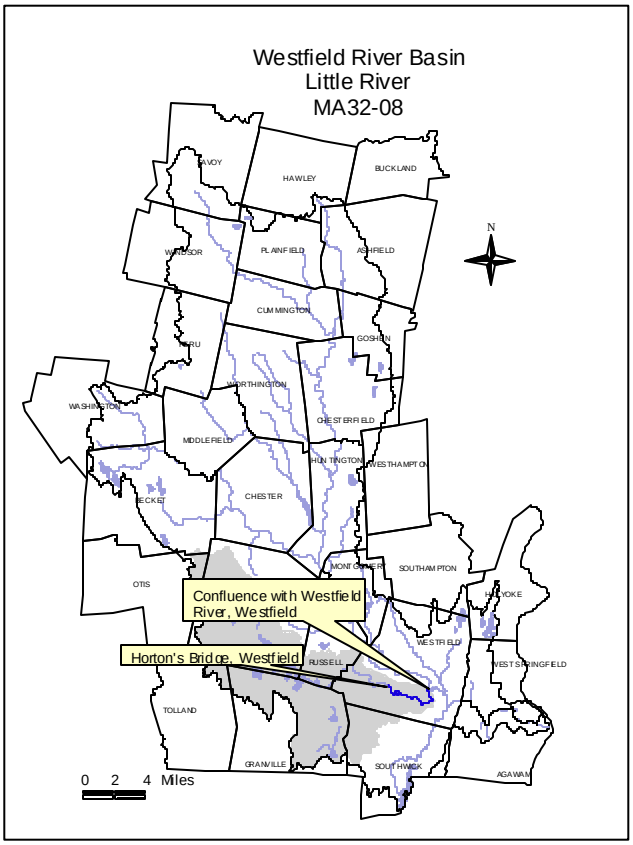
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |

**RECOMMENDATIONS DICKINSON BROOK (MA32-34)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses.
- Continued biological monitoring is recommended in order to assess the *Aquatic Life Use*.
- Dickinson Brook should be listed in the next revision of the Massachusetts Surface Water Quality Standards as a cold water fishery.

## LITTLE RIVER (SEGMENT MA32-08)

Location: Horton's Bridge, Westfield, to confluence with the Westfield River, Westfield.
Segment Length: 5.4 miles
Classification: Class B, Warm Water Fishery, CSO




The drainage area of this segment is approximately 85 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 80%
Residential ..... 7%
Agriculture..... 5%

The impervious cover area for the individual sub-basins located in this segment is 2.9%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

The Little River is dammed just downstream from Horton's Bridge in Westfield. From there the river continues flowing southeast around Wolfpit Meadows where it encounters another dam forming Crane Pond in the urbanized area of Westfield. The river then flows into a large flood plain and meanders northward through an industrial area to its confluence with the Westfield River in Westfield.

No CSOs are permitted for the city of Westfield (Boisjolie 2004a).

Based on the last evaluation of water quality conditions this segment of the Little River is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

**WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)**

| Facility | WMA Permit Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Old Farm Golf Club, LLC | 9P10427902 | Lake A<br>Lake D<br>Well # 2<br>Well # 4 | 0.15 |

**NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)**

The City of Westfield is permitted (NPDES permit MAG640001 issued November 2001) to discharge effluent from the water treatment facility (near Sackett Reservoir on Reservoir Road) in Southwick and discharge up to <1 MGD to Jack's Brook, a tributary to this segment of the Little River.

The Stevens Paper Mills, Inc., Lower Mills (MA0004693), located on Mill Street in Westfield, is no longer in operation.

Columbia Manufacturing Company (Cycle Street) Westfield was permitted (MA0001571) to discharge to the Little River, but the facility tied into the Westfield WWTP in 1993. The company is no longer in operation although a permit (MAR05C251) to discharge stormwater was issued 5 May 2001 and is still active.

Westfield and Southwick are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003/2004 and are authorized to discharge stormwater from the municipal drainage systems (MAR041236 and MAR041022, respectively). Over the five-year permit term the communities will develop, implement and enforce stormwater management programs to reduce the discharge of pollutants from their storm sewer systems to protect water quality (Domizio 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 in one reach of this segment of the Little River - approximately 90 m upstream from the Route 20 overpass near the confluence with the Westfield River in Westfield - in the summer of 1996 (Station LR01). Habitat quality conditions at this location are described in detail in Appendix C.

Biology

In July 2001 MDFW conducted backpack electrofishing in one reach of this segment of the Little River near Hundred Acres Road/South Meadow Road in Westfield (Station 517, Richards 2003). Eleven fish species collected, in order of abundance, were blacknose dace, longnosed dace, white sucker, tessellated darter, American eel, common shiner, brown trout, brook trout, fallfish, yellow perch, and one slimy sculpin. Multiple age classes of brown trout were collected, however the sample was dominated by tolerant and moderately tolerant species.

A benthic macroinvertebrate and habitat survey was performed by DWM biologists in the summer of 1996 in one reach of this segment of the Little River - approximately 90 m upstream from the Route 20 overpass near the confluence with the Westfield River in Westfield - in the summer of 1996 (Station LR01). Results of the RBP II analyses are provided in detail in Appendix C.

Chemistry – water

DWM collected *in-situ* measurements from a station on the Little River (Station LITR00.1) approximately 100 feet upstream from Route 20 bridge, Westfield) between 1 August and 3 October 2001 (n=4). Parameters measured were dissolved oxygen, pH, temperature, conductivity, and total dissolved solids. Grab samples were also collected and analyzed for alkalinity, hardness, chloride, and suspended solids (n=4) (Appendices B and C of Appendix A).

*DO*

The instream DO measured by DWM on the Little River (Station LITR00.1) ranged from 7.9 to 10.2 mg/L (89% to 94% saturation) (Appendix 2 of Appendix A).

*Temperature*

Temperatures recorded by DWM ranged from 12.7°C to 22.5°C.

*pH*

pH measurements recorded by DWM ranged from 7.0 SU to 7.2 SU.

*Conductivity*

Conductivity reported by DWM ranged from 120 µS/cm to 149 µS/cm.

*Solids*

Total suspended solid concentrations reported by DWM ranged from <1.0 to 1.5 mg/L (Appendix 3 of Appendix A)

*Alkalinity*

The alkalinity reported by DWM ranged from 19 to 22 mg/L.

*Hardness*

Hardness values reported by DWM ranged from 17 to 22 mg/L.

*Chloride*

Chloride concentrations reported by DWM ranged from 29 to 35 mg/L.

The *Aquatic Life Use* is assessed as support for this segment of the Little River based on the fish population information, the limited water quality information and best professional judgment. Although there is a diverse assemblage of stream fishes, the samples were dominated by species tolerant to both enrichment and habitat degradation (blacknose dace.

***FISH CONSUMPTION***

Fish were collected by MA DEP and MDFW personnel from two reaches in this segment of the Little River in October 1990 - downstream from the dam by Horton's Bridge and upstream from the Railroad Bridge in Westfield (Maietta 1993). Brown trout from the upstream reach and brown trout, eastern brook trout and white suckers from the downstream reach were analyzed for selected metals (including mercury), PCB, and other pesticides. The results of this survey did not indicate a problem, nor did MA DPH issue any advisories with respect to fish consumption (Maietta 1993).

Because no site-specific fish consumption advisory was issued by MA DPH for this segment of the Westfield River the *Fish Consumption Use* is not assessed.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from the Little River approximately 100 feet upstream from Route 20 bridge, Westfield (Station LITR00.1) between 1 August and 3 October 2001 (N=4). Counts ranged from 200 to 670 cfu/100 ml and three of the four counts were >200 cfu/100 ml. Field survey crews did not note any objectionable odors or objectionable deposits other than a very limited amount of trash and debris (MA DEP 2001b).

ESS collected fecal coliform samples from the Little River at the Route 20 bridge (also known as East Main Street), Westfield (ESS Station PS-02) on 28 December 1999. The count was 60 cfu/100 ml (ESS 2000).

ESS, 2000) also collected fecal coliform samples from two tributaries to this segment of the Little River on 3 November 1999 - Ashley Brook at Hillside Road Bridge, Westfield (Station SS-29) on 3 November, 1999 and Jacks Brook at Sackett Road bridge, Westfield (Station SS-30). The counts were 900 and 600 cfu/100 mls, respectively.

DWM collected fecal coliform bacteria samples upstream from an outfall at the end of South Street (Station LITR00.2) as well as from the outfall itself (Station LITRPIPE) between May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4). Fecal coliform bacteria counts were elevated in the outfall.

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

Little River (MA32-08) Use Summary Table

| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | IMPAIRED<br>Cause: Fecal coliform bacteria<br>Source: Unknown<br>(Suspected Sources: Storm drains and Runoff) |
| Secondary Contact |  | SUPPORT |
| Aesthetics |  | SUPPORT |

**RECOMMENDATIONS LITTLE RIVER (MA32-08)**

- Continue to conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Westfield's Phase II stormwater management permit and program.

- Continued biological monitoring is recommended to assess the status of the *Aquatic Life Use*.

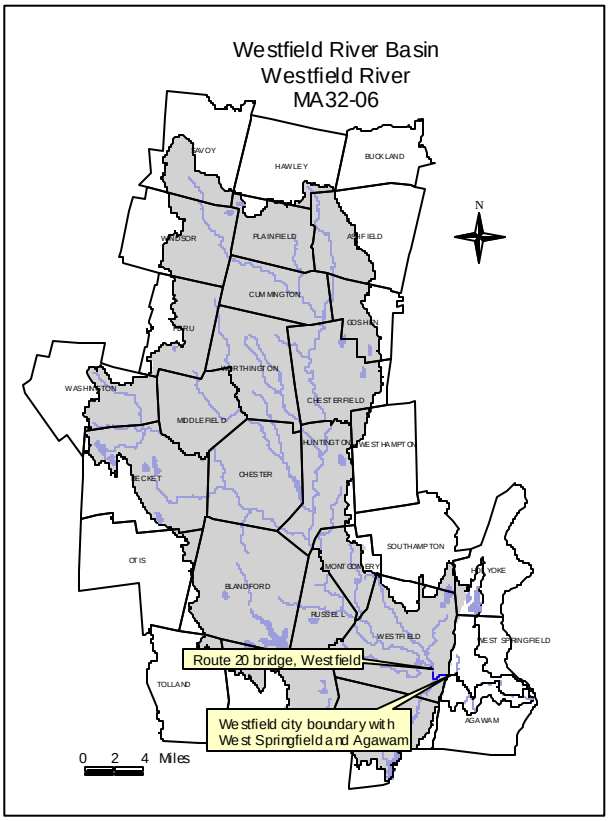
- Although not proposed as a cold water fisheries resource by MDFW, the Little River should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.

- The CSO designation for this segment of the Little River should be removed in the next revision of the Massachusetts Surface Water Quality Standards.

- Review the Westfield (MAR041236) and Southwick (MAR041022) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## WESTFIELD RIVER (SEGMENT MA32-06)

Location: Route 20 bridge, Westfield, to Westfield city boundary with West Springfield and Agawam.
Segment Length: 1.9 miles
Classification: Class B, Warm Water Fishery, CSO




The drainage area of this segment is approximately 497 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 81%
- Residential ... 7%
- Agriculture .... 6%

The impervious cover area for the individual sub-basins located in this segment is 2.7%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

From the Route 20 bridge in Westfield the Westfield River continues to meander to the southeast through an industrial area and then loops to the northeast where it crosses the city of Westfield municipal boundary and this segment ends. CSOs in West Springfield and Agawam to Westfield River have been eliminated (Boisjolie 2004a).

Based on the last evaluation of water quality conditions this segment of the Westfield River is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). The segment was not assessed for any uses.

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

The Western Massachusetts Hospital, which discharged into a small unnamed brook that flows a short distance to the Westfield River, was last issued a minor NPDES permit (MA0102270) on 18 September 1988. Current information from the MA DEP Western Regional office indicates that a NPDES permit is no longer required since the discharge was eliminated between 1997 and 1998 when the facility tied into the Westfield WWTP (Boisjolie 2004a).

Renaissance Manor (formerly known as the Valley View Nursing Home), Feeding Hills Road, in Westfield is currently under an Administrative Consent Order (ACO) until a NPDES permit is issued (Nietupski 2004a). The facility discharges approximately 0.01 MGD of treated wastewater to the Westfield River. The wastewater receives secondary treatment and is chlorinated prior to discharge.

Westfield is a Phase II Stormwater community. The City was issued a stormwater general permit from EPA and MA DEP in 2003 and is authorized to discharge stormwater from the municipal drainage system (MAR041236). Over the five-year permit term the City will develop, implement and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

The USGS gage 01183500 is located in this segment of the Westfield River. The USGS remarks for this gage indicate that flow is regulated by several factors including: Borden Brook Reservoir, Cobble Mountain Reservoir, Knightville Reservoir and Littleville Lake, and diversion from Little River for municipal supply of Springfield (Socolow *et al*. 2003). The estimated 7Q10 flow for this gage is 69.5 cfs (USGS 2002). Evidence of regulation is observed using real-time USGS gaging data available on-line (USGS 2004).

Biology

MDFW regularly stocks trout in this segment of the Westfield River.

Chemistry – water

The USGS, as part of their National Water Quality Assessment Program (NAWQA) Connecticut, Housatonic, and Thames River Basins Study Unit, conducted sampling on 27 June 1994 at a site on the Westfield River approximately 0.7 miles downstream from the confluence with Great Brook, on the north side of the river just off Route 20 (Zimmerman 1999). Most pesticide compounds (2,4-D Alachlor, Atrazine, Carbaryl, Chorpyrifos, Cyanazine, Dichlorprop, Ethyl- Abazine, S-ethyl dipropylthiocarbamate (EPTC), Malathion, Metrribuzin, Prometon, and Propargile) tested below minimum detection limits. Other pesticides were detected (Atrazine 0.017 ug/l, Dimethyl tetrachloroterephthalate (DCPA) 0.002 ug/l, Diazinon 0.006 ug/l, Metolachlor 0.007 ug/l, and Simazine 0.010 mg/l). USGS indicates that three of these are herbicides (Atrazine, Metolachlor, Simazine) are most frequently detected downstream from agricultural activities. None of the pesticides detected at the Westfield River sampling station were in concentrations that exceeded the USEPA's maximum contaminant level or health advisory limit for the particular compound. No other NAWQA program activities, including sediment or fish tissue sampling, occurred in the Westfield River Watershed during the 1990's to the present time.

Too limited data are available for this segment of the Westfield River, so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status, however, because of the evidence of alterations in normal streamflow conditions.

Westfield River (MA32-06) 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 WESTFIELD RIVER (MA32-06)**

- There are currently no known CSO discharges to this segment of the Westfield River. Therefore, during the next revision of the Massachusetts Surface Water Quality Standards the CSO designation should be removed.

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Westfield's Phase II stormwater management permit and program. It should also be noted that a high bacteria count was documented on the small tributary to this segment of the Westfield River near the USGS gaging station.

- Biological monitoring is recommended to assess the status of the *Aquatic Life Use*.

- Further investigate source(s) of aberrant streamflow fluctuations observed using on-line real-time data for the USGS gage 01183500. Ideally, a natural flow regime should be restored in the Westfield River.

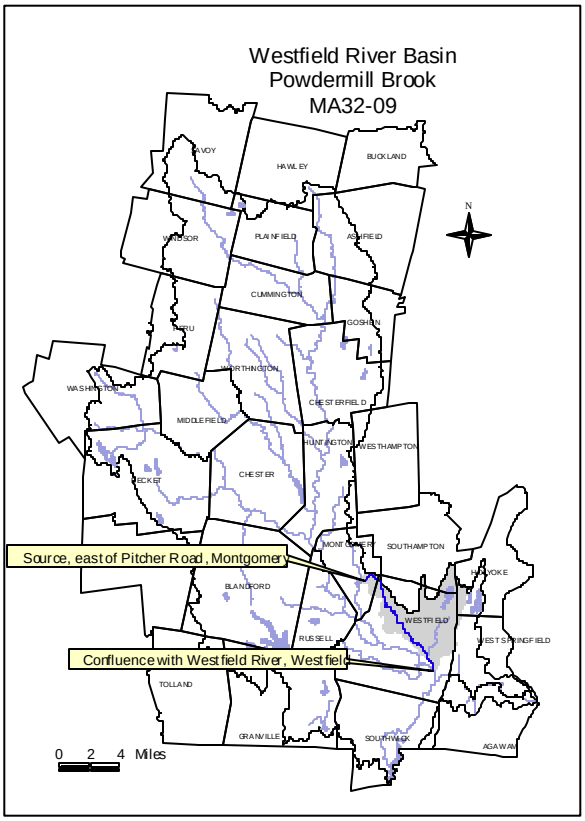
- To ensure run-of-river operations all dam operators should install, calibrate and maintain a continuous streamflow monitoring gage, or determine some other method to ensure compliance with run-of-river operations.

- Renaissance Manor NPDES permit should be issued with appropriate limits and monitoring requirements.

- Review City of Westfield (MAR041236) Phase II Stormwater SWPPP, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## POWDERMILL BROOK (SEGMENT MA32-09)

Location: Source, east of Pitcher Road, Montgomery, to confluence with the Westfield River, Westfield.
Segment Length: 9.5 miles
Classification: Class B




The drainage area of this segment is approximately 19 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 81%
Residential ..... 7%
Agriculture..... 6%

The impervious cover area for the individual sub-basins located in this segment is 2.7%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Powdermill Brook begins north of Ball Mountain in Montgomery. It flows in a general southeast direction towards the city of Westfield, paralleling Montgomery Road through the villages of West Farms and Wyben. The brook turns more easterly and flows under the Massachusetts Turnpike near the Westfield Interchange into an unnamed pond from which it exits meandering to the southeast crossing under Routes 202 and 10. Powdermill Brook then travels through a fairly straight reach along the edge of the Westfield River floodplain, passes a sand and gravel pit, and then parallels railroad tracks. The brook crosses under Route 20 and flows by Frog Hole before its confluence with the Westfield River in Westfield.

Based on the last evaluation of water quality conditions Powdermill Brook is listed in Category 5 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired by several pollutants (siltation, pathogens, suspended solids, turbidity) and will require TMDLs for these pollutants.

MDFW has proposed that Powdermill Brook be listed in the SWQS as a cold water fishery (MDFW 2003).

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

Micro Abrasives Inc. was permitted (MA0002224) to discharge into Arm Brook, a tributary to Powdermill Brook. The facility connected to the wastewater treatment plant and the permit was terminated in March 1999.

Westfield is a Phase II Stormwater community. The City was issued a stormwater general permit from EPA and MA DEP in 2003 and is authorized to discharge stormwater from the municipal drainage system (MAR041236). Over the five-year permit term the City will develop, implement and enforce a stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

### USE ASSESSMENT

#### *AQUATIC LIFE*

Habitat and Flow

As part of the 2001 DWM Westfield River Watershed benthic macroinvertebrate survey, a habitat survey was performed in Powdermill Brook downstream from I-90 behind the Westfield High School

in Westfield (Station PB00, Appendix B). The habitat score at Station PB00 was 138 out of a possible 200. Sediment deposition and embeddedness were major determinants of the low habitat score although bank instability and degradation related to reduced baseflow conditions also contributed to the low score (Appendix B). During field reconnaissance of Powdermill Brook severe habitat quality degradation was observed in Powdermill Brook downstream from the small unnamed impoundment to the confluence with the Westfield River (Fiorentino 2004b).

Biology

MDFW regularly stocks trout in Powdermill Brook.

In September 2001 DWM conducted a modified Rapid Bioassessment Protocol III (RBP III) benthic macroinvertebrate survey in Powdermill Brook downstream from I-90 behind the Westfield High School in Westfield (Station PB00). The RPB III analysis of the benthic macroinvertebrate community indicated slightly impacted conditions compared to the reference station on Yokum Brook near Route 8 in Becket (Station YB01A, Appendix B). The fish community in this reach was comprised of four species including, in order of abundance, slimy sculpin, eastern brook trout, brown trout, and a largemouth bass. Multiple age classes of eastern brook trout and brown trout were included in the sample. The presence of slimy sculpin and reproducing brook trout are indicative of high quality cold water. The yellow-green alga *Vaucheria* sp. was very abundant in the periphyton sample collected in the partially-canopied riffle zone in the brook (Station PB00, Appendix D). Approximately 40% of the substrates were observed to have algal growth in the reach sampled. It is the opinion of DWM biologists that, while water quality factors cannot be completely ruled out, sediment inputs responsible for the instream habitat degradation compromise biological potential in Powdermill Brook, at least for resident macroinvertebrate populations.

In July 2001 MDFW conducted backpack electrofishing further downstream in Powdermill Brook near Sandy Hill Road Bridge in Westfield (Station 562, Richards 2003). Five fish species collected, in order of abundance, were blacknose dace, brown trout, tessellated darter, white sucker, and one American eel. The fish community at this location was dominated by tolerant species and the total fish numbers were low including brown trout (n=3).

Chemistry – water

DWM collected *in-situ* measurements from two stations on Powdermill Brook - Station PDMB03.8 at Russellville Road in Westfield and Station PDMB00.1 downstream from the Union Street culvert, Westfield - between 1 August and 3 October 2001 (n=4). Parameters regularly measured at both stations were dissolved oxygen, pH, temperature, conductivity, and total dissolved solids (Appendix 2 of Appendix A). Grab samples were collected and analyzed for alkalinity, hardness, chloride, suspended solids while ammonia-nitrogen, nitrate nitrogen, total phosphorus samples were collected only at the upstream sampling location (Appendix 3 of Appendix A).

*DO*

The instream DO measured by DWM on Powdermill Brook at Station PDMB03.8 ranged from 6.1 to 10.6 mg/L (61% to 94% saturation) and at Station PDMB00.1 ranged from 9.1 to 9.9 mg/L (90% to 102% saturation).

*Temperature*

Temperatures recorded by DWM at Station PDMB03.8 ranged from 11.0 to 18.9°C, at Station PDMB00.1 ranged from 11.9 to 18.4°C

*pH*

pH measurements reported by DWM at Station PDMB03.8 ranged from 6.6 to 6.9 SU and at Station PDMB00.1 ranged from 7.3 to 7.8 SU.

*Conductivity*

Conductivity reported by DWM at Station PDMB03.8 ranged from 133 to 175 µS/cm and at Station PDMB00.1 ranged from 283 to 311 µS/cm.

*Solids*
Total suspended solid concentrations reported by DWM at Station PDMB03.8 ranged from <1.0 to 14 mg/L and at Station PDMB00.1 ranged from <1.0 to 2.3 mg/L.

*Alkalinity*
The alkalinity reported by DWM at Station PDMB03.8 ranged from 19 to 35 mg/L and at Station PDMB00.1 ranged from 43 to 51 mg/L.

*Hardness*
Hardness values reported by DWM at Station PDMB03.8 ranged from 15 to 18 mg/L and at Station PDMB00.1 ranged from 41 to 56 mg/L.

*Chloride*
Chloride concentrations reported by DWM at Station PDMB03.8 ranged from 30 to 36 mg/L and at Station PDMB00.1 ranged from 75 to 81 mg/L.

*Ammonia-Nitrogen (as N)*
Ammonia-nitrogen concentrations reported by DWM at Station PDMB03.8 were below minimum detection limits. No samples were collected at the downstream location.

*Total Phosphorus (as P)*
Total phosphorus concentrations reported by DWM at Station PDMB03.8 ranged between 0.016 and 0.021 mg/L. No samples were collected at the downstream location.

The *Aquatic Life Use* is assessed as support for the upper 6.1 miles of Powdermill Brook (upstream from the small unnamed impoundment behind the Westfield High School in Westfield) based primarily on the benthic macroinvertebrate community analysis, the fish population information and best professional judgment of DWM biologists. The *Aquatic Life Use* is assessed as impaired for the 3.4 mile reach downstream from the small impoundment to the confluence with the Westfield River because of severe habitat quality degradation, reduced overall fish abundance, and the shift in the fish community structure (dominated by pollution tolerant species).

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM collected fecal coliform bacteria samples from Powdermill Brook near Russellville Road in Westfield (Station PDMB03.8) between 1 August and 3 October 2001 (n=4). The fecal coliform bacteria counts ranged from 10 to 52 cfu/100 ml. Field survey crews did not note any objectionable odors or objectionable deposits other than a very limited amount of trash and debris (MA DEP 2001b).

No objectionable odors, oils, or turbidity were observed by MA DEP DWM biologists in Powdermill Brook downstream from Interstate 90, behind Westfield High School in Westfield, in September 2001(MA DEP 2001c). However, it should be noted that trash was scattered throughout the reach and especially concentrated along the steep left (south) bank in the form of scrap metal and a mostly intact automobile. Filamentous algae (*Vaucheria* sp.) and dense beds waterwort (*Elodea* sp.) were also observed covering approximately 40% of the streambed of the reach sampled (MA DEP 2001c). The yellow-green filamentous alga responds to enriched nutrient conditions (Appendix D). During field reconnaissance of Powdermill Brook in June 2001 construction activities, failing stormwater pollution controls, disturbances in the riparian zone and other activities all contributed to instream turbidity and excessive instream sedimentation in the lower 3.3 mile reach of the brook (downstream from the small unnamed impoundment).

ESS collected fecal coliform bacteria samples from two locations along the lower portion of Powdermill Brook in 1999. The locations and results are as follows (ESS 2000).

- Conrail bridge, Westfield (Station SS-40), on 3 November: 1,500 cfu/100 ml
- East Main Street bridge near Union Street (Station PS-3), on 28 December: <10 cfu/100 ml.

DWM collected fecal coliform bacteria samples from Powdermill Brook downstream from culvert at Union Street in Westfield (Station PDMB00.1) between 1 August and 3 October 2001 (N=4). Sample results for fecal coliform ranged from 57 to 140 cfu/100 mls. No objectionable odors were noted by

the field sampling crews, but the water column was described as slightly turbid during three of the four sampling events (MA DEP 2001b). Trash and debris were also present.

DWM collected fecal coliform bacteria samples from two locations on Powdermill Brook in May and August 1996 - near Russellville Road, Westfield (Station PDMB03.8) and at Union Street, Westfield (Station PDMB01.1) - as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

The *Primary* and *Secondary Contact Recreational* and *Aesthetic* uses are assessed as support for the upper 6.1-mile reach of Powdermill Brook (upstream from the small unnamed impoundment behind the Westfield High School in Westfield) based on the limited fecal coliform bacteria data and the generally good aesthetic quality, although these uses are identified with an Alert Status because of anthropogenic debris (mostly along the banks) and the presence of some filamentous instream algae. The *Recreational* and *Aesthetic* uses are assessed as impaired, however, for the lower 3.4-mile reach because of instream turbidity and severe sedimentation, and nuisance growths of algae/macrophytes.

Powdermill Brook (MA32-09) Use Summary Table

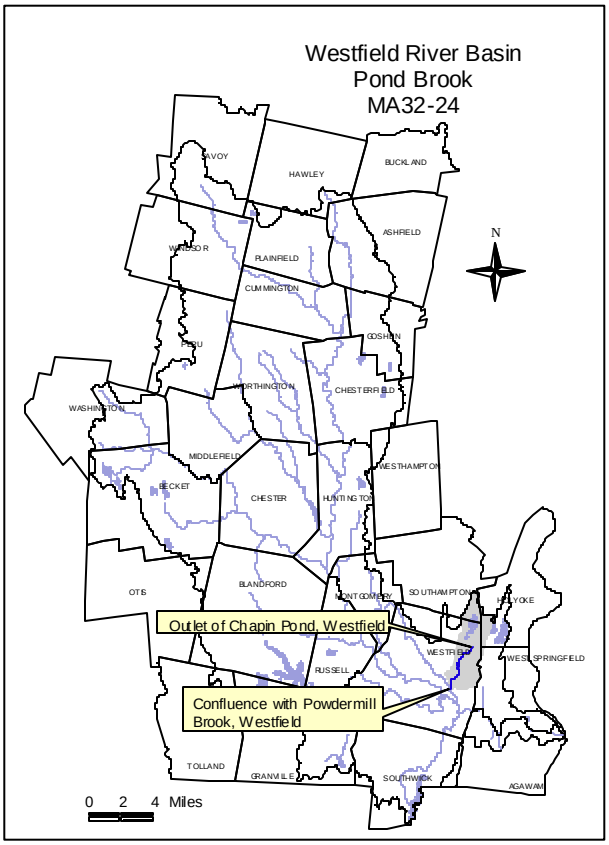
| Designated Uses | | Status |
|---|---|---|
| Aquatic Life |  | SUPPORT upper 6.1 miles<br>IMPAIRED lower 3.4 miles<br>Cause: Sedimentation/siltation<br>Sources: Land development, Streambank modification/destabilization, and Post-development erosion and sedimentation<br>(Suspected sources: Construction road runoff, Road runoff, and Sand and gravel operations) |
| Fish Consumption |  | NOT ASSESSED |
| Primary Contact |  | SUPPORT upper 6.1 miles<br>IMPAIRED lower 3.4 miles<br>Causes: Sedimentation/siltation, Turbidity, Excess algal growth<br>Sources: Land development, Streambank modification/destabilization, and Post-development erosion and sedimentation<br>(Suspected sources: Construction road runoff, Road runoff, and Sand and gravel operations) |
| Secondary Contact |  | |
| Aesthetics |  | |

**RECOMMENDATIONS POWDERMILL BROOK (MA32-09)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Westfield's Phase II stormwater management permit and program.
- Conduct more thorough habitat evaluations in Powdermill Brook and identify sites where stormwater pollution prevention plans should be developed and implemented or enforced to protect and restore instream habitat quality in the brook.
- Continue to conduct biological monitoring (benthic macroinvertebrate and fish population) to document changes resulting from nonpoint source pollution controls in Powdermill Brook.
- Excerpted from MA DEP's 2001 biological monitoring technical memorandum:
  - Potential sources of sediment loadings are numerous and include highway (I-90) runoff, a sand and gravel operation adjacent to the right (north) bank of the PB00 reach, and agricultural (livestock) runoff (streambank erosion and inadequate riparian buffer) at the Russellville Road crossing about 1.5 km upstream. An investigation into the need for BMPs at these or other potential nonpoint sources is strongly recommended.
  - A stream clean-up to improve the aesthetics of Powdermill Brook. This includes removal of the abandoned automobile located on the steep right bank of the PB00 sampling reach.
- Review City of Westfield Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## POND BROOK (SEGMENT MA32-24)

Location: Outlet of Chapin Pond to confluence with Powdermill Brook, Westfield.
Segment Length: 3.9 miles
Classification: Class B




The drainage area of this segment is approximately 9 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Forest ..... 52%
- Residential ..... 22%
- Open Land ..... 7%

The impervious cover area for the individual sub-basins located in this segment is 9.1%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Pond Brook begins at the outlet of Chapin Pond in Westfield and flows southwest. The brook soon enters a small, unnamed impoundment and continues to the southwest flowing close to Barnes Municipal Airport. The brook enters a wetland and another small impoundment and from there flows under the Mass Pike, where it is joined by Bush Brook. Pond Brook then flows through Springdale Pond and continues to its confluence with Powdermill Brook in Westfield.

Based on the last evaluation of water quality conditions Pond Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed Pond Brook and its tributary Bush Brook be listed in the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Holyoke Water Works | 10413701 | Driven Wells, 13701G | 1.01* |
| Westfield Water Department | 10432901 | Well#1, 329-01G<br>Well#7, 329-07G<br>Well#8, 329-08G | 6.11* |

* indicates system-wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

Westfield, Holyoke, and Southampton are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003 and are authorized to discharge stormwater from the municipal drainage systems (MAR041236, MAR041011 and MAR041021, respectively). Over the five-year permit term the communities will develop, implement and enforce stormwater management programs to reduce the discharge of pollutants from their storm sewer systems to protect water quality (Domizio 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Biology

MDFW conducted backpack electrofishing in two reaches of Pond Brook - near the Eastern Mountain Country Club, Westfield (Station 521), in August 2001 and near the mouth of the brook near Union Street, Westfield (Station 492), in July 2001 (Richards 2003). Twelve fish species collected in the upstream reach, in order of abundance, were bluegill, blacknose dace, pumpkinseed, tessellated darter, white sucker, brook trout, largemouth bass, brown bullhead, and an individual each of American eel, chain pickerel, yellow bullhead, and yellow perch. Macrohabitat generalists and tolerant species dominated the fish community. Six species collected near the mouth of Pond Brook, in order of abundance, were blacknose dace, brown trout, brown bullhead, and an individual each of brook trout, slimy sculpin, and white sucker. Multiple age classes of brown trout were found.

The *Aquatic Life Use* is not assessed but is identified with an Alert Status because macrohabitat generalists and pollution tolerant species dominated the fish community at the upstream station. Although brown trout (multiple age classes), brook trout (n=1), and slimy sculpin (n=1) were present at the downstream location, the sample was still dominated by a pollution tolerant species (blacknose dace).

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

Environmental Sciences Services, Inc (ESS, 2000) collected fecal coliform samples on 30 September 1999 at two locations on Pond Brook - below the outlet to Horse Pond at Black Pond Road, Westfield (Station SS-11), and at Holyoke Road bridge, Westfield (Station SS-10). Both fecal coliform bacteria counts were elevated 1,200 and 1,400 cfu/100 ml at Stations SS-11 and SS-10, respectively.

DWM collected fecal coliform bacteria samples from Pond Brook at Union Street, Westfield (Station PNDB00.1), in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are currently available, so the *Primary* and *Secondary Contact Recreational* and *Aesthetics* uses are not assessed. The recreational uses are identified with an "Alert Status", however, because of a few high counts.

Pond Brook (MA32-24) Use Summary Table

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

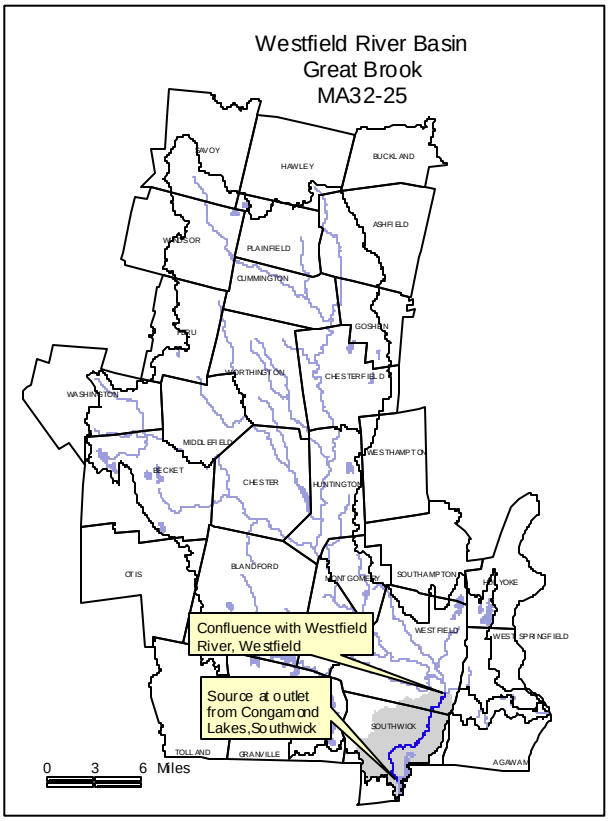
*Alert Status issues identified, see details in use assessment section

**RECOMMENDATIONS POND BROOK (MA32-24)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Westfield's, Holyoke, and Southampton Phase II stormwater management permits and programs.
- Conduct additional biological monitoring (benthic macroinvertebrate and fish population) to document changes resulting from nonpoint source pollution controls in Pond Brook and to assess the status of the *Aquatic Life Use*.
- Pond Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Review municipalities of Westfield (MAR041236), Holyoke (MAR041011), and Southampton (MAR041021) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## GREAT BROOK (SEGMENT MA32-25)

Location: Source at outlet of Congamond Lakes in Southwick to confluence with Westfield River, Westfield.
Segment Length: 10.7 miles
Classification: Class B




The drainage area of this segment is approximately 22 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 44%
Residential ..... 21%
Agriculture..... 20%

The impervious cover area for the individual sub-basins located in this segment is 5.4%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Great Brook begins at the outlet on the southwest end of Middle Congamond Lake in Southwick. The brook flows northwest through a wetland and then meanders through a floodplain looping around the north end of the Congamond lakes and flowing east through the center of Southwick. The brook then turns northeast meandering through wetlands and near residential developments to its confluence with the Westfield River in Westfield.

Based on the last evaluation of water quality conditions Great Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

MDFW has proposed that Great Brook and its tributary Johnson Brook be listed in the SWQS as cold water fisheries (MDFW 2003).

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility Name | WMA Permit Number | WMA Registration Number | Source(s) | Authorized Withdrawal (MGD) |
|---|---|---|---|---|
| Southwick Water Department | 9P10427901 | 10427905 | Well #1, Great Brook | 0.45 (reg)<br>0.28 (per)<br>0.73 total |
| West Springfield Water Department | 9P10432501 | 10432503 | Well #1, 13250000-01G<br>Well #2, 13250000-02G<br>Well #3, 13250000-03G<br>Well #4, 13250000-04G | 3.89 (reg)<br>2.82 (per)<br>6.71 total* |
| Westfield Water Department | -- | 10432901 | Well #3, 329-03G<br>Well #4, 329-04G | 6.11* |

* indicates system-wide withdrawal; all sources are not within this segment

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

Westfield and Southwick are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003/2004 and are authorized to discharge stormwater from the municipal drainage systems (MAR041236 and MAR041022, respectively). Over the five-year permit term the communities will develop, implement and enforce stormwater management programs to reduce the discharge of pollutants from their storm sewer systems to protect water quality (Domizio 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Biology

MDFW regularly stocks trout in Great Brook.

In July 2001 MDFW conducted backpack electrofishing in two reaches of Great Brook - upstream from the Route 57 Bridge in Southwick (Station 564) and near the Shaker Road Bridge in Westfield (Station 328, Richards 2003). In the upstream reach five fish species collected, in order of abundance, were brown trout, blacknose dace, white sucker, brook trout, and one bluegill. Multiple age classes of brown trout were found. Further downstream eight species collected, in order of abundance, were brown trout, blacknose dace, brook trout, tessellated darter, white sucker, American eel, bluegill, and longnosed dace. Multiple age classes of brown trout and brook trout were found. With the exception of bluegill and American eel these species are all fluvial specialists/dependants.

Chemistry – water

DWM collected *in-situ* measurements and water quality samples from one station on Great Brook ~ 250 feet upstream from Route 187 bridge, Westfield (Station GRTB00.3), between 1 August and 3 October 2001 (n=4). *In-situ* parameters measured included dissolved oxygen, pH, temperature, conductivity, and total dissolved solids (Appendix 2 of Appendix A). Grab samples were collected and analyzed for alkalinity, hardness, chloride, and total suspended solids (Appendix 3 of Appendix A).

*DO*

The instream DO measured by DWM in Great Brook (Station GRTB00.3) ranged from 7.5 to 9.0 mg/L (74 to 81% saturation)

*Temperature*

Temperatures recorded by DWM ranged from 11.0 to 17.5°C.

*pH*

pH measurements recorded by DWM ranged from 7.1 to 7.2 SU.

*Conductivity*

Conductivity reported by DWM ranged from 224 to 230 µS/cm.

*Solids*

Total suspended solid concentrations reported by DWM ranged from <1.0 to 4.4 mg/L.

*Alkalinity*

The alkalinity reported by DWM ranged from 23 to 25 mg/L.

*Hardness*

Hardness values reported by DWM ranged from 53 to 55 mg/L.

*Chloride*

Chloride concentrations reported by DWM ranged from 73 to 82 mg/L.

The *Aquatic Life Use* for Great Brook is assessed as support based primarily on the fish population information, the water quality data, and best professional judgment. The presence of two intolerant species (brown trout and brook trout) is indicative of excellent water and habitat quality.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

ESS collected fecal coliform bacteria samples from four locations on Great Brook in 1999. The stations and results can be summarized as follows (ESS 2000).

- Outlet of Congamond Lake at Sheep Pasture Road, Southwick (Station SS-23), on 3 November: <10 cfu/100 mls,
- South Longyard Road, Southwick (Station SS-22), on 3 November: 1,700 cfu/100 mls,
- Feeding Hills Road, Southwick (Station SS-21), on 3 November: 1,800 cfu/100 mls,
- Little River Road/Feeding Hills Road bridge in Westfield (Station PS-4), on 28 December: 30 cfu/100 ml

DWM collected fecal coliform bacteria samples from Great Brook near the Route 187 bridge, Westfield (Station GRTB00.3) between 1 August and 3 October 2001 (n=4). Sample results for fecal coliform ranged from 33 to 130 cfu/100 ml (Appendix 3 of Appendix A). No trash, debris or other objectionable deposits were noted by the field survey crews (MA DEP 2001b). Occasional septic odors were noted however.

ESS also collected fecal coliform bacteria samples from three tributaries to Great Brook in 1999. The stations and results can be summarized as follows (ESS 2000).

- Pearl Brook near Route 202/10, Southwick (Station SS-45), on 28 December: 20 cfu/100 ml.
- Johnson Brook at Route 202/10, Southwick (Station SS-44), on 28 December: 30 cfu/100 ml.
- unnamed tributary at Route 202/10 (slightly south of Route 57), Southwick (Station SS-46), on 28 December: 60 cfu/100 ml.

It should also be noted that DWM collected fecal coliform bacteria samples from three stations (as described below) along Great Brook in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

- near Sheep Pasture Road in Southwick (Station GRTB08.6)
- near Route 57 in Southwick (Station GRTB03.1)
- Little River Road, Westfield (Station GRTB00.3)

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for Great Brook based on the generally low fecal coliform bacteria counts for the brook. The recreational uses are identified with an "Alert Status", however, because of the two high bacteria counts documented in the brook near Longyard Road and Feeding Hills Road in 1999. Although no objectionable deposits were noted, too limited data are available, so the *Aesthetics Use* is currently not assessed.

Great Brook (MA32-25) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact* | Secondary Contact* | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | SUPPORT | SUPPORT | NOT ASSESSED |

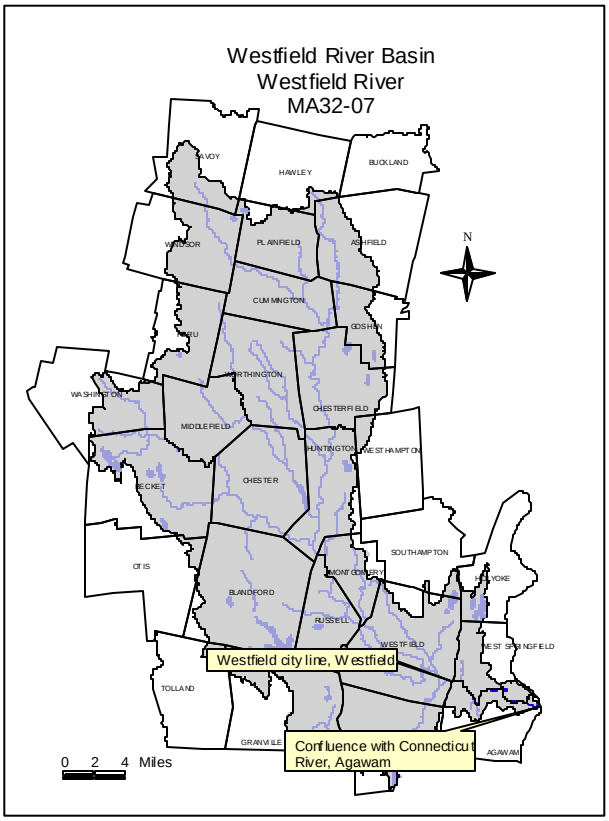
*Alert Status issues identified, see details in use assessment section

**RECOMMENDATIONS GREAT BROOK (MA32-25)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Westfield's and the Town of Southwick's Phase II stormwater management permits and programs.
- Conduct additional biological monitoring to assess the status of the *Aquatic Life Use*.
- Great Brook should be listed in the next revision of the Massachusetts Surface Water Quality Standards as a cold water fishery.
- Review municipalities of Westfield (MAR041236), and Southwick (MAR041022) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## WESTFIELD RIVER (SEGMENT MA32-07)

Location: Westfield/ West Springfield/Agawam city line to confluence with Connecticut River, Agawam.
Segment Length: 8.5 miles
Classification: Class B, Warm Water Fishery, CSO




The drainage area of this segment is approximately 516 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 80%
Residential ..... 7%
Agriculture..... 6%

The impervious cover area for the individual sub-basins located in this segment is 3.2%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

From the Westfield city boundary with West Springfield and Agawam the Westfield River meanders in an easterly, then southeasterly, then northeasterly direction through a narrow floodplain with steep banks (this passing through Robinson State Park). The River then flows easterly by an industrial area (West Springfield side) and township of North Agawam (Agawam side), splits around an oxbow, flows southeasterly under the Route 147 bridge and continues easterly by the Eastern States Exposition Grounds (West Springfield side). The River continues east through a series of former oxbows on both sides, flows under Route 5, and reaches its confluence with the Connecticut River.

Based on the last evaluation of water quality conditions this segment of the Westfield River is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). The segment was not assessed for any uses.

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Registration Number | Sources | Authorized Withdrawal (MGD) |
|---|---|---|---|
| Southworth Company | 10432501 | Westfield River | 0.15 |
| DSI- West Springfield | 10432502 | Westfield River- Canal | 0.11 |

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLES H2 AND H3)

Fiber Mark DSI (formerly Decorative Specialties International, Inc. and Rexam DSI), located at Front Street, West Springfield, is authorized to discharge < 1 MGD of non–contact cooling water via outfall #001 to the Westfield River (NPDES permit # MAG250966 issued July 2001). The individual permit (#MA0032492 issued to DSI in August 1992 and modified in 1994) was terminated in January 1999 when the facility received coverage under the general permit. Fiber Mark notified the MA DEP that production at the facility stopped and the discharge was ceased until further notice in June 2002 (Rose 2002).

The Town of Agawam had an NDPES permit (MA0101320) issued September 1995 to discharge combined sewer from eight pipes into the Westfield River. These combined sewer overflows (CSO) outfalls (004, 005, 006, 007, 008, 009, 014 and 015) were located downstream from the DSI Facility in West Springfield. According to the MA DEP Western Regional Office CSO outfall 004 was eliminated in

May 1994, CSO outfalls #008 and 009 were eliminated in July 1999, CSO outfall #005 was eliminated in September 1999, and CSO outfalls # 006, 007, 014 and 015 were eliminated in April 2000 (Boisjolie 2004a and 2004b). The permit was terminated by EPA in September 2000.

The Town of West Springfield had an NPDES permit (MA0101389) issued September 1995 to discharge sanitary sewer and/or emergency bypass from three pump station outfalls to the Westfield River (outfall # 001 near Mittineague Park, 003 near Park Street, and 004 near Agawam Bridge). According to MA DEP WERO these outfalls were eliminated by 1999 (Boisjolie 2004a). The permit was terminated by EPA in September 2000.

The City of West Springfield and Town of Agawam are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003 and are authorized to discharge stormwater from their municipal drainage systems (MAR041024 and MAR041001, respectively). Over the five-year permit term these communities will develop, implement and enforce their stormwater management programs to reduce the discharge of pollutants from the storm sewer systems to protect water quality (Domizio 2004).

**FERC (APPENDIX H, TABLE H4)**

A & D Hydro, Inc. is licensed (transfer approved by FERC in May 2004) to operate the West Springfield FERC Project No. 2608. Prior license holders include FiberMark, FiberMark DSI, Inc. and Rexam DSI, Inc. The license was last issued on 24 October 1994. The total installed capacity is 1,400 kW (DSI, Inc. 1991). The project's powerhouse, power canal, head gate structure intake, and tail-race lie in the town of West Springfield. The dam for the project, known both as the West Springfield Dam and the Mittineague Dam, spans the river between the town of West Springfield and the town of Agawam. There are two Rodney Hunt-Biggs vertical Francis turbine generating units.

Unit. 1 has a rated hydraulic capacity of 400 cfs and can generate 900 kW
Unit. 2 has a rated hydraulic capacity of 222 cfs and can generate 500 kW

The generating unit capacities listed above are for each unit operating alone. If both units are operating together, flow limitations of the power canal and tailrace result in a maximum plant capacity of 1,200 kW (800 kW for No. 1 and 400 kW No. 2) (DSI, Inc. 1991). The power canal is 6 feet by 50 feet wide and extends approximately 2,610 feet.

It should also be noted that the Southworth Company was allowed to draw a maximum of 61 cfs (39.4 MGD) from the power canal at FERC Project No. 2608 through an intake along the south bank of the canal through a water right agreement for use in their plant operations (DSI, Inc. 1991). The unlicensed Southworth Company hydroelectric facility has not operated for the last ten years (Lak 2004).

**USE ASSESSMENT**

***AQUATIC LIFE***

Habitat and Flow

USGS gage 01183500 is located just upstream from this segment of the Westfield River. The USGS remarks for this gage indicate that flow is regulated by several factors including: Borden Brook Reservoir, Cobble Mountain Reservoir, Knightville Reservoir and Littleville Lake, and diversion from Little River for municipal supply of Springfield (Socolow *et al*. 2003). The estimated 7Q10 flow for this gage is 69.5 cfs (USGS 2002). Evidence of regulation at this stream gaging location can be observed using on-line real-time USGS gaging data (USGS 2004).

A & D Hydro, Inc. is licensed to operate the West Springfield FERC Project No. 2608. The project is supposed to operate in a strict run-of-river mode with inflows to the project impoundment passed instantaneously through the project works or over the dam. The project's bypass reach extends from the dam to the confluence with the project tailrace (approximately 0.5 river miles). The license requires that a continuous minimum instream flow of 125 cfs or inflow, whichever is less, from 1 April to 15 July and from 1 September to 31 October and 85 cfs or inflow, whichever is less, the remainder of the year be released into the Westfield River bypass reach (LoVullo 2001). The minimum flow requirement was violated from 21 September 2001 through 11 October 2001 when only approximately 65 cfs was released into the bypass reach (Taylor 2002). A new fishway, a denail type

ladder, was constructed at the Project in the fall of 1995. The fish ladder is designed to allow upstream passage of anadromous and resident fish and downstream passage for Atlantic salmon smolts, American shad and blueback herring (MCFWRU 2004). Eel passage at the fishway was also installed in 2002 (WRWA 2002 and Poggi 2001).

Biology

MDFW regularly stocks trout in the Westfield River.

American shad returns at Holyoke Dam have fluctuated greatly over the last 10 years (counts ranged between 170,000 and 370,000). Westfield River shad returns at DSI appear to be declining from 2001 through 2004 (Table 4). According to the anadromous fish management plan for the Westfield River male American shad mature one year earlier than females and return as virgin spawners at ages three, four or five while females return to spawn at ages four, five or six (Slater 2001). While the reason for a decline in the American shad spawning run is not specifically known, it is interesting to note that three years after a documented minimum flow violation at FERC Project No. 2608, coincident with the outmigration of juvenile shad (fall 2001), there was a substantial decrease in the Westfield River 2004 annual return of adult American shad.

Table 4. Counts of anadromous fish between 2000 and 2004 migrating through the fish passageway at the West Springfield DSI Dam on the Westfield River in West Springfield (USFWS 2004a and USFWS 2004b).

| Species | Anadromous Fish Management Plan (AFMP) goal for the Westfield River by 2010 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|
| American Shad | annual spawning run of 15,000 adult American shad | 3,558 | 4,720 | 2,762 | 1,729 | 913 |
| Atlantic Salmon | annual spawning population of 500 adult Atlantic salmon for natural production, sport fishing, and aesthetic purposes | 11 | 8 | 5 | 5 | 11 |
| Blueback Herring | annual spawning run of 15,000 adult Blueback herring | | 2 | 4 | 5 | 1 |
| Sea Lamprey | no GOAL stated | 2,040 | 2,345 | 3,638 | 361 | 1,171 |

In August 2001 MDFW conducted boat electrofishing in the Westfield River near the Route 5 Bridge in Agawam (Station 559, Richards 2003). Ten fish species collected, in order of abundance, were rock bass, red breast sunfish, white sucker, smallmouth bass, largemouth bass, sea lamprey, tessellated darter, black crappie, and an individual each of bluegill and common carp. Although the assemblage was dominated by macrohabitat generalists, this is consistent with deep, slow-moving habitats associated with larger river systems.

Chemistry – water

DWM collected *in-situ* measurements and water quality samples from one station on the Westfield River 260 feet upstream from Route 5 bridge, Agawam (Station WSFR00.2) between 1 August and 3 October 2001. *In-situ* parameters measured included dissolved oxygen, pH, temperature, conductivity and total dissolved solids (Appendix 2 of Appendix A). Grab samples were collected and analyzed for alkalinity, hardness, chloride, suspended solids (n=4) (Appendix 3 of Appendix A).

*DO*

The instream DO measured by DWM ranged from 6.3 to 9.7 mg/L (72% to 93% saturation)

*Temperature*

Temperatures recorded by DWM ranged from 14.3 to 23.7°C.

*pH*

pH measurements recorded by DWM ranged from 7.1 to 7.2 SU.

*Conductivity*

Conductivity reported by DWM ranged from 158 to 259µS/cm.

*Solids*

Total suspended solid concentrations were low ranging from <1.0 to 4.8 mg/L.

*Alkalinity*
The alkalinity reported by DWM ranged from 18 to 39 mg/L.

*Hardness*
Hardness values reported by DWM ranged from 28 to 42 mg/L.

Too limited data are available for this segment of the Westfield River, so the *Aquatic Life Use* is not assessed. This use is identified with an Alert Status, however, because of the evidence of alterations in normal streamflow conditions.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

DWM and ESS both collected fecal coliform bacteria samples from the Westfield River near the Route 5 bridge, Agawam (DWM Station WSFR00.2 and ESS Station PS-5). Fecal coliform bacteria counts of samples collected by DWM between 1 August and 3 October 2001 (n=4) ranged from 24 to >10,000 cfu/100 ml, although only one count of the four was >52 cfu/100 ml. The replicate fecal coliform bacteria counts reported by ESS for samples collected at PS-5 on 28 December 1999 were 310 and 250 cfu/100 ml (ESS 2000). No objectionable odors and very little trash debris or other objectionable deposits were noted by the field survey crews (MA DEP 2001b).

Two tributaries to this segment of the Westfield River were also sampled by DWM or ESS in 2001 and 1999, respectively. The locations sampled and the results of the analyses are summarized below:

- ESS collected one fecal coliform bacteria sample from an unnamed tributary at Route 20 (south of Sibley Avenue), West Springfield (Station SS-13), on 30 September 1999. The count was 11,000 cfu/100 mls.
- DWM collected a total of four fecal coliform bacteria samples from Block Brook at Plymouth Terrace crossing, West Springfield (Station BLBR01.0), between 1 August and 3 October 2001. Results ranged from 170 to 900 cfu/100 ml. Three of the four sampling events exceeded 200 cfu/100 ml. No objectionable deposits, trash or debris or other conditions were noted (MA DEP 2001b).

DWM also collected fecal coliform bacteria samples from the Westfield River near the Robinson State Park in Agawam (Station WSFR01.5) and near the Route 5 bridge in Agawam (Station WSFR00.2) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Given the variability in the limited fecal coliform bacteria dataset for this segment of the Westfield River the *Primary Contact Recreational Use* is not assessed. The *Secondary Contact Recreational Use* is assessed as support. The *Recreational Uses* are identified with an "Alert Status", however, because of the very high bacteria count and the elevated counts in tributaries to this segment of the Westfield River. The *Aesthetics Use* is assessed as support.

Westfield River (MA32-07) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact* | Secondary Contact* | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT | SUPPORT |

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

**RECOMMENDATIONS WESTFIELD RIVER (MA32-07)**

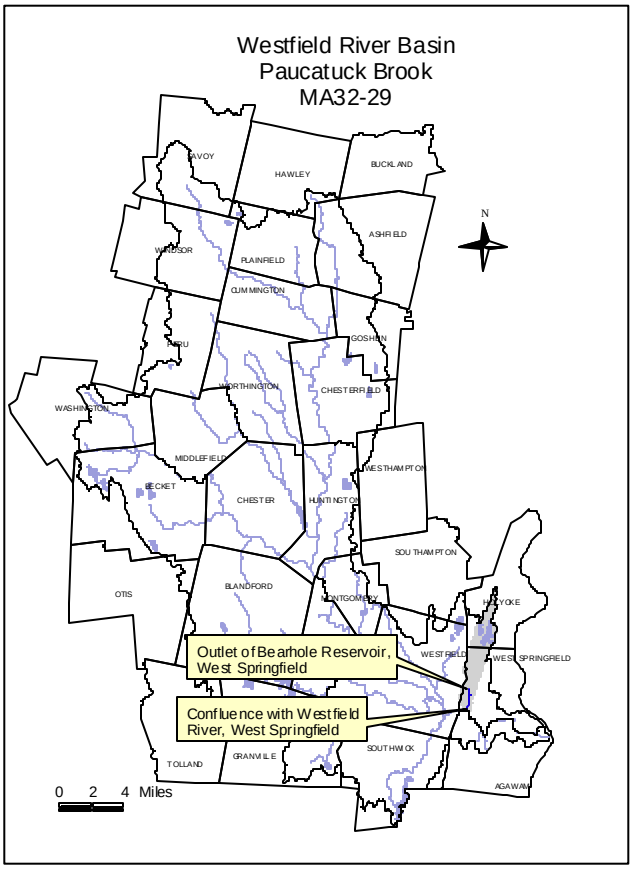
- There are currently no known CSO discharges to this segment of the Westfield River. Therefore, during the next revision of the Massachusetts Surface Water Quality Standards the CSO designation should be removed.
- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of West Springfield and Town of Agawam's Phase II stormwater management permits and programs. Further investigation should also be conducted on two small

tributaries to this segment of the Westfield River where elevated bacteria counts were documented.

- Further investigate source(s) of aberrant streamflow fluctuations observed using on-line real-time data for the USGS gage 01183500. Ideally, a natural flow regime should be restored in the Westfield River.
- To ensure run-of-river operations all dam operators should install, calibrate and maintain a continuous streamflow monitoring gage, or determine some other method to ensure compliance with run-of-river operations.
- Conduct additional biomonitoring (benthic macroinvertebrate and fish community sampling) within this segment of the Westfield River to assess the status of the *Aquatic Life Use*.
- Review West Springfield (MAR041024) and Agawam (MAR041001) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## PAUCATUCK BROOK (SEGMENT MA32-29)

Location: From outlet of Bearhole Reservoir, West Springfield, to confluence with Westfield River, West Springfield.
Segment Length: 1.5 miles
Classification: Class B




The drainage area of this segment is approximately 6 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 77%
Industrial ..... 6%
Residential ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 2.2%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Paucatuck Brook flows south from the outlet of Bearhole Reservoir in West Springfield towards its confluence with the Westfield River in Westfield. The brook is culverted underground in the vicinity of the railroad lines near its mouth.

Based on the last evaluation of water quality conditions Paucatuck Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

### WMA WATER WITHDRAWAL SUMMARY (APPENDIX H, TABLE H7)

| Facility | WMA Permit Number | WMA Registration Number | Source | Authorized Withdrawal (MGD) |
|---|---|---|---|---|
| Holyoke Water Works | N/A | 10413701 | McLean, 13703S<br>Ashley Pond Reservoir, 13701S | 1.01* |
| West Springfield Water Department | 9P10432501 | 10432503 | Bearhole Reservoir, 13250000-01S** | 3.89 (reg)<br>2.82 (per)<br>6.71 total* |

*indicates system-wide withdrawal; all sources are not within this segment
**Note: Based on the Safe Yield Study of the Bearhole Reservoir, the WMA permit authorizes a maximum average annual withdrawal of 1.1 MGD from Bearhole Reservoir (MA DEP 2003c).

It should be noted, however, that all three sources identified are not the primary sources of water for their respective public water supply systems (Cabral 2004).

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H3)

The City of Holyoke and Town of West Springfield are Phase II Stormwater communities. These communities were issued stormwater general permits from EPA and MA DEP in 2003 and are authorized to discharge stormwater from their municipal drainage systems (MAR041011and MAR041024, respectively). Over the five-year permit term these communities will develop, implement and enforce their stormwater management programs to reduce the discharge of pollutants from the storm sewer systems to protect water quality (Domizio 2004).

**USE ASSESSMENT**

No recent data have been collected in Paucatuck Brook, so all uses are currently not assessed. Although there are WMA sources in this small subwatershed none of them are primary sources for their respective public water supply systems. It should be also be noted that DWM collected fecal coliform bacteria samples from Paucatuck Brook near Sikes Avenue in West Springfield (Station PCTB00.3) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Paucatuck Brook (MA32-29) Use Summary Table

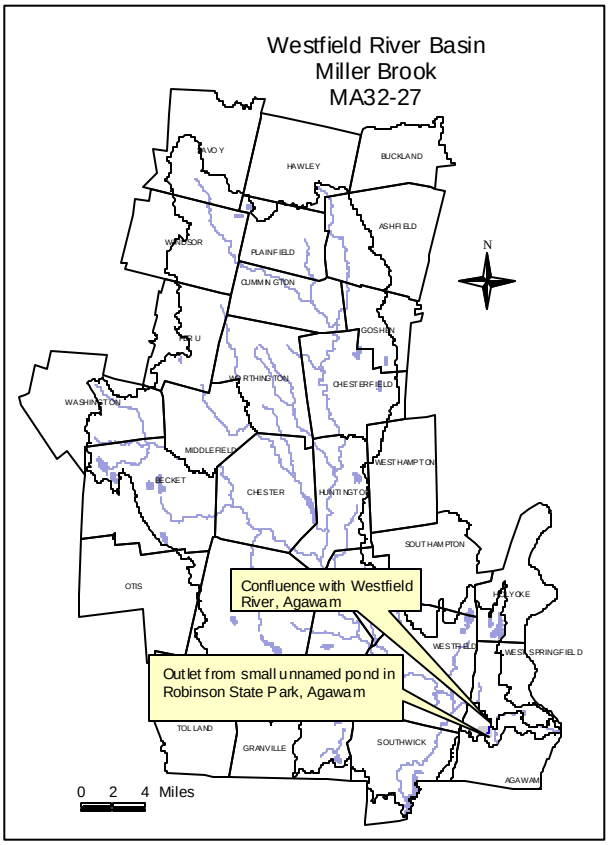
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| NOT ASSESSED | | | | |

**RECOMMENDATIONS PAUCATUCK BROOK (MA32-29)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of the City of Holyoke and Town of West Springfield Phase II stormwater management permits and programs.
- Evaluate outlet control practices at Bearhole Reservoir. To the extent possible natural flow regimes should be maintained at this outlet structure to minimize impacts to the aquatic biota in Paucatuck Brook.
- Conduct biomonitoring (benthic macroinvertebrate and fish community sampling) and water quality monitoring to assess the status of the *Aquatic Life Use*.
- Review Holyoke (MAR041024) and West Springfield (MAR041024) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## MILLER BROOK (SEGMENT MA32-27)

Location: Outlet from small unnamed pond in Robinson State Park, north of North Street, Agawam, to confluence with Westfield River, Agawam.
Segment Length: 0.6 miles
Classification: Class B




The drainage area of this segment is approximately 0.3 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

Forest ..... 51%
Residential ..... 42%
Agriculture..... 4%

The impervious cover area for the individual sub-basins located in this segment is 5.9%, thereby classifying this subwatershed as a low threat to water quality from impervious surface water runoff (CWP 1998).

Miller Brook originates at the outlet of a small, unnamed pond in Agawam and flows north/northeast through Robinson State Park to its confluence with the Westfield River in Westfield.

Based on the last evaluation of water quality conditions Miller Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H3)

Agawam is a Phase II Stormwater community. Agawam was issued a stormwater general permit from EPA and MA DEP in 2003 and is authorized to discharge stormwater from the municipal drainage system (MAR041001). Over the five-year permit term Agawam will develop, implement and enforce their stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

In August 2001 MDFW conducted backpack electrofishing in Miller Brook in Robinson State Park in Agawam (Station 571, Richards 2003). Two fish species collected, in order of abundance, were brook trout (multiple age classes) and blacknose dace. Both species collected are fluvial specialists/dependants and brook trout are intolerant of pollution.

The *Aquatic Life Use* is assessed as support for Miller Brook based on the fish population information and best professional judgment. The presence of reproducing brook trout is indicative of high quality water.

#### *PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS*

DWM collected fecal coliform bacteria samples in Miller Brook, at the Robinson State Park entrance road bridge in Agawam (Station MILB00.2) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

Too limited data are available and therefore the *Recreational* and *Aesthetic* Uses for Miller Brook are not assessed.

Miller Brook (MA32-27) Use Summary Table

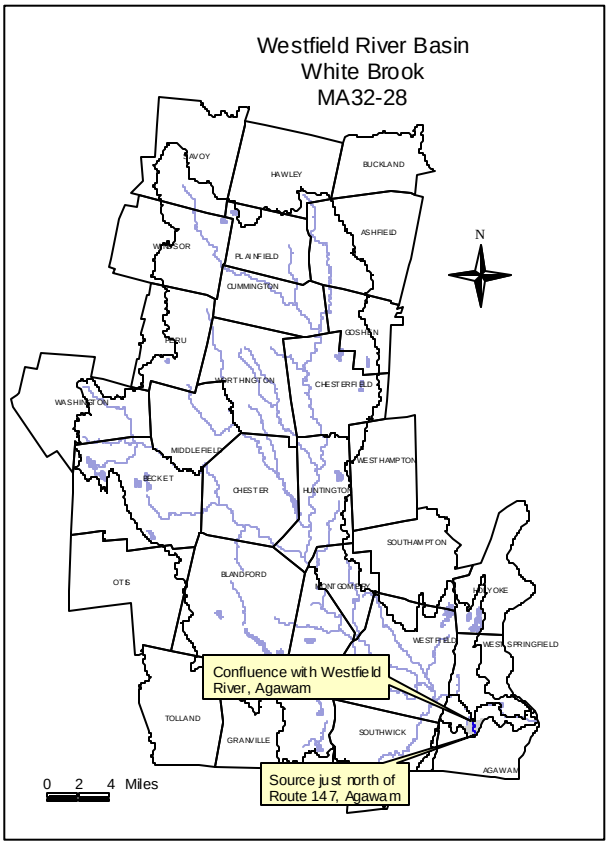
| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS MILLER BROOK (MA32-27)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of Agawam's Phase II stormwater management permit and program.
- Although not proposed as a cold water fisheries resource by MDFW, Miller Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Review municipality of Agawam's (MAR041001) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

## WHITE BROOK (SEGMENT MA32-28)

Location: Source just north of Route 147, Agawam, to confluence with Westfield River, Agawam.
Segment Length: 0.9 miles
Classification: Class B




The drainage area of this segment is approximately 0.6 square miles. Land-use estimates (top 3, excluding water) for the subwatershed (map inset, gray shaded area):

- Residential ..... 61%
- Forest ..... 32%
- Open Land ..... 4%

The impervious cover area for the individual sub-basins located in this segment is 14.7%, thereby classifying this subwatershed as a moderate threat to water quality from impervious surface water runoff (CWP 1998).

White Brook originates just north of Route 147 in Agawam and flows north through Robinson State Park to its confluence with the Westfield River in Westfield.

Based on the last evaluation of water quality conditions White Brook is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses.

### WMA WATER WITHDRAWAL

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

### NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX H, TABLE H3)

Agawam is a Phase II Stormwater community. Agawam was issued a stormwater general permit from EPA and MA DEP in 2003 and is authorized to discharge stormwater from the municipal drainage system (MAR041001). Over the five-year permit term Agawam will develop, implement and enforce their stormwater management program to reduce the discharge of pollutants from the storm sewer system to protect water quality (Domizio 2004).

### USE ASSESSMENT

#### *AQUATIC LIFE*

Biology

In August 2001 MDFW conducted backpack electrofishing in White Brook downstream from North Street in Agawam (Station 570, Richards 2003). Two fish species collected, in order of abundance, were brook trout (multiple age classes) and blacknose dace. Both species collected are fluvial specialists/dependants and brook trout are intolerant of pollution.

The *Aquatic Life Use* is assessed as support for White Brook based on the fish population information and best professional judgment. The presence of reproducing brook trout is indicative of high quality water.

***PRIMARY CONTACT AND SECONDARY CONTACT RECREATION AND AESTHETICS***

ESS personnel collected a fecal coliform sample from White Brook at the North Street Bridge, Agawam (Station SS-31) on 3 November 1999. The fecal coliform bacteria count was 140 cfu/100 ml (ESS 2000).

DWM collected fecal coliform bacteria samples at the mouth of White Brook in Robinson State Park at the park entrance road bridge, Agawam (Station WHTB00.0) in May and August 1996 as part of the 1996 Westfield River Watershed monitoring survey (Appendix G, Table G4).

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

WHITE BROOK (MA32-28) Use Summary Table

| Aquatic Life | Fish Consumption | Primary Contact | Secondary Contact | Aesthetics |
|---|---|---|---|---|
|  |  |  |  |  |
| SUPPORT | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |

**RECOMMENDATIONS WHITE BROOK (MA32-28)**

- Conduct bacteria monitoring to assess the *Primary* and *Secondary Contact Recreational* uses and the effectiveness of Agawam's Phase II stormwater management permit and program.
- Although not proposed as a cold water fisheries resource by MDFW, White Brook should be considered for designation as a Cold Water Fishery in the next revision of the Massachusetts SWQS.
- Review the Town of Agawam's (MAR041001) Phase II Stormwater SWPPPs, extent of compliance, and the effectiveness in minimizing impacts of stormwater runoff from their facilities into the Westfield River and subwatershed tributaries.

# WESTFIELD RIVER WATERSHED LAKE ASSESSMENTS

A total of 82 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 Westfield River Watershed (Ackerman 1989 and MA DEP 2004). The total surface area of the Westfield River Watershed lakes is 4,197 acres. They range in size from 1 to 1, 034 acres. This report presents information on 33 of these lakes that are in the WBS/ADB database (Figure 9). The remaining 49 lakes, which total 543 acres, are unassessed; they are not currently included as segments in the WBS/ADB database. Twelve of the 33 lakes assessed in this report (36%), representing 1,926 of the 3,654 acres (53%), are designated public water supplies (i.e., Class A).

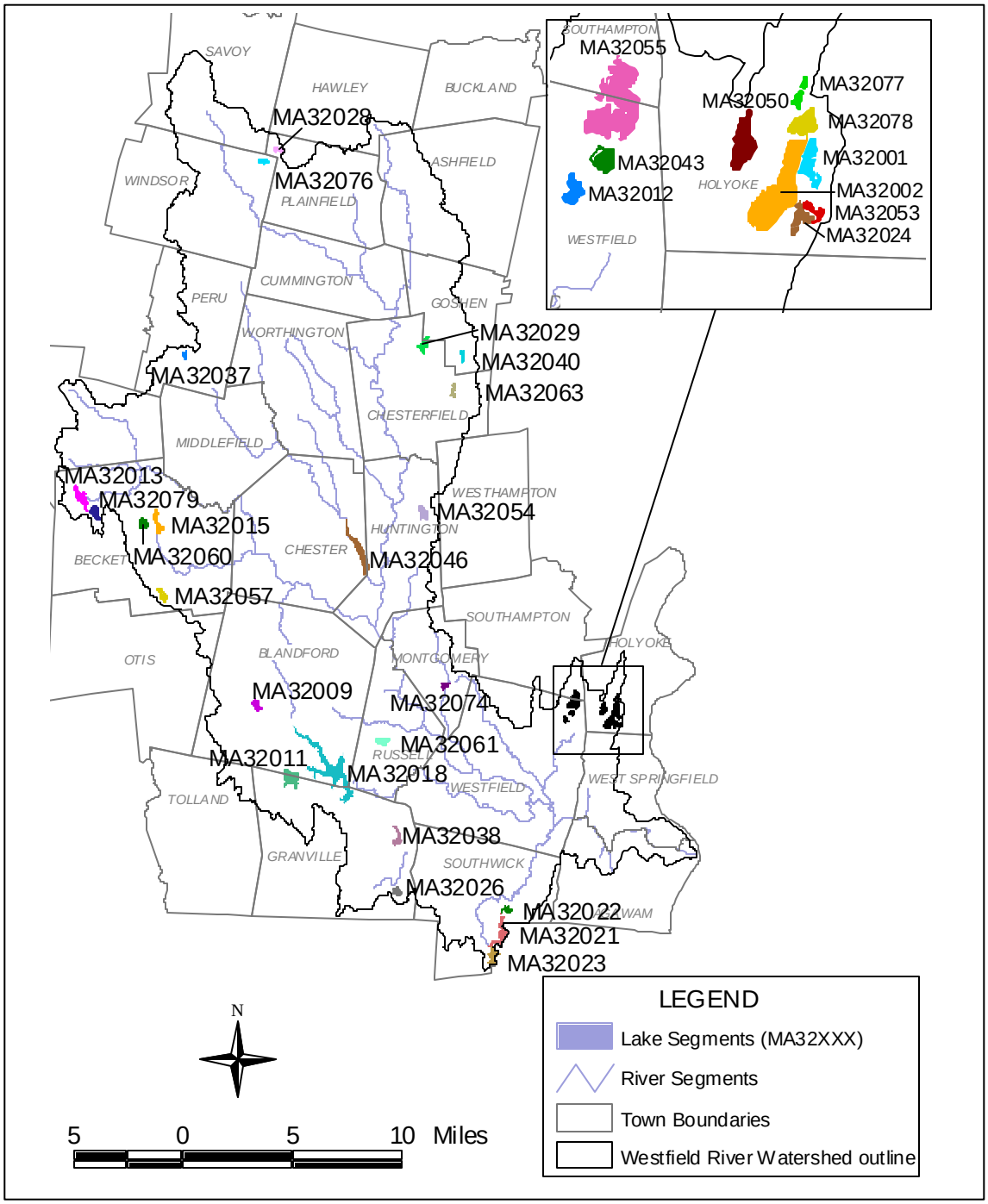



Figure 9. Westfield River Watershed – lake segment locations identified segment number

The designated use assessments for lakes are based on information gathered during DWM surveys (recent and historic) as well as pertinent information from other reliable sources (i.e., abutters, herbicide applicators, diagnostic/feasibility studies, MA DPH, etc.). The 1996 DWM synoptic surveys focused on visual observations of water quality and quantity (e.g., water level and sedimentation), the presence of native and non-native aquatic plants (as well as distribution and aerial cover) and presence/severity of algal blooms (Appendix F, Table F1). During 2001 more intensive in-lake sampling was conducted by DWM in two lakes in the Westfield River Watershed - Congamond Lake (North Basin) and Congamond Lake (Middle Basin), both in Southwick) - as part of the TMDL program. This sampling included: in-lake measurements of dissolved oxygen, pH, temperature, Secchi disk transparency, total phosphorus, alkalinity, apparent color, and chlorophyll *a* (Appendix F, Tables F2 and F3). Additionally, detailed macrophyte mapping was performed on these two lakes. While these surveys provided additional information to assess the status of the designated uses, fecal coliform bacteria data were not collected so the *Primary Contact Recreational* Use was usually not assessed. In the case of the *Fish Consumption Use* fish consumption advisory information was obtained from the MA DPH (MA DPH 2001 and MA DPH 2004a). Although the *Drinking Water Use* was not assessed in this water quality assessment report the Class A waters were identified. Information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/brp/dws/dwshome.htm and from the Westfield River Watershed's public water suppliers.

The use assessments and supporting information reported herein will be entered into either the EPA Water Body System (WBS) or Assessment Database (ADB). Data on the presence of non-native plants were entered into a MA DEP DWM informal non-native plant-tracking database.

***WMA***

Ashley Cutoff (MA32001), Ashley Pond (MA32002), Blair Pond (MA32009), Borden Brook Reservoir (MA32011), Clear Pond (MA32077), Cobble Mountain Reservoir (MA32018), Connor Resevoir (MA32024), Granville Reservoir (MA32038), Littleville Lake (MA32046), Mclean Reservoir (MA32050), North Railroad Pond (MA32053), Wright Pond (MA32078) are Class A Water Supplies. Additional information is available in Table 6 and in Appendix H, Table H7).

***NPDES***

There are no NPDES discharges to any of the 33 lakes assessed in this watershed.

**USE ASSESSMENT**

***AQUATIC LIFE***

Biology

Non-native aquatic macrophytes were observed in eight of 30 lakes surveyed by DWM or MA DCR in 1996 (Table 5 and Appendix F, Table F1). The four non-native aquatic species documented (Figure 10) in the Westfield River Watershed lakes were fanwort (*Cabomba caroliniana*), curly leaf pondweed (*Potamogeton crispus*), Eurasian milfoil (*Myriophyllum spicatum*), and variable milfoil (*Myriophyllum heterophyllum*). The mere presence of these species is considered an imbalance to the native biotic community, so these lakes are listed as impaired (901acres). Additionally, these species have a high potential for spreading and are likely to have established themselves in downstream lake and river segments in the Westfield River Watershed, which may not have been surveyed. Figure 10 indicates where these species were observed and the likely, or potential, avenues of downstream spreading. Two species were found in only one lake each. Fanwort (*Cabomba caroliniana*) was found only in Blair Pond in Blandford and curly leaf pondweed (*Potamogeton crispus*) was only noted in Pequot Pond in Southampton/Westfield. There is potential that the fanwort from Blair Pond may have spread, or could in the future spread, downstream via Pond Brook and Peeble Brook into the Cobble Mountain Reservoir. Curly leaf pondweed is one of three non-native aquatic plant species that were found in Pequot Pond. At least two of these (*Myriophyllum heterophyllum* and *Myriophyllum spicatum*) were recorded as having spread to ponds in the same vicinity. Horse Pond contained both species and Buck Pond was observed to contain *M. heterophyllum*. Since spreading of these species has already occurred in this system it is reasonable to assume that one or all species may have spread downstream to Chapin Pond and possibly the Westfield River via Pond Brook and Powdermill Brook. Eurasian milfoil (*Myriophyllum spicatum*) is a non-native aquatic species that can reproduce rapidly via vegetative cuttings and, thus, represents a threat to spread throughout watershed systems. In addition to the lakes mentioned above,

the presence of this species was recorded in Windsor Pond in Windsor and in all three basins of the Congamond Lakes in Southwick. Thus, there is reasonable potential for the spreading of Eurasian milfoil from these sites to the upper Westfield River via Clear Brook and to the lower Westfield River via Great Brook.

Two non-native wetland species, purple loosestrife (*Lythrum salicaria*) and reed grass (*Phragmites australis*), were identified at four lakes surveyed by DWM in 1995 (Table 5 and Appendix F, Table F1). Although the presence of these species is not generally a cause of impairment to lakes their invasive growth habit can result in the impairment of wetland habitat associated with lakes.

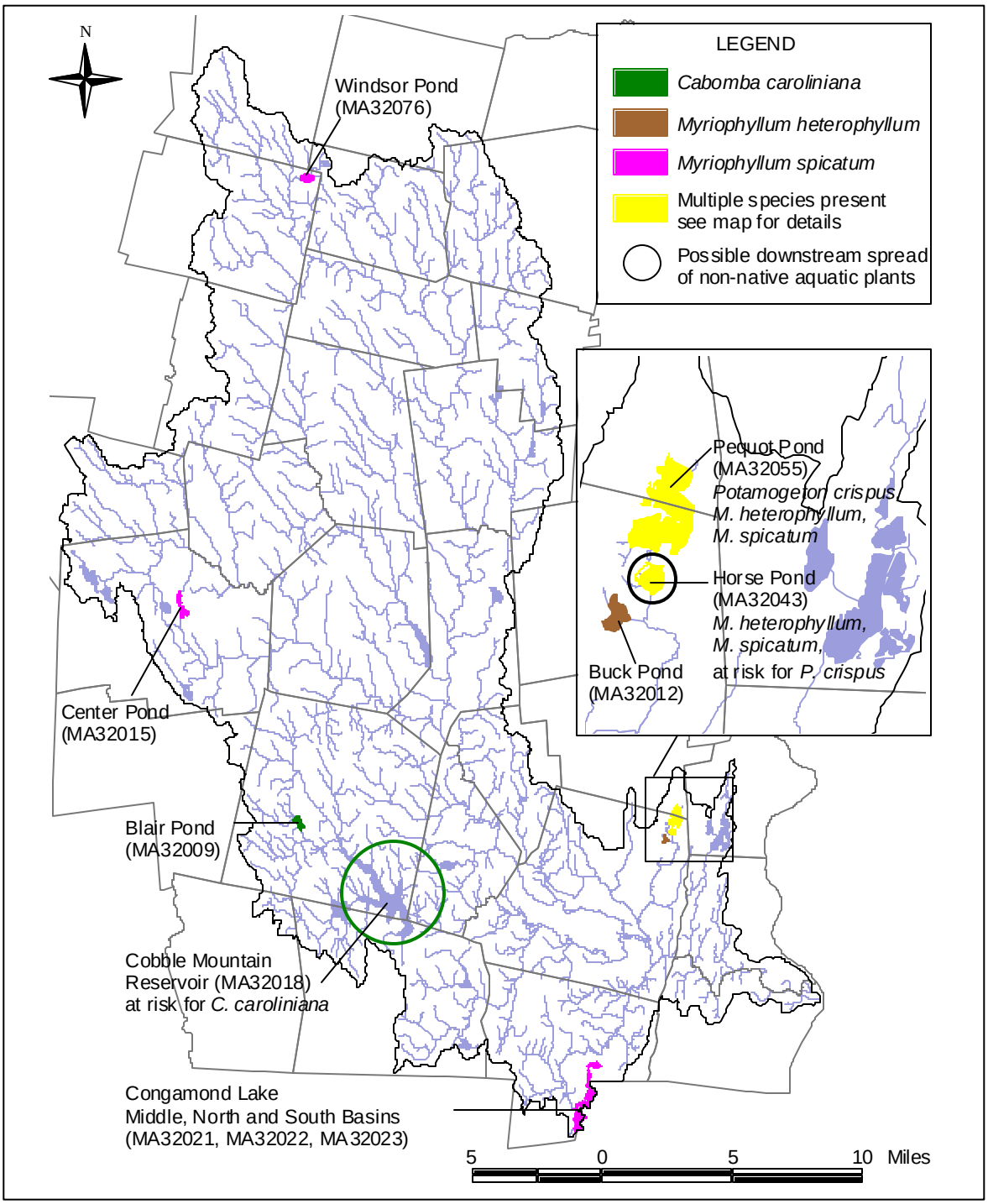



Figure 10. Westfield River Watershed – presence of non-native aquatic vegetation and potential for downstream spreading in Massachusetts.

Chemistry-water

Oxygen depletion occurred below 6 m and 8 m in Congamond Lake (Middle Basin and North Basin, respectively) in the summer of 2001 (Appendix F, Table F2). The lake area affected by oxygen depletion was almost 50% for the Middle Basin and approximately 25% for the North Basin. The total phosphorus concentrations were low to moderately high and the deep-water samples show evidence of phosphorus release due to the anoxic conditions (Appendix F, Table F3). Because >10% of the lake area in both the Middle Basin and North Basin of Congamond Lake was affected by oxygen depletion the *Aquatic Life Use* is assessed as impaired for both lakes.

The *Aquatic Life Use* is assessed as impaired for a total of nine lakes (including the three basins of Congamond Lake) in the Westfield River Watershed based on the confirmed presence of non-native macrophyte(s) representing a total of 901 acres (Table 5). The Middle and North Basins of Congamond Lake were also impaired because of oxygen depletion. The *Aquatic Life Use* for Robin Hood Lake was identified with an Alert Status as the result of an observed algal bloom. The remaining 23 lakes, representing 2,753 acres in the Westfield River Watershed, were not assessed for the *Aquatic Life Use* because of the cursory nature of the 1996 synoptic surveys and/or the lack of dissolved oxygen data and other more recent observations.

***FISH CONSUMPTION***

In July 2001 MA DPH issued new consumer advisories on fish consumption and mercury contamination (MA DPH 2001). The MA DPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age." Additionally, MA DPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury." MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially. The advisory encompasses all freshwaters in Massachusetts and, therefore, the *Fish Consumption Use* for lakes in the Westfield River Watershed cannot be assessed as support.

Fish and sediment from a total of five lakes in the Westfield River Watershed were sampled in 1994 as part of a research and development study on mercury contamination developed by the Department's Office of Research and Standards (ORS) (Rose *et al*. 1999 and Maietta 2002). These lakes included Ashley Pond (Holyoke); Crooked Pond (Plainfield); and Buckley-Dunton Lake, Center Pond and Yokum Pond in Becket. Fish toxics monitoring (metals, PCB, and organochlorine pesticide in edible fillets) were conducted by DWM in Congamond Lake, Middle Basin (Southwick) and Pequot Pond (Westfield/Southampton) in June 2001. These data can be found in Appendix E, Table E1. Yokum Pond was sampled again in 2002 as part of a seasonal ORS or long-term study of mercury.

MA DPH has not issued any site-specific advisories for lakes in the Westfield River Watershed. Therefore, the *Fish Consumption Use* is not assessed for any lakes in this watershed because of the statewide advisory. [Note: The MA DPH fish consumption advisory list contains the recommendations for each waterbody for which an advisory has been issued. If a water body is not on the list it may be because either an advisory was not warranted or the water body has not been sampled. MA DPH's most current Fish Consumption Advisory list is available online at http://www.state.ma.us/dph/beha/fishlist.htm.]

***PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS***

In 1996 DWM conducted synoptic surveys of 30 lakes in the Westfield River Watershed. These surveys included general observations of water quality and quantity, the presence of native and non-native aquatic plants and the presence/severity of algal blooms (Appendix F, Table F1). Additional data were collected in three of these lakes in 2001 by DWM for the purpose of TMDL development. These data, combined with the Category 5 section of the 2002 Integrated List of Waters (the 303(d) list), MA DCR and MA DPH public beach posting data and diagnostic/feasibility studies were used to assess the recreational and aesthetics uses.

Bacteria samples were collected from three town bathing beaches in the Westfield River Watershed during the summers of 2001 to 2003 - Center Pond in Becket (MA32015), Congamond Lake (South Basin) in Southwick (MA32023), and Russell Pond in Russell (MA32061) (Becket BOH 2003, Russell BOH 2003, and Southwick BOH 2003). There was only one closure reported for these three beaches; Congamond Lake (South Basin) between 7 and 14 July 2003 (MA DPH 2004b). Although no bacteria data are available for either the Middle or North Basins of Congamond Lake, no objectionable deposits, odors, or other conditions were noted during the field surveys in either of these two basins or the South Basin Congamond Lake (MA DEP 2001b).

Bacteria samples were also collected at two state managed beaches in the Hampton Ponds State Park on Pequot Pond in Westfield -- the Kinsley Beach and the Lambert's Beach during 2001-2003 swimming seasons (MA DCR 2003b).

- At the Kinsley Beach beach closures occurred on the following dates (approximate percentage of bathing beach season noted in parentheses).
  In 2001: 20-21 June, 9 to 11and 16-18 July (8%)
  In 2002: 28-9 May, 3 to 9 June, 12 and 14-15 August (13%)
  In 2003: 27 May to 1 June (5%)
- At the Lambert's Beach beach closures occurred on the following dates.
  In 2001: 11 to 13 and 25 to 27 June, 9-11, 16-18, and 25 July (13%)
  In 2002: 28 and 30 May, 3,10, and 17 to 23 June (10%)
  In 2003: 18-19 August (2%)

The *Primary* and *Secondary Contact Recreational* uses are assessed as support in four lakes in the Westfield River Watershed (Center Pond, South Basin Congamond Lake, Pequot Pond, and Russell Pond), representing a total of 495 acres, based on beach closure information (Table 5). The *Recreational Uses* for Pequot Pond, however, are identified with an Alert Status because of the frequency of beach closures (approximately 9% overall during the 2001 to 2003 beach seasons). The *Aesthetics Use* is assessed as support for all three basins (Middle, North and South) of Congamond Lake since no objectionable conditions were noted during by DWM staff during the 2001 sampling surveys. A total of 27 lakes (2,834 acres or 78% of the total lake acreage in this report) were not assessed for either the *Recreational* or *Aesthetic* uses.

It should also be noted that there are two state managed beaches at the man-made pond in Robinson State Park. Although this pond is not a segment in this report, the following closures occurred during the 2001-2003 swimming season (MA DCR 2003b).

- At beach #1 closures occurred on the following dates
  21-23 May 2001; none in 2002; and 23-24 June, 4 and 6-10 August, 2 September 2003
- At Beach #2 beach closures occurred on the following dates:
  In 2001: 21 May, 24 May to 29 June, 4 to 11 July 2001; 28 May to 2 June 2002 and none in 2003

**SUMMARY**

A total of nine of the 33 lakes in the Westfield River Watershed assessed in this report were impaired for the *Aquatic Life Use* (Table 5). No other uses were assessed as impaired. Causes of impairment for the *Aquatic Life Use* included non-native plant infestation and oxygen depletion. Four lakes were assessed as support for the *Recreational Uses* and three lakes were assessed as support for the *Aesthetics Use*. The remaining 23 lakes, representing 2,753 acres in the Westfield River Watershed, were not assessed for any uses because of the cursory nature of the 1996 synoptic surveys and/or the lack of dissolved oxygen, other water quality data, or other more recent observations. Table 5 presents the use assessments for the individual lakes in the Westfield River Watershed.

**Table 5. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| Ashley Cutoff, Holyoke | MA32001 | 31 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Ashley Cutoff is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Ashley Cutoff is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Ashley Cuttoff in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Ashley Pond, Holyoke | MA32002 | 133 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Ashley Pond is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Ashley Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Ashley Pond in 1996 (Appendix F, Table F1). Fish contaminant monitoring (select metals, PCB and organochlorine pesticides) was conducted in Ashley Pond in 1994 as part of the MA DEP ORS Mercury Study (Maietta 2002 and Rose *et al*. 1999) to examine fish mercury distribution in Massachusetts lakes. No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. | | | | | | | |
| Blair Pond, Blandford | MA32009 | 69 | IMPAIRED (Non-native aquatic plants: *C. caroliniana*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Blair Pond is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Blair Pond is listed in Category 4C of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired because of exotic species, but is not subject to TMDL calculations because the impairment is not caused by a pollutant. DWM conducted a synoptic survey of Blair Pond in 1996 and the pond was found to be infested with the non-native aquatic species, *Cabomba caroliniana* (Appendix F, Table F1), so the *Aquatic Life Use* is assessed as impaired. | | | | | | | |
| Borden Brook Reservoir, Granville/Blandford | MA32011 | 211 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Borden Brook Reservoir is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Borden Brook Reservoir is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Borden Brook Reservoir in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Buck Pond, Westfield | MA32012 | 23 | IMPAIRED (Non-native aquatic plants: *M. heterophyllum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Buck Pond is listed in Category 4C of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired because of exotic species, but is not subject to TMDL calculations because the impairment is not caused by a pollutant. DWM conducted a synoptic survey of Buck Pond in 1996 and the pond was found to be infested with the non-native aquatic species, *Myriophyllum heterophyllum* (Appendix F, Table F1), so the *Aquatic Life Use* is assessed as impaired. | | | | | | | |
| Buckley-Dunton Lake, Becket | MA32013 | 154 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Buckley-Dunton Lake is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). Fish contaminant monitoring and sediment sampling was conducted in Buckley-Dunton Lake in 1994 as part of the MA DEP ORS Mercury Study (Maietta 2002 and Rose *et al*. 1999). No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. The concentration of arsenic in the sediment was 0.44 mg/kg, selenium was 0.32 mg/kg, mercury was 0.29 mg/kg, cadmium was 10 mg/kg, and lead was 55 mg/kg. | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| Center Pond, Becket | MA32015 | 114 | IMPAIRED (Non-native aquatic plants: *M. spicatum*) | NOT ASSESSED | SUPPORT | SUPPORT | NOT ASSESSED |
| In 1995 the Town of Becket received an MA DEM (now MA DCR) Lakes and Ponds Grant to make structural improvements at the town beach on Center Pond by installing drainage pipes, and creating swales and vegetated buffers to prevent erosion of beach soils (MA DEM 2000). In 2000 the Town received an MA DEM Lake and Pond Grant to control the spread of the non-native nuisance aquatic plant *Myriophylum spicatum* (Eurasian Milfoil) (MA DEM 2000). Chemicals were applied in Center Pond in June 2000 and May 2001. Since the pond is infested with the non-native aquatic species, *Myriophyllum spicatum* , the *Aquatic Life Use* is assessed as impaired. Based on the last evaluation of water quality conditions Center Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Center Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). Fish contaminant monitoring and sediment sampling was conducted in Center Pond in 1994 as part of the MA DEP ORS Mercury Study (Maietta 2002 and Rose *et al*. 1999). No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. The concentration of arsenic was 0.44 mg/kg, selenium was 0.29 mg/kg, mercury was 0.08 mg/kg, cadmium was less than the method detection limit, and lead was 144 mg/kg. The Town of Becket maintains a town beach at Center Pond. No beach closings have been reported for any of the 2001 to 2003 bathing seasons (Becket BOH 2003 and MA DPH 2004b), so the *Recreational* uses are assessed as support. The *Aesthetics Use* is not assessed. | | | | | | | |
| Clear Pond, Holyoke | MA32077 | 10 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Clear Pond is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Clear Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Clear Pond in 1996; the non-native wetland plant L*ythrum salicaria* was identified (Appendix F, Table F1). | | | | | | | |
| Cobble Mountain Reservoir, Blandford/Granville/Russell | 32018 | 1034 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Cobble Mountain Reservoir is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Cobble Mountain Reservoir is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Cobble Mountain Reservoir in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| **Note following information applicable to all three Congamond Lake segments (Middle, North and South Basins):** From 1995 - 2001 the Town of Southwick received four separate MA DEM (now MA DCR) Lakes and Ponds Grants, each for $10,000 to make structural improvements (e.g., culverts, catch basins with sumps, vegetate shorelines) to the drainage system into and between the three interconnecting ponds to reduce erosion, trap sediments and silt, reduce pollution loadings to the lakes, maintain equal levels in the lakes, and provide some flood control (MA DEM 2000 and MA DEM 2001). The Town applied chemicals to the lake to control nuisance plant growth in 1999, 2000, and 2001. Based on the last evaluation of water quality conditions Congamond Lake (Middle, North and South Basins) is listed in Category 4C of the 2002 Integrated List of Waters because of exotic species (MA DEP 2003a). | | | | | | | |
| Congamond Lake (Middle Basin), Southwick | MA32021 | 279 | IMPAIRED (DO, DO saturation, Non-native aquatic plants: *M. spicatum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |
| DWM conducted a synoptic survey of Congamond Lake (Middle Basin) in 1996 and the pond was found to be infested with the non-native aquatic plant, *Myriophyllum spicatum* (Appendix F, Table F1). In 2001 DWM surveyed the lake for water quality parameters (Appendix F, Table F2). Low DO and percent saturation occurred at depths greater than 6m during the 2001 survey. In-lake total phosphorus concentrations were not high but there was evidence of phosphorus release from anoxic sediments. None of the Secchi disk depth measurements violated the bathing beach guidance of four feet. The *Aquatic Life Use* is assessed as impaired because of low DO/saturation and | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| the presence of the non-native aquatic species. Fish contaminant monitoring (select metals, PCB and organochlorine pesticides) was conducted in Congamond Lake (Middle Basin) in 2001 (Appendix E, Table E1 and Maietta and Colonna Romano 2002). No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. No bacteria data are available to assess the status of the *Primary* and *Secondary Contact Recreational* uses, however there were no objectionable deposits, odors or other conditions noted during the 2001 sampling surveys, so the *Aesthetics Use* is assessed as support. | | | | | | | |
| Congamond Lake (North Basin), Southwick | MA32022 | 46 | IMPAIRED (DO, DO saturation, Non-native aquatic plants: *M. spicatum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | SUPPORT |
| DWM conducted a synoptic survey of Congamond Lake (North Basin) in 1996 and the pond was found to be infes ted with the non-native aquatic plant, *Myriophyllum spicatum* (Appendix F, Table F1). In 2001 DWM surveyed the lake for water quality parameters (Appendix F, Table F3). Low DO/saturation occurred at depths greater than 8 m during the 2001 survey. In-lake total phosphorus concentrations were not high but there was evidence of phosphorus release from anoxic sediments. None of the Secchi disk depth measurements violated the bathing beach guidance of four feet. The *Aquatic Life Use* is assessed as impaired because of low DO/saturation and the presence of the non-native aquatic species. Although no bacteria data are available to assess the status of the *Primary* and *Secondary Contact Recreational* uses, there were no objectionable deposits, odors or other conditions noted during the 2001 sampling surveys, so the *Aesthetics Use* is assessed as support. | | | | | | | |
| Congamond Lake (South Basin), Southwick | MA32023 | 144 | IMPAIRED (Non-native aquatic plants: *M. spicatum*) | NOT ASSESSED | SUPPORT | SUPPORT | SUPPORT |
| Although not surveyed by DWM in 1996 Congamond Lake (South Basin) was also assumed to be infested with the non-native aquatic species, *Myriophyllum spicatum* (Appendix F, Table F1), so the *Aquatic Life Use* is assessed as impaired. The Town of Southwick maintains a town beach on this basin. There were no closures reported for either the 2001 or 2002 bathing season and there was only one closure reported during the 2003 swimming season (Southwick BOH 2003 and MA DPH 2004b). No objectionable deposits, odors or other conditions noted during the 2001 sampling surveys. Based on this information the *Recreational* and *Aesthetics* are assessed as support. | | | | | | | |
| Connor Reservoir, Holyoke | MA32024 | 17 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Connor Reservoir is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Connor Reservoir is listed in Category 3 of the 2002 integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses. DWM conducted a synoptic survey of Connor Reservoir in 1996 (Appendix F, Table F1). | | | | | | | |
| Cooley Lake, Granville | MA32026 | 66 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Cooley Lake is listed in Category 3 of the 2002 integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses. | | | | | | | |
| Crooked Pond, Plainfield | MA32028 | 34 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Crooked Pond is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses. DWM conducted a synoptic survey of Crooked Pond in 1996 (Appendix F, Table F1). Fish contaminant monitoring (select metals, PCB and organochlorine pesticides) and sediment sampling was conducted in Crooked Pond in 1994 as part of the MA DEP ORS Mercury Study (Maietta 2002 and Rose *et al*. 1999). No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. | | | | | | | |
| Damon Pond, Chesterfield/Goshen | MA32029 | 78 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Damon Pond is listed in Category 3 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment was not assessed for any uses. DWM conducted a synoptic survey of Damon Pond in 1996 (Appendix F, Table F1). | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| Garnet Lake, Peru | MA32037 | 17 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Garnet Lake is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Garnet Lake in 1996 (Appendix F, Table F1). | | | | | | | |
| Granville Reservoir, Granville | MA32038 | 74 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Granville Reservoir is a Class A Public Water Supply. Based on the last evaluation of water quality conditions Granville Reservoir is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Granville Reservoir in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Hammond Pond, Goshen | MA32040 | 38 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Hammond Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Hammond Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Horse Pond, Westfield | MA32043 | 24 | IMPAIRED (Non-native aquatic plants: *M. heterophyllum and M. spicatum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Horse Pond is listed in Category 4C of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired because of exotic species, but is not subject to TMDL calculations because the impairment is not caused by a pollutant. DWM conducted a synoptic survey of Horse Pond in 1996 and the pond was found to be infested with the non-native aquatic species, *Myriophyllum heterophyllum* and *Myriophyllum spicatum* (Appendix F, Table F1), so the *Aquatic Life Use* is assessed as impaired. | | | | | | | |
| Littleville Lake, Chester/Huntington | MA32046 | 255 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Littleville Lake is a Class A Public Water Supply. The Springfield Water and Sewer Commission has a WMA registration (10428101) to withdraw up to 37.2 MGD from their sources including Littleville Lake (Appendix H, Table H7). Based on the last evaluation of water quality conditions Littleville Lake is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a) for supporting some designated uses (Secondary Contact Recreation, Aesthetics) and not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Littleville Lake in 1996; the non-native wetland plant L*ythrum salicaria* was identified (Appendix F, Table F1). Littleville Dam is classified by the ACOE as a Class A project (no significant water quality problems) and is one of 14 flood control dams in the Connecticut River Basin (encompassing parts of the states of Vermont, New Hampshire, Massachusetts, and Connecticut). During the past five years there has been no indication of significant water quality problems, including bacteria problems. There is one well that is regularly monitored by the ACOE. In FY 02 The Water Management Section of ACOE, New England District, completed a report on a priority pollutant scan conducted by ACOE at Littleville Dam (ACOE 2002 and Barker 2004). Sediment samples were collected in September 2000 and analyzed for metals, PCB' pesticides, semi-volatile organic compounds, dioxins and furans, grain size, and TOC. Overall levels of EPA priority pollutants at these Westfield River projects were low and indicative of natural background conditions. No substances were in concentrations high enough to pose a risk to humans or interfere with uses of the projects or their waters. | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| McLean Reservoir, Holyoke | MA32050 | 55 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| McLean Reservoir is a Class A Public Water Supply (PWS). Based on the last evaluation of water quality conditions McLean Reservoir is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of McLean Reservoir in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| North Railroad Pond, Holyoke | MA32053 | 9 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| North Railroad Pond is a Class A Public Water Supply. Based on the last evaluation of water quality conditions North Railroad Pond is listed in category 5 of the 2002 Integrated List of Waters because of noxious aquatic plants and turbidity (MA DEP 2003a). DWM conducted a synoptic survey of North Railroad Pond in 1996 (Appendix F, Table F1). Although objectionable turbidity was noted, there are no recent data available, so all uses are currently not assessed. | | | | | | | |
| Norwich Pond, Huntington | MA32054 | 116 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| In 2000 the Town of Huntington received a $520 MA DEM (now MA DCR) Lakes and Ponds Grant to improve water quality by conducting a water quality monitoring program and developing a newsletter to educate residents on best applicable best management practices to improve water quality. Based on the last evaluation of water quality conditions Norwich Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Norwich Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Pequot Pond, Westfield/Southampton | MA32055 | 155 | IMPAIRED (Non-native aquatic plants: *P. crispus, M. spicatum* and *M. heterophyllum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| In 1997 the City of Westfield received a $10,000 MA DEM (now MA DCR) Lakes and Ponds Grant to control the spread of the non-native nuisance aquatic plant, *Myriophyllum spicatum*, through the application of the chemical herbicide SONAR. Based on the last evaluation of water quality conditions Pequot Pond is listed in category 5 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired by pollutants (nutrients, organic enrichment/low DO, noxious aquatic plants) and will require TMDLs for these pollutants. MA DEM conducted surveys of Pequot Pond in 1995 and 1996 and the pond was found to be infested with three non-native aquatic species, *Potamogeton crispus*, *M. spicatum* and *M. heterophyllum*, so the *Aquatic Life Use* is assessed as impaired. Fish contaminant monitoring (select metals, PCB and organochlorine pesticides) was conducted in Pequot Pond in 2001 (See Appendix E, Table EX and Maietta and Colonna-Romano 2002). No site-specific advisory was issued by MA DPH, so the *Fish Consumption Use* is not assessed. | | | | | | | |
| Robin Hood Lake, Becket | MA32057 | 64 | NOT ASSESSED* | NOT ASSESSED | NOT ASSESSED* | NOT ASSESSED | NOT ASSESSED* |
| Based on the last evaluation of water quality conditions Robin Hood Lake is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Robin Hood Lake in 1996; the non-native wetland plant *Phragmites australis* was identified (Appendix F, Table F1). An algal bloom that decreased transparency was observed by DWM staff in Robin Hood Lake in September 2001 (estimated <4 foot Secchi disk) (Mitchell 2005). Because of these observations the *Aquatic Life*, *Primary Contact Recreation* and the *Aesthetics* uses are identified with an Alert Status. Robin Hood Lake was treated in 2002 and 2003 with a herbicide to control nuisance aquatic plants. | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| Rudd Pond, Becket | MA32060 | 72 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Rudd Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Rudd Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Russell Pond, Russell | MA32061 | 82 | NOT ASSESSED | NOT ASSESSED | SUPPORT | SUPPORT | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Russell Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Russell Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). The Town of Russell maintains a town beach at Russell Pond. No beach closings have been reported for any of the 2001 to 2003 bathing seasons (Russell BOH 2003 and DPH 2004b), so the *Recreational* uses are assessed as support. | | | | | | | |
| Scout Pond, Chesterfield | MA32063 | 37 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Scout Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Scout Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Westfield Reservoir, Montgomery | MA32074 | 40 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Westfield Reservoir is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Westfield Reservoir in 1996; no objectionable conditions were noted (Appendix F, Table F1). | | | | | | | |
| Windsor Pond, Windsor | MA32076 | 47 | IMPAIRED (Non-native aquatic plants – *M. spicatum*) | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Windsor Pond is listed in Category 5 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment is impaired by pollutants (Organic Enrichment/Low DO) and will require TMDLs for these pollutants. It is also impaired by exotic species, but this will not require a TMDL since the cause is not a pollutant. DWM conducted a synoptic survey of Windsor Pond in 1996 and the pond was found to be infested with the non-native aquatic species, *Myriophyllum spicatum* (Appendix F, Table F1), so the *Aquatic Life Use* is assessed as impaired. | | | | | | | |
| Wright Pond, Holyoke | MA32078 | 28 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Wright Pond is a Class A PWS. Based on the last evaluation of water quality conditions Wright Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Wright Pond in 1996; the non-native wetland plant *Lythrum salicaria* was identified (Appendix F, Table F1). | | | | | | | |

**Table 5 continued. Designated Use Assessments for Individual Lakes in the Westfield River Watershed.**

| Lake, Location | WBID | Size (Acres) | Aquatic Life (Impairment Cause) | Fish Consumption (Impairment Cause) | Primary Contact (Impairment Cause) | Secondary Contact (Impairment Cause) | Aesthetics (Impairment Cause) |
|---|---|---|---|---|---|---|---|
| Yokum Pond, Becket | MA32079 | 98 | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED | NOT ASSESSED |
| Based on the last evaluation of water quality conditions Yokum Pond is listed in Category 2 of the 2002 Integrated List of Waters (MA DEP 2003a). This segment supported some designated uses (Secondary Contact Recreation, Aesthetics) and was not assessed for others (Primary Contact Recreation, Aquatic Life, Fish Consumption). DWM conducted a synoptic survey of Yokum Pond in 1996; no objectionable conditions were noted (Appendix F, Table F1). Yokum Pond was sampled as part of the MA DEP DWM nutrient criteria development study in 2003. These data however are not yet available. In August 2003 a macrophyte survey of Yokum Pond was conducted by DWM; no non-native aquatic species were observed (MA DEP 2003b). Fish contaminant monitoring (select metals, PCB and organochlorine pesticides) and sediment sampling was conducted in Yokum Pond in 1994 as part of the MA DEP ORS Mercury Study and additional monitoring was conducted in 2002 (Maietta 2002 and Rose *et al*. 1999). No site-specific advisory has been issued by MA DPH, so the *Fish Consumption Use* is not assessed. | | | | | | | |

**RECOMMENDATIONS – LAKES**

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

- Implement recommendations identified in lake diagnostic/feasibility studies, including lake watershed surveys to identify sources of impairment.

- Continue to review data from "Beaches Bill" required water quality testing (bacteria sampling at all formal bathing beaches) to assess the status of the recreational uses.

- Quick action is necessary to manage non-native aquatic or wetland plant species that are isolated in one or a few location(s) in order to alleviate the need for costly and potentially fruitless efforts to do so in the future. Two courses of action should be pursued concurrently. More extensive surveys need to be conducted, particularly downstream from these recorded locations to determine the extent of the infestation. And, "spot" treatments (refer to the Final Generic Environmental Impact Report [GEIR] for Eutrophication and Aquatic Plant Management in Massachusetts [Mattson et *al*. 2004] for advantages and disadvantages of each) should be undertaken to control populations at these sites. These treatments include careful hand-pulling of individual plants in small areas. In larger areas other techniques, such as selective herbicide application, may be necessary. In either case the treatments should be undertaken prior to fruit formation and with a minimum of fragmentation of the individual plants. These actions will minimize the spreading of the populations. The Final GEIR for Eutrophication and Aquatic Plant Management in Massachusetts (Mattson et *al*. 2004) should be consulted prior to the development of any lake management plan to control non-native aquatic or wetland plant species.

- Where non-native plant infestations are more widespread conduct additional monitoring to determine the extent of the problem. The Final GEIR for Eutrophication and Aquatic Plant Management in Massachusetts (Mattson et *al*. 2004) should be consulted prior to the development of any lake management plan to control non-native aquatic plant species. Plant control options can be selected from several techniques (e.g., bottom barriers, drawdown, herbicides, etc.) each of which has advantages and disadvantages that need to be addressed for the specific site. However, methods that result in fragmentation (such as cutting or raking) should not be used because of the propensity for some invasive species of these plants to reproduce and spread vegetatively (from cuttings).

- Continue to monitor for the presence of invasive non-native aquatic vegetation. Prevent spreading of invasive aquatic plants. Once the extent of the problem is determined and control practices are exercised, vigilant monitoring needs to be practiced to guard against infestations in unaffected areas and to ensure that managed areas stay in check. A key portion of the prevention program should be posting of boat access points with signs to educate and alert lake-users to the problem and responsibility of spreading these species.

- Develop TMDLs for lakes listed in Category 5 of the 2002 Integrated List of Waters (MA DEP 2003a).

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**APPENDIX E - MA DEP DWM 2001 FISH TOXICS MONITORING IN THE WESTFIELD RIVER WATERSHED**



**APPENDIX F - MA DEP DWM 1996 AND 2001 LAKES SURVEY DATA WESTFIELD RIVER WATERSHED**



**APPENDIX G - 1996/1997 MA DEP DWM WATER QUALITY MONITORING IN THE WESTFIELD RIVER WATERSHED**



**APPENDIX H - SUMMARY OF NPDES AND WMA PERMITTING INFORMATION FOR THE WESTFIELD RIVER WATERSHED**



**APPENDIX I - MA DEP GRANT AND LOAN PROGRAMS**

There are no tables or figures in this appendix.